Business Acumen (35%)

This domain focuses on several key theoretical topics. It presents a corporation's mission, vision, goals, objectives, business strategy, and strategic planning process. It describes how to measure performance in the right way. It discusses organizational behavior, performance management, organizational structures, and common business processes. It compares and contrasts the roles of managers, leaders, and entrepreneurs. It highlights project management techniques and business contracts. It explores big data and data analytics that can be performed with big data. It explains what is involved in gathering business intelligence for use in formulating a business strategy. This domain highlights major business functions, business development life cycle, business skills, and business controls. All these topics are tested at the basic and proficient cognitive levels in Part 3 of the CIA Exam with a 35% weight given.

With respect to the CIA Exam, cognitive levels are labeled as proficient level and basic level. These cognitive levels suggest that more time and effort should be spent in studying and mastering the subject matter covered in the topics labeled as the proficient level. Comparatively less time and effort should be spent on the topics labeled as the basic level.
1.1 Strategic Planning Process

This section begins with the definition of business acumen, which sets the foundation and tone for the entire domain. A business's strategy, containing mission, vision, strategies, goals, objectives, and plans, is discussed with different types of strategies. Competitive forces, competitive strategies, and competitive analysis are highlighted. This section discusses value chain analysis and business portfolio models (i.e., BCG and GE). An overview of a business's strategic management and strategic planning process is presented. Related strategies and frameworks such as blue-ocean and red-ocean strategies, McKinsey 7-S Framework, and business policy are discussed.

**(a) Business Acumen Defined**

*Business acumen* means possessing the essential knowledge, skills, and abilities (KSAs) to succeed in the business field. Simply stated, business acumen means business savvy in terms of increasing revenues, decreasing costs, increasing profits, enhancing the stock market price, and creating a sustainable value to all stakeholders.

**Business acumen is a collective term representing several parts, such as:**

- Obtaining a deep understanding of a business's mission and vision
- Developing a business's strategies, goals, objectives, and plans
- Developing grand strategy, formulating strategic plans, executing (implementing) strategic plans, and exercising strategic controls
- Understanding the inner workings of core business functions (e.g., marketing, operating, and finance) and noncore business functions (e.g., accounting, human resources, IT, supply chain (procurement and logistics), legal, and public relations).
- Introducing new products and services with a long-lasting and built-in value into existing markets and new markets to increase the size of the market share, revenue, and profits.
- Applying general technology and IT as the major drivers of organizational change with the aim of improving business processes and gaining a competitive advantage.
- Complying with regulatory, legal, and social requirements
- Developing an organization's management reporting structures and systems
- Analyzing and streamlining business policies, procedures, and processes to gain efficiencies and to eliminate waste of resources
- Creating and growing human talent as a strategic asset and possessing the right mix of skill sets containing both soft skills and hard skills
- Analyzing big data for greater insights and better decisions
- Solving business problems and making business decisions
- Conducting business operations and handling all stakeholders in an ethical and legal manner
- Collecting business intelligence to develop better strategies for the company and to outsmart or outperform competitors' strategies
### (b) Business Strategy Defined

A corporation’s mission, vision, goals, and objectives establish its **business strategies**. The mission/vision and goals/objectives lead a company where it wants to go, and strategies define how it will get there. Strategy shows a big picture of the company and explains how senior management works on developing and executing the big-picture strategy.

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<th>Goals/Objectives</th>
<th>Strategies</th>
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#### (i) Mission and Vision

Mission and vision are the documented reasons for and purposes of the existence of an organization. The mission describes the organization’s vision, because the vision is a part of the mission. **Mission** reflects management’s values and beliefs. In other words, both mission and vision describe the overall goal of an organization.

Specifically, **vision** is a statement that explains what a company wants to become and what it hopes to achieve. It is an attractive, ideal future that is credible and believable yet not easily and readily attainable. Both mission and vision documents are developed simultaneously.

#### (ii) Goals

Goals are developed from mission and vision. A **goal** is a statement of general, broad-based, and long-term target, aim, and intent. It is the point toward which management directs its efforts and resources. It is a desired future state that the organization attempts to reach. Goals, which are derived from mission/vision, can be classified as strategic, tactical, operational, and stretch. Goals can be quantitative and qualitative in nature, with qualitative goals most common.

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Goals represent major targets, aims, and intentions of management to make an organization better than before. Goals are of four types: strategic, tactical, operational, and stretch. Operational goals are derived from tactical goals, which, in turn, are derived from strategic goals. Note that stretch goals can be applied to the three primary types of goals (strategic, tactical, and operational). The reason for the varieties of goals is that they all have different purposes and timelines.

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**Strategic goals** are the starting point for all the other goals and include general, very broad, and high-level measurable results expected of the entire organization. They do not focus on individual divisions, departments, or business units of a company. Strategic goals focus on how to increase market share, how to enter into new markets, how best to position products and services, how to outsmart competitors, how to increase revenues and profits, and how to decrease costs. Strategic plans define how to achieve the strategic goals.

**Tactical goals** include both specific, broad, and medium-level measurable results in terms of clear outcomes expected of individual divisions, departments, and business units that support the strategic goals. These goals focus on how to get maximum performance from employees, suppliers, vendors, and contractors. Tactical plans define how to achieve the tactical goals.
**Operational goals** include very specific, very detailed (narrow), and low-level measurable results expected of individual employees and work groups. These goals focus on how to get maximum utilization of resources. Operational plans define how to achieve the operational goals.

**Stretch goals** expand normal (ordinary) goals to abnormal (extraordinary) goals and require radical thinking in order to achieve major and noteworthy improvements. Stretch goals are highly ambitious, coming from aim-high thinking. Stretch goals are normal goals stretched out, and they are difficult and challenging, not impossible, to achieve. Stretch plans define how to achieve the stretch goals (i.e., extended goals). Note that strategic, tactical, and operational goals can have variations of stretch goals, meaning each goal is further challenged and expanded to get the most out of it.

(iii) **Objectives**
Objectives are developed from goals. An **objective** is a statement of specific, narrow-based, and short-term target, aim, and intent. It is the expected result or product of a project, usually defined in terms of scope, schedule, and cost. An objective is the quantitative statement of future expectations and an indication of when expectations should be achieved. Objectives flow from goals and specify what needs to be accomplished. Both goals and objectives are developed simultaneously as objectives are derived from goals.

\[
\text{Goals} \rightarrow \text{Objectives}
\]

(iv) **Strategies**
Strategies are developed from goals and objectives, which, in turn, form the basis for developing plans and actions and for producing results. **Strategies** identify general approaches a business should take in order to achieve its mission/vision and goals/objectives. Mission/vision and goals/objectives lead an organization where it wants to go, and strategies define how it will get there. Strategies are developed from goals and objectives.

\[
\text{Goals/Objectives} \rightarrow \text{Strategies}
\]

Strategy shows a documented plan of actions with required four resources (men, money, machinery, and materials—4Ms) to achieve an organization’s stated goals and objectives. Strategies have time frames of short term (within one year), intermediate term (between one and two years), and long term (three years and up).

(v) **Plans, Actions, and Results**
A **plan** is a blueprint specifying the resources, schedules, and actions needed to achieve goals. Planning types include strategic, tactical, operational, and contingency plans. The latter plan (contingency plan) is needed to support the former three plans. Planning levels include corporate, business unit, functional, and department. Plans are derived from strategies. Plans are turned into actions, which, in turn, are turned into results.

\[
\text{Strategies} \rightarrow \text{Plans}
\]

**Actions** are systematic and structured steps, tasks, or activities required to achieve the defined plans. Actions are the solid proof that a plan is fully implemented or executed into required operations. Actions produce **results** that management is expecting.

\[
\text{Plans} \rightarrow \text{Actions} \rightarrow \text{Results}
\]
In summary, the correct sequence of elements of a retailer’s strategy is:

Mission/Vision → Goals/Objectives → Strategies → Plans/Actions → Results

(c) Different Types of Strategies

Organizational strategies answer a basic question: What is the basis for developing a strategy internally? Organizational strategies identify general approaches a business should take in order to achieve its stated mission, vision, goals, and objectives. Strategy sets the major directions for the entire organization to follow.

A corporation’s strategy is a combination of corporate-level, business unit-level, functional-level, and department-level strategy.

- A corporate-level strategy is concerned with the question “What business are we in?” This question is similar to the mission statement’s question. Senior managers and executives develop this long-term strategy.
- A business unit-level strategy is concerned with the question “How do we compete?” This question is linked to the corporate-level strategy. A business can be divided into business-unit 1, business-unit 2, and business-unit N. These units can be major divisions of a company. The division heads and general managers develop this intermediate-term strategy.
- A functional-level strategy is concerned with the question “How do we support our chosen strategy?” This question is linked to both business unit-level and corporate-level strategies. A business is divided into various functions, including marketing, operations, and others. For example, executives in the marketing function develop this intermediate-term strategy.
- A department-level strategy is concerned with the question “How do we mobilize our resources to support the chosen strategy?” This question is linked to both functional-level and business unit-level strategy. For example, the marketing function is divided into sales, advertising, and customer service departments. Managers of these departments develop this short-term strategy.

(d) Competitive Forces, Strategies, and Analysis

The essence of formulating a competitive strategy is relating a company to its environment, that is, the industry or industries in which it operates and competes. The major components of competitive strategy include understanding competitive forces, identifying competitive strategies, and performing competitor analysis in a specific industry.

(i) Competitive Forces

Porter’s six competitive forces are at work on an industry. These forces include:

1. Threat of new entrants
2. Rivalry among existing firms
3. Pressure from substitute products or services
4. Bargaining power of buyers
5. Bargaining power of suppliers
6. Availability of complementary products and services

All six competitive forces jointly determine the intensity of industry competition and profitability.¹

1. **Threat of new entrants.** New entrants to an industry bring new capacity and the desire to gain market share. They often also bring substantial resources. As a result, prices can be low, cost can be high, and profits can be low. A relationship exists between threat of new entrants, barriers to entry, and reaction from existing competitors. For example:
   - If barriers are high and reaction is high, then the threat of entry is low.
   - If barriers are low and reaction is low, then the threat of entry is high.

Seven major *barriers to entry* exist, including: economies of scale, product differentiation, capital requirements, switching costs, access to distribution channels, cost disadvantages independent of scale, and government policy.

2. **Rivalry among existing firms.** Rivalry tactics include price competition, advertising battles, new product introduction, and increased customer service or product/service warranties.

   Competitors are mutually dependent in terms of action and reaction, moves and counter-moves, or offensive and defensive tactics. Intense rivalry is the result of a number of interacting structural factors, such as numerous or equally balanced competitors, slow industry growth, high fixed costs or storage costs, lack of differentiation or switching costs, capacity increases in large increments, diverse competitors, high strategic stakes, and high exit barriers.

3. **Pressure from substitute products or services.** In a broad sense, all firms in an industry are competitors with industries producing substitute products. Substitutes limit the potential returns of an industry by placing a ceiling on the prices firms can profitably charge. The more attractive the price–performance alternative offered by substitutes, the stronger or firmer the lid on industry profits. Substitute products that deserve the most attention are those that are subject to trends that improve their price–performance trade-off with the industry’s product or that are produced by industries earning high profits.

4. **Bargaining power of buyers.** Buyers (purchasing agents) compete with the industry by forcing down prices, bargaining for higher quality and larger quantities or for better services, and playing suppliers against each other—all at the expense of industry profits. Buyers acquire full information about product demand, prices, and costs. Informed buyers become empowered buyers.

5. **Bargaining power of suppliers.** Suppliers can exert bargaining power over participants in an industry by threatening to raise prices or reduce the quality of purchased goods or services. The conditions making suppliers powerful tend to mirror those making buyers powerful.

6. **Availability of complementary products and services.** This means how buying a product (product 1) from one company impacts the sales of a complementary product (product 2) from the same company or other companies. Customers have a choice of buying product 1 and product 2 either from the same company or from different companies.

   The impact is high if product 1 cannot function without product 2. The impact of complementary products can be good or bad for an industry’s profitability because the complementary products can belong to the same industry or to different industries.

(ii) Competitive Strategies

**Competitive strategy** is taking offensive or defensive actions to create a defendable position in an industry, to cope with the six competitive forces in order to achieve a superior return on investment (ROI). It is more important than ever for companies to distinguish themselves through careful strategic positioning in the marketplace.

Porter studied a number of businesses and introduced a framework describing three generic competitive strategies to outperform other firms in an industry. These three strategies include *differentiation, low-cost leadership,* and *focus.* The focus strategy, in which the organization concentrates on a specific market or buyer group, is further divided into a strategy called focused low cost and focused differentiation. Before developing these four basic strategies, managers can evaluate two factors, such as competitive advantage and competitive scope.

**Competitive advantage.** Managers can determine whether to compete through lower cost or through the ability to offer unique or distinctive products and services that can command a premium price.

**Competitive scope.** Managers can then determine whether the organization will compete on a broad scope (in many customer segments) or a narrow scope (in a selected customer segment or group of segments). These choices determine the selection of strategies.

1. **Differentiation strategy.** The differentiation strategy involves an attempt to distinguish the firm’s products or services from others in the industry. An organization may use advertising, distinctive product features, exceptional service, or new technology to achieve a product that is perceived as unique.

   This strategy usually targets customers who are not particularly concerned with price, so it can be quite profitable because customers are loyal and will pay high prices for the product.

   Companies that pursue a differentiation strategy typically need strong marketing abilities, a creative flair, and a reputation for leadership.

   A differentiation strategy can reduce rivalry with competitors and fight off the threat of substitute products because customers are loyal to the company’s brand. However, companies must remember that successful differentiation strategies require a number of costly activities, such as product research and design and extensive advertising.

2. **Low-cost leadership strategy.** With a low-cost leadership strategy, the organization aggressively seeks efficient facilities, pursues cost reductions, and uses tight cost controls to produce products more efficiently than competitors. A low-cost position means that the company can undercut competitors’ prices and still offer comparable quality and earn a reasonable profit. Being a low-cost producer provides a successful strategy to defend against the six competitive forces.

   The low-cost leadership strategy tries to increase market share by emphasizing low cost compared to competitors. This strategy is concerned primarily with stability rather than taking risks or seeking new opportunities for innovation and growth.

3. **Focus strategy.** With Porter’s third strategy, the focus strategy, the organization concentrates on a specific regional market or buyer group. The company will use either a differentiation or low-cost approach, but only for a narrow target market.

(iii) Competitive Analysis

The objective of a competitive or competitor analysis is to develop a profile of the nature and success of the likely strategy changes, each competitor’s response to the strategic moves, and
each competitor’s probable reaction to the industry changes. A series of what-if questions must be raised and answered during this sensitivity analysis.

Competitive Forces ➔ Competitive Strategies ➔ Competitive Analysis

Four diagnostic components to a competitor analysis include:

1. Future goals
2. Current strategy (either explicit or implicit)
3. Assumptions
4. Capabilities (strengths and weaknesses)

Both future goals and assumptions jointly answer the question “What drives the competitor?” Both current strategy and capabilities jointly answer the question “What is the competitor doing and what can it do?”

Future goals should focus on attitude toward risks, financial goals, organizational values or beliefs, organizational structure, incentive systems, accounting systems, leadership styles, composition of the board of directors, and contractual commitments (e.g., debt covenants, licensing, and joint ventures).

Examining assumptions can identify biases or blind spots that may creep into management thinking. Rooting out these blind spots can help the firm identify competitive moves or retaliation methods (i.e., fighting back). Assumptions focus on competitors’ relative position in cost, quality, and technology; cultural, regional, or national differences; organizational values; and future demand and industry trends.

A competitor’s goals, assumptions, and current strategy will influence the likelihood, timing, nature, and intensity of a competitor’s reactions. A competitor’s strengths and weaknesses (i.e., strengths, weaknesses, opportunities, and threats [SWOT] analysis) will determine its ability to initiate or react to strategic moves and to deal with industry events that occur.

(e) Value Chain Analysis

(i) Value Defined
Defining the value of a product or service is difficult because different people perceive value very differently. For example, most people equate value of a product to low-cost, friendly service; a pleasant shopping experience; free parking; less driving; more convenience; more time savings; fewer hassles; name brand; high quality; ease of use; and other factors. Value comparison based on cost factor is shown next:

Retailer A is selling a national brand at a price of $1.99 per item.
Retailer B is selling the same national brand at a price of $2.19 per item.
Value to a customer buying this item from Retailer A: $0.20 due to low cost.

Defined in a simple and clear way, value is realized when benefits exceed costs. Within the retail context, value to a retailer or customer is realized when benefits exceed costs, and the difference is value.
Value to retailer = Price received from customer > Costs paid to producers or others
= Benefits – Costs

Value to customer = Benefits received from retailer > Costs paid to retailer
= Benefits – Costs

Note that a retailer receives an initial value for a product when it is purchased from producers (e.g., manufacturers, distributors, or vendors). Then suppliers in the supply chain can add their own value to make the product more functional, and later the same retailer can add its own value to make the product even better to his customers. Customers receive that total value (cumulative value) when they purchase a product from that retailer.

Although a retailer can create or add value anytime during a business process, it is useful and beneficial to add value at the right time and at the right place to seize the right opportunity. A built-in value at the beginning of a process lasts longer and is visible throughout the process than an add-on value later; and it is true with manufacturers, producers, suppliers, and retailers. Most customers can recognize value when they see a product, touch and feel it, and use it.

**Example 1:** Value is created when fresh apples are not bruised or stained (colored).

**Example 2:** Value is destroyed when a smartphone catches fire while its battery is charging.

Because a business process consists of a series of several interdependent and interconnected activities with various tasks of different sizes and length, value must be added from the beginning to the end of the process to provide a continuity of and consistency in value for some products. Moreover, value must be built in, not built on for most products; it must be based on forethought, not afterthought; and it must be based on a proactive thinking, not reactive thinking.

Value must be thought through for products and services as a continuum, as shown:

Value to Products → Product Conception → Product Commercialization

Value to Services → Service Initiation → Service Delivery

**(ii) Value Creation**

If value given to products and services is so important to customers, how will retailers create or add such value to their products and services? Retailers that create and sustain value to customers will survive; those that do not create or add value to customers will die. There are several places, points, and factors available for retailers to provide value-oriented products and services to customers. Broadly speaking, examples of value-creating places include:

- When a retailer is:
  - Procuring or purchasing a product (merchandise) from a manufacturer, wholesaler, distributor, vendor, dealer, or supplier
  - Receiving a product (merchandise) from a manufacturer, wholesaler, distributor, vendor, dealer, or supplier
  - Placing or displaying the merchandise in a physical store or online store for customers to view and see
  - Selling a product or service, either offline or online
When a customer is:
- Conducting research or making inquiries during a prepurchase phase
- Being helped by a retail employee in purchasing a product or service, either offline or online
- Purchasing a product or service, either offline or online
- Paying for a purchased product or service
- Receiving a purchased product or service
- Returning a purchased product
- Providing feedback after purchasing a product or service (i.e., postpurchase)
- Using a product

Note that value creation is a continuous and constant process of improving. Value can be created or destroyed at the level of an individual product, service, employee, store, division, and corporation in the aggregate. All these levels provide an additive value with synergistic and long-lasting effect at the corporation level.

### (iii) Value Maximization Goal
Implementing value maximization goals will eventually turn normal organizations into world-class organizations. This is achieved through productive employees, efficient design of business processes, and effective use of quality tools and techniques combined with forward-looking management to create a sustainable and synergistic value for an organization’s products and services.

Value-Based Organization = World-Class Organization

Creating new value or adding value to existing value is the major purpose of business corporations. For example, the total value of a manufacturing corporation is the summation of individual values of each product manufactured. Similarly, the total value of a service corporation is the summation of individual values of each service provided.

One way to increase the value of a product or service is by decreasing the cost while keeping the price of a product or service constant. Other ways of increasing the value of a company include breaking the value–cost trade-off with innovative strategies and investing in human capital and technology capital for creating innovative new products and services with sustainable value.

Value creation is the heart of organizational activity at the organization level. Benchmarking provides the metrics by which to understand and judge the value provided by the organization and its resources. Benchmarking focuses on continuous improvements and value creation for stakeholders (i.e., owners, customers, employees, and suppliers), and it can utilize best practices to focus on improving performance. When it comes to valuing or selling a specific brand, division, or a retail company, goodwill is often considered in addition to strategic, operational, and functional advantages. Goodwill is a subjective and qualitative assessment of a company, which is difficult to assess.

### (iv) Value Chain Analysis
Michael Porter of Harvard Business School has created a generic value chain concept covering from manufacturing to marketing activities primarily aimed at the manufacturing industry. It includes nine activities divided into five primary activities and four secondary ones, where each
activity interacts with other activities and where each activity contributes an incremental value to the total value of a firm or company. Customer consumers are the primary beneficiaries of the value chain; the stockholders and owners are the secondary beneficiaries.²

The author of this book adapted and tailored the value chain concept to the retail industry and showed how retailers can add or create value to their customers during customer’s shopping journey through retail examples.

Five primary activities include:

1. **Inbound logistics.** The scope of work activities in inbound logistics includes bringing raw materials or ingredients from source to destination (i.e., from suppliers to manufacturers). Inbound logistics balances variables such as delivery speed, cost, and quality. Upstream suppliers (supplier 1, 2, and N) are involved in inbound logistics where they bring raw materials, ingredients, product parts, and product components from various places and deliver them to manufacturers to make finished goods.

2. **Operations.** The scope of work activities in operations includes:
   - Transforming raw materials into finished goods with just-in-time (JIT) production methods in a manufacturing factory;
   - Applying total quality management principles to improve quality of products;
   - Complying with the manufacturing and quality standards issued by the International Organization for Standards (ISO);
   - Implementing Six Sigma quality concepts to develop and deliver near-perfect products and services;
   - Implementing statistical process control techniques to reduce variations in processes and products from expected standards or targets and to eliminate defects and errors in manufacturing processes;
   - Adhering to the generally accepted manufacturing practices, which focus on separating value-added activities from non-value-added activities;
   - Embracing lean manufacturing practices, which focus on eliminating waste and enhancing the value of a company’s products; and
   - Complying with Underwriters Laboratory guidelines (UL certified logo) to prevent hazards from using unsafe products by children and adults.

3. **Outbound logistics.** The scope of work activities in outbound logistics includes shipping finished goods from manufacturers or producers to wholesalers, distributors, and retailers. Similar to inbound logistics, outbound logistics balances variables such as delivery speed, cost, and quality. Downstream suppliers (supplier 1, 2, and N) are involved in outbound logistics where they bring finished goods from manufacturers or producers to retailers and eventually to customers. Basically, the supply chain members bring products from producers and suppliers and deliver them to consumers and customers; it is a logistics and delivery concept.

4. **Marketing and sales.** The scope of work activities in marketing and sales includes developing strategies and short- and long-term sales plans and budgets; marketing mix, including marketing channels; brand positioning and equity; and developing plans for advertisements and promotions.

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5. **Service.** The scope of work activities in service includes postsale service such as addressing product warranties and guarantees; product returns, exchanges, and replacements; product repairs, recalls, and recovery methods. Whether a current customer will repurchase from the same company depends on how well that customer is currently serviced. Service is an important area that is often neglected or forgotten by management at all levels.

Four secondary activities include:

1. **Procurement.** The scope of work activities in procurement includes:
   - Developing short-term and long-term procurement plans and budgets for purchasing various materials and products;
   - Negotiating various terms and conditions involved in procuring various types of raw materials and finished products;
   - Participating in developing product specifications with manufacturing and design engineers; and
   - Placing and receiving raw materials and finished goods.

   Procurement is a big-budget item for both manufacturers and retailers, especially for the latter because retailers spend most of their money buying finished goods from manufacturers, wholesalers, distributors, and vendors.

2. **Technology development.** The scope of work activities in technology development includes formulating short-term and long-term plans and budgets for improving current technology and exploring new technology. It includes computer hardware and software, computer networks, peripheral devices, and mobile devices. Technology is seen as the major driver of many businesses, especially those in retail.

3. **Human resource management.** The scope of work activities in human resource (HR) management includes hiring, training, and developing talented employees to retain and sustain human talent; providing health benefits to employees and their families; and working with labor unions.

4. **Firm infrastructure.** The scope of work activities in a firm’s infrastructure includes external framework and internal framework. Components of external framework include understanding the economic and political conditions and governmental laws and regulations in a country. Components of internal framework include practicing good corporate governance principles and management strategies in a single firm or company.

**(f) Business Portfolio Models**

A firm is said to have a sustainable competitive advantage over other firms when it has technical superiority, low-cost production, good customer service/product support, good location, adequate financial resources, continuing product innovations, and overall marketing skills.

**Portfolio strategy** pertains to the mix of business units and product lines that fit together in a logical way to provide synergy and competitive advantage for the corporation. For example, an individual might wish to diversify in an investment portfolio with some high-risk stocks, some low-risk stocks, some growth stocks, and perhaps a few fixed-income bonds. In much the same way, corporations like to have a balanced mix of business divisions called strategic business units (SBUs). An SBU has a unique business mission, product line, competitors, and markets relative to other SBUs in the corporation. Executives in charge of the entire corporation generally define the grand strategy and then bring together a portfolio of SBUs to carry it out.
Portfolio models can help corporate management to determine how resources should be allocated among the various SBUs, consisting of product lines and/or divisions. The portfolio techniques are more useful at the corporate-level strategy than at the business-level or functional-level strategy. Two widely used portfolio models are the Boston Consulting Group (BCG) matrix and the General Electric (GE) model, which are discussed next.

(i) BCG Matrix Model
The BCG matrix model organizes businesses along two dimensions—business growth rate and market share. **Business growth rate** pertains to how rapidly the entire industry is increasing. **Market share** defines whether a business unit has a larger or smaller share than competitors. The combinations of high and low market share and high and low business growth provide four categories for a corporate portfolio.

The BCG matrix model utilizes a concept of **experience curves**, which are similar in concept to learning curves. The experience curve includes all costs associated with a product and implies that the per-unit cost of a product should fall, due to cumulative experience, as production volume increases. The manufacturer with the largest volume and market share should have the lowest marginal cost. The leader in market share should be able to underprice competitors and discourage entry into the market by potential competitors. As a result, the leader will achieve an acceptable ROI.

The BCG model (growth/market share matrix) is based on the assumption that profitability and cash flows will be closely related to sales volume. Here, **growth** means use of cash, and **market share** means source of cash. Each SBU is classified in terms of its relative market share and the growth rate of the market the SBU is in, and products are classified as stars, cash cows, dogs, or question marks. Relative market share is the market share of a firm relative to that of the largest competitor in the industry.

The following list describes the components of the BCG model:

- **Stars** are SBUs with a high market share of a high-growth market. They require large amounts of cash to sustain growth despite producing high profits.
- **Cash cows** are often market leaders (high market share), but the market they are in is a mature, slow-growth industry (low growth). They have a positive cash flow.
- **Dogs** are poorly performing SBUs that have a low market share of a low-growth market. They are modest cash users and need cash because of their weak competitive position.
- **Question marks (problem children)** are SBUs with a low market share of a new, high-growth market. They require large amounts of cash inflows to finance growth and are weak cash generators because of their poor competitive position. The question mark business is risky: It could become a star, or it could fail.

The desirable sequence of portfolio actions for the BCG model is:

- A star SBU eventually becomes a cash cow as its market growth slows.
- Cash cow SBUs should be used to turn question marks into stars.
- Dog SBUs should either be harvested or divested from the portfolio.
- Question mark SBUs can be nurtured to become future stars.
- Unqualified question mark SBUs should be harvested until they become dogs.
(ii) GE Model
The GE model is an alternative to the BCG model. It incorporates more information about market opportunities (industry attractiveness) and competitive positions (company/business strength) to allocate resources. The GE model emphasizes all the potential sources of business strength and all the factors that influence the long-term attractiveness of a market. All SBUs are classified in terms of business strength (i.e., strong, average, weak) and industry attractiveness (i.e., high, medium, low).

**Business strength** is made up of market share, quality leadership, technological position, company profitability, company strengths and weaknesses, and company image. The major components of **industry attractiveness** are market size, market share, market growth, industry profitability, and pricing.

Overall strategic choices include either to invest capital to build position, to hold the position by balancing cash generation and selective cash use, or to harvest or divest. The GE model incorporates subjective judgment, and accordingly, it is vulnerable to manipulation. However, it can be made stronger with the use of objective criteria.

(iii) BCG Model versus GE Model
Both the BCG matrix model and the GE model help in competitive analysis and provide a consistency check in formulating a competitive strategy for a particular industry. Either model can be used, based on the manager’s preference. However, if a competitor uses the BCG model because of experience curves, then a company can benefit by using the same model.

**BCG, GE, and Porter Models Compared**

- Both the BCG matrix and the GE model focus on corporate-level strategy accomplished through acquisition or divestment of business.
- Porter’s five competitive forces and three competitive strategies focus on business-level strategy accomplished through competitive actions.
- Despite its widespread use in allocating corporate resources and acceptance by managers, the BCG model has been criticized for:
  - Focusing on market share and market growth as the primary indicators of profitability.
  - Its assumption that the major source of SBU financing comes from internal means.
  - Its assumption that the target market has been defined properly along with its interdependencies with other markets.

(g) Strategic Management Process
**Strategic management** is the set of decisions and actions used to formulate and implement strategies that will provide a competitively superior fit between the organization and its environment so as to achieve organizational goals. Managers ask questions such as: What changes and trends are occurring in the competitive environment? Who are our customers? What products or services should we offer? How can we offer those products and services most efficiently? Answers to these questions help managers make choices about how to position their organization in the environment with respect to rival companies. Superior organizational performance is not a matter of luck. It is determined by the choices that managers make.
Top executives use strategic management to define an overall direction for the organization, which is the firm’s grand strategy. The strategic management process is defined as a series of these activities:

```
Grand Strategy  →  Strategy Formulation (Planning)  →  Strategy Implementation  
                  →  Strategic Control
```

(i) Grand Strategy
The grand strategy is the general plan of major action by which a firm intends to achieve its long-term goals. Grand strategies can be defined for four general categories: growth, stability, retrenchment, and global operations.

Growth can be promoted internally by investing in expansion or externally by acquiring additional business divisions. Internal growth can include development of new or changed products or expansion of current products into new markets. External growth typically involves diversification, which means the acquisition of businesses that are related to current product lines or that take the corporation into new areas. The number of companies choosing to grow through mergers and acquisitions (M&A) is astounding, as organizations strive to acquire the size and resources to compete on a global scale, to invest in new technology, and to control distribution channels and guarantee access to markets.

Stability, sometimes called a pause strategy, means that the organization wants to remain the same size or grow slowly and in a controlled fashion. The corporation wants to stay in its current business. After organizations have undergone a turbulent period of rapid growth, executives often focus on a stability strategy to integrate SBUs and to ensure that the organization is working efficiently.

Retrenchment means that the organization goes through a period of forced decline by either shrinking current business units or selling off or liquidating entire businesses. The organization may have experienced a precipitous drop in demand for its products or services, prompting managers to order across-the-board cuts in personnel and expenditures. Liquidation means selling off a business unit for the cash value of the assets, thus terminating its existence. Divestiture involves the selling off of businesses that no longer seem central to the corporation. Studies show that between 33% and 50% of all acquisitions are later divested. Retrenchment is also called downsizing.

In today’s global operations, senior executives try to formulate coherent strategies to provide synergy among worldwide operations for the purpose of fulfilling common goals. Each country or region represents a new market with the promise of increased sales and profits. In the international arena, companies face a strategic dilemma between global integration and national responsiveness. Organizations must decide whether they want each global affiliate to act autonomously or whether activities should be standardized and centralized across countries. This choice leads managers to select a basic grand strategy alternative, such as globalization versus multidomestic strategy. Some corporations may seek to achieve both global integration and national responsiveness by using a transnational strategy.

When an organization chooses a strategy of globalization, its product design and advertising strategies are standardized throughout the world. This approach is based on the assumption that a single global market exists for many consumer and industrial products. The theory is that
people everywhere want to buy the same products and live the same way. A globalization strategy can help an organization reap efficiencies by standardizing product design and manufacturing, using common suppliers, introducing products around the world faster, coordinating prices, and eliminating overlapping facilities. Globalization enables marketing departments alone to save millions of dollars.

When an organization chooses a **multidomestic strategy**, competition in each country is handled independently of industry competition in other countries. Thus, a multinational company is present in many countries, but it encourages marketing, advertising, and product design to be modified and adapted to the specific needs of each country. Many companies reject the idea of a single global market.

A **transnational strategy** seeks to achieve both global integration and national responsiveness. A true transnational strategy is difficult to achieve because one goal requires close global coordination while the other goal requires local flexibility. However, many industries are finding that, although increased competition means they must achieve global efficiency, growing pressure to meet local needs demands national responsiveness.

Although most multinational companies want to achieve some degree of global integration to hold costs down, even global products may require some customization to meet government regulations in various countries or some tailoring to fit consumer preferences. In addition, some products are better suited for standardization than others. Most large multinational corporations with diverse products will attempt to use a partial multidomestic strategy for some product lines and global strategies for others. Coordinating global integration with responsiveness to the heterogeneity of international markets is a difficult balancing act for managers, but it is an increasingly important one in today’s global business world.

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**KEY CONCEPTS TO REMEMBER: Vocabulary Related to Strategic Management**

- **Organizational goal.** An organizational goal is a desired state of affairs that the organization attempts to reach. A goal represents a result or an end point toward which organizational efforts are directed. The choice of goals and strategy affects organization design. Top managers give direction to organizations. They set goals and develop the strategies for their organization to attain those goals.

- **Organizational purpose.** Organizations are created and continued in order to accomplish something. This purpose may be referred to as the overall goal or mission. Different parts of the organization establish their own goals and objectives to help meet the overall goal, mission, or purpose of the organization.

  Many types of goals exist in an organization, and each type performs a different function. One major distinction is between the officially stated goals, or mission, of the organization and the operative goals that the organization actually pursues.

- **Mission.** The overall goal for an organization is often called the mission—the organization’s reason for existence. The mission describes the organization’s vision, its shared values and beliefs, and its reason for being. It can have a powerful impact on an organization. The mission is sometimes called the official goal, which consists of the formally stated definition of business scope and outcomes the organization is trying to achieve. Official goal statements typically define business operations and may focus on values, markets, and customers that distinguish the organization. Whether
called a mission statement or an official goal, the organization's general statement of its purpose and philosophy is often written down in a policy manual or annual report.

- **Operative goals.** Operative goals designate the ends sought through the actual operating procedures of the organization and explain what the organization is actually trying to do. Operative goals describe specific measurable outcomes and are often concerned with the short run. Operative versus official goals represent actual versus stated goals. Operative goals typically pertain to the primary tasks an organization must perform. These goals concern overall performance, boundary activities, maintenance, adaptation, and production activities. Specific goals for each primary task provide direction for the day-to-day decisions and activities within departments.

- **Purpose of strategy.** A strategy is a plan for interacting with the competitive environment to achieve organizational goals. Some managers think of goals and strategies as interchangeable, but for our purposes, goals define where the organization wants to go and strategies define how it will get there. For example, a goal may be to achieve 15% annual sales growth; strategies to reach that goal might include aggressive advertising to attract new customers, motivating salespeople to increase the average size of customer purchases, and acquiring other businesses that produce similar products.

  Strategies can include any number of techniques to achieve the goal. The essence of formulating strategies is choosing whether the organization will perform different activities from its competitors or will execute similar activities more efficiently than its competitors do.

  Within the overall grand strategy of an organization, executives define an explicit strategy, which is the plan of action that describes resource allocation and activities for dealing with the environment and attaining the organization's goals. The essence of formulating strategy is choosing how the organization will be different. Managers make decisions about whether the company will perform different activities or will execute similar activities differently than its competitors do. Strategy necessarily changes over time to fit environmental conditions, but to remain competitive, companies develop strategies that focus on core competencies, develop synergy, and create value for customers.

  A company's **core competence** is something the organization does especially well in comparison to its competitors. A core competence represents a competitive advantage because the company acquires expertise that competitors do not have. A core competence may be in the area of superior research and development (R&D), expert technological know-how, process efficiency, or exceptional customer service.

  When organizational parts interact to produce a joint effect that is greater than the sum of the parts acting alone, synergy occurs. The organization may attain a special advantage with respect to cost, market power, technology, or management skill. When properly managed, synergy can create additional value with existing resources, providing a big boost to the bottom line. Synergy can also be obtained through good relations with suppliers or by strong alliances among companies.

  Delivering value to the customer should be at the heart of strategy. Value can be defined as the combination of benefits received and costs paid by the customer. Managers help their companies create value by devising strategies that exploit core competencies and attain synergy.

- **Levels of strategy.** Another aspect of strategic management concerns the organizational level to which strategic issues apply. Strategic managers normally think in terms of three levels of strategy: corporate, business, and functional.

  The question “What business are we in?” concerns corporate-level strategy, which pertains to the organization as a whole and the combination of business units and product lines that make up the corporate entity. Strategic actions at this level usually relate to the acquisition of new businesses; additions or divestments of business units, plants, or product lines; and joint ventures with other corporations in new areas.

(continued)
The question “How do we compete?” concerns business-level strategy, which pertains to each business unit or product line. It focuses on how the business unit competes within its industry for customers. Strategic decisions at the business level concern the amount of advertising, direction and extent of R&D, product changes, new-product development, equipment and facilities, and expansion or contraction of product lines. Many companies are operating e-commerce units as a part of business-level strategy.

The question “How do we support the business-level competitive strategy?” concerns functional-level strategy, which pertains to the major functional departments within the business unit. Functional strategies involve all of the major functions, including finance, R&D, marketing, and manufacturing.

**Partnership strategies and business ecosystems.** So far, we have been discussing strategies that are based on how to compete with other companies. An alternative approach to strategy emphasizes collaboration. In some situations, companies can achieve competitive advantages by cooperating with other firms rather than competing. Partnership strategies are becoming increasingly popular as firms in all industries join with other organizations to promote innovation, expand markets, and pursue joint goals. Partnering was once a strategy adopted primarily by small firms that needed greater marketing muscle or international access. Today, however, it has become a way of life for most companies, large and small. The question is no longer whether to collaborate but rather where, how much, and with whom to collaborate. Competition and cooperation often exist at the same time representing business ecosystems. The Internet is both driving and supporting the move toward partnership thinking.

Mutual dependencies and partnerships have become a fact of life, but the degree of collaboration varies. Organizations can choose to build cooperative relationships in many ways, such as through preferred suppliers, strategic business partnering, joint ventures, or M&As. A still higher degree of collaboration is reflected in joint ventures, which are separate entities created with two or more active firms as sponsors. M&As represent the ultimate step in collaborative relationships.

Today’s companies embrace both competition and cooperation simultaneously. Few companies can go it alone under a constant onslaught of international competition, changing technology, and new regulations. In this new environment, businesses choose a combination of competitive and partnership strategies that add to their overall sustainable advantage.

Overall effectiveness is difficult to measure in organizations, which are large, diverse, and fragmented. They perform many activities simultaneously and pursue multiple goals. They also generate many outcomes, some intended and some unintended. Managers determine which indicators to measure in order to gauge the effectiveness of their organizations. One study found that many managers have a difficult time with the concept of evaluating effectiveness based on characteristics that are not subject to hard, quantitative measurement. However, top executives at some of today’s leading companies are finding new ways to measure effectiveness, using indicators such as “customer delight” and employee satisfaction. A number of approaches to measuring effectiveness look at which measurements the organization managers choose to track. These contingency effectiveness approaches are based on looking at which part of the organization managers consider most important to measure.

**Contingency effectiveness approaches.** Contingency approaches to measuring effectiveness focus on different parts of the organization. Traditional approaches include the goal approach, the resource-based approach, and the internal process approach. Organizations bring resources in from the environment, and those resources are transformed into outputs delivered back into the environment. The goal approach to organizational effectiveness is concerned with the output side and whether the organization achieves its goals in terms of desired levels of output. The
resource-based approach assesses effectiveness by observing the beginning of the process and evaluating whether the organization effectively obtains resources necessary for high performance. The internal process approach looks at internal activities and assesses effectiveness by indicators of internal health and efficiency.

These traditional approaches all have something to offer, but each one tells only part of the story. A more recent stakeholder approach (also called the constituency approach) acknowledges that each organization has many constituencies that have a stake in its outcomes. The stakeholder approach focuses on the satisfaction of stakeholders as an indicator of the organization’s performance.

(ii) Strategy Formulation

The overall strategic management process begins when executives evaluate their current position with respect to mission, goals, and strategies. They then scan the organization’s internal and external environments and identify strategic factors that might require change. Internal or external events might indicate a need to redefine the mission or goals or to formulate (plan) a new strategy at the corporate, business, or functional level. The next stage is implementation of the new strategy. The final stage is strategic control to keep strategic plans on track.

Strategy formulation (planning) includes the planning and decision making that lead to the establishment of the firm’s goals and the development of a specific strategic plan. Strategy formulation may include assessing the external environment and internal problems and integrating the results into goals and strategy. This contrasts with strategy implementation, which is the use of managerial and organizational tools to direct resources toward accomplishing strategic results. Strategy implementation is the administration and execution of the strategic plan. Managers may use persuasion, new equipment, changes in organization structure, or a reward system to ensure that employees and resources are used to make formulated strategy a reality.

WHAT IS STRATEGIC MANAGEMENT?

Strategic management is strategic formulation (planning) plus strategic implementation plus strategic control.

Formulating (planning) strategy often begins with an assessment of the internal and external factors that will affect the organization’s competitive situation. Situation analysis typically includes a search for SWOT (strengths, weaknesses, opportunities, and threats) that affect organizational performance. Situation analysis is important to all companies but is crucial to those considering globalization because of the diverse environments in which they will operate. External information about opportunities and threats may be obtained from a variety of sources, including customers, government reports, professional journals, suppliers, bankers, friends in other organizations, consultants, and association meetings. Many firms hire special scanning organizations to provide them with newspaper readings, Internet research, and analyses of relevant domestic and global trends. Some firms use more subtle techniques to learn about competitors, such as asking potential recruits about their visits to other companies, hiring people away from competitors, debriefing former employees or customers of competitors, taking plant tours posing as innocent visitors, and even buying competitors’ trash. In addition, many companies hire competitive intelligence professionals to scope out competitors.
Executives acquire information about internal strengths and weaknesses from a variety of reports, including budgets, financial ratios, profit and loss statements, and surveys of employee attitudes and satisfaction. Managers spend 80% of their time giving and receiving information. Through frequent face-to-face discussions and meetings with people at all levels of the hierarchy, executives build an understanding of the company’s internal strengths and weaknesses.

**Internal strengths** are positive internal characteristics that the organization can exploit to achieve its strategic performance goals. **Internal weaknesses** are internal characteristics that might inhibit or restrict the organization’s performance. The information sought typically pertains to specific functions, such as marketing, finance, production, and R&D. Internal analysis also examines overall organization structure, management competence and quality, and HR characteristics. Based on their understanding of these areas, managers can determine their strengths or weaknesses vis-à-vis other companies.

**External threats** are characteristics of the external environment that may prevent the organization from achieving its strategic goals. **External opportunities** are characteristics of the external environment that have the potential to help the organization achieve or exceed its strategic goals. Executives evaluate the external environment in several sectors of the economy. The task environment sectors are the most relevant to strategic behavior and include the behavior of competitors, customers, suppliers, and the labor supply. The general environment contains those sectors that have an indirect influence on the organization but nevertheless must be understood and incorporated into strategic behavior. The general environment includes technological developments, the economy, legal-political and international events, and sociocultural changes. Additional areas that might reveal opportunities or threats include pressure groups, interest groups, creditors, natural resources, and potentially competitive industries.

(iii) **Strategy Implementation**

The next step in the strategic management process is **implementation**—how strategy is put into action. Some people argue that strategy implementation is the most difficult and important part of strategic management. No matter how creative the formulated strategy, the organization will not benefit if the strategy is incorrectly implemented. In today’s competitive environment, there is an increasing recognition of the need for more dynamic approaches to formulating and implementing strategies. Strategy is not a static, analytical process; it requires vision, intuition, and employee participation. Many organizations are abandoning central planning departments, and strategy is becoming an everyday part of the job for workers at all levels. Strategy implementation involves using several tools—parts of the firm that can be adjusted to put strategy into action. Once a new strategy is selected, it is implemented through changes in leadership, structure, information and control systems, and employees. For strategy to be implemented successfully, all aspects of the organization need to be in concert with the strategy. Implementation involves regularly making difficult decisions about doing things in a way that supports rather than undermines the organization’s chosen strategy.

Implementing strategy is more difficult when a company goes global. In the international arena, flexibility and superb communication emerge as mandatory leadership skills. Likewise, structural design must merge successfully with foreign cultures as well as link foreign operations to the home country. Managers must make decisions about how to structure the organization to achieve the desired level of global integration and local responsiveness. Information and control systems must fit the needs of and incentives within local cultures. In Japan or China, for example, financial bonuses for star performance are humiliating to an individual whereas group motivation and reward are acceptable. As in North America, control typically is created through timetables and budgets and
by monitoring progress toward desired goals. Finally, the recruitment, training, transfer, promotion, and layoff of international employees create an array of problems not confronted in North America due to labor unions and social cultures. Labor laws, guaranteed jobs, and cultural traditions of keeping unproductive employees on the job provide special problems for strategy implementation.

In summary, strategy implementation is essential for effective strategic management. Managers implement strategy through the tools of leadership, structural design, information and control systems, and employees. Without effective implementation, even the most creative strategy will fail.

(iv) Strategic Control
A formal control system can help keep strategic plans on track. A control system (e.g., reward systems, pay incentives, budgets, information technology [IT] systems, rules, policies, and procedures) should be proactive instead of reactive. Control should not stifle creativity and innovation since there is no trade-off between control and creativity. Feedback is part of control.

The goal of a control system is to detect and correct problems in order to keep plans on target. This means negative results should prompt corrective action at the steps immediately before and after the problem identification. Some examples of corrective actions include updating assumptions, reformulating plans, rewriting policies and procedures, making personnel changes, modifying budget allocations, and improving IT systems.

(v) Tools to Develop Strategies
During the development of an organization’s grand strategy, management can use several tools, such as those mentioned next.

- Strengths, weaknesses, opportunities, and threats (SWOT) analysis focuses on a company's internal and external environments. Specifically, it focuses on strategies; competitors; core competencies of products, services, and employees; and government laws. SWOT represents analysis of a situation (i.e., situation analysis).
- Political, economic, social, and technological (PEST) analysis focuses only on the external environment. Specifically, it focuses on political agendas, economic cycles, social trends, and technological factors.
- Market-opportunity matrix analysis focuses only on the external environment. Specifically, it focuses on customers, products, and markets.
- SMART guidelines mean goals and objectives must be Specific (considers exactness), Measurable (considers quantification), Achievable (considers agreeability to all), Realistic (considers resources), and Timely (considers deadlines). Suggests how goals and objectives should be documented and developed. Specifically, SMART guidelines focus on training aspects of managers and executives.
- Fit-gap analysis focuses only on the internal environment. Specifically, it focuses on what fits and what does not fit (gap). It is also known as a gap analysis.
- Strengths, weaknesses, opportunities, and problems (SWOP) analysis focuses on internal environments. Specifically, it focuses on operational aspects of a company to solve day-to-day operational problems.
- Force-field analysis identifies all inhibiting and facilitating forces or positive and negative variables acting on a specific situation at hand, whether those situations are internal or external to an organization. This is a problem-solving tool.
(h) Strategic Planning Process

The output of the strategic planning process is the development of a strategic plan. Its four components include: mission, objectives, strategies, and portfolio plan (see Exhibit 1.1).

EXHIBIT 1.1 Components of the Strategic Planning Process

- Organizational mission
- Organizational objectives
- Organizational strategies
- Organizational portfolio plan

(i) Organizational Mission

Every organization exists to accomplish something, and the mission statement is a reflection of this. The mission statement of an organization should be a long-term vision of what the organization is trying to become, the unique aim that differentiates the organization from similar ones. The mission statement raises questions such as: “What is our business?” and “What should it be?” In developing a statement of mission, management must take into account three key elements: the organization’s history, its distinctive competencies, and its environment.

The organization’s environment dictates the opportunities, constraints, and threats that must be identified before a mission statement is developed.

When completed, an effective mission statement focuses on markets rather than products and is achievable, motivating, and specific. A key feature of mission statements has been their external rather than internal focus. This means that a mission statement should focus on the broad class of needs that the organization is seeking to satisfy (external focus), not on the physical product or service that the organization is offering at present (internal focus). As Peter Drucker, a prominent management consultant and author, puts it, the question “What is our business?” can be answered only by looking at the business from the outside, from the point of view of customer and market.

WHAT IS OUR BUSINESS?

- A business is defined by the want the customer satisfies when he or she buys a product or service.
- Satisfying the customer is the mission and purpose of every business.

A mission statement should be realistic and achievable and should not lead the organization into unrealistic ventures far beyond its competencies. A mission statement is a guide to all employees and provides a shared sense of purpose that offers a strong motivation to achieve the organization’s objectives.

A mission statement must be specific to provide direction to management when it is choosing between alternative courses of action. For example, a mission to provide the highest-quality products at the lowest possible cost sounds good, but it is not specific enough to be useful. Specific quantitative goals are easier to measure.
(ii) Organizational Objectives
An organization’s mission is converted into specific, measurable, and action-oriented commitments and objectives. These objectives, in turn, provide direction, establish priorities, and facilitate management control. When these objectives are accomplished, the organization’s mission is also accomplished. Peter Drucker recommends at least eight areas for establishing objectives, including:

1. Market standing
2. Innovations
3. Productivity
4. Physical and financial resources
5. Profitability
6. Manager performance and responsibility
7. Worker performance and attitude
8. Social responsibility

(iii) Organizational Strategies
Organizational strategy involves identifying the general approaches a business should take in order to achieve its objectives. It sets the major directions for the organization to follow. Specific steps include understanding and managing the current customer and current products and identifying new customers and new products. Mission and objectives lead an organization where it wants to go. Strategies help an organization to get there.

Marketing writers describe organizational strategy in terms of a product/market matrix. The matrix is shown in Exhibit 1.2.

**EXHIBIT 1.2 Product/Market Matrix**

<table>
<thead>
<tr>
<th>Current Products</th>
<th>New Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current customers</td>
<td>Market penetration</td>
</tr>
<tr>
<td>New customers</td>
<td>Market development</td>
</tr>
</tbody>
</table>

A market penetration strategy focuses on improving the position of the current product with an organization’s current customers. It involves designing a marketing plan to encourage customers to purchase more of a product. It can also include a production plan to produce more efficiently than what is being produced at present. A market development strategy would seek to find new customers for current products. With a product development strategy, new products are developed to direct to current customers. A diversification strategy seeks new products for new customers.

(iv) Organizational Portfolio Plan
An organization can be thought of as a portfolio of businesses (i.e., combination of product lines and divisions, and service lines and divisions). It is understandable that some product lines will be more profitable than others. Management must decide which product lines or divisions to build, maintain, add, and eliminate.
(i) Related Strategies and Frameworks

Some related strategies and frameworks addressed include a discussion about blue-ocean and red-ocean strategies, McKinsey 7-S Framework, and business policy.

(ii) Blue-Ocean and Red-Ocean Strategies

Authors Kim and Mauborgne first discussed the concept of blue-ocean strategy, where its scope encompasses all the industries not in existence today—the unknown market space that is untainted by competition (Harvard Business Review, October 2004). In a blue-ocean strategy, demand is created rather than fought over. There is ample opportunity for both profits and growth created by the blue-ocean strategy because it deals with new and uncontested market space that makes competition irrelevant.

In contrast, the red-ocean strategy works within the established market spaces that are slowly and steadily shrinking. It deals with old and highly contested market space where competition is relevant, vigorous, and overcrowded. One firm tries to steal a share of demand from other firms, instead of creating its own demand. Exhibit 1.3 presents the differences between the red-ocean and blue-ocean strategies.

EXHIBIT 1.3 Comparison of Red-Ocean Strategy with Blue-Ocean Strategy

<table>
<thead>
<tr>
<th>Red-Ocean Strategy</th>
<th>Blue-Ocean Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compete in existing market space</td>
<td>Create uncontested market space</td>
</tr>
<tr>
<td>Beat the competition</td>
<td>Make the competition irrelevant</td>
</tr>
<tr>
<td>Exploit existing demand</td>
<td>Create and capture new demand</td>
</tr>
<tr>
<td>Make the value–cost trade-off</td>
<td>Break the value–cost trade-off</td>
</tr>
<tr>
<td>Align whole system of company activities with</td>
<td>Align whole system of company activities in pursuit of</td>
</tr>
<tr>
<td>its strategic choice of differentiation or low cost</td>
<td>differentiation and low cost simultaneously</td>
</tr>
<tr>
<td>separately</td>
<td></td>
</tr>
</tbody>
</table>

It is interesting to note that both the blue- and red-ocean strategies have always coexisted and always will, and the one who separates them and breaks out of the old mold will win big. Practical reality, therefore, requires that corporate management understand the strategic logic of both types of oceans before diving into them.

(ii) McKinsey 7-S Framework

A management consulting firm McKinsey & Company has developed a 7-S framework as criteria for an organization’s success. This framework includes seven elements: structure, strategy, skills, staff, style, systems, and shared values.

Structure is the way in which tasks and people are specialized and divided and authority is distributed. It consists of the basic grouping of activities and reporting relationships into organizational subunits and includes the mechanisms by which activities of members of the organization are coordinated. There are four basic structural forms—functional, divisional, matrix, and network, with the functional form being the most common of all.

Strategy is the way in which competitive advantage is achieved. It includes taking actions to gain a sustainable advantage over the competition, adopting a low-cost strategy, and differentiating products or services.
Skills include the distinctive competencies that reside in the organization. They can be distinctive competencies of people, management practices, systems, and/or technology.

Staff includes employees, their backgrounds, and competencies. It consists of the organization’s approaches to recruitment, selection, and socialization and focuses on how people are developed; how recruits are trained, socialized, and integrated; and how employee careers are managed.

Style deals with the leadership style of top management and the overall operating style of the organization. Style impacts the norms employees follow and how they work and interact with each other and with customers.

Systems include the formal and informal processes and procedures used to manage the organization, including management control systems; performance measurement and reward systems; planning, budgeting, and resource allocation systems; information systems; and distribution systems.

Shared values are the core set of values that are widely shared in the organization and serve as guiding principles of what is important. These values have great meaning to employees because they help focus attention and provide a broader sense of purpose. Shared values are one of the most important elements of an organization’s culture.

In order to manage the change process and seek improvements needed, organizations are classifying these seven elements into two groups: hard S’s and soft S’s. Hard S’s include strategy, structure, and systems, which are easier to change than the soft S’s, and the change process can begin with hard S’s. Soft S’s include staffing, skills, style, and shared values, which are harder to change directly and take longer to do. Both hard S’s and soft S’s are equally important to an organization.

(iii) Business Policy

Business goals and objectives (ends) are derived from a company’s mission and vision statements. Business strategy (means) is designed to achieve such goals and objectives. Business policy, along with budgets, is a part of strategy execution and implementation in that the policy supports the strategy. Business policies are explicit statements of management’s intentions to support a business strategy.

Mission/Vision → Goals/Objectives → Business Strategy

Business Strategy → Business Policy

Business policies can be established either at high level (e.g., ethical behavior and pollution control) or low level (e.g., a policy requiring or not requiring a receipt for customer product returns; a policy of requiring signed contracts prior to acquisition of assets or start of projects; and a policy on employee compensation, benefits, and training).

Similar to business strategy, business policy can be both proactive (intended and deliberate as in the case of hiring employees with diverse backgrounds) and reactive (adaptive as in the case of handling a major issue or crisis such as a nationwide product recall).

Moreover, business strategy precedes business policy, whereas business ethics succeeds business policy. Also, note that business ethics precedes social responsibility because the latter is derived from the former. The policy statements are expressed in several ways such as in the form of
detailed rules, procedures, standards, and guidelines so employees can follow them during their job execution.

The following shows the linkages between business policy, strategy, ethics, and social responsibility and the linkages between policies, rules, procedures, standards, and guidelines.

Business Strategy → Business Policy → Business Ethics → Social Responsibility
Policies → Rules and Procedures
Policies → Standards and Guidelines

**Example 1:** An example of an ethical behavior policy is that no employee is allowed to take or give gifts to any customer, supplier, and contractor for doing business except for receiving small, nominal gifts not more than $25.

**Example 2:** An example of a pollution control policy is that no manufacturing division is allowed to dump its toxic substances (waste) discharged from factories into drinking water lakes, ponds, or oceans. All factories are required to comply with the U.S. Environmental Protection Agency’s (EPA’s) rules and standards.

**Example 3:** A retailer’s policy in the area of customer product returns states that customers can return their purchased products for cash, credit, exchange, or a store credit within 15 days from the date of purchase only after showing a valid sales receipt, provided that the product is in working condition.

**Example 4:** A retailer’s policy in the area of customer product returns states that customers can return their purchased products for cash, credit, exchange, or a store credit within 30 days from the date of purchase without showing a valid sales receipt, provided that the product is in working condition.

**Example 5:** An example of a rule is that employees should not take more than 45 minutes for lunch, except with supervisory permission.

**Example 6:** An example of a procedure for handling a customer’s claim filed for a car damage consists of 11 steps performed as follows:

- Steps 1 through 5 can be performed in the sequential order
- Steps 6 and Step 7 can be performed in the parallel order
- Steps 8 through 11 can be performed in the sequential order

**Example 7:** An example of a standard is to allow two hours to open a new customer’s auto claim case file. Allow one hour to complete an already opened and being worked on auto claim case file (i.e., work-in-process case).

**Example 8:** An example of a guideline is to allow a 5% discount when a customer wants to purchase a one-half case of six bottles and a 10% discount on a full case of 12 bottles. No discount is allowed on three bottles or on individual bottles.
1.2 Performance Measurement Systems

Topics such as performance indicators, design of performance measurement systems, specific performance measures (e.g., productivity, effectiveness, efficiency, and economy), cycle times, business velocities, key performance indicators, balanced scorecard system, benchmark studies, metrics, dashboards, and data visualization tools are discussed in this section.

(a) Performance Indicators

In work settings, employees accomplish job-related activities and tasks that are measured by their supervisors. These accomplishments become a part of the employee’s performance record, which is used during the employee appraisal review. It is a fact of business life that an organization’s performance is an aggregation of each employee’s performance. Strategic, financial, regulatory, legal, and organizational reasons drive the measurement of an organization’s performance.

**SELECTION CRITERIA FOR PERFORMANCE INDICATORS**

The type of performance indicators utilized should be credible, meaningful, and significant to the business. For better management of the measurement process, only a few performance indicators should be assessed.

Leading organizations, in both the public and the private sector, are using various performance indicators to measure, track, and report organization performance levels for improvement as part of their value chain. These include scorecards (balanced, strategy, stakeholder, KPI, functional, and dashboard scorecards), metrics, cycle times, and standards (including national, international, organization, industry, and professional standards). For example, some U.S. organizations compare their performance to that of the U.S. Malcolm Baldrige Criteria for Performance Excellence Results, which is an example of a national standard.

Performance indicators such as scorecards, metrics, cycle times, and standards are part of an organization’s value chain. The value chain should be enhanced by increasing value-added activities and by eliminating non-value-added activities to provide permanent value to internal and external customers as well as to the organization as a whole.

Selecting the right type of performance indicators (stretch goals) is as important as initiating the performance measurement program, if not more important. Incorrect selection leads to unusable results. The selected indicators should be: simple to understand, easy to implement and measure, and able to interpret results without much difficulty. Performance indicators should be selected from various generic sources, such as an organization’s:

- Strategic and business plans
- Functional and operational goals and objectives
- Internal and external benchmark reports
- Employee performance targets that employees commit to
- Quality, process, and operations improvement plans
- Teachings from “lessons learned” files
- Industry white papers; list of critical success factors
- Internal/external audit reports
- Publicly available databases on best practices and benchmarks
(b) Design of Performance Measurement Systems

Performance measures should be accurately defined, analyzed, and documented so that all interested parties are informed about them. Performance standards should bring meaning to measurements. Employees who are being measured should feel that standards and specific performance measures are fair and achievable. Self-measurement may create confidence and trust and permit fast feedback and correction from employees. But it can also lead to distortions, concealment, and delays in reporting.

One design objective is that performance standards must be simple, meaningful, comparable, reproducible, and traceable, given similar business conditions. Care should be taken to compare items that are alike in terms of units of measurements (pounds, grams, liters, or gallons), time frames (hours or days), quantity (volume in units or tons), and quality (meeting the requirements).

During the design of performance measurements, the design team should take both human factors and technical factors into account. From a human factor viewpoint, the performance measures must not be so loose that they present no challenge or so tight that they cannot be attainable. Ideally, both subordinates and superiors must participate in identifying and developing the performance metrics. From a technical factor viewpoint, employees should be given proper tools, training, and equipment to do their job. Otherwise frustration will result. Above all, performance measures should be based on objective measurement instead of subjective measurement to minimize human bias and suspicion of the reported measurements.

Periodically, the performance measurements should be reviewed and updated to ensure their continued applicability to the situations at hand. Evaluations of performance measures should concentrate on significant exceptions or deviations from the standards. Therefore, exception reporting is preferred. Significant variances (deviations) require analysis and correction of standards or procedures.

The standards should match the objectives of the operation or function being reviewed. In developing standards, it is better for the auditor to work with the client than alone, with standards later validated by subject matter experts (SMEs) or industry experts for authentication. Usually the standards can be found in standard operating procedures, job descriptions, organizational policies and directives, product design specifications, operating budgets, trade sources, organization's contracts, applicable laws and regulations, generally accepted business practices, generally accepted accounting principles, and generally accepted auditing standards.

(c) Specific Performance Measures

Performance is the organization’s ability to attain its goals by using resources in an efficient and effective manner. In this section, topics such as productivity, effectiveness, efficiency, and economy are discussed, compared, and contrasted.

(i) Productivity Defined

Productivity is the organization’s output of goods and services divided by its inputs. This means productivity can be improved by either increasing the amount of output using the same level of inputs or reducing the number of inputs required to produce the output.
Two approaches for measuring productivity are total factor productivity and partial productivity. **Total factor productivity** is the ratio of total outputs to the inputs from labor, capital, materials, and energy. **Partial productivity** is the ratio of total outputs to a major category of inputs (e.g., labor, capital, or material). Productivity measurement is used to indicate whether there is a need for any improvement in the first place. It is often a part of the improvement process itself and is used to gauge whether improvement efforts are making any progress.³ Measurement alone has a dramatic impact on productivity since the effects of feedback are so powerful. Measurement helps diagnose productivity needs and can be used to focus improvement resources on the most-needed operations. Monitoring of performance, feedback, and regular consideration of performance peaks and valleys as indicated by measurement data are powerful stimuli for change.

Productivity measurement strategies must be simple and practical and must be continually reevaluated. From a classical viewpoint, productivity is defined as a ratio such that the output of an effort under investigation is divided by the inputs (e.g., labor and energy) required to produce the output. Examples of productivity measurement metrics are:

- Number of customers helped divided by the number of customer service representatives
- Number of pages typed divided by the number of hours of clerical time

**(ii) Components of Productivity Measurement**

Four components of productivity measurement exist: inputs, processes, interim outputs, and final outputs. From these four components, all measures of productivity are built (see Exhibit 1.4).

**EXHIBIT 1.4 Components of Productivity Measurement**

<table>
<thead>
<tr>
<th>Components of productivity measurement</th>
<th>Inputs</th>
<th>Processes</th>
<th>Interim outputs</th>
<th>Final outputs</th>
</tr>
</thead>
</table>

**Inputs** represent the amount of resources consumed in the production of outputs such as clerical time, budget, and labor hours. **Processes** transform inputs to final outputs through **interim outputs**. **Final outputs** represent some unit of production or results, such as number of contracts negotiated and amount of profit per completed contract. Both outputs and inputs must be measurable and quantifiable.

**(iii) Criteria for Productivity Improvement**

In addition to accuracy, four other criteria must be considered as part of the continuous process of productivity improvement: quality, mission and goals, rewards and incentives, and employee involvement (see Exhibit 1.5).

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EXHIBIT 1.5 Factors of Productivity Improvement

<table>
<thead>
<tr>
<th>Factors of productivity improvement</th>
<th>Quality</th>
<th>Mission and goals</th>
<th>Rewards and incentives</th>
<th>Employee involvement</th>
</tr>
</thead>
</table>

1. **Quality.** A measure that assesses only quantity of outputs can lead to reduced productivity in the long run. Both quality and quantity must be defined and measured.

2. **Mission and goals.** The measure must be related to an organization’s mission and strategic goals. Measures directed to products and services that are not consistent with mission and goals threaten productivity.

3. **Rewards and incentives.** Measures must be integrated with performance incentives, reward systems, and practices. Measures that have no important contingencies will not work to improve productivity. Rewards include both intrinsic rewards and extrinsic rewards.

4. **Employee involvement.** Employees must participate in the definition and construction of productivity measures. Lack of employee involvement can result in lack of commitment and buy-in, the output results from the measures are not likely to be received favorably by employees or to have any positive impact on future productivity. Empowering employees can encourage employee involvement.

**COMMON KINDS OF CRITERIA FOR MEASUREMENT OF OUTPUTS**

- Accuracy
- Timeliness
- Quantity
- Customer satisfaction
- Completeness
- Cost performance

(iv) **Guidelines for Productivity Measurement**

Productivity measurement occurs within a dynamic and complex organization. This means that the organization’s culture, the values and experience of employees, and the political context all will have a greater impact on the measurement process. The ideal organization is the one that institutionalizes a productivity measurement system as a way of doing business.

Brinkerhoff and Dressler⁴ provide the following guidelines for successful productivity and performance measurement:

- Handle productivity measurement as a change strategy in the organization. It requires carefully laid out groundwork and the expectation of barriers and resistance.

⁴ Ibid.
Create a vision for productivity improvement through productivity measurement. Management should expect to provide strong leadership by showing a can-do attitude in the face of skepticism and barriers. The vision needs to be sold by finding win-win examples in productivity measurements improvement.

Involving and getting buy-in from senior management. Productivity efforts require massive changes in the corporate culture, policies, and procedures. These changes will need more than one-time approval of senior management.

Aim initial efforts at targets with a high probability for success. A careful survey of the organization is required to seek out a high potential win situation.

Be alert to, and account for, the political ramifications of measurements. The introduction of productivity measurement procedures into the current organizational context may be viewed as disruptive of the power balance. Any change in resources threatens some power bases and offers others the opportunity for new power.

Grow the productivity measurement effort from the ground up. This means that lower-level employees should be viewed as valued partners in productivity improvement efforts. They must clearly agree that any output measurers are those that they have control over. They must be given a reason to know and appreciate how productive they are. Productivity measurement systems imposed from above are likely to involve the traditional labor argument over who is responsible for productivity.

Build ongoing communication networks and procedures. Because productivity improvement is a process in change management, the no-surprises rule is critical. It is good to involve employees from all levels of the organization. Ongoing communication includes posting results, updating newsletters, and sending internal memos.

Provide the necessary training and support to implement and sustain productivity improvement efforts. Analytical skills are required to look at processes and see opportunities. Productivity requires an ability to quantify and measure in simple ways. Productivity demands interpretive skills so that gathered data can be put to good use. Productivity change requires the abilities to communicate, solve problems, and coach people concerning new products and processes.

Implementation of productivity measures requires training in basic productivity and quality concepts. Helping team leaders and supervisors conduct productivity meetings is vital to productivity improvement.

Employees also need training in using data in decision making. People must be able to spot productivity trends. They must be able to take measurement data and determine the causes of both productivity gains and declines. Employees must be trained to use statistical process control techniques.

Supervisors and managers need training in coaching and feedback skills. Managers who catch their subordinates in the act of doing things right will find the right behaviors repeated. Early and ongoing positive feedback can make the difference between success and failure.

Evaluate the productivity measurement system and diffuse the process across the organization. All systems must be open for inspection and evaluation. The only effective way to evaluate productivity measurement efforts is to have clearly defined goals and benchmarks. With those in place, productivity improvement efforts can be objectively evaluated. Evaluation provides the fuel for revising productivity measurement systems. Evaluation will feed directly into finding those areas where productivity can be improved.
Evaluation of productivity measurement results must support a reward system for those responsible for creating those outcome results. Both public recognition and financial recognition should be in place. The culture of the organization usually prescribes the type of reward. Information about productivity progress must be made highly visible through charts and graphs of productivity growth.

The success of the initial pilot project is very important to spread or institutionalize the process throughout the organization. Keeping internal curiosity high but reporting the challenges and opportunities presented in the process helps all employees, especially those who are not part of the pilot project. It is good to use personnel from the pilot as mentors or coaches in other areas of the organization. Their experience and success can be quite contagious. It also makes the system a peer-to-peer effort. Relying solely on management expertise may slow the process of producer-level mentoring and hinder success in measuring and raising productivity.

*The traditional performance and productivity measurements, such as time schedules, on-time delivery, and cost savings, continue to be valid. However, new concepts, such as benchmarking, continuous process improvement, concurrent engineering, quality circles, self-managed teams, statistical process control, and total quality management, should be practiced and should complement the traditional measurements.*

**(v) Improving Productivity**
When an organization decides that it is important to improve productivity, there are three places to look: technological productivity, worker productivity, and managerial productivity. **Increased technological productivity** refers to the use of more efficient machines, robots, computers, and other technologies to increase outputs. **Increased worker productivity** means having workers produce more outputs in the same time period. This includes employees working harder, improving work processes, acquiring more knowledge, more resources, improved task or workplace design, and motivating employees. **Increased managerial productivity** simply means that managers do a better job of running the business. Often the real reason for productivity problems is due to poor management.

**(vi) Effectiveness, Efficiency, Economy, and Economics**
**Effectiveness** is the degree to which an organization achieves a stated goal or objective. **Efficiency** is the use of minimal resources—raw materials, money, and people—to provide a desired volume of output. Efficiency measures how well a task or activity is performed relative to existing standards. **Economy** means whether an organization is acquiring the appropriate type, quality, and amount of resources at an appropriate cost. **Economics** deals with the allocation and utilization of scarce resources (e.g., men, money, materials, and machinery; 4Ms) to produce goods and provide services. These 4Es and 4Ms are connected with the common term **resources**.

Effectiveness and efficiency are related to productivity measurement. Effective production is the process that produces the desired results. Efficient production means achieving the desired results with a minimum of inputs. Efficiency and effectiveness must go hand in hand in productive organizations. Organizations can temporarily survive without perfect efficiency; they usually die if they are ineffective. Productivity is defined as the number of goods produced per hour, productivity does not measure the number of dollars spent in producing those goods.
MANAGEMENT APPROACHES TO IMPROVE EFFICIENCY

Management approaches to improve efficiency include:

- Restructuring outmoded business functions and operations
- Implementing BPI methods
- Deploying technology improvement methods
- Implementing a strategic approach to spending using spend analysis

A return-on-value metric can be computed as annualized savings in operating costs divided by annual total operating costs. The resulting fraction is multiplied by 100 to yield a percentage. Here, \textit{value} refers to savings. The goal is to increase the return-on-value metric every year.

Note that economy and efficiency are directly related with “resources” being the common factor. At the same time, economy and efficiency are indirectly related to effectiveness, where the latter is achieving the stated objectives. For example, an employee can be efficient at work (i.e., increased production with fewer resources) but may not be effective due to misdirected nature of that employee’s work (i.e., did not achieve the stated objective).

(d) Cycle Times and Business Velocities

**Cycle time** is the maximum time that a product or service is allowed to spend at a workstation, machine, or office desk. In a manufacturing company, the scope of cycle time starts from raw materials and ends up with finished goods shipping to customers. It includes all the transformation (processing) stages, inspection steps, and transportation stages. Similarly, in a service company, the scope of process analysis starts, for example, with claims application and ends up with making payment to the claimant. The goal of process analysis is to facilitate change for improvement. Doing this requires looking not only at the individual processes where problems exist but also at the upstream and downstream processes that are related to the process in question. Process improvements can be made by rearranging equipment layout, plant layout, inspection points, and testing stages with the help of motion, material, time, and material handling studies. In this effort, both product processes and service processes should be examined for waste, delays, and improvement.

Business processes, whether manufacturing or service, go through cycles from initiation to completion of defined tasks and activities. Each process has a beginning point and an ending point, and consumes resources (e.g., time, money, people talent, materials, machinery, and energy) to accomplish the defined tasks and activities. The goal is to consume as few of these resources as possible and complete these tasks and activities as efficiently and effectively as possible. Industrial engineers, also called efficiency experts, can help in establishing and measuring cycle times. Cycle time measures focus on the time dimension, expressed as hours or days.

EXAMPLES OF CYCLE TIMES

- Cycle times can be used in retail merchandising operations to determine metrics such as time to order, time to receive, time to display, time to replenish, and time to sell.
- Cycle times can be used in marketing to develop and introducing new products (time to market), improve existing products, and deliver new products to the markets.
- Cycle times can be used in HR to determine metrics such as time to hire, hire to retire, time to train, and time to promote.
Out of all the resources mentioned, time is a limited and critical resource because lost time cannot be gained. Organizations that can beat the time clock are clear winners in the highly competitive global business environment. The goal is to become the best in the best-in-class group using shorter cycle times. The shorter the cycle time, the better it is, because more work can be accomplished in less time. Cycle times measure the elapsed time between two or more successive events, the time taken to reach from point A to point B and back, or the time taken to complete a task from the beginning to the end.

If cycle times are found to be unacceptable (i.e., too long), management should do the following to make them acceptable (i.e., shorter):

- Streamline the upstream and downstream work processes through work-study, process-flow, flowcharting, and process-mapping analyses.
- Simplify the work processes by eliminating or decreasing non-value-added activities, deleting duplicate tasks, and removing unnecessary hand-offs.
- Standardize the work processes by issuing new policies, procedures, and tools for organization-wide use.
- Institutionalize standardized work processes across the entire organization in phases (i.e., phased roll-outs).

The sequence of steps needed to reduce the cycle time in the value chain is:

Streamline —> Simplify —> Standardize —> Institutionalize

**Velocity** refers to speed and rate of turnover of something tangible, such as inventory and money currency. As mentioned, cycle time is the time taken to complete a task from the beginning to the end. “Time” is the common element between velocity and cycle time. Let us look at the velocity concept in two business settings: manufacturing industries and service industries.

**BUSINESS VELOCITIES**

**For Manufacturing Industries**

Sales Velocity —> Inventory Velocity —> Production Velocity —> Finance velocity

**For Service Industries**

Sales Velocity —> Service Velocity —> Finance velocity

For manufacturing industries, as sales are increasing (sales velocity), inventory is depleted quickly (inventory velocity), and it should be filled with increased production (production velocity). Money needs to be invested to support the increased production in terms of buying raw materials, parts, and components and paying the workforce (finance velocity). More employees may need to be hired to meet the increased production levels (human capital velocity). All these velocities in aggregate may require developing new systems or modifying existing ones, whether manual or automated (systems velocity). The same logic applies to pure service industries except that they have no inventories to sell.
When sales velocity is increasing (i.e., more sales), production velocity should also be increasing (i.e., more production) in synchronization with sales velocity. However, longer cycle times for specific internal tasks and operations within production departments can delay production of the required quantities of goods, thus preventing the organization from meeting the sales velocity demand. This delay requires optimizing the cycle times for all internal tasks and operations within production departments prior to handling the production velocity. Cycle times should not become a bottleneck to achieving any type of velocity.

In summary, velocities and cycle times are solidly linked in that shorter cycle times increase any type of business velocity, which, in turn, can increase revenues, decrease costs, and increase profits. For example, sales velocity, in part, cannot be increased if time-to-market cycle time for introducing new products is taking longer.

**(e) Key Performance Indicators**

Key performance indicators (KPIs) state what is most important to management to operate a company. It means that achieving a KPI is a success and its absence is a failure. KPIs are a type of metrics that show whether a business activity or function is achieving its stated objectives, established milestones, or performance targets. KPIs are warning mechanisms or red flags because they can signal or alert when an actual outcome deviates much from the targeted or expected outcome. Because KPIs should represent key measurements, they should be few in number. They must be reliable, valid, appropriate, and meaningful to be of any use. Dashboards are often used to show the periodic progress of KPIs requiring management attention. Some companies combine KPIs with metrics due to their similarity in function and focus. Therefore, both management and employees should focus on a few significant KPIs.

Some KPIs or red flags in an IT function are listed next.

- Computer system reports indicate unauthorized disclosures of customer information and/or lapses of security practices in protecting customer privacy information.
- Computer system reports are not timely or are incomplete, inconsistent, or inaccurate.
- Computer system reports lack relevance and are too detailed for use as an effective decision-making tool.
- Computer systems do not have a fully tested and ready business continuity plan.
- Computer system problems are attributed to integration of systems when old computer systems of an old company are merged with a new company’s new computer systems. These problems include system failures and unreliable systems as they do not keep pace with new technologies.
- Computer systems are exposed to fraudulent activities due to lack of built-in preventive and detective controls.
- Computer systems are not audited frequently or have many unresolved control deficiencies.

Some KPIs in a production plant safety operation are listed next.

Number of:

- Safety inspections conducted in a month, quarter, and year
- Factory equipment tested and calibrated in a month, quarter, and year
Factory operations observed for safety conditions in a month, quarter, and year
- Safety accidents investigated and reported in a month, quarter, and year
- Accidents reduced from month to month, quarter to quarter, and year to year

Amount of:
- Machine downtime reduced resulting from reduced accidents in a month, quarter, and year
- Worker compensation insurance premiums reduced resulting from reduced accidents

Some KPIs in the board room operations are listed next.
- Percentage of bad directors*
- Percentage of independent directors
- Percentage of qualified directors
- Percentage of female directors
- Percentage of minority directors
- Percentage of re-nominated directors
- Percentage of directors with excessive job length
- Percentage of shadow directors
- Percentage of directors with personal reputation at risk

*Bad directors are unprofessional at work with negative attitude, they are outdated in knowledge and skills, and they stick to their own agenda which is at odds with the company’s agenda. Moreover, they are not team players, they are incompetent and inadequate for the job, they are a big distraction in the board room with their constant focus on trivial matters, and they bring down the productivity and performance of the entire board. Hence, they should be replaced.

Internal auditors need to be aware that some employees may manipulate and distort KPIs to survive and may distort performance results to receive larger bonuses and promotions. Therefore, auditors should compare KPIs with industry norms as well as with the same company data from period to period. Also, auditors should be careful in analyzing both KPIs that look too good and KPIs that do not meet standards.

(f) Balanced Scorecard System

Most businesses have traditionally relied on organizational performance based almost solely on financial or accounting-based data (e.g., ROI and earnings per share [EPS]) and manufacturing data (e.g., factory productivity, direct labor efficiency, and machine utilization). Unfortunately, many of these indicators are inaccurate and stress quantity over quality. They reward the wrong behavior; lack predictive power; do not capture key business changes until it is too late; reflect functions, not cross-functional processes; and gave inadequate amount of considerations to difficult-to-quantify resources such as intellectual capital. Most measures are focused on cost, not so much on quality.

Robert Kaplan and David Norton of Harvard Business School coined the term “balanced scorecard” in response to the limitations of traditional financial and accounting measures. They recommend that key performance measures should be aligned with the organization’s strategies

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and action plans. They suggest translating the strategy into measures that uniquely communicate the organization's vision. Setting targets for each measure provides the basis for strategy deployment, feedback, and review.

A good balanced scorecard system contains both leading and lagging indicators and both financial and nonfinancial measures. For example, a customer survey (performance drivers) about recent transactions might be a leading indicator for customer retention (a lagging indicator); employee satisfaction might be a leading indicator for employee turnover (a lagging indicator); and so on. These measures and indicators should also establish cause-and-effect relationships across the four perspectives. The cause-and-effect linkages describe the path by which improvements in the capabilities of intangible assets (people) get translated into tangible customer satisfaction and financial outcomes.

Balanced scorecards provide a graphical presentation on strategy maps and a logical and comprehensive way to describe strategy. They communicate clearly the organization's desired outcomes and describe how these outcomes can be achieved. Both business units and their employees will understand the strategy and identify how they can contribute by becoming aligned to the strategy.

Measures should include both financial and nonfinancial ones. Financial measures include ROI, residual income, EPS, profit, cost, and sales. Nonfinancial measures include customer measures, internal business process measures, innovation and learning measures, and manufacturing measures. Customer measures include satisfaction, perception, and loyalty. Internal business process measures include efficiency, quality, and time. Innovation and learning measures include R&D investment, R&D pipeline, skills and training for employees, and time to market a product or service. Manufacturing measures include factory productivity, direct labor efficiency, and machine utilization.

The balanced scorecard system is a comprehensive management control system that balances traditional financial measures with nonfinancial measures (e.g., customer service, internal business processes, and the organization's capacity for innovation and learning). This system helps managers focus on key performance measures and communicate them clearly throughout the organization.

Kaplan and Norton divided the strategy-balanced scorecard into four perspectives:

1. The financial perspective focuses on matters from the shareholders’ perspective. It measures the ultimate results that the business provides to its shareholders, including profitability, revenue growth (net income), ROI, economic value added, residual income, costs, risks, and shareholder value. Financial measures are lagging measures (lag indicators); they report on outcomes, the consequences of past actions. They tell what has happened. The financial perspective looks back.

2. The internal business process perspective focuses on strategic priorities for various business processes, which create customer and shareholder satisfaction. It focuses attention on the performance of the key internal processes that drive the business, including such measures as quality levels, efficiency, productivity, cycle time, and production and operating statistics such as order fulfillment or cost per order. Internal process measures are leading measures (lead indicators); they predict what will happen. The internal process theme reflects the organization's value chain. The internal process (operations) perspective looks from the inside out.
3. The **customer perspective** is aimed at creating value and differentiation from the customers’ perspective. It focuses on customer needs and satisfaction as well as market share, including service levels, satisfaction ratings, loyalty, perception, and repeat business. The customer perspective looks from the outside in.

4. The **innovation and learning perspective** sets priorities to create a climate that supports organizational change, innovation, and growth. It directs attention to the basis of future success—the organization’s people and infrastructure. Key measures might include intellectual assets, employee satisfaction and retention, market innovation (new product introductions), employee training and skills development, R&D investment, R&D pipeline, and time to market a product or service. The innovation and learning perspective looks ahead.

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**WHICH SCORECARD PERSPECTIVE IS WHICH?**

- The financial perspective looks back.
- The internal process perspective looks from inside out.
- The customer perspective looks from outside in.
- The innovation and learning perspective looks ahead.

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**(g) Business Process Analysis**

The scope of business process analysis includes two topics: business process reengineering (BPR) and business process improvement (BPI).

**(i) Business Process Reengineering**

In an effort to increase revenues and market growth, organizations are conducting business process reviews. The idea behind business process reviews, whether for a production process or a service process, is to streamline operations and eliminate waste. The result is increased efficiencies, which can lead to greater effectiveness. A proven technique is BPR, which requires big thinking and making major, radical changes in business processes. Workflow analysis is a part of BPR.

BPR is one approach for redesigning the way work is done to support the organization’s mission and reduce costs. BPR starts with a high-level assessment of the organization’s mission, strategic goals, and customer needs. Basic questions are asked, such as: Does our mission need to be redefined? Are our strategic goals aligned with our mission? Who are our customers? An organization may find that it is operating on questionable assumptions, particularly in terms of the wants and needs of its customers. Only after the organization rethinks what it should be doing does it go on to decide how best to do it.

Within the framework of this basic assessment of mission and goals, reengineering focuses on the organization’s business processes: the steps and procedures that govern how resources are used to create products and services that meet the needs of particular customers or markets. As a structured ordering of work steps across time and place, a business process can be decomposed into specific activities and can be measured, modeled, and improved. It can also be completely redesigned or eliminated altogether. Reengineering identifies, analyzes, and redesigns an organization’s core business processes with the aim of achieving dramatic improvements in critical performance measures, such as cost, quality, service, and speed.
Reengineering recognizes that an organization's business processes are usually fragmented into subprocesses and tasks that are carried out by several specialized functional areas within the organization. Often no one is responsible for the overall performance of the entire process. Reengineering maintains that optimizing the performance of subprocesses can result in some benefits but cannot yield dramatic improvements if the processes themselves are fundamentally inefficient and outmoded. For that reason, reengineering focuses on redesigning processes as a whole in order to achieve the greatest possible benefits to the organization and its customers. This drive for realizing dramatic improvements by fundamentally rethinking how the organization's work should be done distinguishes reengineering from BPI efforts that focus on functional or incremental improvement.

Reengineering is not a panacea. There are occasions when functional or incremental improvements are the method of choice, as when a process is basically sound or when the organization is not prepared to undergo dramatic change. When there is a need to achieve order-of-magnitude improvements, reengineering is the method of choice.

(ii) Business Process Improvement
BPI should be continuous, not discrete, and it tends to be more of an incremental change that may affect only a single task or segment of the organization. The concept of fundamental or radical change is the basis of the major difference between BPR and BPI. Quite often BPI initiatives limit their focus to a single existing organizational unit. This in itself breaks one of the tenets of BPR, which is that BPR must focus on redesigning a fundamental business process, not existing departments or organizational units. While BPR seeks to define what the processes should be, BPI focuses more on how to improve an existing process or service.

Through BPI, organizations can achieve significant incremental improvements in service delivery and other business factors (e.g., increase in employee productivity). The expected outcomes of BPI are not as dramatic as those associated with BPR initiatives, but the process is also not as traumatic as occurs when achieving the radical changes seen with BPR. In many cases, incremental changes may be achieved in situations lacking the support necessary for more radical changes. Exhibit 1.6 shows the key differences between BPR and BPI.

EXHIBIT 1.6 BPR versus BPI

<table>
<thead>
<tr>
<th>Element</th>
<th>BPR</th>
<th>BPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of change</td>
<td>Radical (e.g., 80%)</td>
<td>Incremental (e.g., 10–30%)</td>
</tr>
<tr>
<td>Scope</td>
<td>Entire process</td>
<td>Single area, function/unit</td>
</tr>
<tr>
<td>Time</td>
<td>Years</td>
<td>Months</td>
</tr>
<tr>
<td>Driver</td>
<td>Business</td>
<td>Technology</td>
</tr>
<tr>
<td>Focus</td>
<td>Redefine process</td>
<td>Automate/eliminate function</td>
</tr>
<tr>
<td>Work structure</td>
<td>Unified</td>
<td>Fragmented</td>
</tr>
<tr>
<td>Orientation</td>
<td>Outcome</td>
<td>Function</td>
</tr>
</tbody>
</table>
(h) Benchmarking Studies

(i) Benchmarking Defined

Benchmarking is the selection of best practices implemented by other organizations. Best practices are the best ways to perform a business process. Organizational change and improvement are the major elements of benchmarking. Benchmarks are the result of a study of organizational processes and performance through internal comparisons (i.e., between and among a company’s business units and divisions) and external comparisons (i.e., between two or more outside organizations). The first-level, basic processes that define a company’s operations are listed next.

- Understanding markets and customers
- Designing products and services
- Marketing and selling those products and services
- Producing what customers need and want
- Delivering products and services
- Providing service to customers

Supporting these basic processes, management and support processes maximize the value with the use of human resources, IT, and financial/physical resources.

The best way to practice benchmarking is to:

- Analyze business processes (inventory major business processes, conduct documentary research, and attend conferences to understand new developments).
- Plan the benchmark study (define scope, request site visits, and develop a methodology for capturing the new data).
- Conduct the benchmark study (analyze best practices and identify performance gaps).
- Implement the benchmark results (incorporate best practices into business processes and reevaluate the business processes).

(ii) Types of Benchmarking

Two types of benchmarking exist: business process benchmarking and computer system benchmarking. Business process benchmarking deals with BPI and BPR to reduce costs and to improve quality and customer service. Computer system benchmarking focuses on computer hardware/software acquisition, computer system design, computer capacity planning, and system performance. Each type of benchmarking has its own place and time.

Business benchmarking is an external focus on internal activities, functions, or operations in order to achieve continuous improvement. The objective is to understand existing processes and

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activities and then to identify an external point of reference, or standards, by which that activity can be measured or judged. A benchmark can be established at any level of the organization in any functional area, whether manufacturing or service industries. The ultimate goal is to attain a competitive edge by being better than the best.

Value creation is the heart of organizational activity, whether in a profit or a nonprofit entity. Benchmarking provides the metrics by which to understand and judge the value provided by the organization and its resources. Benchmarking focuses on continuous improvements and value creation for stakeholders (i.e., owners, customers, employees, and suppliers), utilizing the best practices to focus improvement efforts.

Benchmarking targets the critical success factors for a specific organization. It considers the mission of an organization, its resources, products, markets, management skills, and others. It requires an identification of customer(s), whether internal or external to the organization. Benchmarking is an early warning system of impending problems and is not a onetime measurement. Benchmarking can focus on improving organization structures, analyzing managerial roles, improving production processes, and developing strategic issues.

Benchmarking can be done by using published materials, insights gained at trade association meetings, and conversations with industry experts, customers, suppliers, academics, and others.

(iii) The Right Time for Business Process Benchmarking

Benchmarking should be undertaken when triggers are present. These triggers can arise internally or externally in response to information needs from some other major project or issue or problem in the company. Examples of these triggers include quality programs, cost reduction programs, new management, new ventures, and competitive moves. Benchmarking should be done as needed, without any preconceived notions.

(iv) Reasons for Business Process Benchmarking

A company should benchmark for three reasons:

1. It wants to attain world-class competitive capability.
2. It wants to prosper in a global economy.
3. It simply wishes to survive (desperation).

A company can benchmark in six distinct ways:

1. Internal benchmarking
2. Competitive benchmarking
3. Industry benchmarking
4. Best-in-class benchmarking
5. Process benchmarking
6. Strategic benchmarking

Internal benchmarking is the analysis of existing practices within various departments or divisions of the organization, looking for best performance as well as identifying baseline activities and drivers. Drivers are the causes of work: the triggers that set in motion a series of actions or activities that will respond to the requests or demands by the stockholders.
In doing internal benchmarking, management is looking downward, examining itself first before looking for outside information. Significant improvements are often made during the internal analysis stage of the benchmarking process. Value-added activities are identified, and non-value-adding steps are removed from the process. Internal benchmarking is the first step because it provides the framework for comparing existing internal practices to external benchmark data. Internal benchmarking focuses on specific value chains or sequences of driver-activity combinations.

**Competitive benchmarking** looks outward to identify how other direct competitors are performing. Knowing the strengths and weaknesses of competitors provides good input for strategic and corrective actions.

**Industry benchmarking** extends beyond the one-to-one comparison of competitive benchmarking to look for trends. It is still limited in the number of innovations and new ideas it can uncover because every company is following every other company in the industry. At best, industry benchmarking can help establish the performance baseline or can give an incremental gain. It gives a short-run solution and a quick fix to an existing problem. However, it does not support quantum leaps or breakthroughs in performance since the comparison is limited to one industry.

**Best-in-class benchmarking** looks across multiple industries in search of new, innovative practices, no matter what their source. Best-in-class benchmarking is the ultimate goal of the benchmarking process. It supports quantum leaps in performance and gives a long-run competitive advantage.

**Process benchmarking** centers on key work processes, such as distribution, order entry, or employee training. This type of benchmarking identifies the most effective practices in companies that perform similar functions, no matter in what industry.

**Strategic benchmarking** examines how companies compete and seeks the winning strategies that have led to competitive advantage and market success.

<table>
<thead>
<tr>
<th>WHICH BENCHMARKING DOES WHAT?</th>
</tr>
</thead>
<tbody>
<tr>
<td>◾ Internal benchmarking looks downward and inward.</td>
</tr>
<tr>
<td>◾ Competitive benchmarking looks outward.</td>
</tr>
<tr>
<td>◾ Industry benchmarking looks for trends. It provides a short-run solution and a quick fix to a problem.</td>
</tr>
<tr>
<td>◾ Best-in-class benchmarking looks for the best all around. It provides a quantum jump in improvement.</td>
</tr>
<tr>
<td>◾ Process benchmarking is specific.</td>
</tr>
<tr>
<td>◾ Strategic benchmarking is broad with big impact.</td>
</tr>
</tbody>
</table>

(i) **Metrics**

Metrics are performance measurements that provide a baseline where progress can be compared and assessed. They provide an accurate yardstick against which an employee’s and individual department’s progress can be evaluated. Metrics may or may not have warning mechanisms, signals, and alerts as KPIs do. Some companies could combine the metrics with KPIs due to their
similarity in function and focus. For example, quality metrics can be developed for the cost of quality measurement to help managers monitor quality, as listed next.

- The total cost of quality (COQ) as percentage of revenue by year
- The cost of conformance as percentage of total COQ
- The cost of nonconformance as percentage of total COQ

Prior to measuring metrics performance, metrics criteria must be established consisting of the following.

- Align with the organization’s goals and objectives
- Drive organizational efficiency and effectiveness either directly or indirectly
- Be applicable and linkable to the organization’s mission, vision, and value
- Be actionable, accountable, and implementable in practice
- Be practical in terms of cost effectiveness, cost acceptance, cost reduction, and operationally economical and efficient
- Be reliable, stable, predictable, and measurable
- Be valid, accurate, and appropriate for its purpose
- Be reproducible given the same circumstances, which is a sign of metric design strength
- Be repeatable to ensure consistency in metric outcomes and results
- Be traceable from the origination to the destination in both directions (i.e., forward tracing and backward tracing)
- Above all, metrics must be significant in size and scope, few in number for manageability, meaningful, and useful to decision makers

(j) Presentation Methods

Performance measurement outcomes and results can be presented to management using at least three methods such as traditional reports, dashboards, and data visualization tools. The latter two methods are further discussed next.

(i) Dashboards

Dashboards in general and specifically business data dashboards are a collection of performance indicators showing an object’s or a device’s status and quality levels in colors. Dashboards are used to present vital data in order to develop a strategy or plan. They provide a concise and visual summary of overall performance. Data dashboards are presented in several forms, including numerical, graphical, and interactive formats (exhibits, slides, audios, and videos). They use drill-down and drag-and-drop features. An example is showing an automobile’s performance in terms of its speed, revolutions per minute, oil pressure, and temperature.

Dashboards are of two types: static and interactive (basic and advanced). Static dashboards show traditional reports that are mainly focused on financial information (e.g., sales, revenues, costs, and profits). Basic interactive dashboards show information about customers’ buying habits and cross-sales to them. Advanced interactive dashboards can have built-in simulation models to do what-if type of analyses (i.e., sensitivity analysis).
Today, most organizations present only structured data on dashboards. Better insights and rewards can be achieved if dashboards show structured data, unstructured, and semistructured data to provide big-picture perspectives of businesses.

**Data filters** can be built into dashboards so data can be sliced from different perspectives or drilled down to a more detailed level using parameters, such as:

- Transaction date, month, quarter, or year
- Cost data by contract
- Revenue or profit data by a retail store
- Sales data by a market region
- Quarterly performance by a business segment

Data filters provide the ability to explore data at multiple levels and to customize user-driven data analysis. Data filters show only the requested data and ignore the rest of the data not requested.

**(ii) Data Visualization tools**

Data visualization tools are data presentation methods and include various reporting and information dissemination methods to report data results to management for their actions and decisions. These methods include charts and graphs (e.g., tabular, column, bar, pie, line, layer, Pareto, and radar charts; as well as dashboards, histograms, and scatter diagrams).

### 1.3 Organizational Behavior

This section discusses topics such as organizational theory, group dynamics and group development; management structures and organization systems (i.e., closed or open system); and organizational effectiveness and decline.

**(a) Organizational Theory**

**(i) Theories of Organization**

Basically, two theories of organization exist: the traditional view and the modern view. The traditional view has closed-system thinking while the modern view incorporates open-system thinking (see Exhibit 1.7).

**EXHIBIT 1.7 Theories of Organization**

<table>
<thead>
<tr>
<th>Theories of organization</th>
<th>Traditional view (closed-system thinking, variables are known and controllable, less uncertain environment)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Modern view (open-system thinking, variables are difficult to predict or control, more uncertain environment)</td>
</tr>
</tbody>
</table>
The **traditional view** assumes that the surrounding environment is fairly predictable and that uncertainty within the organization can be eliminated through proper planning and strict control. The primary goal is economic efficiency. All goal-directed variables are known and controllable.

The **modern view** assumes that both the organization and its surrounding environments are filled with variables that are difficult to predict or control. The organization interacts continuously with an uncertain environment. The primary goal is survival in an environment of uncertainty and surprise. The modern view deals with more variables that cannot be controlled or predicted.

Next we explore the evolution of traditional organization theory and its challenges followed by system characteristics.

**(A) Traditional View of Organizations**

Henri Fayol and Frederick Taylor treated organizing as a subfield of management. They believed that close supervision, obedience, orders, and rules were the norm. Four traditional principles of organization emerged:

1. A well-defined hierarchy of authority (to ensure the coordinated pursuit of organizational goals)
2. Unity of command (each individual answered to only one superior)
3. Authority equal to responsibility (Authority is the right to get subordinates to accomplish objectives, and responsibility is the obligation to accomplish those objectives. Individuals should be accountable for getting something done only when they were given formal authority to get it done.)
4. Downward delegation of authority but not of responsibility (The obligation for getting something done remains with the superior although the authority and responsibility were passed along to subordinates.)

Later Max Weber called bureaucracy efficient because of these four characteristics: division of labor, hierarchy of authority, a framework of rules, and impersonality (hiring and promoting people on the basis of what they know, not who they know). Bureaucracy is a matter of degree, and a moderate degree of bureaucratization can enhance organizational efficiency while extreme cases can hinder efficiency. However, trying to eliminate bureaucracy is impractical.

The traditionalists’ rigid recommendations for organizing and managing were challenged by Weber since they did not work in all situations. Experience has proved that organizing was more than just strict obedience to authority and that bureaucracy has become the epitome of inefficiency. In addition, bottom-up authority and environmental complexity and uncertainty also challenged the traditional thinking about organizations.

**Authority.** Is authority top-down or bottom-up? Traditionalists believed that authority was tied to property ownership and therefore naturally flowed from the top of the organization to the bottom. Chester Barnard questioned the traditional assumption about the automatic downward flow of authority. Instead, he proposed a more democratic *acceptance theory of authority* in which a leader’s authority is determined by subordinates’ willingness to comply with it.
Acceptance Theory of Authority. The acceptance theory of authority opened the door for upward communication and the informal organization that is based on friendship rather than work rules. Subordinates are viewed as active controllers of authority, not mere passive recipients.

Barnard believed that a subordinate recognizes a communication from a superior as being authoritative and decides to comply with it only when

1. The message is understood,
2. The subordinate believes it is consistent with the organization's purpose,
3. It serves the subordinate's interest, and
4. The subordinate is able to comply.

Uncertainty. Charles Perrow observed that the increasing complexity of markets, variability of products, increasing number of branch plants, and changes in technology all required more adaptive organizations, not rigid structure. Plans usually have to be made on the basis of incomplete or imperfect information, and, consequently, things do not always work out according to plan.

(B) Modern View of Organizations

Proponents of open-systems views realize that system-to-system interactions are often as important as the systems themselves. Here the “system” includes social, political, legal, and economic systems. A highly organized and vigorously interactive world needs realistically dynamic models, which is a characteristic of open-system thinking.

CLOSED SYSTEMS VERSUS OPEN SYSTEMS

- Traditional closed-system thinking emphasizes rigid organization structure. It largely ignores environmental influences. Closed-system thinking does not have permeable boundaries. It assumes that all organizations are systems with common characteristics.
- Modern open-system thinking emphasizes the need for flexibility and adaptability in organization structure. It fosters a more realistic view of the interaction between an organization and its environment. Open systems have permeable boundaries. All modern organizations are open systems.

Four characteristics that emphasize the adaptive and dynamic nature of all modern open systems are: interaction with the environment, synergy, dynamic equilibrium, and equifinality.

Since open systems are not self-sufficient, they depend on the environment for survival (i.e., on **interaction with the environment**). An open system adds up to more than the sum of its parts (i.e., **synergy**). A successful business is more than the factors of production: labor, land, and capital.

In open systems, dynamic equilibrium is the process of maintaining the internal balance necessary for survival by importing needed resources from the environment (i.e., **dynamic equilibrium**). **Equifinality** means reaching the same result by different means. It indicates that there is more than one way to get the job done.
Another way of looking at open systems is in relation to subsystems. If a system is made up of subsystems, three organizational subsystems would include technical, boundary spanning, and managerial. The technical subsystem (production function) physically transforms raw materials into finished goods and services. Boundary-spanning subsystems facilitate the organization's interaction with its general environment. Most boundary-spanning jobs (interface functions) are easily identified by their titles. The managerial subsystem controls and directs the other subsystems in the organization.

**KEY CONCEPTS TO REMEMBER: Open Systems**
- Technical subsystems are the very core of the organization.
- Boundary-spanning subsystems are directed outward toward the general environment.
- The managerial subsystem serves as a bridge between the other two subsystems.

Many traditional theories of organizing exist, including bureaucracy, administrative theory, scientific management theory, and human relations theory. The latter topic is discussed briefly.

**(ii) Human Relations Theory**
Many management philosophers rejected the individualism, which was emphasized in the theories of bureaucracy, administrative theory, and scientific management. These philosophers deplored competition between individuals in the organization and supported the idea of a cooperative group ethic. Emphasis was placed on the relations between people who are members of groups.

Mary Parker Follett and George Elton Mayo were two prominent philosophers associated with the human relations movement. Follett proposed the idea that individual freedom must be subordinated to the interest of the group. She was concerned with the individual but thought that the individual finds his or her creative self only by relating to others in groups. Follett thought that all authority rested on the consent of those who are directed. Therefore, she proposed that demands should arise from the situation rather than from the superior. Follett proposed that superiors should give reasons for their orders to subordinates. Participative management style is most likely to produce subordinates with management skills.

Mayo was very concerned with groups in the organization. He attempted to employ scientific methods to study the behavior of groups. He is most famous for his experiments at the Hawthorne Electric Plant in 1928, which in part investigated the influence of the degree of illumination on the productivity of workers. According to the Hawthorne studies, worker behavior is a complex system of forces that include personalities of the workers, nature of their jobs, and formal measurement and reward practices of the organization.

Closely related to the human relations movement is the behavioral science approach. Both of these approaches deal with the individual and his or her interaction in groups. However, the behavioral science approach arose because of the discontent with the methodology of researchers such as Mayo. Behavioral scientists deplored the small amount of data gathered by human relations advocates and the unsystematic examination of the data gathered.
Also, behavioral scientists thought that human relations writers overemphasized group behavior at the expense of individual behavior. Finally, behaviorists rejected the overriding concern with cooperation, when conflict may result in such benefits as innovation. It is easy to see that behavioral scientists emphasize the scientific method in investigating the individual and groups so that conclusions can be objective.

Behavioral scientists use three primary methods to study individuals and groups so that management can learn better ways of handling people: the case study, the sample survey, and the experiment. These three methods are inductive approaches since they involve studying a small number of persons or one organization and generalizing the results to other persons and organizations.

There are two primary criticisms of the behavioral science approach. First, behavioral science is not as precise a science as physics or chemistry because people are not as predictable as the nature of the universe. Second, behavioral science conclusions are useful, but since people and the environment in each organization are different, the application of findings may produce different results in different settings.

Douglas McGregor outlined a set of highly optimistic assumptions about human nature. He recommended Theory Y, which is a set of assumptions for his optimistic perspective about people. This is in contrast with the traditional view of people by managers (Theory X). McGregor criticized Theory X for being pessimistic, stifling, and outdated. Exhibit 1.8 shows the comparison between Theory X and Theory Y assumptions about people from the manager’s perspective.

**EXHIBIT 1.8 McGregor Theory X/Y Assumptions**

<table>
<thead>
<tr>
<th>Theory X Assumptions</th>
<th>Theory Y Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most people are lazy, dislike or avoid work.</td>
<td>Work is a natural activity, and people are creative, energetic, and imaginative.</td>
</tr>
<tr>
<td>Most people must be coerced and threatened, and are unwilling to take responsibility.</td>
<td>The average person is willing to take responsibility.</td>
</tr>
<tr>
<td>Most people prefer to be directed.</td>
<td>People are capable of self-direction and self-control.</td>
</tr>
<tr>
<td>Most people are interested only in job security.</td>
<td>People are committed to do a good job if they are rewarded adequately.</td>
</tr>
</tbody>
</table>

Senior management believes employees will volunteer to serve on committees because they: (1) want to play a greater role in the operation of their company, (2) want to receive more from their jobs than just a paycheck, and (3) have interests that extend beyond the boundaries of their specific jobs and will welcome the opportunity to pursue those interests. The motivational strategy that senior management has adopted is McGregor’s Theory Y.

William Ouchi discovered a type of organization that exhibited a style of management that effectively combines the traits of typical American and Japanese companies. He called these hybrid companies **Theory Z organizations**. These companies focus on the employee in areas such as:

- Long-term employment
- Relatively slow evaluation and promotion
Cross-functional career paths
- Participative decision making
- Individual responsibility
- Concern for the employee
- Emphasis on employee self-control

Theory Z is an organizational culture based on a participative decision-making process.

**Theory T** and **Theory T+** are complementary theories based on these Southeast Asian assumptions:

- Work is a necessity but not a goal itself.
- People should find their rightful place in peace and harmony with their environment.
- Absolute objectives exist only with God.
- In the world, persons in authority positions represent God, so their objectives should be followed.
- People behave as members of a family and/or group.
- Those who do not are rejected by the general society.

**Contingency Design Theory**
Organizing is the structuring of a coordinated system of authority relationships and task responsibilities. It spells out who does what and who reports to whom. Organizational structure can translate strategy into an ongoing productive operation (see Exhibit 1.9).

**Exhibit 1.9 Strategy and Structure**

Contingency design is an extension of the modern open-system view that permits the custom tailoring of organizations to meet unique external and internal situational demands. This design is based on the assumption that there is no single best way to structure an organization. It is the process of determining the degree of environmental uncertainty and adapting the organization and its subunits to the situation. *Contingency design is fitting the organization’s strategy to its internal and external environment.*

Two popular contingency models that validate the contingency approach by systematically matching structural characteristics with environmental demand include the Burns and Stalker model and the Lawrence and Lorsch model.
(A) *Burns and Stalker model*

Behavioral scientists Tom Burns and G. M. Stalker proposed a typology for categorizing organizations by structural design. They distinguished between mechanistic and organic organizations (see Exhibit 1.10).

**EXHIBIT 1.10 Structural Design of Organizations**

<table>
<thead>
<tr>
<th>Characteristics of mechanistic organizations</th>
<th>Characteristics of organic organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Rigid in design</td>
<td>• Flexible in structure</td>
</tr>
<tr>
<td>• Have strong bureaucratic qualities</td>
<td>• Adaptive to change</td>
</tr>
<tr>
<td>• Communication tends to be formal, command-and-control type</td>
<td>• Communication tends to be participative</td>
</tr>
<tr>
<td>• Narrow task definition</td>
<td>• Broad task definition</td>
</tr>
<tr>
<td>• Low task flexibility</td>
<td>• Low reliance on instructions</td>
</tr>
<tr>
<td>• High reliance on instructions</td>
<td>• Broader knowledge requirements</td>
</tr>
<tr>
<td>• Narrow knowledge requirements</td>
<td>• Suitable for unstable and uncertain environments</td>
</tr>
<tr>
<td>• Suitable for relatively stable and certain environments</td>
<td></td>
</tr>
</tbody>
</table>

(B) *Lawrence and Lorsch Model*

Paul Lawrence and Jay Lorsch documented the relationships between two opposing structural forces (differentiation and integration) and environmental complexity.

**Differentiation** resulting from a division of labor and technical specialization is the tendency among specialists to think and act in restricted ways. Differentiation tends to fragment and disperse the organization.

**Integration**, in opposition to differentiation, is the collaboration among specialists that is needed to achieve a common purpose. Integration is a unifying and coordinating force and is partially achieved through hierarchical control, standard policies and procedures, departmentalization, cross-functional teams and committees, better human relations, and liaison individuals and groups.

According to Lawrence and Lorsch, every organization requires an appropriate dynamic equilibrium (an open-system theme) between differentiation and integration. *They demonstrated that in successful firms, both differentiation and integration increased as environmental complexity increased.* These findings are equally applicable to the overall organization, departments, or divisions. They also found that the more differentiated an organization, the more difficult it is to achieve integration. These findings suggest that organizational failure in the face of environmental complexity probably results from a combination of high differentiation and inadequate integration. Under these conditions, specialists work at cross-purposes and become involved in counterproductive conflicts.

Contingency design models conclude that there is no single best organization design and that the more uncertain the environment, the more flexible and adaptable the organization structure must be.
KEY CONCEPTS TO REMEMBER: Various Theories of Management

- Bureaucratic organization is characterized by division of labor, hierarchy (top-down) authority, a framework of rules, impersonality, formal policies and procedures, and a competency level for hiring and promotions. Bureaucracies focus on organizational tasks rather than people and emphasize productivity of human behavior and task results. Bureaucracies tend to be stable in the long run. Division of work deals with specialization of labor to achieve organizational objectives.

- The classical view of an early theory of management includes the universality concept. Esprit de corps, one of Fayol’s 14 universal principles of management, emphasizes teamwork, communications, and harmonious effort among individuals. An example is “employees of a small retail outlet are highly motivated and genuinely concerned about the store’s prosperity.”

- The universal process is based on the belief that a single management process can be applied in all organizations. It believes that good managers are interchangeable among organizations. It uses a rigid, inflexible organizational structure regardless of the external environment.

- The operational approach, also known as scientific management or operations research, is concerned with technical, quantitative, and objective means of achieving efficiency in production operations. The manager is production oriented, and his or her primary interest is in improving efficiency and reducing waste. Standardization of work is a goal of the scientific school of management.

- Behavioral approaches to management primarily focus on people. They imply that it is in management’s best interest to be concerned about employees’ well-being. The behavioral approach to management most likely to have resulted from the prospect of unionization.

- Operations management is a management process that designs, operates, and controls production systems. The focus of productive systems is to transform physical resources and human talent into needed goods and services. The operations management theory or approach views organizations as productive systems consisting of inputs, a transformation process, and outputs.

- In general systems theory, the term “subsystem” is used to describe the relationship of each system component to the next higher component. In the opinion of general systems theorists, all organizations are identified as being open. The systems approach to management views the organization as a system of interconnected and interdependent parts. It believes that the whole is greater than the sum of its parts. The systems approach to management is demonstrated by a chief executive officer (CEO) who stresses the importance of the interdependencies among the various components of the organization.

- The contingency management approach is practiced by a member of an organization who assigns responsibility and delegates authority based on the task to be performed and the individual available for assignment. Contingency management theory uses multivariate analysis to determine how a grouping of variables react together to produce an outcome.

- According to contemporary management thought, managers should be given training in a course linking key staffing issues with organizational strategy and structure. Such a course should include HR planning, selection, training, and performance appraisal.

- The principle of equity is concerned with fairness and justice.

- Under the scalar chain principle (chain of command), there is a chain of direct authority relationship from superior to subordinate. The scalar principle of management is violated when an employee goes over a supervisor’s head and receives special permission from the departmental manager to, for example, take an extra week of vacation.

- The unity of command principle is violated when an employee answers to several bosses.

- Unity of direction requires the focus of all efforts aimed toward accomplishing the same, common goal, that is, all employees move in the same direction.
(b) Group Dynamics

(i) How Groups Think and Make Decisions

(A) Overview

Today, groups or committees make many decisions in organizations. There is a link between communication concepts and the subject of group decision making. Since messages are transmitted between members of the group, the effectiveness of this communication process will have a greater impact on the quality of the group’s decisions.

Groups offer an excellent vehicle for performing many of the steps in the decision-making process. They are a source of both breadth and depth of input for information gathering. If the group is composed of individuals with diverse backgrounds, the alternatives generated should be more extensive and the analysis more critical. When the final solution is agreed on, there are more people in a group decision to support and implement it. These pluses, however, can be more than offset by the minuses—time consumed by group decisions, the internal conflicts they create, and the pressures they generate toward conformity.

KEY CONCEPTS TO REMEMBER: The Group Decision—Strengths and Weaknesses

- **Strengths or assets.** Breadth of information, diversity of information, acceptance of solution, and legitimacy of process
- **Weaknesses or liabilities.** Time consuming, conformity, domination of discussion, ambiguous responsibility, and loss of personal accountability

(B) Group Behaviors

Group psychology studies have revealed that various groups produced contradictory behavior. Sometimes people did better at their tasks when there were other people around and sometimes they did worse.

Groupthink, groupshift, and group polarization are the three by-products of group decision making, all of which have the potential to affect the group’s ability to evaluate alternatives objectively and arrive at quality decision solutions (see Exhibit 1.11).

EXHIBIT 1.11 Types of Group Behavior

<table>
<thead>
<tr>
<th>Types of group behavior</th>
<th>Groupthink (members ignore risks and contingencies)</th>
<th>Groupshift (members move between conservative shift and risky shift)</th>
<th>Group polarization (members take more risks than any individual would)</th>
</tr>
</thead>
</table>

**Groupthink** is related to norms and describes situations in which group pressures for conformity deter the group from critically appraising unusual, minority, or unpopular views. Groupthink is a

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A disease that attacks many groups and can dramatically hinder their performance. Individuals who hold a minority position that is different from that of the dominant majority are under pressure to suppress, withhold, or modify their true feelings and beliefs. Opposition is viewed as disloyal and is discouraged. Groupthink can ignore risks and contingencies. The group leader must remain impartial and play the devil’s advocate to come up with new challenges and alternatives.

**Groupshift** indicates that in discussing a given set of alternatives and arriving at a solution, group members tend to exaggerate the initial position that they hold. Groups move between conservative shift and risky shift. The fact that it is a group decision frees any single member from accountability for the group’s final choice. Greater risk can be taken because even if the decision fails, no one member can be held fully responsible.

**Group polarization** can occur when a group decides to take more risks than any individual would have judged reasonable. Groups tend to make more extreme decisions than individuals who are part of the group. Group polarization and groupthink are two extremes on a risk measurement scale (see Exhibit 1.12).

**EXHIBIT 1.12 Groupthink and Group Polarization**

| Groupthink (low-risk takers) | Groupshift (low to high) | Group polarization (high-risk takers) |

**(ii) Factors Affecting Group Decisions**

Many factors affect group decisions, including ownership, nature, and structure of the problem; and nature, maturity level, size, and climate of the group (see Exhibit 1.13).

**EXHIBIT 1.13 Factors Affecting Group Decisions**

- Ownership of the problem
- Nature of the problem
- Structure of the problem
- Nature of the group
- Maturity level of the group
- Size of the group
- Climate of the group

**(A) Ownership of the Problem**

One of the selection criteria for a problem-solving method focuses on whether the problem is one that is “owned” by an individual or by a group. Individual ownership means that one person has the major interest in the solution of a problem; in effect, the group then works for that person. Group ownership means that several individuals or departments have an investment in the solution of a particular problem. Synectics is a good technique to use to solve problems owned either by individuals or by groups.
(B) Nature of the Problem
Not all problems can or should be solved by a group of people. One or two people might straighten out a problem if they have enough information and if they can take actions to remedy the problem by themselves. But if the problem is uncertain—that is, if not enough is known about it or the strategies for achieving a solution, or if implementation of the solution requires the acceptance, investment, or action of many people—then the best approach is to work with a group.

(C) Structure of the Problem
Another dimension to decision making is the structure of the problem. Structure has to do with the routineness of the decision required. How much is known or understood about the problem? If a problem is structured, if it is well understood, and if there are routine ways of dealing with it, the group can usually move quickly from the problem identification stages to the generation of solutions. But if a problem is unstructured or if it is not well understood, the group will need to spend a good deal of time identifying the problem before moving on to subsequent stages.

(D) Nature of the Group
Basically, group membership should reflect the level of the problem. For example, if the problem is a departmental one, then members of the department should be asked to resolve it. Participants should also be considered with regard to their potential functions within the group. Ideally, the membership should include people who are knowledgeable about various aspects of the problem: technical, political, organizational, environmental, personal, and so on. In addition, since any final solution needs to be accepted by those who will implement it, the people who actually will carry out the solution should be present in the group. The presence of knowledgeable people improves the quality of the decision; implementers improve the acceptance of it.

(E) Maturity Level of the Group
Knowledge of the maturity of the group helps to gain a clear understanding of its dynamics. “Group maturity” refers to the length of time a group has worked together and the kinds of dynamics that usually accompany old or new relationships. Chris Argyris, a management theorist, suggests that, over time, a group develops from an immature, passive state to a mature, self-directive state. Dependency of members on the group leader, passivity of individuals, a scarcity of overt verbal or nonverbal behaviors, inner-directed responses, short time perspective, and erratic, shallow interests characterize the behavior of the immature, passive group. The mature group, however, characteristically displays independence of the members from the leader, activity of group members, many overt verbal or nonverbal behaviors, outer-directed responses, long-range time perspective, and a deep, strong interest among members concerning the direction of the group.

Many problem-solving groups will exist for only short periods of time, and group maturity will most likely be minimal. In another setting, however, the group may be an ongoing problem-solving group that is very mature.

(F) Size of the Group
The size of the group should be decided after considering organizational role, group functions, and group maturity. Although the size should reflect all of these factors, the optimum number of participants for problem-solving technique is between 6 and 10 persons. A group of this size allows for involvement and idea generation in a workable situation.

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(G) Climate of the Group
The climate of the group is also important for decision making. Certain behaviors are clues to the climate in the group. Members in a supportive group will offer positive reinforcement, stroking, smiling, head nodding, direct eye contact, forward body movement, and so on. Members in a hostile or nonsupportive environment will discount ideas and people, sigh deeply, frown, avoid eye contact, and behave passively. Passive behaviors in this situation are those that deny the problem.

(H) Criteria and Determinants of Group Effectiveness
A group is defined as two or more freely interacting individuals who share a common identity and purpose. Individuals join groups for various reasons to satisfy their personal and professional goals. Two kinds of groups exist: informal and formal groups. An informal group is a collection of individuals seeking friendship while a formal group is a collection of individuals doing productive work. Individuals can be subjected to ostracism, which is rejection from a group.

Two criteria for group effectiveness include attractiveness and cohesiveness. Attractiveness has the outside-looking-in view, while the cohesiveness has the inside-looking-out view. Cohesive group members tend to stick together as they focus on “we” instead of “I.” An individual’s perception and frames of reference have a lot to do with how groups can be attractive or cohesive.

Factors that can enhance a group’s attractiveness and cohesiveness include cooperative relationships among members, a high degree of interaction among group members, a relatively small-size group, and similarities among group members.

Factors that can detract from a group’s attractiveness and cohesiveness include unreasonable demands on the individual, disagreement over work rules and procedures, unpleasant experience with some group members, and destructive competition or conflict.

(c) Group Development
Effectiveness and efficiency increase as the group matures. Similarly, immature groups are ineffective and inefficient. A significant benefit of group maturity is that a person’s individuality strengthens. Also, members of mature groups tend to be emotionally mature.

Kreitner suggests six stages of group development:

1. Orientation
2. Conflict and challenge
3. Cohesion
4. Delusion
5. Disillusion
6. Acceptance

During stages 1 through 3, group members attempt to overcome the obstacles of uncertainty over and authority, while during stages 4 through 6, they overcome the obstacles of uncertainty over interpersonal relations. An understanding of group development stages will improve an employee’s time management skills.

---

Stage 1: Orientation. Group members give the impression to managers and leaders that they want permanent control expressed through their wants and needs.

Stage 2: Conflict and change. Group members struggle for control by suggesting alternative courses of action and strive to clarify and reconcile their roles. Many groups do not continue past this stage because they get bogged down due to emotionalism and political infighting. An “I” feeling is dominant at this stage for power and authority.

Stage 3: Cohesion. A “we” feeling becomes apparent at this stage as everyone becomes truly involved in the project and any differences over power and authority are resolved.

Stage 4: Delusion. Issues and problems are dismissed or treated lightly. Group members work in group participation and promote harmony at all costs.

Stage 5: Disillusion. Disillusion sets in as unlimited goodwill wears off and disenchantment grows. Some members will prevail by showing their strengths while others hold back. Tardiness and absenteeism are the norm, which is symptomatic of diminishing cohesiveness and commitment.

Stage 6: Acceptance. Some group members move from conflict to cohesion and act as group catalysts as their expectations are more realistic. Power and authority structure is accepted. Consequently, the group members tend to be highly effective and efficient.

(d) Management Structures and Organization Systems

In this section, we review two organization systems—closed system and open system—and two management structures—mechanistic and organic. A relationship between management structures and organization systems is established.

A closed system is independent of its external environment; it is autonomous, enclosed, and sealed off from the external environment. It focuses on internal systems only. Its external environment is simple, stable, and predictable. The major issue for management is to run the business efficiently with centralized decision making and authority. A closed system represents a bureaucratic organization.

An open system is dependent on its environment to survive; it both consumes resources and exports resources to the external environment. It transforms inputs into outputs. It must continuously change and adapt to the external environment. Open systems are complex, unstable, and unpredictable, and internal efficiency is a minor issue for management. Open systems represent modern organizations.

A mechanistic management structure is characterized by rules, procedures, and a clear hierarchy of authority. Organizations are formalized and centralized, and the external environment is stable.

An organic management structure is characterized by a fluid (looser) and free-flowing nature, which is adaptive to changes in the external environment with few or no written rules and regulations and operates without a clear hierarchy of authority. Organizations are informal and decentralized, and responsibility flows down to lower levels. An organic management structure encourages teamwork and problem solving by letting employees work directly with each other.
MANAGEMENT STRUCTURES AND ORGANIZATION SYSTEMS

- A mechanistic management structure resembles a closed system of an organization.
- An organic management structure resembles an open system of an organization.

**Organizational Effectiveness and Decline**

The next items are highlights of organizational effectiveness and organizational decline:

- Effectiveness is a measure of whether organizational objectives are accomplished or not.
- Efficiency is the relationship between outputs and inputs.
- The effectiveness criteria are prescribed by society in the form of explicit expectations, regulations, and laws and by stockholders in the form of profits, ROI, and growth.
- Organizational effectiveness has a time dimension to it (i.e., near, intermediate, and distant future).
- Organizational decline results from management complacency (usually the primary culprit), unsteady economic growth, resource shortages, competition, and weak demand for products and services. It typically involves a reduction in the size or scope of the organization.

Ways to prevent organizational decline are listed next.

- Organize the company into definable ventures that have explicit goals.
- Concentrate on the toughest competitors and the most difficult customers.
- Define each job so that it is closely tied to a venture.
- Promote individual diversity to take risks and experiment with new ideas.
- Strengthen the participative management process.
- Emphasize more effective information flow, both downward and upward.

**1.4 Performance Management Techniques**

This section defines motivation, presents motivation theories and motivation strategies (e.g., job design, rewards, participative management, work schedules, and hard-sell and soft-sell tactics), and discusses organizational politics.

**Motivation Defined**

All employees, whether they are doing routine tasks or not, need to increase their motivation levels to excel in their day-to-day jobs. **Motivation** refers to the psychological process that gives a purpose and direction to human behavior. Motivation theories are generalizations about the “why” and “how” of purposeful behavior. The goal is to move individual employees toward achieving organizational objectives, including job performance. Job performance is defined as follows:

\[
\text{Job Performance} = \text{Ability} \times \text{Motivation}
\]
Both ability (skills and competence) and motivation (willingness to work hard) are necessary for effective and efficient job performance. Ability and skills are acquired through education, training, and on-the-job experience. The individual’s motivational factors such as needs, satisfaction, expectations, and goals are affected by challenging work, rewards, and participation. Motivational factors are both inborn and learned.

(b) Motivation Theories

Four popular motivation theories exist: Maslow’s needs hierarchy theory, Herzberg’s two-factor theory, expectancy theory, and goal-setting theory (see Exhibit 1.14).

(i) Maslow’s Needs Hierarchy Theory

Maslow’s theory focuses on five needs structured as a hierarchy, from bottom to top, and includes physiological, safety, love, esteem, and self-actualization needs. Individuals proceed up the hierarchy of needs, one level at a time. Higher needs emerge as lower needs are met. A fulfilled need does not motivate an individual. Needs are related to motivation in that unsatisfied needs motivate behavior. Maslow’s esteem needs are most closely associated with Herzberg’s concept of job enrichment.

A major deficiency of Maslow’s theory was which higher-order needs come into play after the lower ones are satisfied and in which order they come into play cannot be predicted. If anything, it seems that most people are simultaneously motivated by several of the same-level needs. Another criticism is that individual perception is secondary. Maslow’s needs theory failed under actual testing.

(ii) Herzberg’s Two-Factor Theory

Herzberg’s theory was based on employee satisfaction in that a satisfied worker is motivated from within to work harder and a dissatisfied employee is not self-motivated. Herzberg’s two factors are satisfiers and dissatisfiers. Dissatisfaction is associated with complaints about the job context or factors in the immediate work environment. Exhibit 1.15 presents some factors labeled as satisfiers and dissatisfiers.

EXHIBIT 1.14 Motivation Theories

<table>
<thead>
<tr>
<th>Motivation theories</th>
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<tbody>
<tr>
<td>Maslow’s needs hierarchy theory</td>
</tr>
<tr>
<td>Herzberg’s two-factor theory</td>
</tr>
<tr>
<td>Expectancy theory</td>
</tr>
<tr>
<td>Goal-setting theory</td>
</tr>
</tbody>
</table>

EXHIBIT 1.15 Satisfiers versus Dissatisfiers

<table>
<thead>
<tr>
<th>Dissatisfiers</th>
<th>Satisfiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company policy and administration</td>
<td>Achievement</td>
</tr>
<tr>
<td>Supervision</td>
<td>Recognition</td>
</tr>
<tr>
<td>Relationship with supervisor, peers, and subordinates</td>
<td>Work itself</td>
</tr>
<tr>
<td>Work conditions</td>
<td>Responsibility</td>
</tr>
<tr>
<td>Salary</td>
<td>Advancement</td>
</tr>
<tr>
<td>Personal life</td>
<td>Growth</td>
</tr>
<tr>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
</tr>
</tbody>
</table>
The elimination of dissatisfaction is not the same as truly motivating an employee. Herzberg is convinced that money is a weak motivational tool because, at best, it can only eliminate dissatisfaction. To satisfy and motivate employees, an additional element is required: meaningful, interesting, and challenging work. Some critics argued that his theory was weak on an empirical basis, and the individual’s perception was secondary. Others argued that one person’s dissatisfier may be another’s satisfier. Herzberg’s biggest contribution is the motivating potential for enriched work.

(iii) Expectancy Theory
Individual perception, although secondary in the Maslow and Herzberg models, is central to expectancy theory. Expectancy theory is based on the assumption that motivational strength is determined by perceived probabilities of success. The term “expectancy” refers to the subjective probability (or expectation) that one thing will lead to another. The focus of this model is as follows: One’s motivational strength increases as one’s perceived effort–performance and performance–reward probabilities increase. This theory has received empirical support from researchers and is based on common sense since $\text{Effort} \rightarrow \text{Performance} \rightarrow \text{Reward}$. Employees tend to work harder when they believe they have a good chance of getting personally meaningful rewards.

(iv) Goal-Setting Theory
Goal setting is the process of improving individual or group job performance with clear objectives and high standards. Management by objectives (MBO) is an example of goal-setting theory.

Management by Objectives. Organizational goals can be better achieved if the goals of superiors and subordinates are integrated with organizational goals. All levels of management should be involved in setting the objectives of the organization in working toward the common goals.

The essence of MBO is close consultation between superior and subordinate in the setting of and agreement on goals. They must agree on the goals to be achieved. Feedback is necessary during the period of working toward the goals and after the goals are accomplished. A key requirement is unity of command. Unity of command requires subordinates to be evaluated by a single superior—the manager.

MBO characteristics are listed next.

- Organizational common goals and measures of the achievement of those goals are fully complied with.
- If necessary, the organizational structure is changed. That is, the chain of command and the unity of command may have to be changed.
- Each superior confers with each subordinate on the subject of the subordinate’s goals.
- The superior and subordinate must agree on the subordinate’s goals and the criteria for achieving the goals.
- The subordinate must be given feedback on achievement of the goals based on the criteria established.
- The performance of the subordinate must be reviewed.
- The performance of the organization must be reviewed periodically.

When implementing MBO, these problems/barriers can be encountered:

- Unity of command must be achieved.
- Managers must change to a democratic style of leadership.
- Accomplishment of goals that are nonquantifiable may be difficult to measure.

See Exhibit 1.16 for advantages and disadvantages of MBO.

**EXHIBIT 1.16** Advantages and Disadvantages of MBO

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improves communications between superiors and subordinates</td>
<td>Opposition by managers for employee participation</td>
</tr>
<tr>
<td>Performance evaluation relatively easier due to established criteria</td>
<td>Suboptimization can occur</td>
</tr>
<tr>
<td>Room for innovation and creativity</td>
<td>Difficulty in reaching agreement on goals</td>
</tr>
<tr>
<td>Results in fewer or no surprises to managers</td>
<td>Learning is on trial-and-error basis</td>
</tr>
<tr>
<td></td>
<td>Imposition of external factors (e.g., economy) on employee goals</td>
</tr>
<tr>
<td></td>
<td>without full control over them</td>
</tr>
</tbody>
</table>

**WHICH MOTIVATION THEORY IS WHICH?**

- Maslow’s theory is built around the hierarchy of human needs.
- Herzberg’s theory is concerned with job performance and job satisfaction and focuses on maintenance and motivational factors.
- Expectancy theory is based on concept that people’s expectations of rewards are derived from their unique personal motive structure, beliefs, and perceptions.
- Goal-setting theory (MBO) is based on improving individual or group job performance.

**(c) Motivation Strategies**

Motivation strategies are derived from the motivational theories. Five strategies are listed next (see Exhibit 1.17):

1. Motivation through job design
2. Motivation through rewards
3. Motivation through employee participation
4. Motivation through work schedules and services
5. Motivation through hard-sell and soft-sell tactics
EXHIBIT 1.17 Motivation Strategies

- Job design (fitting people to jobs and fitting jobs to people)
- Rewards (material and psychological payoffs for performing tasks in the workplace)
- Employee participation (empowering employees to assume greater control of the workplace)
- Work schedules and services (flexible work schedules, family support services, sabbaticals)
- Hard sell and soft sell tactics (carrot and stick approach)

(i) Motivation through Job Design
Motivation through job design deals with two specific strategies: fitting people to jobs and fitting jobs to people. Three proven alternatives in fitting people to jobs include realistic job previews, job rotation, and limited exposure.

Job previews deal with audiovisual previews about the job and written descriptions in booklet form. Surveys have shown that those who were given realistic job previews tended to have lower initial expectations, greater organizational commitment and job satisfaction, and a lower turnover rate. However, the impact of realistic job previews on job performance was mixed.

Job rotation involves periodically moving people from one specialized job to another. It permits employees to rotate among several job positions. Job rotation provides for the continual development of managerial skills.

Limited exposure deals with limiting the individual’s exposure to tedious and highly fragmented jobs. This technique is called “earned time off,” which involves establishing a challenging yet fair daily performance standard and letting employees go home when the standard is reached.

The strategy of fitting jobs to people includes job enlargement and job enrichment. Job enlargement is the process of combining two or more specialized tasks in a workflow sequence into a single job. Job enrichment is redesigning a job to increase its motivating potential. It increases the challenge of work by reversing the trend toward greater specialization. Unlike job enlargement, which merely combines equally simple tasks, job enrichment builds more complexity and depth into jobs by introducing planning, decision making, and responsibility normally carried out at higher levels. Job enrichment may motivate employees because it addresses the work itself instead of trying to change the workers to fit the jobs.

JOB ENRICHMENT VERSUS JOB ENLARGEMENT
- Job enrichment adds depth to a job.
- Job enlargement adds width to a job.
Exhibit 1.18 presents a comparison of characteristics between job enrichment and job enlargement.

**EXHIBIT 1.18  Comparison of Job Enrichment and Job Enlargement**

<table>
<thead>
<tr>
<th>Characteristics of Job Enrichment</th>
<th>Characteristics of Job Enlargement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs are loaded vertically.</td>
<td>Jobs are loaded horizontally.</td>
</tr>
<tr>
<td>It allows employees to participate in planning and controlling.</td>
<td>It combines two or more specialized tasks but does not increase the planning or decision-making aspects of the job.</td>
</tr>
<tr>
<td>It promotes employee discretion and judgment.</td>
<td></td>
</tr>
<tr>
<td>It gives a feeling of personal responsibility.</td>
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</tbody>
</table>

**(ii) Motivation through Rewards**

Every employee expects to be rewarded in some way for work performed. Rewards may include material and psychological payoffs for performing tasks in the workplace. Managers have found that job performance and satisfaction can be improved by properly administered rewards. Two types of rewards exist: (1) extrinsic rewards, which are payoffs granted to the individual by other people (e.g., money, employee benefits, promotions, recognition [employee of the month], status symbols, and praise) and (2) intrinsic rewards, which are self-granted and internally experienced payoffs (e.g., sense of accomplishment, self-esteem, and self-actualization). An intrinsic reward is an internally generated benefit or satisfaction resulting from good work performed. See Exhibit 1.19 for the types of rewards.

**EXHIBIT 1.19  Types of Rewards**

- Money, status
- Praise, promotions
- Benefits
- Recognition
- Self-esteem
- Self-actualization
- Sense of accomplishment

**EXAMPLE**

A positive motivational effect will take place when a director of internal auditing decides to fill a supervisory vacancy by promoting a senior auditor rather than recruiting an outsider for the position.

**(iii) Motivation through Employee Participation**

**Participative management** is defined as the process of empowering employees to assume greater control of the workplace. Employees may participate in setting goals, making decisions, solving problems, and designing and implementing organizational changes. Employee participation will not work if individual values and attitudes are not in tune with it. Organizational factors, such as job design and corporate culture, can also help or hinder the process.
Environmental factors, such as technological change and competition, also affect the participation process.

Two team-oriented approaches to employee participation include quality control circles and self-managed teams. *Quality control circles* are small groups of voluntary, problem-solving employees who meet regularly to discuss quality improvement and ways to reduce costs. To be successful, the quality control circles should be introduced in an evolutionary manner rather than by management order.

*Self-managed teams* (or autonomous work groups) take on traditional managerial tasks as part of their normal work routine. Advocates say self-managed teams foster creativity, motivation, and productivity. The manager’s role will be more of a facilitator than an order giver, and supervision tends to be minimal. Hiring, training, and job design need to be skillfully interlocked with self-managed teams, thus driving up front-end costs. Traditional authoritarian supervisors view self-managed teams as a threat to their authority, job security, and power.

### QUALITY CONTROL CIRCLE VERSUS SELF-MANAGED TEAMS
- Quality control circles foster employee participation within the confines of the existing power structure.
- Self-managed teams create a whole new decentralized power structure.

(iv) **Motivation through Work Schedules and Services**
Approaches such as flexible work schedules, family support services, and sabbaticals are aimed at enhancing employee motivation and increasing job performance. While employees liked flexible work schedules, employers did not like them because of greater administrative expense, supervisory resistance, and inadequate coverage of jobs. Alternative approaches were invented, such as compressed workweeks (40 hours in fewer than five days), permanent part-time jobs (workweeks with fewer than 40 hours), and job sharing (complementary scheduling that allows two or more part-timers to share a single full-time job).

(v) **Motivation through Hard-Sell and Soft-Sell Tactics**
If an employee has no motivation other than salary, then that employee’s quality of work and quantity of work will simply and slowly deteriorate over a period of time. Something more is needed here. When motivating employees, managers can use general motivational strategies such as hard-sell or soft-sell tactics based on an employee’s personality type. The carrot (soft sell) and stick (hard sell) approach is another name for hard-sell and soft-sell tactics.

**Example 1:** Hard-sell tactics use outnumbering (outmaneuvering, outsmarting, and overpowering), pressure (pushy and aggressive behavior), tough (mean and hard-nosed), and rank-pulling (threats and intimidations) approaches, which can make an employee uncooperative and unfriendly. The outcome from using the hard-sell approach is a lose-lose situation. If the hard-sell approach does not work for some reason, then switch to the soft-sell approach.

**Example 2:** Soft-sell tactics use logical reasoning, emotional appeals, convincing, negotiating, nonthreatening, advice, and praise approaches, which can make an employee listen and cooperate. The outcome from using the soft-sell approach is a win-win situation. If the soft-sell approach does not work for some reason, then switch to the hard-sell approach.
(d) Organizational Politics

Organizational politics (OP) focuses on self-interest in response to opposition at the workplace. Many employees feel that freedom from office politics is important to their job satisfaction. Positive aspects of OP include exchanging favors, forcing coalitions, and seeking sponsors at upper levels of the organization. Negative aspects of OP include whistle-blowing, revolutionary coalitions, threats, and sabotage.

**WHAT IS APPLE POLISHING?**

Apple polishing is a political strategy prompted by a desire to favorably influence those who control one's career. Its major purpose is to make the supervisor look good.

Why do employees and employers promote OP? Employees resort to OP when they are unwilling to trust their career solely to competence, hard work, or luck. An organization’s climate or culture placing unreasonable barriers to individual or group success promotes OP.

Research on OP has indicated that:

1. The larger the organization and the higher the levels of management, the greater the perceived amount of political activity.
2. People in staff positions were viewed as more political than those in line positions.
3. Marketing people were viewed as more political than those in production.
4. “Reorganization changes” prompted more political activity than any other types of change.

Examples of positive impact resulting from OP include gaining visibility for ideas, improving coordination and communication, developing teams and groups, advancing one’s career, and increasing esprit de corps. Examples of negative impact resulting from OP include distraction from organizational goals, misuse of resources, and organizational conflict.

Tactics that are common expressions of OP in the workplace include posturing (one-upmanship), empire building, making the superior look good (apple polishing), political favors, creating power and loyalty cliques, reciprocating, engaging in destructive competition, and sabotaging (as a last resort).

Remedies to OP include creating openness and trust, measuring employee performance rather than personalities, integrating individual and organizational goals, implementing job rotation techniques, and practicing better work scheduling and timely career planning.

Rules for winning at OP include:

1. Finding out what the supervisor expects.
2. Finding out how the grapevine works.
3. Finding a mentor.
4. Fighting over major issues only.
5. Not hiring family members or close friends.
1.5 Managers, Leaders, and Entrepreneurs

This section defines the roles and responsibilities of managers, leaders, and entrepreneurs (MLEs). It also presents skills, traits, tools, and theories applicable to MLEs. In addition, this section compares managers, leaders, and entrepreneurs.

(a) Management Defined

Management is defined as the attainment of an organization’s strategies, goals, and objectives in an effective, efficient, economical, and productive manner. To this end, management is carried out through people by utilizing resources. Managers make things happen through hiring employees and deploying resources to accomplish their goals and objectives.

Managers get their power from the organizational structure (i.e., administrative power). This power comes from the manager’s job title or position status in the organization. Managers need the administrative power to provide stability, discipline, and continuity within the organization and to fulfill their roles and responsibilities. Managers share some common qualities with leaders in the areas of problem solving, decision making, and change implementation. Note that an organization has many managers and many more supervisors.

(b) Management Functions

Management achieves its strategies, goals and objectives through four functions of planning, organizing, directing (leading), and controlling an organization’s resources. Managers use a multitude of management skills (e.g., conceptual, human, and technical) and a variety of management styles (e.g., directive, analytic, intuitive, and behavioral) to perform these functions. The correct sequence of management functions is shown next:

Planning → Organizing → Directing → Controlling

(i) Planning

Planning defines where the organization wants to be in the future and how to get there. It describes action steps, detailed tasks, timelines for each task, and resources needed for each task. A lack of planning—or poor planning—can hurt an organization’s overall performance.

Plans are developed from strategies. Four types of plans include strategic, tactical, operational plans, and contingency plans. Tactical plans are derived or translated from the strategic plans, and operational plans are derived or translated from the tactical plans, in that order. Contingency plans are developed for all the other three types of plans because they also need backup plans.

The time horizon for a strategic plan is long term (between three and five years or more) as it deals with the broadest and complex issues that will have a dramatic impact, both positively and negatively, on the success and survival of an entire organization.

The time horizon for a tactical plan is middle term or intermediate term (between one and two years) as it deals with a specific business and its product lines by translating strategic plans.

The time horizon for an operational plan is short term (less than a year) as it deals with a specific department and its functions by translating tactical plans.
The time horizon for a *contingency plan* (backup plan) is short term and long term to address all time frames and all planning types.

These four types of plans are connected with each other in the correct sequence with their timelines, as follows:

Mission/Vision → Goals/Objectives → Strategies → Plans

Planning Types = Strategic Plans → Tactical Plans → Operational Plans → Contingency Plans

(Long Term) (Middle Term) (Short Term) (Short and Long Term)

Planning levels include corporate level (higher level), business unit level (middle level), and functional and departmental level (lower level). These levels are developed by managers at various levels of the company. The lower levels support the higher levels, meaning that the functional level supports the business unit and corporate levels and that the business unit level supports the corporate level. For example,

- Strategic plans are developed at the corporate level and the business unit level.
- Tactical plans are developed at the business unit level and the functional level.
- Operational plans are developed at the functional level and the departmental level.
- Contingency plans are needed if the original plan does not work out for some reason.

**Example 1:** The strategic plan for the KPX Company, a consumer product manufacturing company, is to produce and sell the green dishwashing liquid brand 146 in all retail stores in two years.

**Example 2:** The tactical plan for the KPX Company, a consumer product manufacturing company, is to locate the supplier sources in the world, to reformulate the green dishwashing liquid brand 146, and to fully test the product within one year.

**Example 3:** The operational plan for the KPX Company, a consumer product manufacturing company, is to obtain commitments (including slotting fees) from retailers that they will carry and sell the green dishwashing liquid brand 146 in all retail stores in six months after the product is made in factories.

**Example 4:** The contingency plan for the KPX Company, a consumer product manufacturing company, is to develop alternate, backup plans if the original plan does not work out for some reason. A total of three separate contingency plans are needed—one for each of the strategic, tactical, and operational plans.

The planning process consists of six stages or steps:

1. Analyzing external environment
2. Assessing internal resources
3. Establishing goals and objectives
4. Developing action plans
5. Implementing action plans
6. Monitoring outcomes
The planning tools include budgets and performance goals, resulting from the translation of plans.

(ii) Organizing
The organizing function typically follows the planning function and reflects how the organization tries to accomplish the strategic plan. Organizing involves the assignment of tasks, the grouping of tasks into jobs and departments, the assignment of authority, and the allocation of resources across the organization. Organizing is important because it follows from strategy in that strategy defines what to do and organizing defines how to do it. The organization structure is a tool that managers use to allocate resources for getting things accomplished.

Five design approaches to organizing a business function include:

1. Establishing authority, responsibility, accountability, and delegation
2. Developing organization charts
3. Establishing span of control or span of management
4. Organizing line and staff functions
5. Organizing departments

(iii) Directing
Directing (leading) is the use of influence to motivate employees to achieve organizational goals and objectives. Directing involves creating a shared culture and values, communicating goals to employees throughout the organization, and infusing employees with the desire to perform at a higher level. Directing involves motivating entire departments and divisions as well as those individuals working immediately with the manager.

(iv) Controlling
Controlling is the fourth and final function of management. Controlling helps measure whether a department or company is meeting its established plans and performance standards. Controlling is monitoring employees’ activities, determining whether the organization is on target toward its goals, and making corrections as necessary. Managers must ensure that the organization is moving toward its goals. New trends toward empowerment and trust of employees have led many companies to place less emphasis on top-down controls (i.e., a form of management-imposed controls, such as punishments and disciplinary actions) and more emphasis on bottom-up controls in terms of training employees to monitor and correct themselves (i.e., a form of self-control).

IT is also helping managers provide needed organizational control without strict top-down constraints. Companies can use computer programs to put more constraints (e.g., policies, procedures, and rules) on employees if managers believe the situation demands it.

Traditional controlling tools include operating budgets, capital budgets, analyzing financial statements for profitability and liquidity ratios, and adapting total quality management principles. Note that budgets can act as both planning and controlling tools.

(c) Managers’ Styles
The quality of a decision is a direct reflection of how the decision maker processes information. Managers approach decision making and problem solving in very different ways, depending on
the availability of information. Their approaches, perceptions, and recommendations vary because their minds work differently. Researchers have identified four management styles: directive, analytic, behavioral, and intuitive. One is not superior to the others.

The **directive style** focuses on “more telling and less doing” instead of “less telling and more doing.” This style comes across as a command-and-control style, representing an autocratic management style. Most employees get turned off with this style.

**Analytic-style** managers tend to be logical, precise, and objective. They prefer routine assignments that require attention to detail and systematic implementation. The manager uses deductive reasoning. The analytic style is good to use in model-building exercises and forecasting involving projections.

The **behavioral style** takes into account an employee’s emotions and feelings that people go through. This style considers what people are saying, what they mean, and why they are saying it, requiring a participative management approach. Most employees favor this style.

The **intuitive-style** manager is creative, is comfortable in handling a dynamic and nonroutine environment, follows hunches, and is mostly subjective. This manager likes to address broad issues and use inductive reasoning and sees things in complex patterns rather than as logically ordered bits and pieces. The intuitive style is good to use in brainstorming sessions and where traditional assumptions need to be challenged.

In practice, many managers use a combination of directive, analytic, behavioral, and intuitive styles.

**(d) Managers’ Skills**

Management skills can be broadly classified as conceptual, human, and technical. These skills are not exhibited equally across management levels. They vary with the nature of the job, the level of decision making, and the type of interaction with people.

**Conceptual skill** is the cognitive ability to see the organization as a whole and the relationship among its parts. It involves the manager’s thinking, information processing, and planning. It requires the ability to think strategically—to take the broad, long-term view. Conceptual skills are needed by all managers but are especially important for managers at the top. Many of the responsibilities of top managers, such as decision making, resource allocation, and innovation, require a broad view.

**Human skill** is the manager’s ability to work with and through other people and to work effectively as a group member. It includes the ability to motivate, facilitate, coordinate, lead, communicate, and resolve conflicts. As globalization, workforce diversity, uncertainty, and competition for highly skilled knowledge workers increase, human skills (i.e., interpersonal and people skills) become even more crucial. Here, focus is on emotional needs of employees instead of the physical needs related to the job.

**Technical skill** is the understanding of and proficiency in the performance of specific tasks. It includes mastery of the methods, techniques, and equipment involved in specific functions, such as engineering, manufacturing, or finance. These skills are particularly important at lower organizational levels. Many managers get promoted to their first management job by having excellent
technical skills. However, technical skills become less important than human and conceptual skills as managers move up the hierarchy.

The next table lists the importance of these skills for three management levels in highest to lowest order of importance.

<table>
<thead>
<tr>
<th>Management Levels</th>
<th>Management Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisors</td>
<td>Technical, Human, Conceptual</td>
</tr>
<tr>
<td>Managers</td>
<td>Technical, Human, Conceptual</td>
</tr>
<tr>
<td>Executives</td>
<td>Human, Conceptual, Technical</td>
</tr>
</tbody>
</table>

(e) Managerial Roles

Henry Mintzberg\(^{10}\) studied what managers do by focusing on the key roles they play. He criticized the traditional, functional approach as unrealistic and believed that it does not tell what managers actually do. Mintzberg believed that the functional approach portrays the management process as far more systematic and rational and less complex than it really is.

In his view, the average manager is not the reflective planner and precise “orchestra leader” that the functional approach suggests. Mintzberg used a method called “structured observation,” which included recording the activities and correspondence of few selected top-level executives. He then isolated 10 roles he believed are common to all managers. These 10 roles have been grouped into three major categories: interpersonal, informational, and decisional roles.

(i) Interpersonal Roles

Because of their formal authority and superior status, managers engage in a good deal of interpersonal contact, especially with subordinates and peers. The three interpersonal roles that managers play are:

1. **Figurehead.** As a symbol of legal authority, performing certain ceremonial duties (e.g., signing documents and receiving visitors)
2. **Leader.** Motivating subordinates to get the job done properly
3. **Liaison.** Serving as a link in a horizontal and vertical chain of communication

(ii) Informational Roles

Every manager is a clearinghouse for information relating to the task at hand. Informational roles are important because information is the heart of organizational decision making. The three typical informational roles of managers are:

1. **Nerve center.** Serving as a focal point for nonroutine information; receiving all types of information
2. **Disseminator.** Transmitting selected information to subordinates
3. **Spokesperson.** Transmitting selected information to outsiders

(iii) Decisional Roles
In their decision roles, managers balance conflicting interests and make choices. Through decisional roles, strategies are formulated and put into action. Managers play four decisional roles:

1. **Entrepreneur.** Designing and initiating changes within the organization
2. **Disturbance handler.** Taking corrective action in nonroutine situations
3. **Resource allocator.** Deciding exactly who should get what resources
4. **Negotiator.** Participating in negotiating sessions with other parties (e.g., vendors and unions) to make sure the organization's interests are adequately represented

(f) Managers’ Tools
Managers can deploy several tools to motivate and control employees’ behavior with the ultimate goal of increasing their work-related productivity and performance. The use of each tool depends on the business situation, the manager’s goals, and employee’s performance at a point in time. Five examples of these tools include

1. Management by objectives
2. Management by example
3. Management by exception
4. Management by walking about
5. Management by technology

(i) Management by Objectives
MBO is an example of goal-setting and motivational theory, where it is a process of improving an individual’s or a group’s job performance with clearly established objectives and high standards. MBO is also called management by results, management by standards, or management by authority because an employee’s actual performance (results) is compared with the standards or objectives set for that employee. All this work is accomplished because of a manager’s job authority.

An organization’s goals can be better achieved if the goals of superiors and subordinates are integrated with those of the organization. All levels of management should be involved in setting objectives for their employees that align with the organization’s objectives; that is, all should work toward common goals.

The essence of MBO is a formal agreement between the superior and subordinate in the setting of goals for the upcoming year (i.e., a meeting of minds or a mental contract). They must agree in advance on the goals to be achieved. Feedback mechanisms are necessary during the goal-setting process and after the goals are accomplished (quarterly meetings). A key requirement of MBO is unity of command, meaning that a subordinate’s performance is to be evaluated by only a single superior—the manager.

(ii) Management by Example
Management by example is the ultimate test for all managers and leaders because it is leading or showing by example, meaning it is doing walk the talk. It means practicing what is preached, putting the words into actions, and putting the plans to implementation. This is where most
managers and leaders fall short because management by example is not an easy thing to live by. It requires setting the right tone at the top of the management hierarchy. Employees expect their managers to behave as management by example.

(iii) Management by Exception
Management by exception operates when what actually occurs deviates from the established norms and standards. Only transactions with exceptions—not all transactions—are listed and reported to management for review. Management by exception recognizes that managers have limited time and that their time should not be wasted by requiring them to review and take actions on every business transaction that comes across their desk. This requirement is a waste of resources.

To reduce the unnecessary workload, managers need to establish tolerance or threshold levels for major types of transactions, and business rules need to be defined and programmed into computer systems. Any transaction that goes beyond the threshold level will be flagged and reported to management.

Examples of business rules follow:

- Notify the manager only when actual revenues fall by 5%.
- Notify the manager only when actual expenses go up by 10%.
- Notify the manager only when actual profits fall by 3%.

Management by exception is also called management by reports, meaning a manager notices the exceptions by reviewing some printed or online reports.

(iv) Management by Walking About
The principle of management by walking about (walking around or wandering around) (MBWA) means that managers walk around their business facilities (offices, stores, and warehouses) to talk to employees to find out their problems firsthand and to teach them about company’s direction and management values. MBWA should be practiced regularly so that employees do not think that management is spying on them. The idea is to build trust between management and employees. MBWA is also called open-book management thinking, meaning that employees have the right to be informed about the company’s plans and activities because they have a big stake in the company’s well-being.

**Fact:** The Hewlett-Packard (HP) Company is well known to practice the MBWA principle, which was implemented by many corporations in the United States.

**Example:** Examples of informal communications include MBWA and the grapevine.

MBWA means higher-level employees (e.g., executives and senior managers) talk directly with the lower-level employees (e.g., hourly workers at factory, office, or warehouse) to learn about problems and issues confronting them as well as to share their key ideas and values. These meetings are informal and unannounced. The idea behind MBWA is practicing an open-book management principle, meaning that business matters are kept open on purpose for employees to see with their own eyes. The goal of open-book management is to build trust between management and employees.
(v) Management by Technology
Here, the term “technology” means use of IT (e.g., computers, networks, and mobile devices), manufacturing technology (e.g., computer-aided design and manufacturing), service technology (e.g., customer relationship management system), retail technology (e.g., sensors, tags, electronic commerce, and mobile commerce), and management technology (e.g., decision support systems and data dashboards). All these technologies use the Internet, computers, and mobile devices regardless of the location and who uses them.

Virtual technology with collaborative software is facilitating the vast growth of virtual managers, virtual leaders, virtual employees, virtual teams, and virtual organizations where employees, managers, leaders, suppliers, vendors, and business partners work together in a cooperating and coordinating manner in seamless and borderless global work environments to achieve common business goals and objectives very efficiently and effectively.

(g) Management Staffing Levels
Managers use conceptual, human, and technical skills to perform the four management functions of planning, organizing, leading, and controlling in all organizations. But not all managers’ jobs are the same. Managers are responsible for different departments, work at different levels in the hierarchy, and meet different requirements for achieving high performance. Two management types that describe the need for staffing levels include vertical differences and horizontal differences.

Vertical Differences. An important determinant of the manager’s job is hierarchical level. Three levels in the hierarchy include top managers, middle managers, and front-line (first-line) managers. Top managers are responsible for setting organizational goals, defining strategies for achieving them, monitoring and interpreting the external environment, and making decisions that affect the entire organization. They share a long-term vision for the organization, shape corporate culture, and nurture an entrepreneurial spirit that can help the company keep pace with rapid change. Middle managers are responsible for implementing the overall strategies and policies defined by top managers. They are concerned with the near future and are expected to establish good relationships with peers around the organization, encourage teamwork, and resolve conflicts. First-line managers are directly responsible for the production of goods and services. They include titles such as supervisor, line manager, section chief, and office managers. Their primary concern is the application of rules and procedures to achieve efficient production, provide technical assistance, and motivate subordinates. The time horizon in which they work is short, with the emphasis on accomplishing day-to-day goals.

Horizontal Differences. The other major difference in management jobs occurs horizontally across the organization. These jobs include functional managers and general managers. Functional managers are responsible for departments that perform a single functional task and have employees with similar training and skills. Line managers are responsible for the manufacturing (operations) and marketing departments that make or sell the product or service. Staff managers are in charge of departments such as finance and HR that support the line managers. General managers are responsible for several departments that perform different functions. Project managers also have general management responsibility, because they coordinate people across several departments to accomplish a specific project.
(h) Organizational Commitment

The hallmark of any organization is the strong and sincere commitment to excellence of senior management (i.e., directors, executives, and officers). To achieve this excellence, management needs to consider various facilitating and inhibiting forces or factors that could change the expected outcomes of excellence. Facilitating factors increase the chances of achieving the organizational excellence; inhibiting factors decrease such chances. Senior management’s goal must be to encourage the facilitating factors and discourage the inhibiting factors to achieve excellence. Here, only strong commitment to excellence will succeed, not weak or mediocre commitment. This level of commitment is also needed when building organizational commitment from all levels of management and nonmanagement. Commitment goes both ways, which means that commitment flows from management to employees and flows from employees to management. Management is the catalyst, change agent, goal-setter, inspirer, enabler, and motivator whereas employees are supporters and achievers of management’s goals. Note that employees support management only when they see clear benefits coming to them (i.e., financial and nonfinancial benefits). Exhibit 1.20 presents facilitating and inhibiting factors to achieve organizational excellence and commitment.

<table>
<thead>
<tr>
<th>Factor or Force</th>
<th>Facilitators</th>
<th>Inhibitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational design</td>
<td>Well-structured business functions and job duties</td>
<td>Ill-structured business functions and job duties</td>
</tr>
<tr>
<td>Organizational development</td>
<td>Well-planned and executed training and growth programs</td>
<td>Ill-planned and poorly executed training and growth programs</td>
</tr>
<tr>
<td>Organizational change</td>
<td>Well managed, encourages change</td>
<td>Ill managed, discourages change</td>
</tr>
<tr>
<td>Incentives to managers and employees</td>
<td>Fair and achievable</td>
<td>Unfair and not achievable</td>
</tr>
<tr>
<td>Budget</td>
<td>Well funded</td>
<td>Ill funded</td>
</tr>
<tr>
<td>Human talent</td>
<td>Up-to-date knowledge, skills, and abilities (KSAs)</td>
<td>Outdated KSAs</td>
</tr>
<tr>
<td>Technology</td>
<td>Leader</td>
<td>Follower</td>
</tr>
<tr>
<td>Employees</td>
<td>Empowered</td>
<td>Not empowered</td>
</tr>
<tr>
<td>Business strategy</td>
<td>Well formulated and executed</td>
<td>Ill formulated and poorly executed</td>
</tr>
<tr>
<td>Organizational harmony</td>
<td>Synchronized and united (i.e., everybody is singing the same song). Goal congruence is in place.</td>
<td>Unsynchronized and divided (i.e., everybody is pulling in different directions). Goal congruence is not in place.</td>
</tr>
</tbody>
</table>

Often, management undertakes new initiatives or projects to increase an organization’s efficiency and effectiveness in terms of increasing productivity, performance, sales, revenues, profits, stock market price, and market share and decreasing costs and operating expenses. However, the organizational commitment could be in jeopardy due to organizational politics (i.e., turf building and protecting) and organizational conflicts (i.e., favor one and disfavor others) which, in turn, could derail the organizational harmony. These politics and conflicts are often at play to defund one project and fund another project of interest and to favor one functional department manager to become a project sponsor and disfavor other functional department managers. These politics and conflicts are dysfunctional when unchecked; when they are combined with lack of innovation and bad (toxic) culture, they could lead to an organization’s decline.
The following is a list of issues or problems that should be addressed, which could decide whether organizational excellence and building organizational commitment is possible:

- Commitment by all levels of management and all types of employees must be solid, genuine, trustworthy, and honest. The commitment cannot be a lip service and it cannot come across as a token gesture, flaky, or fake.
- Commitment can quickly become weak or can fail if business strategy is flawed.
- Commitment must be driven by top-level management and supported by lower-level management and employees. Input from all levels of management and all types of employees is a requirement.
- Incentives to managers and employees are poorly defined and structured. Ill-defined incentives are very hard to motivate managers and employees in order to reach the expected performance levels.
- Many new projects fail due to sudden budget cuts, reprioritization of projects, project sponsor leaving the company or changing job responsibilities, lack of a project sponsor. Forging alliances with other businesses is becoming very difficult.
- Organizational commitment must be continuous and relentless regardless of budget cuts and changes in job responsibilities unless otherwise overruled by changes in laws, rules, and regulations.

(i) Leadership Defined

Leadership occurs when a leader mobilizes an organization’s resources to fulfill its mission and vision. Leaders have inherent power (personal and charismatic power) and built-in qualities, such as motivating, inspiring, innovative, imaginative, and visionary. Leadership power promotes creativity and change in the organization. Leaders share some common qualities with entrepreneurs in the areas of innovation, creativity, imagination, and vision. Note that there are few leaders and many managers in an organization. Leaders use depth charts to develop succession plans for executives, officers, and senior managers.

(j) Leadership Theories

Over the past several decades, leadership theories have been slowly evolving due to constant research conducted on this mysterious topic. This evolution will continue until all the old mysteries and new mysteries are fully uncovered. The evolution of leadership theories can be presented in five ways.

1. Trait leadership theory
2. Behavioral styles leadership theory
3. Situational leadership theory
4. Transformational leadership theory
5. Miscellaneous leadership theories

(i) Trait Leadership Theory

It was assumed that leaders are born, not made. Later, this assumption was changed to accept that leadership traits are not completely inborn but can also be acquired through learning and experience.
Although hundreds of physical, mental, and personality traits were said to be the key determinants of successful leadership, researchers reached agreement on only five traits:

1. Intelligence  
2. Scholarship  
3. Dependability in exercising responsibilities  
4. Activity and social participation  
5. Socioeconomic status

Trait profiles do provide a useful framework for examining what it takes to be a good leader. Managers from across the United States were surveyed to determine the traits they admired in superior leaders. Results indicated that honesty (top of the scale), competent, forward looking, inspiring, and intelligent (bottom of the scale) were the most widely admired.

(ii) Behavioral Styles Leadership Theory

Researchers began turning their attention to patterns of leader behavior instead of concentrating on the personal traits of successful leaders. In other words, attention turned from who the leader was to how the leader actually behaved. Subordinates preferred managers who had a democratic style to those with an authoritarian style or a laissez-faire (hands-off) style. Exhibit 1.21 presents strengths and weaknesses of behavioral styles leadership theory.

EXHIBIT 1.21 Strengths and Weaknesses of Behavioral Styles Leadership Theory

<table>
<thead>
<tr>
<th>Strengths of Behavioral Styles Theory</th>
<th>Weaknesses of Behavioral Styles Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authoritarian style stresses prompt, orderly, and predictable performance. Democratic style enhances personal commitment through participation.</td>
<td>Authoritarian approach tends to stifle individual initiative. Democratic process is time consuming. This style does not always stimulate better performance. Some employees prefer to be told what to do rather than to participate in decision making.</td>
</tr>
<tr>
<td>Laissez-faire permits self-starters to do things as they see fit without leader interference.</td>
<td>Laissez-faire groups may drift aimlessly in the absence of direction from leader.</td>
</tr>
</tbody>
</table>

Two popular models that have received a great deal of attention are the Ohio State Model and the Leadership Grid by Robert R. Blake and Jane Srygley Mouton.\(^{11}\)

Ohio State Model. A team of Ohio State University researchers defined two independent dimensions of leader behavior.

Dimension 1: Initiating structure (x-axis from low to high). This dimension represents the leader’s efforts to get things organized and get the job done.

Dimension 2: Consideration (y-axis from low to high). This dimension is the degree of trust, friendship, respect, and warmth that the leader extends to subordinates.

The researchers drew a matrix from these two dimensions. High-structure, high-consideration was generally hailed as the best all-around style.

Leadership Grid Blake and Mouton\textsuperscript{12} remain convinced that there is one best style of leadership, which they described in a grid with two axes.

1. Horizontal (x) axis shows concern for production involving a desire to achieve greater output, cost effectiveness, and profits
2. Vertical (y) axis shows concern for people involving promoting friendship, helping coworkers get the job done, and attending to things that matter to people, such as pay and working conditions

By scaling each axis from 1 to 9, the grid consists of these five leadership styles:

1. \textbf{9, 1 style}. Primary concern for production; people secondary
2. \textbf{1, 9 style}. Primary concern for people; production secondary
3. \textbf{1, 1 style}. Minimal concern for either production or people
4. \textbf{5, 5 style}. Moderate concern for both production and people to maintain the status quo
5. \textbf{9, 9 style}. High concern for both production and people as evidenced by personal commitment, mutual trust, and teamwork

Most managers prefer the 9,9 style, regardless of the situation at hand, since this style correlates positively with better results, better mental and physical health, and effective conflict resolution.

(iii) Situational Leadership Theory
Situational theory or contingency thinking is based on the assumption that successful leadership occurs when the leader’s style matches the situation. It stresses the need for flexibility and rejects the notion of a universally applicable style.

<table>
<thead>
<tr>
<th>Behavioral Style Theorists</th>
<th>Leadership Theory versus Situational Leadership Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral style theorists believe that there is one best style of leadership.</td>
<td></td>
</tr>
<tr>
<td>Situational theorists are convinced that no one best style of leadership exists.</td>
<td></td>
</tr>
</tbody>
</table>

Different approaches to situational leadership include Fred Fiedler’s contingency theory, the path-goal theory, and the Vroom-Yetton-Jago decision-making model, as shown in Exhibit 1.22.

Fiedler's contingency theory, which has been thoroughly tested, is based on two interrelated factors. The performance of a leader depends on two interrelated factors: (1) the degree to which the situation gives the leader control and influence to accomplish the job and (2) the leader's basic motivation: whether to accomplish the task or having close supportive relations with others (the task-motivated leader has a concern for production and the relationship-motivated leader has a concern for people).

WAYS TO ENHANCE WORKER MOTIVATION

Worker motivation can be increased by increasing the number and kinds of personal payoffs for achieving work goals. Other ways to increase worker motivation involve making paths to these payoffs easier to travel by clarifying the paths, reducing roadblocks and pitfalls, and increasing the opportunities for personal satisfaction en route.

Fiedler and his colleagues summed up their findings by noting that “everything points to the conclusion that there is no such thing as an ideal leader.” Instead, there are leaders, and there are situations. The challenge to a manager is to analyze a leader’s basic motivation and then match that leader with a suitable situation to form a product in combination. Fiedler believed that it is more efficient to move leaders to a suitable situation than to tamper with their personalities by trying to get task-motivated leaders to become relationship-motivated ones, or vice versa.

The path-goal theory, which is a derivative of expectancy motivation theory, emphasizes that leaders should motivate their followers by providing clear goals and meaningful incentives for reaching them. Motivation is seen as essential to effective leadership.

Path-goal proponents believe that managers need to rely contingently on four different leadership styles since personal characteristics of subordinates, environmental pressures, and work demands on subordinates will all vary from situation to situation. These four leadership styles include: directive (tell people what to do), supportive (treat subordinates as equals), participative (consult with subordinates), and achievement-oriented (set challenging goals). For example, a directive situational leadership style would be appropriate for a subordinate who possesses very low task maturity for a particular assignment.

PATH-GOAL THEORY VERSUS FIEDLER THEORY

- Path-goals theorists assume that managers can and do shift situationally from style to style.
- Fiedler theorists assume that managers cannot and do not change their basic leadership styles.
The Vroom-Yetton-Jago decision-making model. Vroom helped develop the expectancy theory of motivation based on the assumption that motivational strength is determined by perceived probabilities of success. The term “expectancy” refers to the subjective probabilities (or expectancy) that one thing will lead to another. Researchers Vroom, Yetton, and Jago (the Vroom model) portray leadership as a decision-making process with five distinct decision-making styles, each of which requires a different degree of participation from subordinates. The Vroom model qualifies as a situational-leadership theory because it prescribes different decision styles for varying situations managers typically encounter.

Of these five decision-making styles, two are autocratic, two are consultative, and one is group directed (see Exhibit 1.23). In addition, the Vroom model gives managers the tools for matching styles with various individual and group situations.

EXHIBIT 1.23 Five Decision-Making Styles

![Diagram showing five decision-making styles: Autocratic leader (Low degree of subordinate participation), Consultive leader (Moderate degree of subordinate participation), Group-directed leader (High degree of subordinate participation).

Transformational Leadership Theory

Transformational leaders are characterized as visionaries who challenge people to achieve exceptionally high levels of morality, motivation, and performance. Transformational leaders are masters of change, have charisma, rely on referent power, and can envision a better future, effectively communicate that vision, and get others to willingly make it a reality.

There is a distinction between a transactional leader and a transformational one. Transactional leaders monitor people so they do the expected, according to plan (i.e., maintain status quo). In contrast, transformational leaders inspire people to do the unexpected, above and beyond the plan (fostering creative and productive growth).

TRANSACTIONAL LEADERS VERSUS TRANSFORMATIONAL LEADERS

- Transactional leaders can best handle stable situations.
- Transformational leaders can best handle rapidly changing situations.
- Transformational theory combines the behavioral style leadership theory and situational leadership theory. Charismatic behavior is blended with the traditional behavior.
- Laboratory and field research evidence positively supports the transformational leadership pattern.
- Followers of transformational leaders tend to perform better and to report greater satisfaction than followers of transactional leaders.
(v) Miscellaneous Leadership Theories

At least six other theories of leadership are available in light of globalization, electronic commerce, the Internet, employee diversity and empowerment, and virtual organizations. They include the following:

1. The **level 5 leader** has no ego as he or she reaches the highest level in the management hierarchy in terms of knowledge, skills, and abilities. This leader gives credit for successes to subordinates while taking responsibility for failures.

2. The **interactive leader** is one who uses consensual and collaborative process in problem solving and decision making by including subordinates. This leader’s power is derived from relationship building and caring attitudes instead of positional power. Female leaders are found to be better than male leaders as interactive leaders because they can motivate, communicate, and listen better.

3. The **virtual leader** is one who is open-minded, flexible, and exhibits positive attitudes that focus on solution instead of problems. This leader is good at communicating, coaching, building relationships, and caring skills.

4. The **servant leader** is one who operates on two levels: (1) to fulfill subordinates’ needs and goals and (2) to achieve the organization’s mission. This leader gives away power, ideas, information, recognition, and credit to subordinates and connects the subordinate’s motives to the organization’s mission. The servant leadership position is upside down, meaning that the leader serves the subordinates working for him or her and the organization that the leader works for. The servant leader is at the bottom and others are at the top.

5. The **Zen Principles of leadership** tap into the creative and innovative side of a leader. The seven Zen principles include:
   a. Communicating in a plain, simple, clear, concise, and natural manner.
   b. Staying positive and achieving a balance in solving problems, despite differences, ambiguities, imperfections, and irregularities.
   c. Spending more time in guiding, mentoring, coaching, and delegating and less time in telling, micromanaging, and directing.
   d. More trusting and less doubting and behaving honestly and openly.
   e. Managing change very carefully while respecting the organizational culture.
   f. Striving for innovation by breaking away from the tradition to achieve a competitive edge.
   g. Motivating more and asserting less authority. (The last principle includes creating harmony at workplace, listening with an open mind, and establishing stretch goals.)

6. **Dual-hat leadership**, commonly practiced in the military sector, applies to situations where an incoming executive or officer is given two job responsibilities (dual-hat leadership) in two different organizations, functions, or departments simultaneously. This military practice can be applied to nonmilitary sectors during a transition period where one executive leaves the organization and another executive assumes responsibilities for the two functions simultaneously until a new executive is hired to replace the executive who left the organization. Advantages of this leadership approach include: (1) more in-depth coordination and collaboration; (2) faster decision making; and (3) more efficient
use of resources. Disadvantages of this leadership approach include: (1) concerns about unfair prioritization of requests for support services between the two functions at the same time; (2) broader span of control (i.e., increased breadth, depth, and magnitude of issues to deal with); (3) increased tension between the two functions for routine resource prioritization, allocation, and sharing; and (4) conflict-of-interest situations where the leader favors one function and disfavors other functions.

(k) Leadership Categories

There are two categories of leaders: (1) good and bad leaders and (2) formal and informal leaders. Effective leadership is associated with both better performance and more ethical performance. According to Chester Schriesheim, James Tolliver, and Orlando Behling, leadership is “a social influence process in which the leader seeks the voluntary participation of subordinates in an effort to reach organizational objectives.”

Exhibit 1.24 provides a comparison between formal and informal leadership.

EXHIBIT 1.24  Comparison of Formal Leadership with Informal Leadership

<table>
<thead>
<tr>
<th>Formal Leadership</th>
<th>Informal Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal leadership is the process of influencing relevant others to pursue official organizational objectives.</td>
<td>Informal leadership is the process of influencing others to pursue unofficial objectives that may or may not serve the organization’s interests</td>
</tr>
<tr>
<td>Formal leaders have a measure of legitimate power because of their formal authority.</td>
<td>Informal leaders lack formal authority.</td>
</tr>
<tr>
<td>Formal leaders rely on an expedient combination of reward, coercive, referent, and expert power.</td>
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</tbody>
</table>

(l) Leaders’ Powers

Power is needed in all organizations. Power must be used because managers need to influence those they depend on, such as employees. It is powerlessness, not power, that undermines organizational effectiveness. Power is the ability to manage all types of resources to accomplish something of value to the organization. These resources could be human, material, and informational in content.

Power affects organizational members in three areas: decision making, behavior, and situations. Another dimension to power is how people distinguish between “power over” (ability to dominate), “power to” (ability to act freely), and “power from” (ability to resist the demands of others).

Here, one needs to differentiate between authority and power.

- Authority is the right to direct the activities of others. It is an officially sanctioned privilege that may or may not get results.
- Power is the demonstrated ability to get results.
- One may alternatively possess authority but have no power, possess no authority yet have power, or possess both authority and power.
- A manager who gets subordinates to work hard on an important project has both authority and power.

Experts on power say that power is neutral. It is a tool that can be used in a positive or negative manner. Power exercised for power’s sake can be quite dangerous to all parties affected. Leaders exhibit five bases of power:

1. **Reward power** is gaining compliance through rewards.
2. **Coercive power** is gaining compliance through fear or threat of punishment.
3. **Legitimate power** is compliance based on one’s formal position and parallels formal authority (job title). It can be eroded by frequent abuse or overuse.
4. **Referent power** is compliance based on charisma, personal identification, or attraction and has no relation to job title. A charismatic leader is one who has the ability to motivate subordinates to transcend their expected performance. A charismatic leader is also a visionary leader who speaks to the hearts of subordinates, letting them to be a part of his or her vision and their vision combined.
5. **Expert power** is compliance based on the ability to dispense valued information and is guided by the knowledge or skills possessed by a person (e.g., unique or special skills in computer technology, space technology, nuclear science, business strategy, or bioengineering fields).

**Leaders’ Intelligences**

Leaders need to possess certain type of intelligence to be successful in all business circumstances they face. Four types of intelligence are briefly presented next: cognitive, emotional, social, and contextual.

**Cognitive intelligence** is based on a person’s intelligent quotient (IQ), which is determined in part genetically by birth and in part by education, income, and life environment. The IQ measures cognitive abilities of a person, such as memory, attention, and speed, which are shown as positive predictors of job performance, school performance, and income. Employers use the IQ test scores to hire, train, develop, and promote employees.

**Emotional intelligence** is based on qualities such as self-awareness, self-regulation, motivation, empathy, and social skill. Although it is determined in part genetically, it can be learned or improved by training, coaching, practice, and effort. Specifically, it involves an awareness of others’ feelings and a sensitivity to one’s own emotions and the ability to control them. Emotional intelligence requires the ability to monitor a person’s behavior and adjust that behavior according to assessment of the social context and circumstances.
Social intelligence focuses more on being able to “read” other people’s minds and their intentions, which is different from emotional intelligence. Three components of social intelligence are social perceptions (i.e., the ability to “see” the world around a person keenly), behavioral flexibility (i.e., the ability to modify one’s own behavior in response to what that person perceives socially), and social savviness (i.e., the possession of tacit knowledge). Social intelligence requires the ability to monitor a person’s behavior and adjust that behavior according to assessment of the social context and circumstances.

Contextual intelligence refers to the ability of a person to adjust to a specific context or circumstance at hand. This requires flexibility and adaptability to adjust to new contexts and situations without much delay and deliberation. This type of intelligence is highly required in a fluid and rapidly changing business environment. Leaders wear different hats at different times.

(n) Leaders’ Tools

Leaders have several tools and techniques at their disposal to train, develop, and improve the performance of subordinates as well as themselves. The four tools include job rotation, coaching, delegation, mentoring (job shadowing). These tools have a similar purpose of learning and growing personally and professionally with the advice and experience of others. The goal of leaders’ using these tools is to motivate employees in terms of getting them inspired and excited to make them ready for future leaders.

One of the responsibilities of a leader is to develop future leaders—to get them ready for other similar or different jobs as needed or make them a part of succession plans. Six tools are available for leaders to develop future leaders:

1. Formal training and development programs
2. Mentoring
3. Coaching
4. Job rotation
5. Delegation
6. Assistant to or deputy positions

(i) Formal Training and Development Programs

Management development (MD) is a broad term encompassing elements such as upgrading the knowledge, skills, and abilities (KSAs) required for a manager or a professional to apply them in either the current job or a future job.

Managerial talent consists of a complex group first-line supervisors, middle-level managers, and higher-level executives. For this reason, different types of MD programs cater to the needs of each level in the management hierarchy. For example, as the level goes up in the hierarchy, there should be a strong focus on soft skills and general business knowledge and less focus on hard skills, and vice versa.

MD programs can be conducted either inside or outside the company. The reasons for conducting the program outside the company are that it brings new viewpoints, different
perspectives, and broad exposure to outside experts. The reasons for conducting the program inside the company are that customized courses can be developed in less time and at a reduced cost, the course content is controlled, teamwork is facilitated, and the company culture is known.

Five related concepts in MD programs include mentoring, coaching, job rotation, delegation, and assistant to or deputy position, all with the similar purpose of learning and growing personally and professionally with the advice and experience of others.

**Mentoring**

Mentoring is advising, coaching, and nurturing a protégé to enhance his or her career development. The mentor can be anywhere in the same organization as the protégé or may work in another organization or another industry. The mentor (or sponsor) could be the same or different gender as the protégé. Sometimes a protégé may have more than one mentor to learn the unwritten rules to make it to the top.

Mentoring is not a form of direct training in the pure meaning because the mentor provides a limited amount of guidance and time to a protégé with infrequent meetings set in advance.

Mentoring is of two types: regular mentoring and reverse mentoring.

**Regular mentoring** is a relationship in which experienced managers help employees in the earlier stages of their careers. Such a relationship provides an environment for conveying technical, interpersonal, and organizational skills from more experienced to less experienced persons. Not only does the inexperienced employee benefit, but the mentor may enjoy the challenge of sharing wisdom and knowledge.

In reverse mentoring, older employees learn from younger ones because the latter group has some special skills that the former group does not have. This approach will keep the older employees more productive with special skills and thus more useful to the company.

Regular Mentoring = Less Experienced Person Learns from More Experienced Person

Reverse Mentoring = Older, Less Experienced Person Learns from Younger, More Experienced Person

However, mentoring has problems. Young minority managers frequently report difficulty in finding mentors. Also, men generally show less willingness than women to be mentors. Further, mentors who are dissatisfied with their jobs and those who teach a narrow or distorted view of events may not help a young manager’s development. Fortunately, many managers have a series of advisors or mentors during their careers and may find advantages in learning from the different mentors. For example, the unique qualities of individual mentors may help less experienced managers identify key behaviors in management success and failure. Further, those being mentored find previous mentors to be useful sources for networking.

**Fact 1:** Research has shown that mentoring can break the glass ceiling facing women and minorities.

**Fact 2:** Research has shown that women who have women mentors have done well in enhancing their careers.
Fact 3: Research has shown that African American women who have at least one mentor are more likely to get promoted.

Fact 4: Research has shown that African American women who have more than one mentor are most likely to get promoted.

Although coaching and mentoring concepts sound good in theory, there are some practical problems in selecting and pairing the right mentor and the right protégé, in the amount of attention given by the mentor to the protégé, in the temperament of both parties, and in personality conflicts between the two parties.

When the mentoring option is not available to employees or is not working out, then job rotation, coaching, and delegation practices can help an employee to learn management and leadership skills.

In job shadowing, the protégé closely follows and watches the mentor’s actions and goes wherever the mentor goes. The purpose is to learn how the mentor deals with people, communicates and behaves with other people, makes decisions, and so on. This direct, interactive, and visible learning experience is powerful and strong in that it stays with the protégé for a long time to come. Note that job shadowing is a part of mentoring.

(iii) Coaching

Coaching is a method of instruction where the desired outcome is to obtain a certain level of knowledge or skills. This thought-provoking and creative process inspires employees to maximize their personal and professional potential.

Coaching is a form of direct training that a supervisor or manager provides in the form of work assistance to an employee (i.e., teaching while working). Note that coaching is a part of mentoring because the coach is much like a mentor. Coaching is different from mentoring because it is more intense than mentoring and provides a more detailed learning task.

(iv) Job Rotation

Job rotation provides rotational opportunities for employees to move from job to job to provide them with variety of tasks and mental stimulation. In this method, new or current employees get training to broaden their work experience and to increase their overall knowledge, skills, and abilities.

Job rotation is a form of cross-functional training in preparing an employee for future jobs. It provides a well-rounded experience in other jobs, so an employee can take on a new job or take on more responsibilities in the current job. Note that job rotation programs are based on a manager creating the employee’s career plans, so employees can reach their career goals. For example, an employee doing job A now is sent to job B, then to job C, and comes back to job A.

Job A → Job B → Job C → Job A

(v) Delegation

Delegation is a higher-level management right to transfer authority and responsibility to a lower-level management, where the latter group develops managerial skills, such as problem solving and decision making, and learns how to take more responsibility and accountability for achieving results. Delegation involves developing and empowering lower-level management. Although managers are encouraged to delegate, they often find it difficult to do so.
Delegation is a process of assigning various degrees of authority to subordinates. It is not an all-or-nothing proposition. Authority may be passed along to subordinates; ultimate responsibility cannot be passed along because it stays with the manager who delegates. Thus, delegation is the sharing of authority, not the abdication of responsibility.

Delegation is a form of functional training for an employee to take on more responsibilities than the current job provides. It provides the employee additional managing skills in problem solving and decision making. Experts say that it is good for managers to delegate those activities they know the best.

**Advantages to Delegation**

- Managers can free more of their time for planning and motivating.
- Subordinates will be better trained and developed as future managers (e.g., can work on a task force or committee to solve problems and to develop new policies and procedures).

**Barriers to Delegation**

- Lack of confidence and trust in subordinates
- Vague job definition
- Fear of competition from subordinates
- Poor example set by superiors who do not delegate
- Reluctance in taking the risks involved in depending on others

**(vi) Assistant to or Deputy Positions**

Assistant to or deputy positions (second-tier) job titles are created for high-potential individuals to provide direct, hands-on work experience in performing day-to-day activities and functions. Individuals in second-tier jobs help individuals in first-tier jobs (C-level executives or department heads), and the former can step right into the job when the latter is not available for some reason.

**(o) Leadership Styles**

A leader’s traits are the person’s distinguishing personal characteristics, such as intelligence, values, and appearance. Research has revealed that (1) leaders who had achieved a level of greatness and higher rates of success were called great man, and (2) a strong relationship exists between personal traits and a leader’s success. Three types of leadership styles or approaches exist: autocratic leader, democratic leader, and hybrid leader.

The **autocratic leader** is one who tends to centralize authority and rely on legitimate, reward, and coercive power to influence subordinates. Group members with autocratic leaders performed very high so long as the leader was present to supervise them. However, group members were displeased with the close, autocratic style of leadership and negative feelings (hostility) associated with this type of leader.

The **democratic leader** is one who delegates authority to others, encourages participation, and relies on expert and referent power to influence subordinates. The performance of groups who
were assigned democratic leaders was good with positive feelings. In addition, group members performed well even when the leader was absent and left the group on its own. The participative techniques and majority-rule decision making used by democratic leaders trained and involved group members such that they performed well with or without the leader present. These characteristics of democratic leadership explain why the empowerment of lower-level employees (front-line employees) is a popular trend in companies today.

The hybrid leader is one who exercises both autocratic leader and democratic leader styles, depending on the situation. Most leaders have favored styles that they tend to use most often. However, while switching from autocratic to democratic or vice versa is not easy, leaders may adjust their styles depending on the situation.

In conclusion, leadership styles could be a continuum reflecting different amounts of employee participation. Thus, one leader might be autocratic (superior-centered), another democratic (subordinate-centered), and a third a mix of the two styles (hybrid leader). It is the “behavior” of the leader rather than the “style” of the leader that determines leadership effectiveness.

(p) Leaders’ Personality Factors

In common usage, people think of personality in terms of traits or relatively stable characteristics of a person. Researchers have investigated whether any traits stand up to scientific scrutiny. Although investigators have examined thousands of traits over the years, their findings have been distilled into five general dimensions that describe personality. These often are called the “Big Five” personality factors. Each factor may contain a wide range of specific traits. The Big Five personality factors describe an individual’s openness to experience, conscientiousness, extraversion, agreeableness, and emotional stability (neuroticism).

1. **Openness to experience.** The degree to which a person has a broad range of interests and is imaginative, creative, artistically sensitive, and willing to consider new ideas.

2. **Conscientiousness.** The degree to which a person is focused on a few goals, thus behaving in ways that are responsible, dependable, persistent, and achievement oriented.

3. **Extraversion.** The degree to which a person is sociable, talkative, assertive, and comfortable with interpersonal relationships.

4. **Agreeableness.** The degree to which a person is able to get along with others by being good-natured, cooperative, forgiving, understanding, and trusting.

5. **Emotional stability.** The degree to which a person is calm, enthusiastic, and secure rather than tense, nervous, depressed, moody, or insecure.

However, despite growing use of personality tests in employment situations, there is little evidence that they are a valid predictor of job success. In addition, the Big Five dimensions have been criticized because they are difficult to measure precisely. Because each dimension is made up of a number of specific traits, a person might score high on some traits but low on others. For example, considering the dimension of conscientiousness, a person might score high on a trait such as dependability but score low on achievement orientation. Furthermore, research on the Big Five has mostly been limited to the United States, so there are dangers in applying the theory globally and especially cross-culturally. Next, each factor is divided into few, specific traits, as shown in Exhibit 1.25.
EXHIBIT 1.25  Personality Factors and Personality Traits

<table>
<thead>
<tr>
<th>Personality Factors</th>
<th>Personality Traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Openness to experience</td>
<td>Possesses creative and imaginative skills with new and unusual ideas; likes art and adventure; prefers novelty in and variety of things; and enjoys varieties of activities and experiences in life and work.</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>Exhibits self-discipline character; shows as a well-planner and organizer with tasks to be done; and comes across as dependable and believable.</td>
</tr>
<tr>
<td>Extraversion</td>
<td>Presents positive emotions, energy, assertiveness, and talkativeness.</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>Shows trusting relationships and helpful nature with good-tempered manners.</td>
</tr>
<tr>
<td>Emotional stability</td>
<td>Exhibits calmness, security, and confidence.</td>
</tr>
</tbody>
</table>

**Leaders’ Personality Traps**

Leaders should avoid the next cognitive traps rooted either in their own personality zone or in their organizational culture. Note that these traps are equally applicable to supervisors, managers, and entrepreneurs.

The **mirror-imaging trap** is a leader’s false assumption that followers and others think exactly like him- or herself. With this trap, leaders are unwilling to examine or analyze other viewpoints, variations, or alternatives of the subject matter at hand. This is similar to saying “My way or the highway.” Here, the real issue is that the leader is blindly committing to a set of common assumptions and beliefs and not challenging those assumptions, which leads to failures and disappointments. One way to avoid the mirror-imaging trap is to have a peer review by people from a different background, which will provide a good safeguard of checks and balances. The mirror-imaging trap is also called the bandwagon effect or blind spot bias and is the major cause of numerous common sense failures.

In the **target fixation trap**, individuals get fixated on one hypothesis, rely only on evidence that is consistent with their preconceptions, and ignore other relevant views. In a way, they lose sight of the big-picture perspectives and push for a quick closure. One way to avoid this trap is to have an open mind and broad views. This trap is based on the person’s confirmation bias.

The **analogy trap** arises when a leader is unaware of differences between his or her own context and that of others. This is a case of inappropriate or incorrect use of analogies. The net result is that important knowledge and information is missing because the leader fails to admit ignorance from (1) insufficient study of data and information; or from the inability to (2) differentiate between old facts and new facts and failure to reconcile them; (3) accept conflicting facts to avoid discomfort; and (4) separate relevant information from irrelevant information.

The **projection trap** (halo and horn error) occurs when a leader is conducting an employee’s performance appraisals. The halo error occurs when a leader projects one positive performance
feature or incident onto the rest, resulting in an overall higher rating of that employee’s performance. The horn error occurs when a leader projects one negative performance feature or incident onto the rest, resulting in an overall lower rating of that employee’s performance. Both halo and horn errors are based on a recent behavior bias.

In the **stereotyping trap**, leaders strive to maintain the status quo (no changes) and fail to invite creativity and innovation (requiring changes). This trap results from a personal bias of the leader and leads to lost growth opportunities.

In the **stovepiping trap**, the leader acknowledges only one source of information or knowledge base as the official source and disregards other sources of information or knowledge bases as unofficial sources. This trap is similar to a silo trap or legacy trap, which reflects a functional specialization.

A **decision trap** occurs when ill-defined and unstructured problems are solved and when wrong problems and only symptoms are addressed. Current decisions, in part, are made (1) to undo previously made wrong decisions, (2) to fix satisficing decisions (i.e., not really a good decision but good enough at that time, and (3) to correct nonoptimizing decisions (i.e., not maximizing or not balancing all the resources). Satisficing decisions are suboptimal and dysfunctional in nature, meaning that the benefits to a business unit are less than the costs to the entire organization.

A **measurement trap** stems from quantifying or counting the wrong items of importance. Mainly, this trap results from using incorrect, untimely, and incomplete data and results from inappropriate application of quantitative methods to process and analyze data. Using underskilled, untrained, and unqualified employees to analyze and interpret data results (outputs) and the inability of management to separate irrelevant data from relevant data are also measurement traps. This trap also results from using the wrong metrics to measure performance. Note that measurement traps can lead to decision traps.

An **organizational culture trap** can make someone unwilling to challenge the views and perspectives of SMEs and senior-level managers. Other examples of cultural traps include:

- Assuming that small things in one culture are small things in every culture (reflecting a stereotyping trap). In reality, they work differently and in the opposite manner. For example, adhering to time schedules and waiting in lines is well accepted in some cultures and is not followed at all in other cultures.
- Assuming that all cultures in all countries follow the same way as one culture in one country. (This a reflection of mirror-imaging trap.)
- Knowing that American businesspeople may push for quicker decisions during negotiations whereas Japanese businesspeople may push for building consensus and trust first followed by faster decisions. (This a reflection of cultural diversity effect.)

Other examples of organizational culture traps include the not-invented-here syndrome, and the this-is-how-we-do-things-here syndrome: This is the idea that senior managers know best, and that an employee golden suggestion system (i.e., a suggestion box at the workplace) does not work because it is a waste of time and effort.

One way to avoid the organizational culture trap is to read as many books as possible covering organizational and international cultures in order to gain a better working knowledge of various cultures. Another way is to receive cultural, diversity, and sensitivity training.
(r) Leaders’ Personal Biases

Leaders should be keenly aware of personal, built-in biases that could harm people due to inappropriate actions taken and damage business investments due to prejudiced decisions made. These biases could negatively influence a leader’s job performance. Note that these biases are equally applicable to supervisors, managers, and entrepreneurs. Several biases are listed next.

**Confirmation bias** is the tendency to seek out only that information that supports a person’s preconceptions or misconceptions. This bias could lead to lost or missed opportunities in growth.

**Anchoring bias** is the tendency to develop an estimate of something of value based on a person’s preferences, which could be a completely wrong base to use due to lack of objectivity and clarity. Examples of these estimates could be demand and supply numbers for products and services, quotes, bids, prices, costs, profits, and time lines. This bias could lead to loss of revenues, profits, customers, market share, and suppliers.

**Hindsight bias** is the tendency to assess one’s previous decisions or actions as more or less efficient and effective than they were. Here, there is no use of digging into the past, which is similar to a sunk cost concept or spilled beans saying.

The **bandwagon effect** is the tendency to do or behave blindly that others do or believe. This suggests a lack of confidence in a person’s abilities.

The **halo effect** is the tendency to project unverified capabilities of a person (employee) based on an observed event. This reflects a leader’s blind spot and could result in loss of employees during the employee performance appraisal process.

The **framing effect** is the tendency to react to how information is presented or packaged to others, despite its facts. This bias results from knee-jerk reactions leading to hasty decisions. Problems could be ill-defined with framing errors or effects. Consequently, incorrect problems could be solved, leading to decision traps.

The **snowball effect** is the tendency for one judgment-related mistake and decision-making error to increase, thus becoming an endless chain of mistakes and errors. It is a cascading effect of mistakes and errors leading to magnified negative results.

**Availability bias** results from a fallacy in thinking that what is available today or what happened today will be repeated tomorrow. This bias results from the belief that nothing changes between then and now (i.e., status quo is maintained).

The **overconfidence bias** results from unchecked assumptions, not verifying or confirming the actual facts and figures with other affected or interested parties. It is a person thinking that something she or he does, or did, is correct, and believing absolutely that it was the best decision. This bias leads to validation errors.

**Optimism bias** results from assuming that everything—every outcome, everyone, and every task or event—is good. The overconfidence bias often occurs alongside the optimist bias. One way to reduce optimism bias is to validate inputs, questions, assumptions, processes, and outcomes with SMEs or authorities in the field.

A **blind spot bias** results from not seeing all angles or viewpoints to a problem or situation and using a one-track mind.
The **status quo bias** results when people do not like changes and prefer to keep things the same as before (i.e., status quo). Lost or missed growth opportunities not goods are the major risks here.

The **cultural diversity effect** is the tendency to misunderstand or misinterpret the scope and nature of other cultures in the world. One culture assumes that it is the best culture there is and that the other cultures are not good in terms of (1) different in interacting with people, (2) different in thinking patterns and mind-sets, and (3) different in attitudes toward people, life, and the world. Hence, people do not recognize, respect, and appreciate existing cultural diversity.

**Leaders’ Handling of Issues and Crises Situations**

Both private and public sector organizations face unexpected issues and crises situations at times. Issues can be one-time or recurring events, and the issues can be soft or hard. Either type of issue needs management’s immediate attention and corrective action to bring business operations back to normal. Issues often develop over time, very slowly, and, surprisingly, unnoticed.

**Example 1:** An example of a soft issue is reputation risk resulting from unhappy customers posting unpleasant comments about a company’s products or services on social media platforms and websites.

**Example 2:** An example of a hard issue is reports of bribery and corruption charges and unethical practices against a company’s management.

It is up to management to decide what is a soft issue or a hard issue because management needs to determine an issue’s visibility level (low, average, or high) and impact level (low, moderate, and high) and act accordingly. Usually issues with high visibility and high impact deserve high attention of management.

Issues and crises are related to each other. When does an issue become a crisis situation? When issues are not handled properly and in a timely manner the first time they occur or when they are completely neglected, they become severe crises situations later because many crises are embedded in or erupt from issues. Sometimes a crisis situation can occur abruptly all by itself.

\[
\text{Issues} \rightarrow \text{Crisis}
\]

\[
\text{Ignored Issues} \rightarrow \text{Severe Crises}
\]

Examples of issues (first) becoming crises (later) are listed next.

- Management’s bribery and corruption charges and other unethical and illegal practices.
- A stockholder files a lawsuit against company management and it becomes a class action lawsuit when joined by other stockholders to show their disapproval of and dissatisfaction with the way the company is being run and decisions are made.
- Management of a fast food chain restaurant ignored its employee strikes in one location for a minimum wage increase. Later, it became a severe crisis situation when employees in many other locations in the country joined the minimum wage momentum.
- Data losses and data breaches (millions of customers’ credit and debit card data were lost) occurred due to computer hacking at a major department store resulted in the firing of the CEO and the chief information officer.
(t) Entrepreneurship Defined

**Entrepreneurship** is defined as an economic enterprise founded by an ambitious person who is characterized as a risk taker, idea generator and implementer, opportunity grabber, change agent, and a value creator. Entrepreneurs have different mind-sets and bigger missions and visions than managers and leaders to take advantage of uncertainty (risk). Note that there are very few entrepreneurs, few leaders, and many managers.

(u) Entrepreneurs’ Roles and Skills

**Entrepreneurs** are one-of-a-kind, unique individuals (a rare breed) with unparalleled mission and vision to achieve something new on their own better than others. They want to discover products and services that are better than current products and services. They want to explore something new and exciting that did not exist before (e.g., a new product or a new service).

Entrepreneurs wear many hats and play diverse roles, such as leaders, innovators, decision makers, problem solvers, creators, discoverers, explorers, dreamers, thinkers, doers, and above all trend setters.

Entrepreneurship skills are innate skills, meaning that some people are born with them (although some specific skills, such as presentation and writing skills, can be learned through training and development programs or from others through observation).

**Characteristics of Entrepreneurs**

- They want to become the owners of their own destiny, not depend on others.
- They are leaders, not followers.
- They want to be self-employed, not employed by others.
- They want to pay others, not be paid by others.
- They like to give orders and instructions to others, not to take orders and instructions from others.
- They defy and break the ground rules.
- They challenge the status quo.
- They do not easily accept no for an answer.
- They question silo thinking (narrow thinking).
- They expect and accept failures and use the failures as stepping-stones to success.
- They are economic machines in terms of increasing a country’s gross domestic product (GDP) and employment levels and improving the standards of living for the country’s citizens.

**Fact:** Founders such as Steve Jobs of Apple, Jeff Bezos of Amazon.com, Bill Hewlett and Dave Packard of HP Corporation, Bill Gates of Microsoft, and Warren Buffett of Berkshire Hathaway are examples of entrepreneurs.
(v) Types of Entrepreneurships

Several types of entrepreneurship businesses exist. One needs to choose a business that suits in terms of what to achieve and how to achieve it. Some examples of these businesses include:

- Startups or small businesses
- Licenses or franchises
- Joint ventures or cooperatives
- Strategic alliances or acquisitions

Note that the type of business selected depends on the entrepreneur’s financial resources and previous work experience. For example, entrepreneurs with limited financial resources can launch small businesses; entrepreneurs with significant financial resources can launch startups, licenses, franchises, or joint ventures.

(i) Startups or Small Businesses

The scope and size of startups or small businesses can vary significantly in terms of number of employees (1 to 100), the level of technology (low tech to high tech), the type of work performed (making products or providing services), and the type of legal structure required (proprietorship, partnership, or corporation).

Startups and small business owners can apply to the U.S. Small Business Administration (www.sba.gov) and to commercial banks for business loans to obtain the initial capital (one-time capital as investment) and working capital (ongoing capital to pay bills).

A small business or a startup owner needs to develop a business plan to monitor his or her own business progress and to get a loan from a bank because banks ask for business plans before granting loans to owners.

At a minimum, the components of a business plan should include a:

- Business strategy showing mission, vision, goals, and strategies describing the major reason for the business to exist and what it wants to accomplish in the short term and the long term
- Operations plan (includes manufacturing plan and service plan) describing the types of products to make or the types of services to be delivered to customers
- Marketing plan describing the major markets in which the products and services will be sold, marketing channels (wholesalers, distributors, or retailers), pricing strategies (low or high prices), and selling strategies (direct, online, or store)
- Financial plan containing pro forma or projected income statement, balance sheet, and cash flow statements
- People plan containing the type of employees to be hired (skilled or nonskilled and experienced or inexperienced) and how they will be trained and developed

**Fact:** Hollywood actor Ashton Kutcher invested in several high-tech startup firms, such as Skype and Foursquare.
Example 1: A licensed cosmetologist opens a new salon (a small business) in a shopping center to provide haircuts and manicure, and pedicure services.

Example 2: Examples of startups and small businesses include flower shops, salons, dry cleaners, laundries, pizza stores, gas stations, product assembly factories, package delivery services, food delivery services, consulting services, home improvement contracting services, and Internet services.

(ii) Licenses or Franchises
A license or franchise grants the right to provide a product or service or use a property, and fees are paid for such use. Licensing or franchising arrangements come in several forms to meet various specific needs.

Licensing occurs when a firm gives a legal permission to another firm to produce or package its product.

- A licensing agreement is an arrangement in which one firm permits another to use its intellectual property (IP) in exchange for compensation, typically a royalty.
- A licensing program consists of proprietary information, such as patent rights or expertise that is licensed by the owner (licenser) to another party (licensee). Compensation paid to the licenser usually includes license issuance fees, milestone payments, and/or royalties.
- Licensing occurs when a multinational enterprise sells a foreign company the right to use technology or information.
- Licensing is an arrangement in which a local firm in the host country produces goods in accordance with another firm's (the licensing firm's) specifications; as the goods are sold, the local firm can retain part of the earnings.

Franchising is a form of licensing in which an organization (owner, franchisor) provides its domestic or foreign franchisees with a complete assortment of products and services.

- It is a business arrangement by which the owner of a product or service allows others to purchase the right to distribute the product or service with help from the owner.
- It is an agreement by which a firm provides specialized sales or service strategy, support assistance, and possibly an initial investment in the franchise in exchange for periodic fees.
- It is a form of licensing that grants a wholesaler, distributor, or retailer exclusive rights to sell a product or a service in a specified area.

Example: Popular name brands such as McDonald’s, Pizza Hut, Subway, Kentucky Fried Chicken, and Dunkin Donuts have various licensing and franchising agreements and operations inside and outside of the United States.

(iii) Joint Ventures or Cooperatives
There are various forms, sizes, and locations for joint ventures. Joint ventures are formed when two or more individuals or companies come together to establish business operations either in domestic or foreign markets. They are unincorporated business organizations that usually exist for
a limited time period. These ventures capitalize on each other’s resources, strengths, knowledge, skills, and expertise in fulfilling their mission. They share efforts, profits, assets, liabilities, risks, and duties. Joint ventures are also known as cooperatives and strategic alliances.

A joint venture differs from a proprietorship because the former is formed between two or more companies or individuals whereas the latter is formed with a single individual. Also, the life of a proprietorship is longer than a joint venture. Nonetheless, the law of partnerships generally governs a joint venture.

Example 1: An example of a joint venture is a manufacturing or service operation in a domestic or a foreign country to produce goods or provide services.

Example 2: An example of a joint venture is involving a major research conducted by two or more corporations with researchers participating from different countries.

Example 3: An example of a joint venture is the exploitation of natural resources, such as minerals, coal, iron, copper, water, gold, and oil and gas.

Example 4: An example of a joint venture is a securities underwriting syndicate formed to acquire a certain tract of real estate land for subdivision and resale.

(iv) Strategic Alliances or Acquisitions

A strategic alliance is formed when two or more domestic or foreign companies band together to achieve mutual economic benefits. Strategic alliances are similar to joint ventures and cooperatives. They occur when one company in one country work in collaboration with one or more companies in other countries to share rights, responsibilities, revenues, expenses, and profits as defined in a written agreement. Some common types of strategic alliances are research collaborations, licensing programs, and copromotion deals. Strategic acquisitions occur when one company merges with another company to achieve business synergy.

Example 1: An example of a domestic U.S. strategic alliance occurs when a food retailer establishes a strategic alliance with a gas company such that customers who purchase $50 worth of groceries will get a 5-cent discount per gallon at the gas station.

Example 2: A strong local pizza store acquires a weaker local pizza store to capitalize on the brand name of the stronger store.

(w) Comparisons between Managers, Leaders, and Entrepreneurs

People may have more leadership qualities than management qualities, or vice versa, but ideally they should develop a balance of both qualities. Examples of leadership qualities include visionary, inspiring, creative, innovative, imaginative, and change agent. Examples of management qualities include possessing problem-solving skills, decision-making skills, analytical skills, authority, and stability.

One major difference between management and leadership qualities relates to the source of power and the level of a follower’s compliance with it. Power is the ability to influence the behavior of others. Management power comes from position power (e.g., legitimate, reward, and coercive power) while leadership power comes from personal power (e.g., expert and referent power). An effective manager must have leadership qualities.
Entrepreneurs are characterized as risk takers, idea generators and implementers, opportunity grabbers and exploiters, change agents and innovators, go-getters, and value creators. They have different mind-sets, are a different breed, and have a bigger mission and vision than managers and leaders to take advantage of uncertainty (risk). Both large and small firms and new and established firms can be entrepreneurial. All managers and leaders should think and act like entrepreneurs.

(i) Leaders versus Managers
Much has been written in recent years about the leadership role of managers. Managers and leaders are both important to organizations. Effective managers have to be leaders, too, because there are distinctive qualities associated with management and leadership that provide different strengths for the organization; some of the leader’s qualities include being visionary, inspiring, innovative, and imaginative. Some manager’s qualities include possessing problem-solving skills, decision-making skills, analytical skills, authoritative, and stabilizing. Management and leadership reflect two different sets of qualities and skills that frequently overlap within a single individual. A person might have more of one set of qualities than the other, but ideally a manager develops a balance of both manager and leader qualities.

One of the major differences between manager and leader qualities relates to the source of power and the level of compliance it engenders within followers. Power is the potential ability to influence the behavior of others. Management power comes from the individual’s position in the organization (i.e., administrative power). Because managers’ power comes from organizational structure, it promotes stability, order, and problem solving within the structure. Leadership power, in contrast, comes from personal sources that are not as invested in the organization, such as personal interests, goals, and values. Leadership power promotes vision, creativity, and change in the organization.

**KEY CONCEPTS TO REMEMBER: Managers versus Leaders versus Entrepreneurs**

- All leaders are managers, but all managers are not leaders.
- All entrepreneurs are managers and leaders, but all managers and leaders are not entrepreneurs.
- Most managers and leaders work for an organization that someone already established whereas all entrepreneurs work for their own organization that they created.
- The difference between managers, leaders, and entrepreneurs lies in their personalities, ambitions, and risk appetites (i.e., risk profiles).
- All managers, leaders, and entrepreneurs—in fact, all people—can be classified by their risk appetite levels such as risk taking, risk neutral, risk averse, and risk divert (i.e., moving the risk into other directions). The risk appetite is the level of risk that an individual or organization is willing to accept or live with.
- Entrepreneurs are positively identified as risk takers due to their bold and adventurous business projects and social programs that they undertake.
- In the business world, there are many supervisors in number, many managers, few leaders, and very few entrepreneurs. This is listed here for comparative purposes only.
1.6 Risk and Control Implications of Different Organizational Structures

In this section, organizations are defined and classified; organizational charts are explained; organizational structures are defined; contingency design alternatives are discussed; types of departmentalization are presented; traditional organizational structures are revisited; and the evolution of organizational structures is discussed.

(a) Organization Defined

(i) What Is an Organization?
Organization and management theorist Chester Barnard defines an organization as “a system of consciously coordinated activities or forces of two or more persons.” In other words, when people gather together and formally agree to combine their efforts for a common purpose or goal, an organization is the result.

The purpose of the management process is to achieve organizational objectives in an effective and efficient manner. According to Edgar Schein, a prominent organizational psychologist, all organizations share four characteristics (see Exhibit 1.26).

EXHIBIT 1.26 Common Characteristics of Organizations

<table>
<thead>
<tr>
<th>Common Characteristics of Organizations</th>
<th>Coordination of Effort</th>
<th>Common Goal or Purpose</th>
<th>Division of Labor</th>
<th>Hierarchy of Authority</th>
</tr>
</thead>
</table>

Coordination of effort is based on the idea that two heads are sometimes better than one. Individuals who join together and coordinate their mental and/or physical efforts can accomplish great things. There is a synergy in that coordination of effort multiplies individual contributions.

A common goal or purpose gives organization members a rallying point. Coordination of effort is enhanced when employees join together to strive for something of mutual interest.

Division of labor breaks complex tasks into specialized jobs so those employees become more proficient by repeatedly doing the same specialized task.

A hierarchy of authority is needed to see that the intended goals are carried out effectively and efficiently through outcomes and results. Authority is the right to direct the actions of others. People who promote flatter organizational structure (fewer levels of management) do not favor the traditional hierarchy of authority. However, some people encourage hierarchy of authority, as shown in Exhibit 1.27.

EXHIBIT 1.27 Proponents of Flatter Organizations and of Hierarchy of Authority

<table>
<thead>
<tr>
<th>Proponents of Flatter Organizations</th>
<th>Proponents of Hierarchy of Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer levels of management is present</td>
<td>Hierarchy is the most efficient, the hardest, and the most natural structure.</td>
</tr>
<tr>
<td>Hierarchy connotes bureaucracy.</td>
<td>Hierarchy can release energy and creativity, rationalize productivity, and improve morale.</td>
</tr>
<tr>
<td>Managerial hierarchy kills initiative and crushes creativity.</td>
<td></td>
</tr>
<tr>
<td>Communications are accelerated.</td>
<td></td>
</tr>
</tbody>
</table>
(ii) Classifying Organizations
Organizations can be classified according to their intended purposes. Four categories exist, although some large and complex organizations have overlapping categories. The primary goals of these four types of organizations are described next.

1. Business organizations. These organizations must make a profit to survive. The focus is on satisfying the demand for products and services and earning profits.

2. Nonprofit service organizations. Here the focus is on service, not profits. Specific service is the goal as long as the organization is solvent. These organizations have greater pressure to operate more efficiently in light of limited funds available. Such organizations serve a specific segment of society.

3. Mutual-benefit organizations. For these organizations (e.g., a labor union or other association), the focus is on serving members’ needs. Individuals join together to press for their own self-interest. Such organizations have greater pressure to operate effectively and efficiently to survive. Examples include professional associations, such as the Institute of Internal Auditors, and unions.

4. Commonweal organizations. Here the focus is on offering standardized public services without attempting to earn a profit. Such organizations (e.g., fire and police departments and public schools) serve all segments of society. Their great size makes them unwieldy and difficult to manage.

(iii) Organization Charts
An organization chart is a visual display of an organization's structural skeleton. Such charts show how departments are tied together along the principal lines of authority. They show reporting relationships, not lines of communication. Organization charts are tools of management to deploy human resources (HR) and are common in both for-profit and nonprofit organizations.

Every organization chart has two dimensions—vertical hierarchy and horizontal hierarchy—and two types—formal and informal, as shown in Exhibit 1.28.

EXHIBIT 1.28 Organization Charts

A typical organization chart, displaying the managerial pyramid, will have two dimensions: horizontal and vertical. These dimensions represent the division of labor and chain of command respectively.

The vertical hierarchy establishes the chain of command, or who reports to whom. It does not show responsibilities, cannot show informal organization, and cannot show all lines of communication. A person with a lower job rank may be shown at a higher level on the chart (e.g., administrative secretary or assistant).

The horizontal hierarchy establishes the division of labor and specialization, such as marketing, production, and finance. Generally, specialization is achieved at the expense of coordination when
designing organizations. A workable balance between specialization and coordination can be achieved through contingency design. The horizontal hierarchy does not show responsibilities, cannot show informal organization, cannot show all lines of communication, and does not show reporting channels or hierarchy of authority. A person with a lower job rank may be shown at a higher level on the chart (e.g., administrative secretary or assistant). Networking is accomplished through the horizontal hierarchy where the interaction of persons of equal status takes place for the purpose of professional or moral support.

The **formal chart** is the documented, official map of the company’s departments with appointed leaders who get things done through power granted by their superiors. Formal charts include job titles and are used to fill employee positions and management staffing levels.

**Informal charts** are not documented and are composed of natural leaders who get things done through power granted by peers. Informal charts do not include job titles as they do not exist physically; they exist only in mind.

**KEY CONCEPTS TO REMEMBER: Organization Charts**
- Job title does not necessarily indicate everything about a person's level of authority.
- Formal organization charts show nominal power.
- Informal organization charts show real power.
- Even supervisors need to use the informal power network to get things done.

Formal organization charts serve as guidelines, but they may not always keep track of changes in power relationships. One of the reasons why natural leaders evolve is that modern organizations are complex; they require the close cooperation of many people doing jobs that formal organization charts cannot accommodate. *There is at least one person available in every company with people skills and technical skills together that make him or her a natural leader. There may be more than one informal leader; there is only one formal leader in each area of the company.*

Natural leadership is intangible. It can cause factions, but it can also build a positive team spirit. Formal leaders should be tuned in to informal power to get things done. Formal leaders have the nominal power, and most subordinates obey it. But a formal leader’s job is made easier if he or she can influence the informal employee leadership network and win its support. This may even lay the foundation for establishing real rapport and motivating employees.

Management consultant Gareth Morgan made an interesting observation about organization charts.\(^{14}\) He said that organization charts are useful tools, but they can also be extremely limiting because they entrench the idea that an organization is a structure that can be engineered and reengineered to produce appropriate results. A new organization chart is often seen as a solution to an organization’s problems. But, more often than not, it can leave the basic problems unchanged. Morgan says, for example, that when a large bureaucracy is reshaped or downsized, the result is a smaller bureaucracy. When the current bureaucracy is moved to matrix structure, the result is bureaucratic management in another form. Morgan’s main concern is that this restructuring

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does not create an organization that can flow and self-organize along with the changes faced. The same old organization is reshaped with similar problems and weaknesses.

Organization charts, clearly defined systems, flow diagrams, and other engineered blueprints have provided effective models for systematizing organizational activity. They still do for routine, predictable tasks. However, they do not in nonroutine, unpredictable task environments.

As IT takes us into a world where old structures and forms of organization dissolve and become almost invisible, the old approach no longer works. Through the use of telephone, e-faxes, electronic mail, computers, and video conferencing, employees and their organizations are becoming disconnected physically. They can act as if they are completely connected while remaining far apart. Employees can transcend traditional barriers of space and time, continually creating and re-creating themselves through changing networks of interconnection based on real-time communication. As one network comes into being, others dissolve. Organizations do not have to be organizations anymore.

Nowadays, mechanistic thinking breaks down, and managers have to find fresh images for understanding and shaping what they are doing. Morgan suggests designing organizations as if they were spider plants or dandelion seeds blowing in the wind. He proposes that the management of change is the process of imagination, which invites creativity.

(b) Organizational Structures Defined

Organizational structures are defined as the design of how an organization's business functions and operations are arranged into departments, groups, or divisions (e.g., physical stores, online stores, outlet stores, and catalog stores for a retailer); how individual departments are organized; how jobs and tasks are divided and assigned to employees and departments; who reports to whom with pyramid structure showing management hierarchy and span of control; and how employees and managers interact with each other in performing their day-to-day work through communication, coordination, and collaboration.

The mission statement of an organization, in large part, dictates its organizational structure. The other part dictating the organizational structure is the legal structure: whether the organization is legally registered as a corporation, partnership, or proprietorship. For example:

- A public corporation is less risky than a private corporation.
- A regular corporation is less risky than a proprietorship or partnership.
- A limited liability corporation is less risky than a regular corporation.
- A proprietorship is riskier than a partnership or corporation because all the risks, profits, and losses go to the proprietor or owner.
- A partnership's risk falls between that of a corporation (low risk) and a proprietorship (high risk).

(c) Contingency Design Alternatives

Contingency design requires managers to select from a number of situationally appropriate alternatives instead of blindly following fixed principles of organization. Design alternatives include span of control, centralization and decentralization, and line and staff organizations.
(i) Span of Control

(A) Narrow and Wide

The number of people who report directly to a manager represent that manager's span of control or span of management. The optimal size of a span of control in a work area is dependent on four things:

1. The department's function
2. Organizational levels
3. Changes in the nature of the work
4. The clarity of instructions given employees

The optimal span of control is not dependent on the total number of employees in the department or company.

NARROW SPAN OF CONTROL VERSUS WIDE SPAN OF CONTROL

- A **narrow span of control** means few people to oversee, which in turn creates many hierarchical levels (tall organizations), which in turn requires many managers. The number of subordinates supervised is small. Workers are geographically dispersed.

- A **wide span of control** means many people to oversee, which in turn creates few hierarchical levels (flat organizations), which in turn requires few managers. Jobs are similar, procedures are standardized, all workers are in the same work area, and tasks are simple and repetitive. An upper limit of the number of employees supervised must exist.

Obviously, a balance between too little and too much supervision is required. The ideal span of control ranges from four subordinates at the top of the organization to 12 at the lowest level. The reason for the difference is that top-level managers are supervising people and lower-level managers are responsible for supervising specific tasks.

(B) Tall and Flat

A tall organization has many levels of hierarchy and a narrow span of control. A flat organization structure is one with relatively few levels of hierarchy and is characterized by a wide span of management control. A tall organization is riskier than a flat organization due to coordination and cooperation problems and turf wars between too many managers working in a function (see Exhibit 1.29).

EXHIBIT 1.29 Characteristics of Tall and Flat Organization Structures

<table>
<thead>
<tr>
<th>Characteristics of Tall Organization Structure</th>
<th>Characteristics of Flat Organization Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks are highly complex and varied.</td>
<td>Tasks require little direction and control of subordinates.</td>
</tr>
<tr>
<td>Work areas are geographically dispersed.</td>
<td>Work areas are geographically dispersed.</td>
</tr>
<tr>
<td>Subordinates perform distinctly different tasks.</td>
<td>Employees must be able to work with little or no supervision.</td>
</tr>
<tr>
<td>Employees are good at problem resolution due to discipline imposed by the hierarchy.</td>
<td>Employees make timely and efficient decisions.</td>
</tr>
<tr>
<td>Information flows slowly from top to bottom.</td>
<td>Information flows quickly from top to bottom.</td>
</tr>
</tbody>
</table>
In summary:

- A management’s hierarchical levels can be many or few.
- A span of control can be narrow or wide.
- A span of control or span of management refers to the number of employees a supervisor or manager can oversee. Wider span means more employees and narrow span means fewer employees to manage or oversee. Thus, a span of control can be narrow or wide.
- **Organizational structure** refers to the number of hierarchical levels in management. A tall structure means many levels, and a flat structure means fewer levels.
- A tall organizational structure has many levels of hierarchy and a narrow span of control. It is characteristic of traditional organizations.
- A flat organizational structure has fewer levels of hierarchy and a wide span of control. It is characteristic of agile organizations.

Exhibit 1.30 summarizes the combination of organizational structures, hierarchical levels, and span of control.

EXHIBIT 1.30 Summary of Organizational Structures, Hierarchical Levels, and Span of Control

<table>
<thead>
<tr>
<th>Organizational Structures</th>
<th>Hierarchical Levels</th>
<th>Span of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall (traditional)</td>
<td>Many</td>
<td>Few (narrow)</td>
</tr>
<tr>
<td>Flat (agile)</td>
<td>Few</td>
<td>Many (wide)</td>
</tr>
</tbody>
</table>

(ii) Centralized and Decentralized Organizations

Two methods of organizing organizations exist: centralized and decentralized. In a **centralized organization**, decisions are made at the higher levels of management. Decisions in a decentralized organization are made at the lower levels. Authority is delegated to lower levels of the organization.

Centralization is typically used in those organizations that emphasize coordination of decisions that must be applied uniformly to a set of known or common problems.

Companies that allow managers (e.g., business unit managers or division managers) a great deal of autonomy are described as utilizing decentralized management. Management considers the factors shown in Exhibit 1.31 in determining whether a centralized or decentralized design should be adopted.
EXHIBIT 1.31 Factors to Consider for Centralization and Decentralization

<table>
<thead>
<tr>
<th>Factors</th>
<th>Decentralization</th>
<th>Centralization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number and kind of decisions</td>
<td>Many unique decisions</td>
<td>Generic or uniform decisions</td>
</tr>
<tr>
<td>Organization culture</td>
<td>Less formal</td>
<td>More formal</td>
</tr>
<tr>
<td>Value of uniform procedures</td>
<td>Rapidly changing products and industries</td>
<td>Slowly changing products and industries</td>
</tr>
<tr>
<td>and rules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower-level manager skills</td>
<td>Must be generalists</td>
<td>Do not require as much training</td>
</tr>
<tr>
<td>Firm size and growth rate</td>
<td>Larger organizations and/or rapid growth rate</td>
<td>Smaller organizations and/or less rapid growth rate</td>
</tr>
<tr>
<td>Strategy</td>
<td>Emphasis on new product development through company research</td>
<td>Emphasis on production of standard products in large volume</td>
</tr>
</tbody>
</table>

(A) Two Approaches to Achieve Decentralization

Functional decentralization occurs when related activities or functions are grouped within an organization. For instance, all functions relating to marketing are grouped under one head. The main advantage of functional decentralization is that it allows specialists to work in areas where they contribute the most to the firm. This is very important in industries that survive mainly because of technical expertise.

However, once the specialist can make decisions independently, coordination with other areas, such as production, may suffer. Another problem is that when one group is created, it is difficult to measure the performance of the individual specialists. As the firm grows, this problem also will grow.

Divisional decentralization is the creation of units whose managers are in charge of producing and marketing a certain product, a group of related products, or activities for a geographic region. A division thus created will involve many if not all of the functions in which the entire organization is engaged. Divisional decentralization results in many semi-independent units equivalent to small organizations within the larger parent.

The main advantage of divisional decentralization is that it enables decision making that is closer to the activities of the organization in contrast to decision making that arises from a central office far away. A second advantage is that responsibility can be assigned easily to the manager of a division so that his or her contribution to the company can be evaluated. A third advantage of divisional decentralization is that greater unity of command is achieved. The primary disadvantage is that this method can lead to suboptimization of resources (i.e., resources are not properly and fully utilized).

Divisional decentralization can create a feeling of autonomy in division managers that results in dysfunctional competition between them. As a result, the entire firm will suffer. Some managers will emphasize short-term gains to promote their careers to the detriment of the long-term interests of the organization.

(B) Advantages and Disadvantages of Decentralization

The advantages of decentralization arise from the greater autonomy assumed by lower-level management and workers. Top management is free to concentrate on more important problems,
such as long-range planning, because lower-level management is handling many details on its own. The general speed of business activity is increased since lower-level management does not have to wait for upper-level approval. Probably the greatest advantage of decentralization is that it allows managers the freedom to think boldly and creatively, stimulates a sense of personal freedom, raises morale, and provides an excellent training ground for future top executives.

This greater autonomy also gives rise to the disadvantages of decentralization. With each unit making its own decisions, activities are likely to be duplicated. Normally, it is cheaper to perform some activities centrally (e.g., finance, accounting). Managers of autonomous units may possibly ignore the advice of specialists. Decentralization can lead to suboptimization of resources. In the interest of the whole organization, top management should install some controls to attempt to correct some of the disadvantages of decentralization.

(iii) Line and Staff Organizations

Line and staff organization structure is designed to maximize the unity of command principle by giving only the managers the authority to make decisions affecting those in the chain of command. There is no crossover between line and staff organization structure since each structure has its own chain of command.

Line managers have the authority to make decisions and give orders to all subordinates in their chain of command. Staff authority is generally limited to subordinates within the department. There is a natural conflict between these two parties (i.e., between line managers and staff managers) due to power differences and different backgrounds.

One important source of conflict is the fact that line employees have formal authority while staff employees have informal power. Line managers tend to emphasize decisiveness, results, costs, and implementation, whereas staff members advise and prefer completeness, controls, adherence to policies and procedures, and systematic analysis to solve organizational problems. The staff function supports the line function but does not control it.

(d) Types of Departmentalization

Two common forms of integration are through the hierarchical chain of command and departmentalization. Some integration is needed to offset the negative effects of differentiation. It is through departmentalization that related jobs, activities, or processes are grouped into major organizational subunits, such as departments, divisions, groups, or units. Four basic types of departmentalization include: (1) functional departments, (2) product-service departments, (3) geographic location departments, and (4) customer classification departments

(i) Functional Departments

In both for-profit and nonprofit organizations, functional departments categorize jobs according to the activity performed. Manufacturing, marketing, and finance are some examples of functional departments, and the structure is popular because it permits those with similar technical expertise to work in a coordinated subunit. The structure becomes unpopular when departmental concerns tend to override more important organizational concerns. Functional departments can encourage differentiation at the expense of integration. A small, single, standard product line may be organized as a functional department, such as manufacturing, accounting, and sales. Unbroken organizational and reporting lines are indications of functional departmentalization.
CHARACTERISTICS OF ORGANIZATION STRUCTURES

- Functional departments, product-service departments, geographic location departments, and customer classification departments are the pure forms of organization structures. In practice, a combination of these structures is found.
- Product-service, geographic location, and customer classification departments can create costly duplication of personnel and facilities. Functional departments do not create duplication of personnel and facilities.

(ii) Product-Service Department
In the product-service department category, a product or service, rather than a functional category of work, is the unifying theme. Ideally, those working in a product-service department have a broad business orientation rather than a narrow functional orientation. One weakness of the product-service approach is that inefficient and costly duplication of effort may take place. A product departmentalization strategy may be good for a firm making multiple products. An example would be a computer manufacturer that organizes into mainframe computers, personal computers, mobile technology, and cloud technology groups.

(iii) Geographic Location Departments
In this organization structure, geographic location dictates the structure and format of the organization and emphasizes the concept that managers should be closer to the action. Advantages include knowledge of the local business and customers. Disadvantages include long lines of communication and the fact that the force behind the geographical lines is global competition. “Think globally and act locally” is the catchphrase for companies operating in a global market.

(iv) Customer Classification Departments
Customers have different needs and are of different types (e.g., business versus residential, retail versus wholesale, industrial versus commercial). The rationale behind organizing the company into customer classifications is to better service the distinctly different needs of each customer type.

(e) Traditional Organizational Structures
Organizations with traditional organizational structures are primarily organized by function or department, and the organizational structures are in the shape of pyramids. The traditional structures are inefficient due to their silo design and are less adaptable than the modern structures due to their inflexibility. In general, they are slow to respond and react to changes taking place around them in both internal and external environments.

Traditional organizational structures have a tall management hierarchy with too many job levels/layers and a narrow span of control, meaning a supervisor can manage fewer employees. They have strict job descriptions and job titles combined with well-defined boundaries built around functions, departments, and jobs. Employees’ skills are limited, can become stagnant, and are not easy to transfer to other functions or departments. Two common forms of traditional organizational structures include organizing by function and organizing by department.

(i) Organizing by Function
Most retail businesses are organized according to functions, such as marketing, merchandising, operations (stores, warehouses, and distribution centers), loss prevention, human resources, accounting
and finance, and IT. These functions, in turn, are classified as line functions or staff functions. Managers of a line function have a major role and responsibility in meeting the organization’s primary goals of producing goods, providing services, and marketing such goods and services. Managers of a staff function have a secondary role of supporting the managers of the line function.

Line and staff structure is designed to maximize the unity of command principle by giving only managers the authority to make decisions affecting those in the chain of command. There is no cross-over between the line and staff structures since each structure has its own chain of command.

Line managers have the authority to make decisions and give orders to all subordinates in their chain of command. Staff authority is generally limited to subordinates within the department. There is a natural conflict between these two parties (i.e., line managers and staff managers) due to power differences and different backgrounds.

One important source of conflict is the fact that line employees have formal authority and power while staff employees have informal authority and power. Line managers tend to emphasize decisiveness, results, costs, and implementation, whereas staff members advise and prefer completeness, controls, adherence to policies and procedures, and systematic analysis to solve organizational problems. The staff function supports the line function but does not control it.

The managers of a staff function have a supporting role and responsibility of working with managers of a line function. An HR manager in the HR function supports a marketing manager in recruiting marketing staff. A budget manager in the accounting/finance function supports an operations manager in developing a production or service budget. In other words, staff managers act as advisors or coordinators to line managers.

(ii) Organizing by Department
A business function can contain few or several departments, and each department can contain many employees. For example, the marketing function can be divided into sales, advertising, public relations, and customer service departments. These departments can be organized using either the traditional or the innovative method. Each of these departments will have internal customers (employees within the department) and external customers (employees in other departments of the company and people outside the company, such as customers, suppliers, vendors, and contractors).

A silo or legacy department is a product of traditional design and uses a rigid, vertical hierarchy of management with tightly bounded structures with solid walls built around the department. It has a tall organizational structure with a narrow span of control. It is not at all responsive to customer requests, queries, problems, and issues. Employees working in siloed departments are not empowered at all and receive little or no training (or somewhat ad hoc training) in customer service and organizational excellence, where the latter results from the former.

Unfortunately, most departments today are still operating as silo or legacy departments using traditional methods, which may not work well in ever-changing modern businesses. The time has come to change the silo department structure to something better, such as borderless department or, even better, to agile departments using innovative methods.

A borderless or seamless department is a product of innovative design and uses a flexible, horizontal hierarchy of management with loosely bounded structures with built-in soft walls
around the department. This department has a flat organizational structure with a wide span of control. It is somewhat responsive to customer requests, queries, problems, and issues. Employees working in borderless departments are reasonably empowered and frequently receive training in customer service and organizational excellence.

Silo/Legacy Department ➔ Borderless/Seamless Department

An agile or lean department is a product of innovative design and uses a flexible organizational structure and diagonal communication channels combined with little/no walls built around the department, and loosely designed job descriptions. It has a flat organizational structure with a very wide span of control (i.e., too few job levels and too many employees to manage to become a lean department). It provides a rapid response to customer requests, queries, problems, and issues. Employees working in agile departments are fully empowered, self-organized, and self-managed, as they work in teams and receive continuous training in customer service and organizational excellence.

As organizations become more customer-focused, they will need to transform their silo departments into borderless departments as an intermediate step and finally transform into agile departments. The evolution of a silo department into an agile department is shown next.

Silo/Legacy Department ➔ Borderless/Seamless Department ➔ Agile/Lean Department

(f) Evolution of Organizational Structures

Organizational structures are evolving as they are challenging and reshaping the traditional pyramid-type organizational structures. These evolving organizational structures not only improve the quality of life in the workplace but also improve the practice of management. Seven types of organizational structures are available based on evolution in business:

1. Matrix organizations
2. Hourglass organizations
3. Cluster organizations
4. Network organizations
5. Porous organizations
6. Ambidextrous organizations
7. Agile organizations

Each organization type is discussed next.

(i) Matrix Organizations

In a matrix organization, employees working in departments with vertical (down) and horizontal (across) lines of authority are grouped together to accomplish a specific objective. This design is suitable to a project environment where the project manager is responsible for completing a project without formal line authority. Under these conditions, project managers tend to use negotiation skills, persuasive ability, technical competence, and the exchange of favors to complete a project in order to compensate for their lack of formal authority (see Exhibit 1.32).
EXHIBIT 1.32 Advantages and Disadvantages of Matrix Organizations

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient use of resources</td>
<td>Power struggles</td>
</tr>
<tr>
<td>Project integration</td>
<td>Conflict</td>
</tr>
<tr>
<td>Improved information flow</td>
<td>Slow reaction time</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Difficulty in controlling and monitoring tasks and people</td>
</tr>
<tr>
<td>Discipline</td>
<td>Overhead</td>
</tr>
<tr>
<td>Improved motivation and commitment</td>
<td>Stress due to dual reporting</td>
</tr>
</tbody>
</table>

The matrix organization structure will likely have unity of command problems unless there is frequent and comprehensive communication between the various functional managers and project managers.

For example, a large internal auditing department employs specialists in areas such as computer auditing (IT auditing) and statistical sampling. All specialists report directly to the assistant manager for technical services. When needed on a specific audit, they report to the audit supervisor responsible for the assignment. The matrix form of organizational structure exists in relation to the specialists.

(ii) Hourglass Organizations

The hourglass organization consists of three layers, with the middle layer distinctly pinched. The first layer is strategic management, whose members formulate a vision for the organization and make sure it becomes a reality. The second layer is a shrunken middle management, whose members carry out a coordinating function for diverse lower-level activities. These middle managers wear different hats all the time (i.e., they handle accounting problems one day, product design issues the other day, and marketing dilemmas the next day).

At the bottom of the hourglass is a broad layer of technical employees who act as their own supervisors much of the time. Consequently, the distinction between supervisors and rank-and-file employees is blurred. Employees at this operating level complain about a real lack of promotional opportunities. Management should try to keep them motivated with challenging work assignments, lateral transfers, skill training opportunities, and pay-for-performance schemes.

(iii) Cluster Organizations

Teams are the primary structural unit in cluster organizations. Employees are multiskilled and move from team to team as projects dictate. Flexible work assignments are the norm.
structure promotes innovation and responsiveness. Pay for knowledge is a common practice. Motivation will be high, but so will stress levels. On the downside, job security is an issue due to constantly changing projects. Employees need to attend training programs in team building and communications.

(iv) Network Organizations
Network organizations do not produce what they sell. Hence, their only function is administrative oversight. An independent contractor handles business operations for each organizational function (production, marketing). In other words, network organizations buy a product with their own label on it and then hire other companies to distribute and sell the product.

Network organizations are hollow or virtual corporations built on relationships; employees spend much of their time communicating via computers, emails, text messages, telephones, and efaxes. Advantages are lean and mean, well-run, efficient operations. Drawbacks include national security issues when operating in key industries, friction and vertical polarization (because employees are either executives or clerical workers with big pay differentials), and high turnover among nonmanagerial employees due to the fast pace of the work. Both executives and clerical employees need to attend training programs in negotiation skills, conflict management, effective communication, and handling stress.

KEY CONCEPTS TO REMEMBER: Evolving Organizational Structures
- The hourglass organization is a three-layer structure (strategic layer, middle layer, and operating layer) with a constricted middle layer.
- The cluster organization is a collaborative structure in which teams are the primary unit.
- In the network organization, the only function is coordination between subcontracted production and marketing operations.

(v) Porous Organizations
Porous organizations have a fluid and open network structure consisting of boundaryless, non-traditional, and virtual organizations that are interconnected, representing volunteer members from the public sector, private sector, and academia. Globally, they work together as a virtual team in the digital age to address and respond to disasters (e.g., earthquakes, hurricanes, fires, floods, and cyclones) and other crisis situations occurring worldwide.

Since members are volunteers, they can enter and leave porous organizations easily. These members communicate and coordinate with each other through emails, blog postings, text messages, telephone conversations, video conferences, and voicemails.

Porous networks are more open than others to new ideas and technologies and are more likely to identify useful developments and connections or synergies. In addition, porous network organizations, which are virtual organizations, may have an adaptive advantage over traditional structures (e.g., functional, departmental, and divisional structures) in that they are better able to sense changes (trends and shifts) in the external world and are able to quickly respond and react to such changes. Nongovernmental organizations (NGOs) and international charitable organizations such as UNICEF and Red Cross are examples of porous organizations.
(vi) Ambidextrous Organizations

Ambidextrous organizations, in general, are efficient in operations and adaptable to changes using exploration and exploitation methods. These organizations must achieve a balance between exploration and exploitation methods; they cannot pursue one method at the expense of the other. Each method is discussed next.

**Exploration methods** include R&D efforts and brainstorming sessions to discover new ideas, representing risk-taking experiments. A risk is that these exploration methods may not be successful. Entrepreneurs and innovators by nature focus on the exploration methods.

**Example:** Retailers who are innovators and entrepreneurs utilize exploration methods. Jeff Bezos of Amazon.com and Steve Jobs of Apple, Inc. are examples of innovators. For example, Amazon pioneered in retail technologies such as drones, robots, and artificial intelligence (AI) and Apple pioneered in smartphones and smart tablets. Similarly, most retailers (e.g., Walmart, Target, Zappos, Lowe’s, and Warby Parker) successfully applied exploration methods in developing omnichannel strategies (i.e., integrated channels). These retailers are efficient because they embrace change and produce radical and significant outcomes.

**Exploitation methods** include revisiting, restrategizing, replanning, redesigning, and reimplementing existing ideas to find better approaches. Basically, these methods are a kind of tweaking existing methods to make them little better with incremental benefits. Essentially, management has a status quo thinking and attitude. A risk is that exploitation methods can result in small outcomes and may not reach the levels of significant outcomes.

**Example:** Most retailers with brick-and-mortar stores, such as Sears and K-Mart, are taking on exploitation methods and have been unable to see much success with their status quo thinking, which has resulted in the closing of several stores for Sears, K-Mart, Toys R Us, and other retailers.

(vii) Agile Organizations

An agile or lean organization has the ability to rapidly adapt to changing market conditions (e.g., changes in demand and supply factors for products and services) and competitive environments (e.g., competitors’ aggressive plans and actions) in an efficient and effective manner. The agile organization assumes that change is constant and normal and is built into its life. This organization acknowledges the threats facing it and takes advantage of opportunities waiting to be seized.

**Threats ➔ Opportunities**

Some agile organizations practice holacracy, a distribution of management power, which is claimed to increase agility, efficiency, innovation, transparency, responsibility, and accountability. It is a system of distributed, not centralized, authority. Distributed authority means lower-level employees and managers can make their own decisions without too much dependence on higher-level managers. Agility in operations (i.e., lean operations) and passion for the customer are the two major prerequisites to a successful holacracy practice. However, criticisms against the holacracy include its one-size-fits-all approach and administrative burden with rigorous rules and procedures. Employees working in agile operations have no job descriptions and no job titles; instead, they have roles, work circles, and teams, which are called holarchy, a type of hierarchy.
Agile/lean organizations have a flat organizational structure and a wider span of control, meaning that a supervisor can manage many employees. An agile organization is an innovative one because its employees can customer-related problems through a team-based structure, empowering employees, and sharing information. Here, “empowering employees” does not mean that they abdicate responsibility; instead, it means giving employees power, authority, delegation, and decision making. However, there could be an imbalance between power and authority.

At this time, it is good to compare the agile organization structure with the traditional organization structure (sometimes called bureaucratic organization). See Exhibit 1.33.

**EXHIBIT 1.33 Comparison Between Agile Organizations and Traditional Organizations**

<table>
<thead>
<tr>
<th>Comparative Item</th>
<th>Agile Organizations</th>
<th>Traditional Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational structure</td>
<td>Flexible</td>
<td>Fixed</td>
</tr>
<tr>
<td>Hierarchy and span of control</td>
<td>Flat (few levels), wide (many employees)</td>
<td>Tall (many levels), narrow (few employees)</td>
</tr>
<tr>
<td>Management authority</td>
<td>Distributed</td>
<td>Centralized</td>
</tr>
<tr>
<td>Decision making</td>
<td>Dynamic</td>
<td>Static</td>
</tr>
<tr>
<td>Speed of decisions</td>
<td>Fast</td>
<td>Slow</td>
</tr>
<tr>
<td>Employees’ roles</td>
<td>Fluid</td>
<td>Rigid</td>
</tr>
<tr>
<td>Employees’ expertise</td>
<td>Wide-area expertise</td>
<td>Narrow-area expertise with SMEs</td>
</tr>
<tr>
<td>Human communication</td>
<td>Diagonal, vertical, and horizontal</td>
<td>Vertical only</td>
</tr>
</tbody>
</table>

**Example:** Zappos, an online shoe retailer, implements the holacracy philosophy. It has no formal job descriptions or job titles for its employees and it operates with a flat organizational structure. Employees work in a team environment and can perform any job given to them. Employees get constant training and retraining to make customers fully satisfied.

**Example:** Retailers such as Amazon, Zappos, Walmart, Target, Home Depot, Lowe’s, Warby Parker, and Kroger are known to be agile organizations because they are able to adapt quickly to changing retail market conditions and are innovative and customer-oriented.

**In summary:**

- Traditional pyramid organizational structures are inefficient due to their silo design and less adaptable to changes due to their inflexibility.
- Matrix organizations work as a team to solve a common problem and to find a solution.
- Hourglass organizations represent three diverse layers of employees (strategic layer, middle layer, and operating layer) with a constricted middle layer.
- Cluster organizations consist of employees moving from team to team because they are multiskilled and multitalented. These organizations are collaborative structures in which teams are the primary unit.
Network organizations provide administrative oversight only. The only function is coordination between subcontracted production, marketing operations, and sales activities. They are also called learning organizations and boundaryless organizations.

Porous organizations represent volunteer members from boundaryless global companies and are best suited to sense trends and shifts and react and respond to them.

Ambidextrous organizations, in general, are efficient in operations and adaptable to changes using exploration and exploitation methods. They are also, in part, innovative organizations due to the use of exploration methods.

Agile organizations are lean and innovative organizations with the ability to adapt quickly to changing conditions.

1.7 Risk and Control Implications of Common Business Processes

In this section, risk and control implications of common business processes are discussed, including human resources (HR) management; procurement and supply chain management; new product development process; marketing and sales management; logistics and distribution management; and outsourced business processes.

(a) Human Resources Management

This section presents HR planning process, employee recruiting and selection methods, the preemployment screening process, employee training and development methods, the employee performance appraisal process, and employee termination and resignation procedures.

(i) Human Resource Planning Process

HR planning is a part of an organization’s strategic planning. The HR planning process is a systematic approach of matching the internal and external supply of people with job openings anticipated over a specified period of time. Specifically, it includes three major elements:

1. Forecasting HR requirements
2. Forecasting HR availability
3. Comparing the HR requirements with the HR availability

In **forecasting the HR requirements**, the demand for employees is matched against the supply of employees. If they are equal, no action is necessary. Several methods exist to forecast the HR requirements, including zero-based forecasting, bottom-up approach, simulation models, and relating sales volume to the number of employees needed.

In **forecasting the HR availability**, the number of employees with the required skills and at the required locations is determined. The needed employees may be found internally, externally, or in combination. If a shortage is forecasted, needed employees may come from developing creative recruiting methods, increasing compensation incentives to employees, conducting special training programs, and using different selection standards, such as lowering employment requirements in terms of hiring an inexperienced employee and providing on-the-job training to that employee.
In **comparing the HR requirements with the HR availability**, surplus workers may exist. This surplus can be handled through various reduction methods, such as restricted hiring, reduced work hours, encouraging early retirements, buyouts, mandatory layoffs (furloughs), or even downsizing (restructuring and rightsizing) the department or the company.

The outcome of the HR planning process can be either a surplus or a shortage of workers. HR management needs to address both of these outcomes.

\[
\text{Surplus of Workers} = \text{HR Availability} > \text{HR Requirements}
\]

\[
\text{Shortage of Workers} = \text{HR Requirements} > \text{HR Availability}
\]

**(ii) Employee Recruiting and Selection Methods**

**Recruitment** is the process of attracting qualified individuals on a timely basis and in sufficient numbers to fill the required jobs, based on job descriptions and job specifications. Risks can exist in hiring due to judgment errors, such as yes-hire error and no-hire error.

- Yes-hire error exists when an unqualified or less qualified job candidate is accepted. This means selecting a wrong job applicant.
- No-hire error exists when a qualified job candidate is rejected. This means rejecting a right job applicant.

Two factors affect the job recruiting: external factors and internal factors. **External factors** consist of labor market considerations (e.g., demand and supply) and legal considerations, such as nondiscriminatory practices (e.g., gender, race, and ethnicity). **Internal factors** consist of promotion policies (e.g., promotion from within).

**(iii) Pre-Employment Screening Process**

The pre-employment screening process starts after a job candidate completes an employment application, submits a resume, takes the required selection tests, and undergoes an employment interview. At this point, the candidate is being considered for the job and requires further meetings and interviews prior to hiring.

Two types of pre-employment screening include background investigations and reference checks, where the latter supplements the former.

The focus of background investigations is to determine the accuracy of information submitted or to determine whether the required information was not submitted. Background investigations involve collecting data from various sources, such as previous employers, business associates, credit bureaus, government agencies, academic institutions, and the applicant’s mode of living and the nature of character. Some sensitive jobs require fingerprinting and security clearances.

Reference checks from outsiders verify the accuracy of information provided by applicants. A problem with reference checks is that they do not tell the whole truth about applicants. Another problem is that previous employers are reluctant to reveal information about applicants due to privacy reasons.

Risks can exist when conducting pre-employment screening work due to judgment errors, such as yes-negligent error and no-negligent error. Yes-negligent error results when a current employer was negligent in conducting a thorough background investigation of a job applicant. No-negligent error results when a current employer was not negligent in conducting a thorough background investigation of a job applicant.
HR management needs to be concerned about four legal liabilities when hiring, which provide additional justification for conducting a thorough background investigation of the job applicant. Management’s judgment error is the major reason for the legal liabilities.

1. **Negligent hiring** is the liability of current employers when they fail to conduct a reasonable investigation of a job applicant’s background and then hires a potentially dangerous person who can damage company property and/or harm employees and others. The definition of reasonable investigation depends on the nature of the job. Due diligence is required in conducting background investigations. The hiring organization must be able to foresee the harm resulting from a dangerous employee being hired.

2. **Negligent referral** is the liability of former employers when they fail to warn a potential employer about a severe problem with a past employee.

3. **Negligent retention** is the liability of current employers if they keep on the payroll an employee whose records indicate strong potential for wrongdoing and if they fail to take necessary steps to defuse a possibly violent situation.

4. **Negligent promotion** is the liability of current employers when an incompetent and unqualified employee was promoted at the expense of competent and qualified employees.

**NEGLIGENT HIRING VERSUS REFERRAL VERSUS RETENTION VERSUS PROMOTION**

- Negligent hiring is a legal liability for the current employer.
- Negligent referral is a legal liability for the former employer.
- Negligent retention results from negligent hiring, which is a legal liability for the current employer.
- Negligent promotion is a legal liability for the current employer.

**(iv) Employee Training and Development Methods**

Training and development requirements of employees (i.e., nonsupervisors and nonmanagers) are different from those of supervisors and managers. Similarly, the training and development needs of general managers, senior managers, executives, and leaders are very different from those of supervisors and managers.

**(v) Employee Performance Appraisal Process**

Just as corporations want to grow in sales and market share to increase profits and stakeholder value, employees need to grow personally and professionally to reach their career goals and make a positive contribution to the company they work for and to help the company reach its goals. The goal congruence concept is at play here.

Although neither employees nor supervisors like to give and receive performance appraisal evaluations, such evaluations are a very important part of employee career growth plans. They can be used in justifying employee termination and promotion decisions and can help in identifying employee training and development needs.

**(A) Characteristics of an Effective Performance Appraisal System**

Characteristics of an effective performance appraisal system include job-related criteria, performance expectations, standardization, trained appraisers, continuous open communications, periodic performance reviews, and due process to appeal appraisal results.
Results from the employee performance appraisal process can be put to several good uses, such as input into HR planning, recruitment, and selection; training and development; career planning and development; compensation programs; employee relations; succession planning; promotion or demotion; and assessment of employee potential in the company.

**(B) Factors Affecting Employee Performance Appraisals**

Both external factors and internal factors can affect a company’s process of employee appraisals.

Two external factors include government legislation requiring that nondiscriminatory practices be followed and labor union preferences for seniority, not performance, as the basis for promotions.

One major internal factor that affects performance appraisals is the organization’s culture, where nontrusting culture does not encourage high performance.

The employee performance appraisal process is divided into a series of steps, including identifying specific performance appraisal goals, establishing performance criteria and communicating them to employees (e.g., traits, behaviors, competencies, goal achievement, and improvement potential), examining employees’ work performed, appraising employees’ performance, and discussing appraisal results with employees.

Individuals responsible for conducting employee performance appraisals include the employee him- or herself, immediate supervisor, senior managers, subordinates, peers and team members, and internal and external customers. In this **360-degree feedback** evaluation method, the biggest risk is confidentiality, whether the evaluation is done internally or externally.

A **720-degree review** focuses on the big picture at the company level for all of its employees, not on the individual employee level. The review is all about senior managers and their performance. The participants in the review include senior managers, subordinates, customers, and investors because senior managers deal more with external parties, such as customers and investors.

Performance appraisal methods include these: 360-degree feedback, 720-degree review, graphic rating scales method, ranking and comparison method, critical incident method, written essay method, goal-setting exercises, work standard method, multirater appraisals, weighted checklists, forced distribution method, behaviorally anchored rating scales (BARS) method, and results-based system.

Problems and risks associated with the performance appraisal process include appraiser discomfort, lack of objectivity, halo/horn error, leniency/strictness effect, central tendency error, recent behavior bias, personal bias (stereotyping), manipulating the evaluation, and employee anxiety.

### Halo Error Versus Horn Error

A **halo error** occurs when a manager projects one positive performance feature or incident onto the rest, resulting in a higher rating.

A **horn error** occurs when a manager projects one negative performance feature or incident onto the rest, resulting in a lower rating.
(vi) Employee Termination and Resignation Procedures

Termination is the most severe penalty requiring careful consideration on the part of the employer. Termination of nonmanagerial and nonprofessional employees is handled differently from the termination of higher-level executives and middle-/lower-level managers and professionals.

For example, termination procedures for nonmanagerial and nonprofessional employees (e.g., truck drivers and waiters) are dictated by whether these employees belong to a union or not.

Usually, executive jobs are protected under a contract, if there is one. Executives have no formal appeal rights, because the termination could be due to valid business reasons (e.g., economic downturn, reorganization and downsizing, and decline in performance and productivity). However, if executives are involved in illegal activities, such as management fraud, insider trading, or sexual harassment suits, they can be terminated. Terminated executives can be costly to replace, and terminated executives can make negative statements about the company to the press in order to damage its reputation.

Middle- and lower-level managers and professionals are most vulnerable to termination, unless they belong to a union, because their employment depends on the wills and whims of their immediate supervisor.

Based on the performance appraisal process, some employees could be fired or terminated. It is expensive to fire an employee, especially when there is a judgment error associated with it. There are two types of firing errors:

1. Yes-fire error exists when the employer decides to fire an employee who does not deserve firing.
2. No-fire error exists when the employer does not fire an employee who deserves firing.

Resignations occur on a voluntary basis by employees or are forced by the employer. When an employee resigns voluntarily, the employer must determine the reasons for leaving through the use of exit interview (before an employee departs) and a postexit questionnaire (after an employee departed).

(A) Exit Interviews and Attitude Surveys

Exit interviews, which are face-to-face meetings, can identify the reasons for leaving, which can be used to change the HR planning process, modify training and development programs, and determine other areas needing improvement. A major problem with face-to-face exit interviews is that departing employees may not tell the interviewer the real reasons for leaving due to their sensitivity.

Postexit questionnaires are sent to former employees several weeks after they leave the company to determine the real reasons they left, which can negate the problems with the exit interviews. Departed employees may respond freely to the questionnaire because they are not in front of the interviewer.

The best way to manage employee relations is to conduct a periodic attitude survey of current employees to determine their feelings, issues, and concerns related to their jobs and to seek their ideas for improvement. The scope of the survey can include nature of the work, supervisor
relations, work environment (tools and materials), flexibility in the work schedules, opportunities for job advancement, training and development opportunities, pay and benefits, and workplace safety and security concerns. Survey results can help the employer to correct identified gaps on a proactive basis before the problems get out of hand. If gaps go uncorrected, employees may leave the company.

Note: Exit interviews and postexit questionnaires are reactionary in nature and not timely. Employee attitude surveys are proactive in nature and timely. However, all these methods focus on the same thing: obtaining employee feedback.

(b) Procurement and Supply Chain Management

This section discusses two separate and yet interrelated topics: procurement management and supply chain management.

(i) Procurement Management

Procurement management is purchasing management where a company’s purchasing agents or buyers acquire materials (e.g., raw materials, ingredients, tools, parts, components, subassemblies, packaging materials, and other production supplies) from outside product suppliers to manufacture products. The purchasing agents also award contracts for acquiring services (e.g., building and equipment maintenance, welding, and painting) from outside service vendors. The procurement function is risky in several ways due to huge amounts of money involved in purchasing needed materials and due to the attitude of buyers with potential conflict-of-interest situations and motivation (honesty and integrity) and dismotivation (dishonesty and no integrity) levels, all leading to fraud and collusion with suppliers.

(ii) A Primer on Bid-Rigging: A Major Risk in Procurement Management

Bid-rigging is a fraud scheme involving procurement bids from vendors. It is an agreement among competitors and vendors as to who will be the final winning bidder (seller). Bid rigging occurs when a purchaser (buyer) solicits bids to purchase goods or services from sellers. The bidders agree in advance who will submit the winning bid. The purchaser, who depends on competition between the bidders to generate the lowest competitive price, receives instead a "lowest bid" that is higher than the competitive market would bear.

There are five basic schemes involved in most bid-rigging conspiracies:

1. Bid Suppression: In this type of scheme, one or more competitors agree not to bid, or withdraw a previously submitted bid, so that a designated bidder will win. In return, the non-bidder may receive a subcontract or payoff.

2. Complementary Bidding: In this scheme, co-conspirators (competitors) submit token bids which are intentionally high or which intentionally fail to meet all of the bid requirements in order to lose a contract. It is also called a courtesy bidding and it is the most commonly and frequently used form of bid-rigging.

3. Bid Rotation: In bid rotation, all co-conspirators submit bids, but by agreement, take turns being the low bidder on a series of contracts.

4. Customer or Market Allocation: In this scheme, co-conspirators agree to divide up customers or geographic areas. The result is that the co-conspirators will not bid or will submit only complementary bids when a solicitation for bids is made by a customer or in
5. Subcontracting arrangements are often part of a bid-rigging scheme. Competitors who agree not to bid or to submit a losing bid frequently receive subcontracts or supply contracts in exchange from the successful low bidder. In some schemes, a low bidder will agree to withdraw its bid in favor of the next low bidder, in exchange for a lucrative subcontract that divides the illegally obtained higher profits between them.

All bid-rigging schemes have one thing in common: an agreement among some or all of the bidders which predetermines the winning bidder and limits or eliminates competition among the conspiring vendors.

The laws of both agency and contracts apply to procurement because purchasers (buyers) enter into contracts with suppliers, vendors, and contractors as an agent and employee. The common law recognizes the laws of both agency and contract as valid legal instruments.

Law of Agency = Company (Principal) → Buyer (Agent)
Law of Contracts = Company (Principal) → Employee (Agent)

There are two basic approaches to purchasing: traditional purchasing and reverse purchasing. The latter is preferred by buyers over the former because the buyer has a better control on purchases.

In traditional purchasing, the supplier approaches the purchaser (buyer) to sell materials or products. The supplier establishes prices, terms, and conditions. The buyer takes a reactive, mild, and short-term approach, which does not gain the buyer a competitive advantage in the supply chain.

Traditional Purchasing = Supplier → Buyer

In reverse purchasing, the buyer approaches the supplier to buy materials or products. The buyer establishes prices, terms, and conditions. The buyer takes a proactive, aggressive, and long-term approach to achieve a competitive advantage in the supply chain (e.g., reduced supplier inefficiencies, reduced inventory levels, improved accuracy in demand forecasting, and increased cost savings). Reverse purchasing is also known as reverse marketing and supplier development because suppliers themselves are improved by a collaborative and participative approach with buyers.

Reverse Purchasing = Buyer → Supplier

(A) Sourcing Options in Procurement
A buyer (purchasing agent) in a manufacturing company has several choices to source raw materials, parts, and components that go into a finished product. A buyer in a retail company purchases finished products from a manufacturing company to sell in retail stores. It is important to understand how a manufacturer sources its materials to determine the risks it faces. A manufacturer’s risks can automatically and ultimately become a retailer’s risks.

In retail purchasing and procurement, sourcing of finished goods (merchandise) is everything because without merchandise there are no sales to customers. A caution is required here: Excessive purchase of merchandise from several and similar sources can increase total inventory count and decrease the ROI and the gross margin return on inventory (GMROI) metrics. Sourcing can be domestic or global.
Usually, retail buyers acquire white market goods such as consumer goods, convenience goods, capital goods, private goods, and public goods that are legal goods and that contribute to sales revenues for a retailer and gross domestic product for a country. Consumer goods and convenience goods are further divided into (1) durable and nondurable goods and (2) soft and hard goods based on their useful life (either short or long life). However, retail buyers should be aware of risks in acquiring questionable goods, such as counterfeit (fake) goods, and gray market and black market goods either intentionally or unintentionally.

**RISKS IN BUYING QUESTIONABLE GOODS**

- Counterfeit goods (fake goods) are illegal as they imitate the appearance of well-known brand-name products and are sold to mislead or confuse consumers. It includes knockoff goods and pirated goods.
- Grey market goods are illegal and unauthorized products sold outside of normal distribution channels. Grey market goods are sold in black markets.
- Gray market goods are legal or illegal and unauthorized products that are parallel imported from one country to another country. They are legal or illegal based on where the goods are made and sold.
- Black market goods are illegal products and are unofficially sold in an informal economy.
- White market goods are legal products and are officially sold in a formal and local economy.
- Any products sold in the United States that violate the rights of a U.S. intellectual property owner are illegal in the United States. The products could be legal in other countries based on their IP laws until the IP owner is aware of the IP rights violation.

**EXAMPLES OF SOURCING OPTIONS**

**In-sourcing** is keeping core products or services in-house or buying the same merchandise from the same supplier as before.

**Outsourcing** is acquiring noncore products or services from external sources.

**Sole sourcing (solo sourcing) or single sourcing (mono-sourcing)** is using only one supplier for an inventory item, which could be risky because no backup supplier is available. Sole sourcing also can occur with unique items for which second suppliers cannot be found.

**Multiple sourcing** is more common in the supply chain environment today where there are several suppliers for each item in the chain. However, too many suppliers are not good due to problems in communication and coordination, which is in conflict with the goal of reducing the base of suppliers. A few strong and stable suppliers with long-term commitments are better than many weak and unstable suppliers with short-term commitments.

**Cross-sourcing** (or cosourcing or dual sourcing) is a compromise between single-sourcing and multiple-sourcing options where one supplier is used for one item and another supplier is used for a similar item. Natural competition, incentives, and backups are created between these two suppliers to win a greater share of procurement dollars.

**Offshoring** is moving a business function or process to a foreign country but retaining control of it in the home country.

**Near-shoring** is choosing an outsource provider located either in the home country or in a nearby foreign country.
**Back-sourcing** is the return of a business activity to the original firm in the home country.

**Local sourcing** is using only suppliers within a country to supply all or most of items, thus saving transportation costs, customs duties, and import taxes required in global sourcing.

**Next-shoring** means finding the best source, whether it is in-sourcing, outsourcing, offshoring, or near-shoring, only after carefully considering various decision factors, such as technology, efficiency, cost, raw material availability, skilled labor availability, and political conditions. The next-shoring location could be a new offshoring or near-shoring location or the original in-sourcing location (i.e., back-sourcing).

**Global sourcing** is using suppliers from foreign countries because certain items (e.g., unique and rare) are only found in those countries.

**Combo sourcing** occurs when a domestic source is combined with a foreign source to procure unique and rare items and when two or more sources are combined, as in insourcing and outsourcing.

**Crowd-sourcing** is open sourcing, meaning anybody from anywhere in the world can bid and supply the requested materials. It brings the best talents and capabilities out in the market.

**Cosourcing** is having two suppliers for an inventory item where one supplier works as a backup for the other. Care should be taken not to unwittingly turn cosourcing into multiple sourcing or crowd-sourcing.

**Reshoring** or next-shoring results from changing the previous outsourcing decision to offshoring or near-shoring due to changing market conditions in the world of manufacturing.

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*(B) In-Source Analysis versus Outsource Analysis*

Manufacturing companies usually perform a make-or-buy analysis when deciding to manufacture a part or component inside the company or to buy it from outside companies. Costs for each choice (make or buy) are developed and compared to determine which choice is less expensive.

Purchasing or procurement management in a retail company can perform similar analysis to determine whether to in-source a product (i.e., buy from the same supplier as before) or outsource a product (i.e., buy from a different supplier now). Costs for each choice (in-source or outsource) are developed and compared to determine which choice is less expensive.

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**A PRIMER ON VARIOUS TYPES AND TOOLS OF BUYING**

**Types of Buying**

**Speculative buying** occurs when purchasing materials in excess of current and future known requirements with the intention of profiting on up and down price movements. Speculative buying is risky; financial losses can occur when actual prices significantly deviate from speculative prices.

**Forward buying**, also known as bridge buying, occurs when a buyer purchases higher quantities of products than the current needs during a manufacturer’s announced off-invoice allowances to take advantage of lower prices and special payment discounts consisting of coupons and credits.

**Routine buying** is purchasing small items and office supplies (e.g., pencils, pens, paper clips, rubber bands, copier/printer paper, and writing pads) through supplier websites.

**Discount buying**, also called opportunity buying, occurs when a buyer purchases end-of-season goods, customer-returned goods, slightly imperfect goods (seconds), closeouts, and excess inventory from a manufacturer at significant discounts and sell them to end customers at lower prices.

*(continued)*
A PRIMER ON VARIOUS TYPES AND TOOLS OF BUYING (Continued)

Consignment buying is a method of procurement in which a supplier or vendor maintains an inventory on a retailer’s (purchaser’s) premises. The purchaser’s obligation to pay for the goods begins when goods are drawn from the consigned stock for use or to sell. In the beginning, suppliers assume greater risk because they own the title to goods until they are sold and, at this point, retailers have no risk because they have no title to and no ownership of goods. Retailers assume risk when they acquire ownership of goods to sell. Suppliers with a low-reputation and a low selling power encourage consignment buying practices because retailers pay to the suppliers only for goods sold and can return the unsold goods to suppliers.

Before a product is sold
(Supplier owns the goods and risks) → After a product is sold
(Retailer owns the goods and risks)

Informal buying, also called memorandum buying, means buying without contracts. The retailer takes the title to goods on delivery and is responsible for damaged goods. Suppliers with poor reputation and low selling power encourage informal purchasing because retailers pay to suppliers only for goods sold and can return the unsold goods to suppliers.

Stockless purchasing is an arrangement where a supplier holds inventory until the buyer places orders and the buyer releases specific items. It is also called vendor-managed inventories and is similar to a just-in-time (JIT) purchasing philosophy used in manufacturing. Examples include blanket orders, open-ended orders, and system contracts.

Staple purchasing is buying basic merchandise items that have a continuous demand for day-to-day consumption, such as milk, bread, eggs, salt, sugar, fruits, vegetables, and soups.

A systems contract is a contract generated by the purchasing department that authorizes designated employees of the buying firm to place orders directly with the supplier. A release system is developed for specific materials during a given contract period.

Tools of Buying

A purchase order is a legal document binding a buyer and a seller that describes the product items and quantities a buyer wants to purchase from a seller, the prices to be paid, the shipping costs to be incurred, and the payment terms to be accepted. A purchase order can be a discrete order (a separate order is issued for each item to be procured) or a firm release order (a group of items to be procured over a specified period of time based on flexible/floating demand forecasts).

A blanket order is a commitment to a supplier for certain goods over a predetermined period (one year) at predetermined prices or at prices to be determined.

Purchase cards (P-cards) are a special type of charge cards used to buy products and services without requiring paperwork and advance approvals, as they are based on dollar limits established for each P-card owner. These P-cards track and report all transactions incurred by transaction type, by the amount of purchase, and by the card owner. P-cards are efficient and save time because the card owner does not have to fill out paperwork needed in traditional purchasing and ensures card owner accountability. Each retail buyer and store buyer should be given a P-card to buy merchandise as needed.

Progress payments are specified in a procurement contract to be made to a supplier at specific times, based on a supplier’s progress in completing the job.

Spend analysis is a tool that provides retail merchandise and manufacturing buyers with knowledge about how much is being spent for what goods and services, who the buyers are, and who the suppliers are. This tool provides buyers with opportunities to leverage buying, save money, and improve financial performance. Spend analysis has some elements of open-to-buy analysis for retailers.
(iii) Supply Chain Management
This subsection defines supply chain, explains how to manage the supply base, defines the value chain, presents supply chain risks, and suggests best practices to reduce such risks.

(A) Supply Chain Defined
A supply chain is a series of partnering firms providing value-added activities and value-delivery chain in logistics from raw materials to finished goods purchased by a final consumer/customer. It is a system of organizations, people, activities, information flows, and resources involved in moving a product or service from a supplier or producer to a consumer or customer. The goal is to keep a relatively narrow breadth of supply chain (i.e., few key suppliers) with long-term financial and quality commitments between purchasers (buyers), suppliers, manufacturers (producers), distributors, retailers, and customers (consumers). The supply chain can be domestic and/or global in nature as the suppliers are available from several countries. The players and partners in a supply chain are shown next.

Supply Chain = Purchasers $\rightarrow$ Suppliers $\rightarrow$ Manufacturers $\rightarrow$ Distributors $\rightarrow$ Retailers $\rightarrow$ Customers

Here, the supply chain runs from purchasers (a company’s buying agents) to consumers (end customers). Suppliers and vendors (upstream suppliers) provide or bring raw materials into a manufacturing facility to produce products. Distributors and wholesalers (downstream suppliers) bring manufactured or finished products from the same manufacturing facility and deliver them to retailers.

(B) Managing the Supply Base
Managing the supply base requires several strategic approaches such as integrating suppliers, early involvement of suppliers, supplier reduction practices, supplier performance levels, and supplier certification requirements. The purpose of managing the supply base is to manage quality, quantity, delivery, service, and price of a product.

Integrating suppliers means reducing or balancing the number of suppliers available so that they become part of the buyer/purchaser operation to lower inventories, to increase response time and quality, and to decrease total cost. Here, the focus is on the supplier mix which is a supplier composition dealing with the number of suppliers (i.e., 100 or 1,000), size of suppliers (i.e., large or small), location of suppliers (i.e., domestic or foreign), type of suppliers (i.e., intermediary or final), and nature of suppliers (i.e., strategic or operational).

Early involvement of suppliers in the procurement and product design process reduces cost, improves quality, and shortens product development cycle time. This is achieved through supplier review of product specifications and production standards. Other benefits include a supplier buy-in.

Supplier reduction practices include deciding who will be single-sourcing, second-sourcing, or last-sourcing vendors.

Supplier performance levels are measured in terms of quality, delivery, service, and cost/price, as follows:

- Quality measures may include incoming defect rate, product variability, number of customer complaints, use of statistical process control, documented process capabilities, and supplier’s quality philosophy.
Delivery measures include on-time delivery, percentage and availability of product within quoted lead time, and quantity accuracy.

Service measures include invoice accuracy and length of time required to settle claims, availability of a supply plan, and availability of engineering support.

Cost/price measures include product cost, price reductions, transportation cost, willingness to participate in price reviews, and minimum buy requirements.

Supplier certification requirements is a process conducted by the purchasing organization so that shipments go directly into use, inventories, or production. The goal of certification is to reduce or eliminate a purchaser’s inspection of goods coming from a supplier. Certification involves evaluating the supplier’s quality systems, approving the supplier’s processes, and monitoring incoming product quality. The advantages of supplier certification are increased product quality, reduced inspection costs, and reduced process variation.

Two important concepts in the supply chain and logistics include pull supply chain and push supply chain.

Pull supply chain means customers are driving the demand (pull) in that they place the orders at the retail stores, online, or by phone to pull the products out of the logistics system into their hands.

Push supply chain means historical sales are driving the demand (push) in that purchasing management or retail store management initiates the orders to push the products from the logistics system into the customers’ hands.

Two types of suppliers exist in a supply chain management: upstream suppliers and downstream suppliers.

Upstream and downstream suppliers are partners in a supply chain operation consisting of many suppliers (S-1 to S-N), whether local or global forming a solid business chain. The chain is presented as follows:

Upstream Suppliers 1, 2, and 3 → Manufacturer → Downstream Suppliers 4, 5, and 6 → Retailers → Customers

Here, suppliers 1, 2, and 3 are called upstream suppliers because they transport and deliver raw materials, ingredients, parts, and components to a manufacturer to make a full or partial product. Suppliers 4, 5, and 6 are called downstream suppliers because they transport and deliver a fully completed product from a manufacturer to a retailer, where it is eventually sold to customers. Note that a supply chain can contain only one manufacturer or multiple manufacturers.

All partners in a supply chain are affected by the bullwhip effect (also known as the Forrester effect), which refers to a rippling and magnifying effect on inventory due to changes in product demand between producers and suppliers. This means that a small change in demand at the first downstream supplier (DS-1) creates a big change in demand at the first upstream supplier 1 (US-1) and demand at the producer, as shown next.

US-1 → US-N → Producer ← DS-N ← DS-1
The bullwhip effect results in unnecessary over orders, overproduction, overstorage, over-buildup of inventory, and excessive inventory costs and investments due to an excess of caution exhibited by all levels in the supply chain. In other words, the bullwhip effect is a result of a just-in-case exaggeration of demand incorrectly assumed by all partners in the supply chain, thus reflecting chaos and uncertainty.

(C) Value Chain Defined

The real challenge in the supply chain is to ensure that value is added at every step to achieve customer satisfaction. Both purchasers (buyers) and suppliers (sellers) play a large role in achieving the customer value chain. The correct sequence of partners in the customer value chain is buyers (purchasers), suppliers (vendors), producers (manufacturers), distributors (wholesalers), retailers, and end customers (consumers).

\[
\text{Value Chain} = \text{Purchasers} \rightarrow \text{Suppliers} \rightarrow \text{Manufacturers} \rightarrow \text{Distributors} \rightarrow \text{Retailers} \rightarrow \text{Customers}
\]

The value chain of a manufacturing company includes all activities and departments from idea creation to idea commercialization. This includes suppliers, producers, retailers, and R&D to postsale customer service. Discontinuing a product or department does not take away any value to a customer unless the product or department was providing the value before.

The value chain is improved when delays, defects, waste, and inventories are eliminated in business processes. The goal of the value chain is to make such processes lean, flexible, stable, and predictable. Doing this requires elimination of sources of inefficiency, rigidity, and variability and use of IT to integrate business subprocesses.

Several partners in the value chain can add value to a product or service. Assume that there are two suppliers, one producer, and one retailer in the value chain. Also assume that there is a little or no need for the cost of capital invested. The next equations explain how these partners can all add value to a product.

\[
\begin{align*}
\text{Value added by Supplier 1} &= \text{Supplier 1 price} - \text{Supplier 1 cost} \\
\text{Value added by Supplier 2} &= \text{Supplier 2 price} - \text{Supplier 2 cost} - \text{Supplier 1 price} \\
\text{Value added by producer} &= \text{Producer price} - \text{Producer cost} - \text{Supplier 2 price} \\
\text{Value added by retailer} &= \text{Retailer price} - \text{Retailer cost} - \text{Producer price}
\end{align*}
\]

Total value added to a product is the summation of value added by all partners involved in the value chain. The value of a firm is the summation of all value added for all products that a firm produces. The same logic applies to services.

Value analysis is the organized study of an item’s function as it relates to value and cost. The value of an item is defined as the function of the item divided by the cost of the item. The goal of value analysis is to make improvements in a product while the product is being produced and after deciding that a new product is a success.

There are valued-added and non-value-added tasks in any function due to tasks that were neither changed nor challenged. The goal is to identify those tasks or activities that are not adding value to a function, product, or process. Value engineering techniques can be implemented to
identify non-value-added activities and streamline business processes in order to improve their efficiency and effectiveness.

Assembling tasks, whether subassembly or final assembly, and process times are value-added activities of a manufactured product while other activities are non-value-added activities. Examples of non-value-added activities from a customer’s viewpoint include inspection, move, reporting, governmental compliance, storage, wait, and queue time.

VALUE-ADDED AND NON-VALUE-ADDED ACTIVITIES

Enhance or increase value-added activities, such as production pure process time; ingredients mix time; part fabricating time; part plating, soldering, and painting time; part subassembly time; part final assembly time; customer order processing time; customer order ship time; internal/external customer access points to manufacturing systems; and manufacturing management decision points and control points.

Eliminate or decrease non-value-added activities, such as material storage, handling, and movement steps; inspection steps; rework steps; waiting time; product recall time; product warranty time; and delays at interdepartmental and interdivisional boundaries and at intradepartmental workstations.

Handling these activities requires having the right resources available at the right place and at the right time so that delays and waste in manufacturing operations are decreased.

(D) Supply Chain Risks

Supply chain risks include any threat event that can affect manufacturing and logistics of goods. The goal is to ensure timely production, transportation, and delivery of safe, salable, and quality-based goods to customers. Supply chain risks can arise during manufacturing, logistics, and outsourcing operations and can affect customers’ safety.

A risk assessment exercise should be undertaken with the supply chain describing several risk scenarios explaining upstream and downstream impacts in the supply chain. Risk management asks whether a company possesses risk-mature or risk-immature capabilities. Research has shown that companies with risk-mature capabilities perform better than those with risk-immature capabilities in terms of carrying less inventory in the pipeline; managing with shorter lead times for raw materials and finished goods; earning a larger increase in operating income; and creating faster cash-to-cash cycle times.

Specific examples of supply chain risks include:

- Poor manufacturing practices that do not conform with generally accepted manufacturing practices.
- Poor warehousing and distribution center practices and processes.
- Violation of IP rights such as copyrights, trademarks, service marks, and patents.
- Tampering and manipulating good products with bad parts and components during factory assembly or delivery in-transit.
- Insertion of counterfeit products.
- Insertion of malware (viruses and worms) and ransomware software.
- Theft of goods during transportation and delivery.
- Insertion of dangerous and inferior-quality parts and components in finished goods.

**Best practices for a procurement or purchasing management to reduce supply chain risks include:**

- Conduct a detailed risk assessment exercise and due diligence review on a potential supply chain vendor’s (provider’s) legal history, financial solvency, tax history, and corporate reputation in the marketplace.
- Encourage that a provider’s legal counsel review contracts and agreements to ensure protection of IP, manufacturing production and service processes, or other sensitive material.
- Understand that vetting a foreign provider is more difficult than vetting a domestic provider due to physical distance, time zones, and foreign laws and policies.
- Request an advance notice of changes in a provider’s ownership or product development and marketing strategies.
- Request all providers to establish and maintain visitor logs to their manufacturing, warehouse, and distribution facilities.
- Identify and review a provider’s processes and procedures to verify the quality of its products or third-party products, including inspections of incoming and outgoing materials.
- Determine how providers clean or wipe sensitive information from their electronic equipment and computer devices prior to their disposal or retirement in order to prevent data leakage or data loss.
- Deploy a defense-in-breadth strategy, which focuses on installing horizontal, multiple layers of security protections (security controls) to provide a strong security mechanism. This preventive control concept centers on people, technology, operations, and access policies and procedures. Multiple layers of security controls need to be built into computer systems, networks, mobile devices, data at the source, data in transit, and data in storage. Defense in breadth increases protection and reduces risk in supply chain management as there are several partnering firms (breadth of firms) in the chain.
- Conduct onsite audits of provider’s product development, manufacturing facilities, and physical and cybersecurity standards.
- Establish regular communication channels and maintain a collaborative relationship with all providers.

**(c) New Product Development Process**

This subsection discusses the new product development process with its required steps to be followed, causes of new product failures, and how to develop a new product policy.

**A New Product Steps**

A company that can bring out new products faster than its competition enjoys many advantages and benefits. To increase speed in introducing new products, many companies are bypassing time-consuming regional tests in favor of national programs. The goal is to develop a new
product right the first time. Yet the rate of new product failures is high (33–90%), and the investment is high too. An opportunity cost is involved due to other possible alternative uses of funds spent on product failures and the time spent in unprofitable product development. Marketing writers estimate that the primary reason for new product failure is the selling company’s inability to match its offerings to customer needs. This inability to satisfy customer needs can be attributed:

1. Inadequacy of up-front marketing intelligence efforts.
2. Failure of the company to stick close to what it does best.
3. Inability to provide better value than competing products and technologies.

Developing products that generate a maximum dollar profit with a minimum amount of risk is asking for the best of both worlds—an ideal solution. A more practical, systematic approach is needed to formalize the process for new product planning. New product policy guidelines should be a prerequisite for proper product planning. These guidelines should consist of procedures for various steps shown in sequence (see Exhibit 1.34).

**EXHIBIT 1.34** Sequences of Steps in the New Product Development Process

![Diagram of sequences of steps in the new product development process]

**(B) Causes of New Product Failures**

Many of the reasons for new product failure relate to execution and control problems—mostly management-oriented problems. A brief list of some of the more important causes of new product failures is presented next.

- Faulty estimates of new product potential
- Unexpected reactions from competitors
- Poor timing in the introduction of the product
- Rapid change in the market (economy) after the product introduction was approved
- Inadequate quality control
- Faulty estimates in production costs
- Inadequate expenditures on initial promotion programs
- Faulty market testing
- Improper channel of distribution

To properly address the causes of new product failures, it is important to consider both marketing research and technical research combined with relevant information for decision-making purposes. For example, to calculate a ROI, one needs to know the pricing strategy to be used and the investment outlay. Similarly, to use the payback method, which is the rate of investment outlay to annual cash flow, one needs to estimate the magnitude of the product investment outlay and
the annual cash flow. The basic information required in the investment outlay includes estimates of such things as production equipment, R&D costs, and marketing expenditures; the annual cash flow requires a forecast of quantity demanded in units and unit prices.

(C) New Product Policy
Developing a new product policy is complicated since new products are the lifeblood of successful business firms. Thus, the critical product policy question is not whether to develop new products but in what direction to move. Marketing management needs to develop criteria (standards/norms) for success that new products must meet if they are to be considered candidates for launching. Possible areas for standards development include profits, costs, use of plant capacity, and market share.

There are at least 10 different ways a product can be presented as new:

1. A product performs an entirely new function.
2. A product offers improved performance of an existing function.
3. A product is a new application of an existing product.
4. A product offers additional functions.
5. An existing product is offered to a new market.
6. A product is able to reach more buyers that through lower cost.
7. A product is upgraded (defined as an existing product integrated into another existing product).
8. A product is downgraded.
9. A product is restyled.
10. A growth vector matrix to indicate the direction in which the organization is moving with respect to its current products and markets (see Exhibit 1.35).

EXHIBIT 1.35 Matrix of Current/New Markets and Current/New Products

<table>
<thead>
<tr>
<th>Current Products</th>
<th>New Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Markets</td>
<td>Market penetration</td>
</tr>
<tr>
<td>New Markets</td>
<td>Market development</td>
</tr>
</tbody>
</table>

Market penetration denotes a growth direction through the increase in market share for current product markets. Market development refers to finding new customers for current products. Product development refers to creating new products to replace existing ones. Diversification refers to developing new products and cultivating new markets.

The 10 steps in the development of a new product policy are listed next.

1. Prepare a long-range industry forecast for existing product lines.
2. Prepare a long-range profit plan for the company, using existing product lines.
3. Review the long-range profit plan.
4. Determine what role new products will play in the company’s future.
5. Prepare an inventory of company capabilities.
6. Determine market areas for new products.
7. Prepare a statement of new product objectives.
8. Prepare a long-range profit plan, incorporating new products.

(d) Marketing and Sales Management

This subsection discusses marketing functions, such as marketing mix; customer management; customer service; price management; product life cycles (including product management and product audit); digital marketing; marketing of services; and marketing analysis. Sales functions, such as lead management cycle, the sales process, and selling methods, are presented.

(i) Marketing Mix

A mix is a combination of more than one element of something of importance. Five types of marketing mix can exist for retail and manufacturing companies, including customer, product, service, channel, and communication mix. Note that retailers should analyze the customer mix first because it drives the other types of mixes and its results can be applied in designing the other types of mixes. The rationale is that without a customer, there is no product to sell or no service to provide.

Customer Mix → Product Mix, Service Mix, Channel Mix, and Communication Mix

Customer Mix. Customer mix defines the composition and profile of a company’s current customers. The customer mix concept is similar to the product mix concept, where the latter refers to a group of products that are closely related to each other in terms of their use, customer user groups, and price ranges.

A company can group its current customers based on their sales volume in a given year into four categories, such as loyal customers (highly valued customers), major customers (prime and high-end customers), average customers (middle-of-the-road customers), and below-average customers (minor and low-end customers).

The business purpose of developing a customer mix is to group, track, monitor, and grow the customer base depending on their relative value to the company in terms of the sales volume and contribution margin (sales dollars minus variable costs) they provide to the company. This means loyal customers are treated and valued very dearly and better than minor customers. Note that each company may define, classify, and group its customers differently based on its specific business purpose.

Loyal Customers → Minor Customers
(Most Valued) (Least Valued)
Loyal Customers: Highly committed and highly valued loyal customers who will repeatedly purchase a company's products or services. Marketing management allocates more resources to nurturing, valuing, and growing loyal customers because they make a very big impact, very highly deserved special attention, and very high-risk to ignore. Note that loyalty and profitability are closely linked because the financial rewards of loyalty run deep.

Major Customers: Prime and high-end customers are the next most valued customers after loyal customers. Consequently, more resources are spent on increasing the major customer group and converting them into loyal customers because they make a big impact, highly deserved personal attention, and high-risk to ignore.

Average Customers: Average customers are valued less than major customers. Companies are searching for ways to move this group into the major customer group because they make a moderate impact, reasonably deserved attention, and medium risk to ignore.

Below-Average Customers: Below-average customers provide no value to some companies and hence are completely ignored because they are not at all committed to a company's products or services.

They switch companies very easily when a company's prices are higher and its competitor's prices are lower; a company's customer service is poor; and a competitor's sales discounts are larger (coupons, rebates, and promotions). Marketing management will not spend any money on this type of customer group to convert them into average customers because it is not worth it. These customers make a very low impact, very highly undeserved attention, and very low-risk to ignore.

Product Mix. Product mix represents the seller's view of the marketing tools available for influencing buyers. It includes the 4 Ps (product, price, promotion, and place):

1. **Product** includes variables such as product variety, quality, design, features, brand name, packaging, sizes, services, warranties, and returns.

2. **Price** includes variables such as list price, discounts, allowances, payment periods, and credit terms.

3. **Promotion** includes variables such as sales promotion, advertising, personal selling, direct sales, public relations, and direct marketing.

4. **Place** includes variables such as channels, coverage, assortments, locations, inventory, and transport.

A company can change only few variables in the short run, such as price, sales force size, and advertising expenses. A firm can develop new products and modify its distribution channels only in the long run.

Service Mix. A company's service mix groups customers into residential, commercial (e.g., institutional, business, and professional groups), seasonal, or nonseasonal customers. The major determinant of this type of category is the amount of service revenues and contribution margins provided to the company.

Channel Mix. Channel mix groups marketing channels of distribution into major (primary), intermediary, and minor (secondary) channels. Channels can also be classified as wholesalers (e.g.,
Costco and Sam’s Club), distributors, retailers (Walmart), or resellers. A channel mix determines the availability of products to customers at different locations. A typical channel mix and its flow is:

Manufacturers → Wholesalers → Distributors → Retailers or Resellers

**Communication Mix.** A marketing communication mix should represent the voice of the company and its brands in building relationships with consumers, combined with the voice of the customer. Marketing communications, such as advertising and celebrity endorsements, contribute to building brand equity through the memories and images they create in consumers’ minds, which, in turn, drives sales, margins, and profits. Marketers use tools such as email, text, or apps to communicate with customers.

Marketing Communications → Voice of the Company + Voice of the Customer → Brand Equity

The marketing communications mix consists of eight major modes of communications:

1. Advertising
2. Sales promotion
3. Events and experiences
4. Public relations and publicity
5. Direct marketing
6. Interactive marketing
7. Word-of-mouth marketing
8. Personal selling

Advertisement mix is a nonpersonal communication to a target market from a sponsor using mass communications channels. Communications mix includes traditional communications (e.g., newspaper, radio, television [TV], and billboards) and digital communications (e.g., the Internet, social media platforms, and mobile devices).

**(ii) Customer Management**

This subsection examines a customer’s life cycle with a retailer, how a retailer should treat a customer as a king, and how a retailer should get a well-rounded and full view (360-degree) of a customer by collecting data from multiple channels to win, sell, and serve the customer better and forever.

**(A) Customer Life Cycle**

Customers go through a life cycle of events or experiences with a specific retailer during their shopping or purchase journey. This includes how customers start with a retailer, buy from the same retailer, stay with that retailer, or leave that retailer based on good (positive) or bad (negative) shopping experiences with that retailer. Of course, all customers want a positive and pleasant shopping experience with a retailer. A customer’s good or bad shopping experience depends on how a retailer handles the touch points between the customer and the retailer. It means that properly handled touch points lead to happy points and poorly handled touch points lead to hassle points or pain points.

This shopping journey or experience must be closely and carefully managed to make the customer king and to keep the customer satisfied and retained for life. This is because customers
have greater mobility, meaning they are free to shop at any retailer, anywhere, and anytime. Here, customer mobility means customer switching to other retailers.

Although it is difficult to design and implement customer-volume data and customer-purchase data, all retailers must measure and monitor such data to determine trends because customers are the heart and soul of a retailer. This measuring and monitoring system must integrate customers’ data from multiple channels and provide a full view of a customer to serve the customer better. Due to customer mobility, retailers need to develop a customer database showing an aggregate of the number of new customers acquired and the number of existing customers retained. The difference between acquired and retained customers is the number of customers who defected.

Customer purchase data can help a retailer’s customer service associates most in retrieving a customer’s previous purchase data to verify and validate certain purchases in processing the customer’s product returns. This is a good feature of customer service function.

\[
\text{Customers defected} = \text{Customers acquired} - \text{Customers retained}
\]

The four phases of a customer life cycle include:

- Phase 1: Customer acquisition
- Phase 2: Customer retention
- Phase 3: Customer defection
- Phase 4: Customer reacquisition

Each phase is discussed next.

**Phase 1: Customer Acquisition.** Acquiring a new customer is a difficult task for any retailer because reaching new consumers and turning them into new customers is based on guesswork, which is not a scientific approach. (It is a trial-and-error approach.) Activities such as customer research and discovery are part of the customer acquisition phase of finding and winning over new customers. Retailers often lure new customers with heavy advertising and promotional activities, such as coupons, discounts, rebates, instant savings, free shipping, flexible return policies, and special sale events, all of which create value to customers. Increasing the customer acquisition rate or penetration rate is a strategic move with long-term benefits of increased revenues and profits. Value is created for the customer in this phase.

**Phase 2: Customer Retention.** Acquiring new customers is a difficult task, but retaining existing customers is even more difficult. To retain customers, a retailer must care for and fully engage them during their shopping journey. Losing a current customer, whether large or small, is much riskier than acquiring a new customer because the retailer has already spent time, money, and effort in supporting and keeping current customers. With customer retention, the retailer is hoping for repeated purchases from retained customers. Retained customers are customers who are satisfied with the value received, resulting in assured future sales revenues. Value is increased for customers in this phase.

Positive activities such as customer nurturing and pampering are part of the customer retention phase. Other positive activities, such as customer relationship management and loyalty programs combined with customized, personalized, direct, or one-to-one marketing programs can retain customers. Mutual values hold loyal customers and progressive retailers together.
A related measure of customer retention is customer referral rate, meaning that a happy retained customer is sure to refer to a friend or family members.

Another way to retain current customers is to obtain their feedback or ask them to write product reviews right after purchase transactions are completed or to conduct periodic surveys with such customers. Negative results from such feedback and surveys need to be compiled, and action plans must be established to correct the negative results.

**Phase 3: Customer Defection.** A defected customer is a dissatisfied customer, resulting in a loss of sales revenue for the retailer. A defected customer is a lost customer. Somehow, the value of a retailer’s products, services, policies, practices, and customer services is destroyed. Activities such as customer examination and analysis are part of the customer defection phase with the goal of finding reasons and causes of customer defection.

A customer defection means a loss of customer to a retailer. Unfortunately, retailers do not know or are not aware of how and when they lost existing customers. This is because customers can leave retailers quickly and silently at will and eventually switch to competing retailers. Customers who are not satisfied with a retailer are sure to defect eventually because they are not receiving a value from the retailer. Value is destroyed for the customer in this phase.

A defected customer from one retailer is a new source of customer acquisition for a competing retailer.

Retailers are very much concerned about customer defection rates. If these rates continue to grow, the retailers will not be left with any customers, which is a dangerous situation for any retailer to be in. This implies that “no customers mean no retailers,” a situation that has really occurred with many retailers. For example, Sports Authority and Toys R Us closed all of their stores and filed for bankruptcy due to a slow and steady loss of customers.

Defection rates pinpoint problems and weaknesses in a retailer’s marketing policies, procedures, and practices, problems that must be corrected without delays. Here, the retailer’s goal is to stop or reduce the defection rate to an acceptable level. In addition, root causes of defection must be identified and addressed in a timely manner.

**Customer Engagement, Customer Retention, and Customer Defection.** A direct and proven relationship exists between customer engagement, customer retention, and customer defection. Customer engagement means a store associate making a new or existing customer happy by assisting her, asking the right questions, suggesting new products, searching and locating a product, and explaining good things and bad things about a product, all with great sincerity and honesty. Whether a customer purchases a product or not depends on how a customer is attended to and engaged with. Paying careful attention to customers is a basic requirement of a store associate. Note that a customer can be engaged in several ways, such as in-person, a live chat on the website, phone, email, efaxes, text, or a combination. Simply stated, more attention and full engagement lead to customer retention; less attention and no engagement lead to customer defection.

Customer Retention = More Attention and Full Engagement

Customer Defection = Less Attention and No Engagement

**Phase 4: Customer Reacquisition.** Customer reacquisition means trying to reacquire a lost or defected customer, which may not be possible or practical based on cost-benefit analysis. It could
cost many times more to reacquire a lost customer than the initial acquisition or retention cost of a customer because the customer has already made up her mind to leave the retailer for her own good reasons. Reacquisition efforts are based on the number of lost or defected customers. Customer win-back efforts take place in the customer reacquisition phase to re-create value. Value is enhanced for the customer in this phase.

Some retailers try to reacquire customers with incentives such as cash bonuses, low prices, increased bonus points, gift cards, vacation trips, prizes, instant savings, coupons, rebates, and one-time special offers to lure the lost customers to comeback. This approach to value re-creation may or may not work.

Companies trying to reacquire the lost customers include retail, telephone, cable and satellite, TV, Internet service providers, utility, and insurance firms. This is possible if these companies have the contact information on lost customers in their customer databases.

**EXAMPLE:**

**CALCULATION OF CUSTOMER ACQUISITION, RETENTION, AND DEFECTION RATES**

The marketing department of BXK Retailers has been consistently gathering data on customer volumes for many years from multiple retail channels. BXK is experiencing declines in sales revenues from the last two years, and senior management wants to know the reasons for such declines. The following data is available from the marketing department.

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers at the beginning of a month</td>
<td>1.2 million</td>
</tr>
<tr>
<td>New customers added during the month</td>
<td>0.3 million</td>
</tr>
<tr>
<td>(Total acquired customers = Beginning customers + New customers)</td>
<td>1.5 million</td>
</tr>
<tr>
<td>Customers at the end of the month</td>
<td>1.4 million</td>
</tr>
<tr>
<td>(Retained customers)</td>
<td></td>
</tr>
<tr>
<td>Customers defected during the month</td>
<td>0.1 million</td>
</tr>
<tr>
<td>(Acquired customers − Retained customers)</td>
<td></td>
</tr>
</tbody>
</table>

What are the customer acquisition, retention, and defection rates for the BXK Retailers?

Customer acquisition rate = (New customers/Beginning customers) × 100 = (0.3/1.2) × 100 = 25.0%

Customer retention rate = (Ending customers/Total customers) × 100 = (1.4/1.5) × 100 = 93.3%

Customer defection rate = (Defected customers/Total customers) × 100 = (0.1/1.5) × 100 = 6.7%

Four major takeaway points include (1) how changing consumer behavior affects a retailer’s sales and profits, (2) how value creation and value enhancements differentiate retailers, (3) how retailers must change their value creation and re-creation processes as consumers’ mindsets and preferences change, and (4) why retailers need to understand consumer psychology and how to handle customer management processes to succeed and survive in the changing retail marketplace.

**B Customer Service**

This section focuses on two areas: consumer behavior before deciding to purchase a product and consumer experience after deciding to buy a product. Lessons learned from these two areas could
be different. A customer service audit is suggested. A comparison is shown between consumer behavior and customer service.

Most manufacturing, retail, and other service-oriented companies are big providers and implementers of customer service activities. Other names for the customer service function include customer support, technical support, customer credit services, and customer care center. What companies do or do not do in the customer service function can greatly affect their current and future sales, and that could tarnish their image and reputation very quickly in the marketplace. This is especially true when unhappy customers post bad experiences with customer service on social media platforms. Yet some retail company management does not seem to be serious about customer service issues when they staff their customer service departments. For example, location of the customer service department (i.e., front end or back end of a store) and its staffing levels are crucial as they signify importance to customers.

(C) Consumers Purchasing Behaviors
Buyers or consumers go through an explicit or implicit decision-making process in their mind prior to purchasing the desired product or service because they have a specific need or want to satisfy either for themselves or for their family. Consumers have too many choices to choose from, which makes identifying and selecting products and services a confusing and difficult task.

Note that buyers who are greatly influenced by either friends or family, combined with personal beliefs and opinions, may not make a purchase decision until they learn, feel, hear, see, and touch a product themselves. The buying process can be divided into three phases, as follows:

1. Pre-Purchase
2. Purchase
3. Post-Purchase

In a way, the buyer’s decision-making process is a mental, psychological exercise in deciding whether to buy or not to buy a specific product or service brand; if the buyer decides what to buy, the issues then are where to buy, when to buy, and how much to pay.

Pre-Purchase Phase. Only the buyer is involved in this phase’s activities, which include identifying the specific need or want and researching for relevant information about a specific product or service using sources such as consumer reports, marketer websites, friends and families, and trade journals. After completing the information search, the buyer starts with several alternatives for consideration, eliminates undesirable alternatives, and selects only one alternative to proceed further. An explicit outcome at the end of this phase is a go/no-go decision; go is to proceed with the next phase (purchase), and no-go is not to buy any product or service at this time (i.e., no purchase). The buyer may be taking a wait-and-see approach, hoping to get new information on a product or service, better pricing and timing, and quality products and services later.

Go Decision = Purchase
No-Go Decision = No Purchase

Purchase Phase. Only the buyer is involved in this phase’s activities, which include proceeding with the selected alternative and purchasing the product or service within the time and budget limits. Some buyers may wait for special promotions and discounts to pay a low price.
**Post-Purchase Phase.** Both buyers and sellers are involved in this phase’s activities. A self-question to the product or service sellers is whether the buyer is fully satisfied with the performance of the purchased item because dissatisfied buyers may not purchase the item again in the future, resulting in lost customers.

- Unhappy buyers can voice dissatisfaction through word of mouth or social media networks, resulting in a loss of reputation to sellers.
- Satisfied buyers can become a loyal or disloyal consumer (i.e., exhibits stay or switch behavior), meaning they buy the same product or service repeatedly (i.e., become loyal). If they have a doubt about the previous purchase, they may exhibit switching behavior between product brands (i.e., become disloyal). Some reasons for buyer doubt about previous purchases may include the price paid and the value received from the use of the purchased product or service.

**(D) Consumer Buying Experiences**
A consumer’s buying experience can be divided into three phases, as follows:

1. Pre-transaction services
2. Transaction services
3. Post-transaction services

**Pre-Transaction Services.** Briefly, the tasks involved in the pre-transaction services phase are inquiring about a product’s availability, pricing information, product return policy, and store hours and directions. At this point, the customer has a good intention to buy a product.

**Transaction Services.** Briefly, the tasks involved in the transaction services phase consist of a store associate helping a customer in locating and discussing about a product, the associate’s personal selling methods and approaches used (whether it is a hard sell or soft sell), and the customer completing the sales transaction to his or her satisfaction.

This is a crucial phase because customers have two choices once they are in the store:

- Buy the product that they intended to buy.
- Walk away from the store and not buy the product.

The outcome of these two choices, in part, depends on the associate’s product knowledge and methods used in convincing customers to make a buying decision. Most customers notice a lack of sales assistance in a store or when the associate’s product knowledge is incomplete or incorrect; both are bad situations.

**Post-Transaction Services.** Briefly, the tasks involved in the post-transaction services phase consist of handling customer complaints, merchandise returns and repairs, merchandise warranties and guarantees, and product delivery problems in terms of delayed shipping and shipping wrong products with wrong prices charged. This last product delivery problem is especially true with online retailers.

Whether customers return to the same store depends on how their previous product return was handled, their overall experience with the last purchase (pleasant or unpleasant), and
the quality and competency of store employees (no product knowledge, new employee, untrained employee, and poor interpersonal skills). Unhappy customers do not come back; happy ones do.

**E) Customer Service Audit**

The customer service audit must be performed by someone working in a different department from the customer service department in order to maintain independence and objectivity. To make it completely independent, an outside consultant could perform this audit. The focus of a customer service audit is to determine whether

- Customers are satisfied with the overall quality of a company’s products and services. If not, what are their major suggestions for improvement of quality?
- Customers’ questions, issues, problems, complaints, and concerns are properly addressed and resolved timely.
- Actual experiences of customers meet or exceed their expectations; assess whether any gaps exist. Determine how these gaps can be removed.
- Customers are convinced to stay with the company or decide to leave the company. If they decide to leave, what factors might have contributed to their decision?

**F) Comparison between Consumer Behavior and Customer Service**

Exhibit 1.36 compares outcomes between a consumer’s purchase behaviors (consumer behavior) and a company’s customer service offering (customer service). A consumer becomes a customer after he or she purchases a product from a manufacturer or retailer.

**EXHIBIT 1.36 Comparison of Outcomes between Consumer Behavior and a Company’s Customer Service**

<table>
<thead>
<tr>
<th>Item of Comparison</th>
<th>Consumer Behavior Outcomes</th>
<th>Customer Service Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-purchase phase</td>
<td>Purchase/ no-purchase decision</td>
<td>Intent to buy a product</td>
</tr>
<tr>
<td>Purchase phase</td>
<td>Consumer purchases a product</td>
<td>Either buys or does not buy a product</td>
</tr>
<tr>
<td>Post-purchase phase</td>
<td>Satisfied or dissatisfied consumer</td>
<td>Happy or unhappy customer</td>
</tr>
<tr>
<td>Pre-transaction phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transaction phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-transaction phase</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**iii) Price Management**

Pricing decisions that integrate the firm’s costs with its marketing strategy, business conditions, competition, consumer demand, product variables, channels of distribution, and general resources can determine the success or failure of a business. Pricing of products or services is the cornerstone of the marketing function. If the price is too high, buyers may purchase competitive brands leading to a loss of sales and profits. If the price is too low, profitability may suffer despite increases in sales.

Effective pricing should consider these factors: demand influences, supply influences, and competitive and regulatory influences (see Exhibit 1.37).
EXHIBIT 1.37 Effective Price Considerations

(A) Demand Influences
From a demand perspective, three primary considerations are demographic factors, psychological factors, and price elasticity. Demographic factors include: number, location, and economic strength of potential buyers; type of consumer (i.e., resellers or final); and expected quantity of purchases by type of consumer. These demographic factors help determine market potential and are useful for estimating expected sales at various price levels.

The heart of psychological factors focuses on how consumers perceive various prices or price changes. It is difficult to predict how much potential buyers will be willing to pay for the product and whether they use price as an indicator of product quality. The best way to find out answers to these questions is to conduct marketing research. Although not conclusive, many research studies have found that persons who choose high-priced product categories see the consequences of a poor choice as being undesirable. They believe that quality is related to price and see themselves as good judges of product quality. In general, the reverse is true for persons who select low-priced items in the same product categories.

Both demographic and psychological factors affect price elasticity. Price elasticity \( e \) is a measure of consumers’ price sensitivity, which is estimated by dividing relative changes in the quantity \( Q \) sold by the relative changes in price \( P \). This is expressed as

\[
e = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\text{Change in quantity}}{Q} \div \text{Change in price}/P
\]

Price elasticity can be estimated from historical data or from price/quantity data across different sales districts and by sampling a group of consumers from the target market and surveying them concerning various price/quantity relationships. However, surveying consumers can be expensive and time consuming.

(B) Supply Influences
Supply influences can be understood in terms of pricing objectives, costs, and nature of the product. To be effective, pricing objectives need to be derived from corporate objectives via marketing objectives as shown in Exhibit 1.38.

EXHIBIT 1.38 Pricing Objectives

Marketing research has found that the most common pricing objectives are pricing to achieve a target ROI, stabilization of price and margin, pricing to achieve a target market share, and pricing to meet or prevent competition.
ADDITIONAL PRICING OBJECTIVES

- Target ROI and market share.
- Maximize short-run and long-run profits.
- Grow and stabilize market.
- Desensitize customers to price.
- Maintain price-leadership arrangement.
- Discourage new low-price entrants.
- Speed exit of marginal firms.

Marketing managers focus on multiple objectives when making pricing decisions. This situation becomes even more important considering that managers do not have perfect information about cost, revenue, and market.

Every profit-oriented organization must make a profit after covering production, marketing, and administrative costs. Cost-oriented pricing is the most common approach in practice, and there are at least three basic variations: markup pricing, cost-plus pricing, and rate-of-return pricing. This is shown in Exhibit 1.39.

EXHIBIT 1.39 Variations of Cost-Oriented Pricing Methods

<table>
<thead>
<tr>
<th>Variations of cost-oriented pricing methods</th>
<th>Markup pricing (used in retailing)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost-plus pricing (used in construction)</td>
</tr>
<tr>
<td></td>
<td>Rate-of-return pricing (used in manufacturing)</td>
</tr>
</tbody>
</table>

**Markup pricing** is used in the retail industry, where a percentage is added to the retailer’s invoice price to determine the final selling price. In **cost-plus pricing**, the costs of producing a product or completing a project are totaled and a profit amount or percentage is added on. It is used in job-oriented and nonroutine and difficult-to-cost advance situations, such as military installations. In **rate-of-return or target pricing**, price is determined by adding a desired rate of ROI to total costs. Generally, a breakeven analysis is performed for expected production and sales levels, and a rate of return is added on. This is shown in Exhibit 1.40.

**EXHIBIT 1.40** Advantages and Disadvantages of the Cost-Oriented Approach to Pricing

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple to calculate</td>
<td>Gives little or no consideration to demand factors</td>
</tr>
<tr>
<td>Simple to understand</td>
<td>Price determined by a markup or cost-plus method has no necessary relationship to what people will be willing to pay for the product</td>
</tr>
<tr>
<td>Simple to explain</td>
<td>Places little emphasis on estimating sales volume in rate-of-return pricing</td>
</tr>
<tr>
<td>Simple to trace</td>
<td>Fails to reflect competition adequately, because costs and markups are different for each producer</td>
</tr>
<tr>
<td>Provides objective evidence</td>
<td></td>
</tr>
<tr>
<td>Yields a good pricing decision</td>
<td></td>
</tr>
</tbody>
</table>
Three important product characteristics that can affect pricing are perishability, distinctiveness, and stage in the product life cycle. Goods that are very perishable in a physical sense (e.g., food, flowers) must be priced to promote sales without costly delays. Perishable items also include high-fashion and seasonal products since their demand is based on time. One of the primary marketing objectives of any firm is to make its product distinctive in the minds of buyers and charge higher prices. Homogeneous goods, such as bulk wheat and whole milk, are perfect substitutes for each other; most consumer goods are heterogeneous goods.

The price of a product often depends on the stage of the life cycle that a product is in and is explained in terms of price skimming and price penetration (see Exhibit 1.41).

EXHIBIT 1.41 Pricing Policies

A **skimming policy** is one in which the seller charges a relatively high price on a new product. The price may be lowered later as competition moves in. This pricing strategy is good for monopoly companies and where the demand for the product is price inelastic.

A **penetration policy** is one in which the seller charges a relatively low price on a new product to discourage competition. This pricing strategy is good where competitors can move in rapidly and where demand for the product is price elastic. Regardless of what pricing strategy is used when a new product is introduced, the price may have to be altered later to accommodate changes in market forces.

**(C) Competitive and Regulatory Influences**

Competitive and government regulations are two uncontrollable variables that have environmental influence on pricing. Many factors help determine whether the firm’s selling price should be at, below, or above competition. **Competitive factors** include:

- Number, size, location, and cost structure of competitors
- Conditions of entry into the industry
- Degree of vertical integration of competition
- Number of products sold by competitors
- Historical reaction of competitors to price changes

**KEY CONCEPTS TO REMEMBER: Competition and Pricing**

- **Pricing a product at competition** is called going-rate pricing, which is the average price charged by the industry and is widely used for homogeneous products.
- **Pricing a product below competition** can be found in sealed-bid pricing, where a firm is bidding directly against competitors for project contracts. It is an intentional move to obtain the job contract.
- **Pricing a product above competition** is used when a firm has a superior product or because a firm is the industry price leader.
Governmental regulation includes both state and federal government. The scope of state regulation includes pricing by public utility companies while the scope of federal regulation covers price fixing, deceptive pricing, price discrimination, and promotional pricing.

**(D) Price Equation**
Price is a monetary amount charged to a customer who is buying a retailer’s products or services. To most customers, price of a product or service is a major issue and concern before purchase because customers are price sensitive, meaning sales will be lower when the prices are higher and vice versa. Establishing a product’s price is not an art or a science; instead, it is a combination of art and science due to several constraints working on it. Major constraints include pricing policies and practices of competitors and price controls by government regulations.

A question might arise whether a customer should consider “product first” or “price first” when shopping online or offline. The answer is “product first” for the following reasons. Focusing on “price first” can cloud a customer’s purchase decision and raise doubts about the value of the product because most people equate price to value. The rationale is that the customer needs to buy a particular product to fulfill a specific need, so the product should come first.

Similar to most customers, most retailers are also concerned about prices because they determine whether a retailer is going to make a profit or incur a loss at the end of an accounting period where profit is an incentive for retailers to invest in their specific businesses. In other words, profit is the ROI and is a balancing act. The basic price equation is:

\[
 Price = \text{Costs} + \text{Profits}
\]

Costs are of two types: (1) direct costs of merchandise and materials and employees’ wages, salaries, and benefits; and (2) indirect costs of rent, advertisements, supplies, utilities, insurance, taxes, and others. A targeted or expected percentage of profit (called a markup) is added to the cost amount to arrive at the price of a product. Profits are the remaining amounts after the cost amount is subtracted from the price amount.

**Example:** It costs $2.65 for a retailer to buy a product from a manufacturer or supplier. If the targeted or expected markup is 10%, what is the price of the product?

\[
 Price = \text{Costs} + \text{Profits} \\
 Price = ($2.65) + ($2.65 \times 0.10) = $2.65 + $0.265 = $2.915 = $2.92 \text{ (rounded) = $2.99 (adjusted to reflect odd-pricing practice)}
\]

The price of the product is $2.99.

**(E) Factors Affecting Profits**
Let us look at the various factors affecting profits where some factors decrease profits while others increase profits. Note that factors that can decrease profits are the opposite of factors that can increase profits.

Factors that can decrease profits include:

- Lower prices for products and services (initial lower prices and no markups later)
- Increased direct costs and indirect costs
Increased price markdowns
Frequent sales with progressive and deep discounting of prices
Increased employee theft of merchandise
Increased customer theft of merchandise
Increased loss of or damage to merchandise
Increased amounts of customer returns of merchandise that cannot be resold
Increased misplacing or miscounting of merchandise
Increased and unauthorized overriding of prices by a cashier at the point-of-sale (POS) terminal
Incorrect price scanning of products by a cashier at the POS terminal due to pricing errors resulting from mismatched prices with products
Increased billing errors in products ordered and shipped with incorrect prices
Increased quantity of free samples and product giveaways to customers and others
Increased unavailability of products for customers to purchase

Factors that can increase profits include:

Higher prices for products and services (initial higher prices and markups later)
Decreased direct costs and indirect costs
Decreased price markdowns
Infrequent sales with less progressive discounting of prices
Decreased employee theft of merchandise
Decreased customer theft of merchandise
Decreased loss of or damage to merchandise
Decreased amounts of customer returns of merchandise that can be resold
Decreased misplacing or miscounting of merchandise
Decreased and authorized overriding of prices by a cashier at the POS terminal
Decreased price scanning of products by a cashier at the POS terminal due to no pricing errors resulting from mismatched prices with products
Decreased billing errors in products ordered and shipped with incorrect prices
Decreased quantity of free samples and product giveaways to customers and others
Decreased unavailability of products for customers to purchase

(F) Pricing Strategies
Price is a dollar amount charged by a retailer for the sales of its products and services to customers. Pricing strategies include setting a base price for a product or service and making adjustments to the base price over time. These adjustments include markups and markdowns.

There is no right way to set prices since multiple factors are involved, including: government price regulations; production cost, marketing cost, and other costs; consumer psychology; company’s
profit and market share goals; product demand and supply conditions; consumers’ personal income levels; competitors’ prices; and prices of substitute or complementary products. Pricing decisions are very complex and uncertain, to say the least. Hence, retailers should develop a systematic strategy and structured approach to establishing, adapting, and changing prices.

The pricing continuum is as follows:

- **Very Low Price** → **Floor Price** → **Ceiling Price** → **Very High Price**
  - (No Profits)    (Base price)    (Base price)    (No Sales)
  - + Small profit)  + Large profit)

### (G) Pricing Methods

Seven popular methods exist to establish prices, including markup pricing, cost-plus pricing, target-return pricing, perceived-value pricing, value pricing, going-rate pricing, and auction-type pricing.

The **markup pricing method** adds a percentage of profit (markup) to the retailer’s invoice price (cost to the retailer) to determine the final selling price. This method is popular, easy to determine, and fairer to both buyers and sellers. Wholesalers, dealers, and retailers will add their own markup to the manufacturer’s markup price, thereby increasing the manufacturer’s markup price significantly. Frequently, some retailers take markdowns to lower prices and to increase sales.

**Example:** If a retailer’s invoice price is $15 for an item and if the required profit is 10%, then the markup price is $16.50. That is, \((15 + (15 \times 10\%)) = 16.50\).

The **cost-plus pricing method**, although it is similar in approach to the markup pricing method, is used in industries other than the retail industry. Here, the costs of producing a product or completing a project are totaled and a profit amount or percentage is added on. This method is used in job-oriented projects, such as in the construction business, and nonroutine situations that are difficult to “cost” in advance, such as in military installations.

**Example:** If a project’s total cost is $100,000 and if the required profit is 20%, then the cost-plus price is $120,000. That is, \((100,000 + (100,000 \times 20\%)) = 120,000\).

The **target-return pricing method** adds a required rate of ROI to total costs to determine the target price. This method ignores external factors, such as competitors’ prices, because it is based on internal factors such as costs and profits.

\[ \text{Target Cost} + \text{Target Profit} = \text{Target Price} \]

**Example:** If the target cost for an item is $20 and if the required rate of return is 10% (target profit), then the target price is $22 for the item. That is, \((20 + (20 \times 10\%)) = 22\).

The **perceived-value pricing method** is based on what the customer, not the company, thinks about the value of a product. Organizations use advertising and sales force to communicate and enhance perceived value in buyers’ minds. The goal is to deliver more value to a customer than the competitor and to demonstrate this value to prospective buyers. Market research methods such as focus groups, surveys, judgments, and experimentation are used to determine the value of a product to customers.
Example: Most customers who buy high-end fashion products from Chanel and other retailers believe that they are buying high-value products worthy of high prices.

The value pricing method purposefully charges a low price for a high-quality product with cost savings realized from reengineering the production processes and becoming a low-cost producer without sacrificing quality. The cost savings are passed on to value-conscious customers through programs such as everyday low pricing (e.g., Walmart), high-low pricing, extreme everyday low pricing, and double guarantee pricing (Aldi food store).

Example: Walmart and Aldi food stores are known for value pricing methods; Walmart offers everyday low prices and Aldi offers double guaranteed prices.

The going-rate pricing method focuses on meeting or beating competitors’ prices. Some companies adopt the follow-the-leader strategy, where they change the price when competitors change their price, not when the company’s demand or cost structure changes. This is also referred to as “we will match or beat the price.” This method is appropriate when costs are difficult to estimate and when competition is uncertain.

Example: Few retailers do not offer any price match (i.e., a retailer deciding not to compete can make it hard for him to survive in the long run); most offer 100 percent match (matching the competition); and very few offer more than 100% match of a competitor’s price (beating the competition).

The auction-type pricing method uses the Internet as the primary medium to transact between buyers and sellers. The items that are auctioned include excess inventories and used goods of all kinds. Bids are exchanged between various members, such as one seller and many buyers, one buyer and many sellers, and one buyer and many suppliers (as in procurement of supplies). In general, online auctions give greater overall satisfaction to buyers and sellers due to a large number of bidders, greater economic stakes, and less visibility in pricing.

Example: Procurement officers at some retail companies purchase small-dollar items (e.g., toothpicks, pens, and pencils) or some unique products from auction houses (e.g., artistic or antique type items).
A PRIMER ON PRICING ISSUES AND RISKS (Continued)

Example: A collusive agreement between two or more retailers operating in the same retail channel who are in direct competition with each other and who decide to charge higher prices to end customers is called horizontal price fixing. It can occur between Retailer A and Retailer B and is illegal.

Example: A collusive agreement between two or more parties operating in different retail channels who are not in direct competition with each other and who decide to charge higher prices to end customers is called vertical price fixing. It can occur between a retailer and a vendor (supplier) and is illegal.

In summary,

- Horizontal price fixing occurs between two or more competing retailers because they are in the same hierarchical level in the marketplace. It is illegal.
- Vertical price fixing occurs between a retailer and a manufacturer and between a wholesaler and a retailer because they are in the different hierarchical position in the marketplace and they agreed together to maintain the same prices or increase prices. It is called price maintenance and is illegal.

Price Discrimination

Price discrimination occurs when a seller (retailer) charges customers (buyers) different prices for the same commodity or product. This discrimination also applies to advertising and promotional allowances. Generally, price discriminations are legal, particularly if the price differences reflect the different costs of dealing with different buyers or are the result of a seller’s attempts to meet a competitor’s offering. If the price discriminations do not reflect these issues, they are illegal. Here, the price differences are justified by different costs incurred to manufacture, sell, or deliver, or the price concessions were given in good faith to meet a competitor’s price (i.e., price matching). In the United States, the Robinson-Patman Act prohibits price discrimination.

Price discrimination rules include the following:

- When two retailers buy the same product from the same supplier and pay the same prices, there is no price discrimination.
- When two retailers buy the same product from the same supplier and pay different prices, there is price discrimination except when the different prices are cost justified based on cost differences or cost savings.

Example: When retailers offer price matching of 50%, 100%, or 115% to customers in order to compete with other retailers, then the price matching practice is legal. Coupon-based prices and volume-based discount prices are legal.

The following practices are illegal under the Robinson-Patman Act:

- Below-cost sales prices by a retailer that charges higher prices in different locations with a secret plan of recoupment.
- Price differences in the sale of identical products that cannot be justified on the basis of cost savings or cost differences to meet a competitor’s prices.
- Allowances given for advertisements and promotions that are not equally and practically available to all customers on proportionately equal terms.

Loss Leader Pricing

Loss leader pricing is a retail pricing practice where a primary product is priced at near or below cost to bring more customers into retail stores, whether they are physical or online stores. Retailers hope that when customers come to the stores to buy the primary product, they will also purchase secondary products, such as accessories, derivative products, or complementary products related to the primary product, thus bringing additional sales revenues. Here, primary products are sold at lower prices and secondary products are sold...
at higher prices because they are connected together to make them complete and wholesome. Offering loss-leading prices is legal. Selling eggs at low prices on or before Easter and selling turkeys at low prices on or before Thanksgiving are examples of loss-leader pricing.

**Predatory Pricing**

Predatory pricing is a controversial and confusing topic in pricing where retailers charge lower prices to customers to drive competitors out of the marketplace. The U.S. Supreme Court has been skeptical about claims by the Federal Trade Commission (FTC) of predatory pricing practices, stating that they are illegal and unsustainable and that they destroy healthy competition. However, the Supreme Court did not agree with the FTC, stating that these pricing practices are temporary and unsustainable, and hence legal. Reduced prices for items in a clearance sale are legal and are not a predatory pricing practice.

Predatory pricing works as follows:

Today → Below-cost, low prices to drive competitors out of the market

Tomorrow → Above-cost, high prices after competitors leave the market

A list of various pricing scenarios follows.

- Customers are harmed only if below-cost pricing allows a dominant retailer to knock its rivals out of the market and then later raise prices to above-market levels for a substantial time.
- A retailer’s independent decision (not a collusive decision) to reduce prices to a level below its own costs does not necessarily injure competition and, in fact, may simply reflect vigorous competition. This is good for a free market system.
- Cases of a large retailer using low prices to drive smaller retailers out of the market in hopes of raising prices after smaller retailers leave the market are rare because smaller retailers simply do not go away. This strategy can be successful only if long-term profits from higher prices make up for short-run losses from lower prices.

End-of-season sales where products are priced at very low prices to get rid of old, obsolete, and excess merchandise do not come under predatory pricing guidelines. Also, frequently advertised “clearance items” are excepts to the predatory pricing practices.

**Drip Pricing**

Drip pricing means back-end prices are different from front-end prices and vice versa, and it is illegal. In drip pricing, additional charges are added to a customer’s final prices without disclosing them to the customer at the beginning. Drip pricing can be found in the hospitality industry, such as hotel reservations and vacation resorts, and in consumer financing, such as home mortgage loans and short-term loans. Legal liabilities exist with deceptive and discriminatory price practices in violation of the FTC’s Robinson-Patman Act.

**Price Discounts**

The sky is the limit when comes to designing various innovative ways of offering price discounts among vendors, retailers, and customers. Price discounts are frequently used to attract customers and to turn them into buyers. Price discounts go two ways: from vendors to retailers and from retailers to customers, as follows:

\[
\text{Price Discounts} = \text{Vendors} \rightarrow \text{Retailers} = \text{Value to Retailers} \\
\text{Price Discounts} = \text{Retailers} \rightarrow \text{Customers} = \text{Value to Customers}
\]

Next, we elaborate the price discounts.

**Discounts given to retailers** include trade discounts (e.g., 10%), quantity discounts (volume discounts), seasonal discounts (off-season low prices), cash discounts (2/10, net 30 days), and allowances given to retailers for spending on advertisement and sales promotions.
Discounts given to customers include instant savings (today's savings); mail-in rebates (tomorrow's savings); current/future coupons; current/future rebates; buy one get one free (BOGO); volume discounts; 10%, 20% or 30% off list prices; clearance sale prices; fixed discounts (10% off on $30 purchase); sales events; loss leader pricing; current/future discounts; flash/special sales; buy 2 get the third one free; and buy 1 and get the second one at 50% off.

One of the best ways to reduce the cost of merchandise (cost of sales) for a retailer is to receive various forms of price discounts from the providers of the merchandise (e.g., manufacturers, vendors, suppliers, wholesalers, distributors, agents, and brokers). After receiving those price discounts from the merchandise providers, the retailer can pass on some of the discounts to end consumers and customers. Some retailers have greater flexibility than others in offering various forms of price discounts to end consumers and customers; and this is where retailers are differentiated in increasing sales using various forms of price discounts.

Legality of Price Discounts
Price discounts are legal only when they are properly designed, represented, and advertised. Otherwise, they can be illegal. A list of retailers using deceptive pricing practices with price discounts follows.

Example: Los Angeles prosecutors have initiated lawsuits against J. C. Penney, Sears, Kohl’s, and Macy’s, accusing the retailers of misleading customers into believing they were buying products at more significant markdowns than they actually did. To avoid potential litigation, retailers that advertise “sale prices” in comparison with “regular prices” in California should ensure that the products were actually offered for purchase at those regular prices within the preceding three months.

Example: Kate Spade, Macy’s, and Bloomingdale’s in California were accused of falsely advertising original prices and sales prices and for intentionally duping customers by way of their pricing practices.

Example: Nike and Burberry were accused of using misleading price tags at their outlet stores.

Example: Nike was accused of misrepresenting and misleading the amount of price discounts by advertising false suggested retail prices (SRPs) to mean the same as manufacturer’s suggested retail price (MSRP), which caused confusion among customers. The terms “SRP” and “MSRP” are not the same.

Example: Zara, a fashion retailer, was accused of using deceptive pricing practices using a classic bait-and-switch scheme where customers overpaid for garments they purchased.

Conditional Pricing
Conditional pricing practices occur when a seller establishes its product prices based on factors such as volume (quantity) of products purchased, the set of products purchased, or the buyer’s share of purchases from the seller. The broad range of these practices include incremental discounts, quantity (volume) discounts, bundling and tying of multiple products, bundled discounts, market-share discounts (i.e., loyalty discounts based on loyalty pricing), and exclusive dealing (i.e., agreement not to deal in the goods of another seller). Note that these practices are implemented by companies having a large market share as well as companies with a small market share.

In summary:
- Price fixing is illegal.
- Price discrimination can be legal or illegal depending on the cost structure or cost justification.
- Loss leader pricing is legal.
- Predatory pricing is not illegal, as it is not sustainable.
- Drip pricing is illegal.
- Price discounts can be legal or illegal based on their true intent.
- Conditional pricing can be legal or illegal based on their true intent.
(iv) Product Management and Product Life Cycles
This subsection discusses product management, the product life cycle concept, and product audit.

(A) Product Management
Product strategy is a part of the marketing mix (i.e., product, price, place, and promotion). Other parts include promotion strategy, distribution strategy, and pricing strategy.

There are many decision areas in product management, including product definition, product classification, product mix and product line, and packaging and branding (see Exhibit 1.42).

EXHIBIT 1.42 Decision Areas in Product Management

<table>
<thead>
<tr>
<th>Decision areas in product management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product definition</td>
</tr>
<tr>
<td>Product classification</td>
</tr>
<tr>
<td>Product mix and product line</td>
</tr>
<tr>
<td>Packaging and branding</td>
</tr>
</tbody>
</table>

Product Definition. The way in which the product variable is defined can have important implications for a firm’s survival, profitability, and long-run growth. See Exhibit 1.43 for how a product can be viewed.

EXHIBIT 1.43 Views of a Product

<table>
<thead>
<tr>
<th>Views of a product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangible product (focuses on physical object itself)</td>
</tr>
<tr>
<td>Extended product (focuses on physical object and service)</td>
</tr>
<tr>
<td>Generic product (focuses on essential benefits to be received from the product)</td>
</tr>
</tbody>
</table>

A classic example of an improper definition can be found in railroad passenger service, which defines itself as being in the railroad business instead of in the transportation business. A reasonable definition of product is that it is the sum of the physical, psychological, and sociological satisfaction the buyer derives from purchase, ownership, and consumption.

Product Classification. Product classification is an analytical device to assist in planning marketing strategy and programs. A basic assumption underlying such classifications is that products with common attributes can be marketed in a similar manner. In general, products are classified according to two basic criteria: end use or market and degree of processing or physical transformation required.

Examples of product classification are agricultural products and raw materials, industrial goods, and consumer goods. The market for industrial products has certain attributes that distinguish it from the consumer goods market. For certain products, there are a limited number of buyers, known as a vertical market (which means that it is narrow), because customers are restricted to a few industries, and it is deep, in that a large percentage of the producers in the market use
Product Mix and Product Line. The product mix is the composite of products offered for sale by the firm's product line. It refers to a group of products that are closely related in terms of use, customer groups, price ranges, and channels of distribution. There are three primary dimensions of a firm's product mix, as shown in Exhibit 1.44.

EXHIBIT 1.44 Dimensions of a Product Mix

<table>
<thead>
<tr>
<th>Dimensions of a product mix</th>
<th>Width (number of product lines in the firm)</th>
<th>Depth (average number of products in each line)</th>
<th>Consistency (similarity of product lines)</th>
</tr>
</thead>
</table>

Width of the product mix refers to the number of product lines the firm handles. Depth of the product mix refers to the average number of products in each line. Consistency of the product mix refers to the similarity of product lines. Product line plans take into account consumer evaluation of the company's products (strengths and weaknesses) and objective and accurate information on sales, profits, and market share (actual and anticipated levels).

Packaging and Branding. Distinctive or unique packaging is one method of differentiating relatively homogeneous products, such as toothpaste or soap. The packaging design should focus on the size of the product, how easy it is to open, how strong the packaging should be in protecting the product, the attractiveness of the packaging, and costs.

Many companies use branding strategies to increase the strength of the product image. Factors to be considered include: product quality, whereby products do what they do very well; consistent advertising, in which brands tell their story often and well; and brand personality, where the brand stands for something unique (e.g., Xerox and Kodak). A good brand name can evoke feelings of trust, confidence, security, and strength. Markov analysis can be used to determine the extent to which customers switch brands.

Markov analysis is useful in studying the evolution of certain systems over repeated trials. This analysis has been used, for example, to describe the probability that a machine, functioning in one period, will function or break down in another period and to identify changes in the customer's account receivables collection experience.

(B) Product Life Cycle Concepts
A firm's product strategy must consider the fact that products have a life cycle—phases or stages that a product will go through in its lifetime. This product life cycle (PLC) varies according to industry, product, technology, and market. In general, product growth follows an S-shaped curve (although it is shown in Exhibit 1.45 as linear) due to innovation, diffusion of a new product, and changes in the product and the market. A typical product goes through four phases: introduction, growth, maturation, and decline. Some products skip a phase, such as introduction or maturity, while some products are revitalized after decline and thereby do not go through the S-shaped pattern. Each phase is described briefly next.
EXHIBIT 1.45 Phases/Stages of a Product Life Cycle

<table>
<thead>
<tr>
<th>Phase</th>
<th>Introduction</th>
<th>Growth</th>
<th>Maturation</th>
<th>Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**Introduction phase** (phase 1) incurs high production and marketing costs. Profits are low or nonexistent. This phase is flat due to difficulties of overcoming buyer inertia and stimulating trials of the new product.

Profits increase and are possibly correlated with sales during the **growth stage** (phase 2) as the market begins trying and adopting the product. As the product **matures** (phase 3), profits do not keep pace with sales because of competition. Penetration of the product’s potential buyers is eventually reached, causing the rapid growth to stop and level off. Price concessions, increasing product quality, and expanding advertising will be planned to maintain market share.

At some point, sales will **decline** (phase 4), and the seller must decide whether to drop the product, alter it, seek new uses for the product, seek new markets, or continue with more of the same. Growth will eventually taper off as new substitute products appear in the market. The advice for the decline phase is not to invest in slow or negative growth or unfavorable markets but instead to pull the cash out.

Due to changing conditions, the marketing mix has to be changed in line with PLC changes. The PLC concept can help in forecasting, pricing, advertising, and product plans. The difficult part of the PLC concept is estimating the exact time periods for these four phases, as it is hard to know when a phase begins and ends. The fact that the duration of each phase varies from product to product diminishes the usefulness of the PLC concept as a marketing planning tool.

**(C) Product Audit**

The **product audit** is a marketing management technique whereby the company’s current product offerings need to be reviewed to ascertain whether each product should be continued as is, improved, modified, or discontinued. The product manager, who is responsible for the product, should ensure that the product audit is performed at regular intervals as a matter of marketing policy. One of the major purposes of the product audit is to detect “sick” products for possible discontinuation. Some critical factors to be considered in this area are:

- **Sales trends.** How have sales moved over time? Why have sales declined?
- **Profit contribution.** What has been the profit contribution of this product to the company?
- **PLC.** Has the product reached a level of maturity and saturation in the market? Has the product outgrown its usefulness? The product discontinuation issue is a hard one because it involves consideration of negative impact on employees, keeping consumers supplied with replacement parts, disposing of inventory, and providing repair and maintenance services.

One objective of the product audit is to determine whether to modify or improve the product or to leave things as they are (status quo). Modifying the product requires changes in product features, design, packaging, promotion, price, and channels of distribution. Product improvement suggestions often come from advertising agencies, consultants, sales staff, consumers, and
intermediaries, and involve many functions, such as engineering, manufacturing, marketing, and accounting. Market research is advised when a product improvement is planned because it is not always clear as to how consumers will react to improvements or changes.

**KEY CONCEPTS TO REMEMBER: Elements of Product Strategy**

- An audit of the firm’s actual and potential resources includes financial strength, access to raw materials, plant and equipment, operating personnel, management, engineering and technical skills, and patents and licenses.
- Approaches to current markets include: more of the same products; variations of present products in terms of grades, sizes, and packages; new products to replace or supplement current lines; and product deletions.
- Approaches to new or potential markets include geographical expansion of domestic sales, new socioeconomic or ethnic groups, overseas markets, new uses of present products, complementary goods, and mergers and acquisitions.
- The state of competition includes new entries into the industry, product limitations, and competitive mergers or acquisitions.

**Digital Marketing**

Digital marketing is other than traditional marketing (e.g., newspapers, magazines, billboards, radio, and TV). The scope of digital marketing includes the Internet; social media websites and platforms; digital phones, tablets, notebook computers, and other devices; and mobile apps.

Many traditional elements of marketing easily translate into Internet marketing, such as price, product, place, and promotion. For example, consider the following with respect to “promotion” tactics:

<table>
<thead>
<tr>
<th>Traditional Marketing</th>
<th>Digital Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast advertising</td>
<td>Banner advertising</td>
</tr>
<tr>
<td>Direct mail</td>
<td>Email/inbox mail</td>
</tr>
<tr>
<td>Press releases</td>
<td>Website pressroom</td>
</tr>
<tr>
<td>Promotions</td>
<td>Online events/Chat rooms/Alerts/Notifications</td>
</tr>
<tr>
<td>Networking</td>
<td>Social media websites/platforms/blogs</td>
</tr>
<tr>
<td>Word of mouth</td>
<td>Viral marketing/Apps</td>
</tr>
</tbody>
</table>

Like traditional marketing, successful online and Internet marketing requires persistence and commitment to a long-term strategy. Unfortunately, even with innovative technology, Internet marketing cannot be done with the click of a mouse. If the goal of the marketing is to build stronger relationships between the customer and the brand, the power of a web-based plan should not be ignored.

Companies are realizing that they must approach web-based techniques and strategies as they would with any traditional marketing activity. Fundamental questions must still be answered:

- Who are our customers?
- What is the competition doing?
What are the channel dynamics?
Which marketing mix strategies are most effective?
Are our business models realistic?
How and when we will make a return on sales and return on investment?

(vi) Marketing of Services

(A) Service Characteristics

The service sector of the U.S. economy has grown to such an extent that it captures about 50 cents of the consumer’s every dollar. The definition of what constitutes a service remains unclear. These common variables comprise the marketing mix of both products and services:

- Product or service itself
- Price
- Distribution system
- Promotion
- Marketing research

Yet services possess certain distinguishing characteristics and have unique problems that result in marketing mix decisions that are substantially different from those found in communication with the marketing of goods. *These characteristics include intangibility, inseparability, fluctuating demand, a highly differentiated marketing system, and a client relationship.* Each of these characteristics is discussed next.

- **Intangibility** arises when a service firm is selling an idea or experience, not a product. It is often difficult to illustrate, demonstrate, or display the service in use. Examples include airline or hotel service.
- **Inseparability** arises when a service cannot be separated from the person of the seller. In other words, the service must be created and marketed simultaneously. An example is an insurance agent who is selling a policy.
- **Fluctuating demand** occurs when services fluctuate by season (tourism), days (airlines), or time of day (movie theaters). One example of stimulating demand or unused capacity is when downtown hotels (or those that are used predominantly by business travelers) offer significant discounts for a weekend stay.
- **Highly differentiated marketing systems** offer different service approaches for different services. For example, a different approach is required to market banking or financial services than to market computer services or airline services.
- **Client relationships** exist between the buyer and the seller, as opposed to customer relationships. Examples include physician–patient and banker–investor relationships. The buyer follows the suggestions provided by the seller.

(B) Service Quality

Poor quality of service and nonperformance are two major reasons for switching to the competition, and high price is a minor reason. Service quality is measured against performance, which can be very difficult to ascertain. In general, problems in the determination of good service quality are attributable to differences in expectations, perceptions, and experiences regarding the encounter between service providers and service users.
It is easier and cheaper to keep an existing customer than to find a new one. Product quality can be measured against accepted standards, which are tangible, while service quality is measured against expected performance, which is intangible.

Service quality is the gap between expected service and perceived service. Determinants of service quality, which can help marketing managers avoid losing customers, are listed next.

- **Reliability** involves dependability and consistency of performance.
- **Responsiveness** concerns the willingness or readiness of employees to provide service.
- **Competence** means possession of the necessary skills and knowledge to perform the service.
- **Access** involves approachability and ease of contact.
- **Courtesy** involves politeness, respect, consideration, and friendliness of contact personnel.
- **Communication** means keeping customers informed in language they can understand. It also means listening to customers.
- **Credibility** involves trustworthiness, believability, and honesty.
- **Security** is the freedom from danger, risk, or doubt.
- **Understanding the customer** involves making the effort to understand the customer’s needs.
- **Tangibles** include the physical evidence of the service.

**(C) Overcoming Obstacles in Service Marketing**

In view of the size and importance of the service economy, considerable innovation and ingenuity are needed to make high-quality services available at convenient locations for consumers. The actual services offered by service providers often fall behind the opportunities available due to five obstacles:

1. Limited view of marketing
2. Lack of competition
3. Lack of creative management
4. Concept of “no obsolescence”
5. Lack of innovation in the distribution of services

**(vii) Marketing Analysis**

Marketing analysis focuses on two topics: market opportunity matrix analysis and market basket analysis.

**(A) Market Opportunity Matrix Analysis**

The market opportunity matrix analysis identifies two dimensions (level of attractiveness and probability of success) to develop a market matrix. This matrix can be used when introducing new products into new markets in order to study their success levels. This matrix focuses on external assessment of factors such as markets, products and services, customers, and competitors.
Three values (such as high, medium, or low) can be assigned to the level of attractiveness. Similarly, three values (such as high, medium, or low) can be assigned to the probability of success. A product’s success can be determined with the following formula. (See Exhibit 1.46.)

\[
\text{Product’s Success} = \text{Level of Attractiveness} \times \text{Probability of Success}
\]

Examples of marketing variables to consider for this analysis include target products, target markets, target customers, target market share, and target financial results. This matrix provides a high-level, summary-type assessment of each product for market screening purposes (i.e., market feasibility analysis). Later, the same marketing results can be used to proceed further with low-level, detailed financial analysis (i.e., financial feasibility analysis).

**Step 1. Market Feasibility Analysis = First-Level Impact Analysis**

**Step 2. Financial Feasibility Analysis = Second-Level Impact Analysis**

The scope and nature of financial feasibility analysis can include calculating financial metrics such as return on sales, ROI, and gross/net profits.

**EXHIBIT 1.46 Formula for a Product’s Success**

<table>
<thead>
<tr>
<th>Marketing Variables</th>
<th>A = Level of Attractiveness (H,M,L)</th>
<th>B = Probability of Success (H,M,L)</th>
<th>C = Outcome (C = A × B) Product’s Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Product 1</td>
<td>L</td>
<td>L</td>
<td>LL</td>
</tr>
<tr>
<td>Target Product 2</td>
<td>L</td>
<td>M</td>
<td>LM</td>
</tr>
<tr>
<td>Target Product 3</td>
<td>H</td>
<td>M</td>
<td>HM</td>
</tr>
<tr>
<td>Target Product 4</td>
<td>H</td>
<td>H</td>
<td>HH</td>
</tr>
</tbody>
</table>

**Decision Rule 1:** First select all the products and services with HH outcomes, deserving high priority.

**Decision Rule 2:** Next select all the products and services with HM outcomes when resources are available.

**Decision Rule 3:** Next select all the products and services with LM outcomes only when resources are still available.

**Decision Rule 4:** Do not select any product or service with LL outcomes because they will not be successful.

**B Market Basket Analysis**

Market basket analysis is a marketing management tool to study and understand the purchase behavior of consumers. Also called affinity analysis, it is similar in concept and approach to the consumer price index (CPI) study of determining the price changes in a basket of consumer goods.

Affinity analysis or market basket analysis finds intrinsic relationships between products that a customer is currently purchasing or has purchased in the past. The output of this analysis can be used to promote cross-selling or up-selling opportunities, to design discount plans and loyalty programs, and to offer special coupons and rebates in order to make customers excited and interested in buying more of the same items that they have been buying.
Market basket analysis is mainly targeted at current customers who are actively purchasing some type of goods. For example, this market analysis can be used to reveal

- What products customers are buying.
- Why customers are buying what they are buying.
- What complementary or substitute products customers are buying. How frequently customers are buying such products? (e.g., eggs and cheese are complementary while cow milk and almond milk are substitutes).
- What group of products customers are buying (e.g., eggs, cheese, and bacon to make omelets).

The best place to collect this type of customer data applicable to market basket analysis is the POS registers and online customer ordering systems.

A hypothetical application of market basket analysis is shown next.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Products Purchased</th>
<th>Interrelationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B, J, K</td>
<td>No causal relationship</td>
</tr>
<tr>
<td>3</td>
<td>P, M, R, D</td>
<td>Unclear relationship</td>
</tr>
<tr>
<td>6</td>
<td>V, T</td>
<td>Very useful relationship</td>
</tr>
</tbody>
</table>

There could be four sales recommendations from the market basket analysis:

1. Cross-selling (a common practice)
2. Up-selling (a common practice)
3. Lateral selling (a common practice)
4. Down-selling (an uncommon practice)

**Example 1:** Cross-selling occurs, for example, when Amazon.com makes purchase recommendations to a customer during product selection. The computer system displays a message “Customers who bought book V also bought book T.” This recommendation is possible only due to Amazon’s use of affinity analysis software and/or because previous customers must have ordered this combination of books.

**Example 2:** Up-selling occurs when an airline premier and frequent traveler purchases a coach ticket for some reason. The airline’s computer system recommends an upgrade to either first class or business class with a small incremental price increase.

**Example 3:** Up-selling also occurs when a computer system recommends to a customer who is making a weekend hotel reservation for a family suite A to upgrade to suite B with better amenities and a better view at a small incremental price.

**Example 4:** Lateral selling occurs when a computer recommends buying bed pillows of the same brand to a customer ordering only bed sheets of the same brand. A generous discount might be offered to customers to make this dual purchase decision.
Example 5: Down-selling occurs when a customer is buying a normal item at regular price with a low profit margin and the computer system recommends buying a similar item at a low price with a high profit margin.

(viii) Lead Management Cycle
World-class sales management focuses on two major things: lead management cycle and managing the sales process, because the former feeds the latter.

Lead management is the process of rapidly and effectively creating, nurturing, distributing, and analyzing leads. The ultimate goal is to increase the likelihood that a lead will convert to a qualified sale opportunity and then to a new, satisfied customer.

To implement a lead management strategy, marketing and sales functions must work closely together. The key focus here is on the quality, not the quantity, of leads. Marketing and sales management should focus on the conversion rates of leads to sales (i.e., percentage of leads resulted in closed sales), not so much on the number of raw leads generated.

For best results, a lead management system must bring together the right people, processes, and information at various stages in the lead management cycle:

- Identify hot leads and automatically route to direct sales or channel partners.
- Actively engage the remaining leads (i.e., not-so-hot leads) and nurture them through the pipeline to eventual sale.
- Track all leads to closure and evaluate the return on sales and ROI of marketing campaigns.
- Integrate the external channels, including value-added resellers, other resellers, and strategic partners.
- Integrate off-line qualification resources such as call centers.

Business organizations should do the following to manage the lead management cycle:

- Plan and generate leads.
- Qualify leads.
- Distribute leads.
- Nurture leads.
- Measure and evaluate leads.

(ix) The Sales Process
The sales process to sell a complicated product or service (i.e., rich in features and functions) consists of eight basic steps or stages.

1. Prospecting
2. Pre-approach and planning
3. Approaching the client/customer
4. Identifying the client needs
5. Presenting the product/service to the client
6. Handling buyer objections
7. Gaining commitment from the buyer
8. Following up and keeping promises

**(x) Selling Methods**
Selling methods are changing very rapidly due to the Internet-based electronic commerce and mobile commerce technologies. The traditional methods of in-person selling are fading away fast, and new methods of selling are being invented daily to make the entire selling process quick and impersonal.

Salespeople use either the traditional selling method or the professional selling method, where the latter method is better. Professional selling methods are still needed to sell engineering-based products, which need product knowledge to explain complicated features and functions to prospective clients or customers.

**Traditional Selling Method.** In the *traditional selling method*, little time is spent on the early stages of the sales process (i.e., approaching the client/customer and identifying client needs) and no time is spent on the beginning stages of prospecting and pre-approach and planning. Because prospective buyers are not usually convinced that they really need the product, gaining buyer commitment is difficult, tedious, and time consuming.

In the traditional selling method, little time is spent on:

- Approaching the client/customer
- Identifying the client needs

No time is spent on:

- Prospecting
- Pre-approach and planning

**Professional Selling Method.** In the *professional selling method*, a great deal of time is spent in the early stages of the sales process (i.e., prospecting, pre-approach and planning, approaching the client/customer, and identifying client needs), so that commitment is gained as a very natural or logical, next step. Essentially, customers are convinced that the product will solve their problems or meet their needs, because early in the sales process proper care has been taken to establish that need and link it to the benefits of the product.

In the professional selling method, more time is spent on:

- Prospecting
- Pre-approach and planning
- Approaching the client/customer
- Identifying the client needs
Less time is spent on:

- Presenting the product/service to the client
- Handling buyer objections
- Gaining commitment from the buyer
- Following up and keeping promises

(e) Logistics and Distribution Management

This subsection defines and discusses logistics management, inventory management, and distribution systems.

(i) Logistics Management Defined

Logistics management is moving finished goods from where they were produced (manufacturers and producers) to where they will be consumed (consumers and customers) using various transportation methods, such as trucks, trains, air cargos, and sea cargos. In a way, logistics management supports supply chain management.

Logistics Management = Producers → Consumers

Two important concepts in the supply chain and logistics include pull supply chain and push supply chain.

In the **pull supply chain**, customers are driving the demand (pull) in that they place the orders at the retail stores, online, or by phone to pull the products out of the logistics system into customers’ hands.

In the **push supply chain**, historical sales drive the demand (push) in that purchasing management or store management initiates orders to push products from the logistics system into customers’ hands.

- Customers’ demand drives the pull supply chain.
- Historical sales drive the push supply chain.

Forward logistics and reverse logistics are two diverse concepts in logistics. Merchandise returns use the reverse logistics approach, meaning the supply chain works backward.

In **forward logistics**, raw materials and finished products are moved from upstream suppliers to manufacturers to suppliers and eventually to downstream customers for purchase and consumption.

In **reverse logistics**, already sold finished products are moved from downstream customers to stores to distribution centers to upstream suppliers and eventually to manufacturers for returns, repairs, rework, redesign, remanufacturing, refurbishing, and recycling. These returns could also include recalls of defective products. Later, these repaired products are resold to customers or others to recover some of the original price. Both types of logistics are shown next:
Forward Logistics: Upstream Suppliers ➔ Manufacturers ➔ Downstream Customers
Reverse Logistics: Downstream Customers ➔ Upstream Suppliers ➔ Manufacturers

(ii) Inventory Management Defined
Both manufacturing and retail companies invest huge amounts of money (millions and billions of dollars) in making, holding, and storing inventory (i.e., finished products, parts, components, raw materials, and ingredients) before it is sold to customers. Therefore, a large portion of a production operations manager’s job consists of inventory management. Inventory management is risky due to outdated, obsolete, stolen, misplaced, damaged, and miscounted items. Therefore, inventory assets should be managed similar to any other assets (i.e., cash, buildings, and machinery) to ensure that inventory is tracked and protected until it is sold to customers.

Inventory is the goods the organization keeps on hand for ready to use (raw materials) or already used (finished goods) in the production process. When inventory levels can be kept at an absolute minimum, operations management is considered excellent. When inventory levels are kept above the minimum levels without a business justification, operations management is considered inefficient and ineffective.

A production process deals with transforming resources (inputs such as raw materials, labor, energy, and machines) into products and services (outputs). The transformation of raw materials, labor, and overhead results in finished goods. A company keeps these finished goods in inventory as sellable goods until they are sold to customers.

\[
\text{Raw Materials} + \text{Labor} + \text{Overhead} = \text{Finished Goods} \rightarrow \text{Sellable Goods} \rightarrow \text{Sales to Customers}
\]

Here, overhead means those costs incurred other than the raw materials cost and labor cost. Overhead costs include utility costs (gas, electric, and water), rent and taxes on the facilities, management salaries, and other costs not directly related to production of goods.

(iii) Distribution Systems Defined
Inventory in a distribution system can be managed through the use of independent demand models, such as continuous and periodic review models. Examples of these models include single order point, double order point, periodic review system, and sales replacement system, which are described below.

The primary advantage of distribution models is that they allow the various levels in the distribution chain to manage their inventories autonomously. The primary disadvantage of these models is that they ignore the other stages in the supply chain, leading to stock-outs and back orders. Excess shipping costs can be incurred since no one is coordinating the movement of materials within the system. Also, the demand for replenishment occurs without any regard for what is currently being produced or planned to be produced. Under these situations, the need for an item incurs extra setup costs, lost productivity, and excess transportation costs.

(A) Single Order Point System
The single order point system basically ignores the fact that the order takes place in a chain and assumes that each element in the distribution system is independent of all other components. This independent behavior can cause large swings caused by a phenomenon called lumpy demand at the next level down in the distribution chain. Lumpy demand comes from
the lack of communication and coordination among the factory, warehouse(s), distributors, and retailers.

(B) **Double Order Point System**

The double order point system considers two levels down in the distribution system, hence the name “double.” For example, if a distributor is quoted a lead time from the factory warehouse of two weeks and it takes the factory warehouse three weeks to have stock replenished, the reorder point is set based on the demand for a five-week period. This system does not produce lumpy demand, as does the single order point system. An advantage is that it reduces the risk of stock-outs. Increasing the safety stock is its disadvantage.

(C) **Periodic Review System**

In a periodic review system, orders are placed on a predetermined time schedule. The advantage is that order times can be staggered throughout the chain to smooth demand at each point in the distribution chain. This reduces peaks and valleys caused by several customers ordering at the same time.

(D) **Sales Replacement System**

In the sales replacement system, the supplier ships only what the customer used or sold during the period. The objective is to maintain a stable inventory level in the system. This method requires having enough inventory to cover the potential demand during the replenishment cycle. In essence, the sales replacement system is a periodic review model with variable order quantities.

(E) **Distribution Requirements Planning**

Distribution requirements planning (DRP) is an application of the time-phasing logic of material requirements planning (MRP) applied to the distribution system. The purpose of DRP is to forecast the demand by distribution center to determine the master production scheduling needs. DRP uses forecasts and known order patterns from customers in the distribution chain to develop the demand on the master schedule.

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**DISTRIBUTION REQUIREMENT PLANNING VERSUS ORDER POINT–BASED DISTRIBUTION SYSTEM**

- The DRP anticipates future needs throughout the distribution chain and plans deliveries accordingly.
- The order point–based distribution system does not anticipate future needs. It simply reacts to the current needs.

(F) **Inventory Distribution Methods**

The functions of warehouse distribution, production, and purchasing are closely interrelated and constantly interacting with each other in a manufacturing firm. The decision problems considered during inventory distribution strategy are:

- When, what, and how much to ship to a warehouse.
- When, what, and how much to produce at the factory, with what size workforce.
- When, what, and how much to purchase as inputs to the factory warehouse system.

(G) **Warehouse Inventory Control**

In a distribution system, warehouses usually stand between a factory and final customers or other warehouses, as shown in Exhibit 1.47.
On the sales side, warehouses face a demand from customers that usually is subject to random demand fluctuations and usually requires fast service. On the supply side, warehouses usually face significant and sometimes erratic lead time for receiving shipments of products from factories.

Payments to carriers for making shipments to the warehouse are frequently of major importance in designing the warehouse ordering and distribution system. Economies usually can be achieved by increasing the size of shipment up to some upper limit, such as a full truckload or carload. Efforts to economize on shipping costs by increasing the size of shipments increase the time between shipments and hence decrease the speed of service.

(H) Types of Warehouse Shipments
Warehouses usually stock a very large number of products—the larger the shipment size, the more products are involved, and the greater are the problems of controlling the inventories of different products jointly. These are some of the considerations involved in decisions to order shipment to warehouses. Two basic types of shipments can take place: periodic shipments and trigger shipments (see Exhibit 1.48).

Periodic Shipments. The periodic system of placing orders has the virtue of automatically synchronizing the decisions on many products. Under this system of operation, warehouse shipping decisions can be handled in two steps. First, the product can be considered in the aggregate, and next the shipping costs for different sizes of shipping lot can be weighed against the cost of holding inventory associated with each size lot. On this basis, the optimum shipping lot can be determined. By using the forecasted aggregate shipping rate, the decision period can be determined.

The shipment received at the beginning of a period is associated with the period because that shipment must carry the warehouse through the period. However, because the lead time $T_l$ is required to obtain the shipment, the order for the $t$th period must be initiated a length of time $T_l$ before the beginning of the $t$th period. When the time arrives for placing an order, the inventory records for the products involved are brought up to date. The position of inventories on hand and on order is then known. Orders can then be placed for the amount of each product to be included in the shipment on the basis of expected product sales, initial inventory position at the time of ordering, and expected final inventory position at the end of the period.

In calculating the distribution of forecast errors, the forecast span is $(T_l + T_d)$, where $T_d$ is the length of the decision period, which is equal to the interval between the receipt of shipments.
When decisions on the timing of a shipment are made in advance, any random fluctuations in aggregate sales tend to cause shipment sizes to vary randomly. This may be quite satisfactory in situations where shipments of less than a truckload or carload are being made and variations in the size of the shipment can be accommodated readily. If the fluctuations in the size of the shipment exceed the available capacity, a supplementary shipment may be required or the aggregate inventory buffer may be changed.

**Trigger Shipments.** A warehouse may aggregate its products and decide on the optimal size of shipment but allow timing to be triggered by sales. Because the timing of shipments is irregular, orders for individual products cannot depend on a simple constant lead time. Instead, the lead time for any single product is a random variable that depends partly on orders placed for other products. When the total orders for all products have reached the total desired for a shipping lot, the orders will be placed for a shipment. Under this system, the lead time for any one product is a random variable that depends on the random sales of other products. The outcome for an individual product depends on the correlation between its sales and the aggregate sales.

**Advantages and Disadvantages.** The trigger system is more responsive to fluctuations in sales than the periodic system is. A further advantage is that shipment size is predetermined rather than random; hence problems of overburdening carrier capacity are minimized. However, the costs of administering the continuous review of inventory position for a trigger system are usually somewhat higher than under the periodic system.

**Cost of Alternative Shipping Carriers.** In estimating the cost of alternative shipping carriers, the cost of having valuable inventory tied up while the vehicle is in transit should be considered. While this cost usually is not large, taking it into account will systematically lower the costs of using faster rather than slower carriers. Another economy associated with fast shipments that may be overlooked is the fact that time in transit is one component of lead time. Shortening the lead time allows a reduction in inventory buffers and hence a decrease in inventory holding costs.

A warehouse may be put under a financial constraint in response to the working capital needs of the company; the warehouse also may be constrained by the production-smoothing requirements of the factory; and the warehouse itself may have certain constraints on its capacity to receive shipment or its storage space. Some constraints may be equality constraints on the exact amount of inventory that should be held, and some may be inequality restraints that establish upper or lower limits. Briefly stated, if an inequality restraint is not violated when the corresponding variable is set to zero, then the constraint can be ignored. If it is violated, then the solution is carried through as if an exact constraint applied.

In estimating the costs of stock-outs at the warehouse, the least costly alternative should be used. If the warehouse is out of stock on a product, it may disappoint a customer, or it may initiate a rush order from another warehouse or from the factory. In the latter cases, the cost of depletion may well be the cost of making a special rush shipment, taking into account communication and expediting costs. Although few warehouses keep adequate records on stock-outs and failures to render customer service, these data could be useful in estimating depletion costs as well as costs associated with customer service.

When estimating the cost of holding inventory, the cost of obsolescence should be considered. The indirect costs of having very large inventories in a warehouse may be increased because of product damage resulting from high stacking. Also, increased handling costs from crowded aisles and poor housekeeping and access may show up as overtime payments.
A single warehouse may utilize several different decision systems on different types of products or products from different suppliers according to particular needs. For example, fast-moving products might be segregated from slow-moving products, and a different decision system may be used for each.

(f) Outsourced Business Processes

This subsection discusses the scope, reasons, risks, and benefits from outsourcing. It focuses on how to conduct due diligence reviews in selecting outsourced service providers and how to write the required contractual provisions. It defines vendor governance, service levels required of outsourced vendors, including performance metrics. In addition, it provides guidance on how to manage third-party outsourced organizations.

(i) Outsourced Services Defined

An **outsourced service provider** broadly includes all entities or firms that have entered into a contractual relationship with a user organization (i.e., the company engaging the service provider) to provide business functions or operational activities. Examples of these functions or activities include accounting, internal audit, human resources, sales and marketing, procurement, tax and legal services, risk and insurance management, and IT. Outsourcing a business function does not mean abdication of management’s responsibility. Instead, it means management is searching for the best alternative in an effective and efficient manner and knowing that management is always responsible for and accountable for all business functions, whether they are outsourced or not.

The ability to contract for business or technology services typically enables an organization to offer its customers enhanced services without the various expenses involved in owning the required technology or maintaining the human capital required to deploy and operate it. In many situations, outsourcing offers the organization a cost-effective alternative to in-house capabilities. Outsourcing, however, does not reduce the fundamental risks associated with IT or the business lines that use it. Risks, such as loss of funds, loss of competitive advantage, damaged reputation, improper disclosure of information, and regulatory action, remain. Because the functions are performed by an organization outside the financial institution, for example, the risks may be realized in a different manner than if the functions were inside the organization resulting in the need for controls designed to monitor such risks.

(ii) Scope of Outsourcing

**Outsourcing** means an organization goes “outside” for the knowledge and experience required to do a specific job. In simpler terms, it means subcontracting or farming out for business functions, systems, and services. The scope of outsourcing includes human resources, tax, legal, help-desk services, technical support, telecommunications and network, facilities (computer center) management, disaster recovery services, education and training, ongoing hardware maintenance, data center design and construction, equipment relocation services, systems integration, application development and maintenance, and other services. The scope is broad and could include all or part of any function, service, process, or system operation.

(iii) In-Source Analysis versus Outsource Analysis

Manufacturing companies usually perform a make-or-buy analysis when deciding to manufacture a part or component inside the company or to buy it from the outside companies. Costs for each choice (make or buy) are developed and compared to determine which choice is less costly.
Similarly, purchasing or procurement management in a retail company can perform in-source or outsource analysis to determine whether to in-source a product (i.e., buying from the same supplier as before) or outsource a product (i.e., buying from a different supplier now). Costs for each choice (in-source or outsource) are developed and compared to determine which choice is less costly.

Examples of IT operations frequently outsourced by financial organizations include: the origination, processing, and settlement of payments and financial transactions; information processing related to customer account creation and maintenance; other information and transaction processing activities that support critical banking functions, such as loan processing, deposit processing, fiduciary and trading activities; security monitoring and testing; system development and maintenance; network operations; help desk operations; and call centers.

(iv) Decision Criteria in Outsourcing
From a strategic viewpoint, user organizations should outsource only noncore functions and keep core functions in-house. Core functions are those that closely relate to and are vital to achieving a user organization’s mission, vision, strategy, success, and growth. Note that core functions for each user organization could be different. For example, core functions for a manufacturing company are operations (i.e., production, supply chain, logistics, and inventory), marketing, and finance.

User organizations often outsource their business functions in five cases:

1. Senior management is managing too many internal functions with little time available.
2. Skills and competency levels of internal employees are scarce.
3. Internal operating costs for managing business function are slowly increasing year after year.
4. External vendors possess unique and specialized skills that internal employees do not have.
5. Senior management can improve core functions better because more time can be allocated to them.

Deciding on a wrong function to outsource has several negative consequences, including

- Changing business outcomes
- Creating unknown problems
- Increased operating costs
- Noncompliance with laws, rules, and regulations
- Delaying services to customers

In summary, deciding what function to outsource is more critical than deciding when to outsource (time and conditions), where to outsource (domestic, foreign, local, and regional vendors), and whom to outsource to (known, unknown, old, or new vendors).

(v) Reasons for Outsourcing
Management may choose to outsource business operations and functions for various reasons. These include:
Gaining operational or financial efficiencies
Increasing management focus on core business functions
Refocusing limited internal resources on core functions
Obtaining specialized expertise
Increasing availability of services
Accelerating delivery of products or services through new delivery channels
Increasing ability to acquire and support current technology and avoid obsolescence
Conserving capital for other business ventures

Outsourcing of business or technology-related services may improve quality, reduce costs, strengthen controls, and achieve any of the objectives listed previously. Ultimately, the decision to outsource should fit into the organization’s overall strategic plan and corporate objectives.

Before considering the outsourcing of significant functions, an organization’s directors and senior management should ensure such actions are consistent with their strategic plans and should evaluate proposals against well-developed acceptance criteria. The degree of oversight and review of outsourced activities will depend on the criticality of the service, process, or system to the organization’s operation as well as quality of service and quality of protection.

(vi) Risks from the Use of Service Providers
Organizations should have a comprehensive outsourcing risk management process to govern their business or technology service provider relationships. The process should include risk assessment, selection of service providers, contract review, and monitoring of service providers. Outsourced relationships should be subject to the same risk management, security, privacy, and other policies that would be expected if the organization were conducting the activities in-house.

The use of service providers and third parties to perform operational functions present various risks to user organizations. Some risks are inherent to the outsourced activity itself, whereas others are introduced with the involvement of a service provider. If service providers are not managed effectively, their use may expose user organizations to risks that can result in regulatory action, financial loss, litigation cases, and loss of reputation.

User organizations should consider these seven risks before entering into and while managing outsourcing arrangements:

1. **Operational risks** arise when a service provider exposes a user organization to losses due to inadequate or failed internal processes or systems or from external events/threats and human error.

2. **Compliance risks** arise when the service, products, or activities of a service provider fail to comply with applicable laws, rules, and regulations (LRRs).

3. **Concentration risks** arise when outsourced services or products are provided by a limited number of service providers or are concentrated in limited geographic locations (i.e., regional or local).

4. **Reputational risks** arise when actions or poor performance of a service provider causes the public to form a negative opinion about a user organization.
5. **Legal risks** arise when a service provider exposes a user organization to legal expenses and possible lawsuits.

6. **Country risks** arise when a user organization engages a foreign-based service provider, exposing the user organization to possible economic, social, and political conditions and events/threats from the country where the service provider is located. A few additional requirements apply to the foreign-based service providers: (1) complying with the U.S. laws and regulations, (2) receiving home-country permission to conduct on-site operational reviews by host-country staff; and (3) home-country staff accessing host-country computer systems and vice versa.

7. **Technology risks** arise when a service provider’s computer technology platforms do not fit well with the user organization’s computer technology platforms; business computer application systems lack adequate security protections; security controls over network equipment and mobile devices are weak; and computer backup and contingency plans are not tested.

According to Neo Advisory at www.neogroup.com, offshore outsourcing comes with risk, including cultural compatibility, legal framework, technical infrastructure, geopolitical risks, and security and privacy risks. Security concerns over the IT outsourced vendors include these:

- Business continuity and disaster recovery, which includes risk assessments, restoration process, testing of backup systems, audits, ongoing monitoring, managing the alternate site, key resources, and post disaster communication
- Information protection, which includes vulnerability assessment and penetration studies (technical and nontechnical), data access, data audits, data security, data transmission, data storage, and virus management
- Data backup and recovery, which includes scheduled backups, data recovery, nonstorage of production code and data in an offshore location, and disposal of sensitive data
- Insurance coverage, which includes protection over buildings, equipment, personnel, and electronic information
- Intellectual property rights protection, which includes agreements, country laws, data security, physical security, legal obligations, compliance to international security and data privacy standards, logging and auditing, employee contract, and security management training.
- Network security, which includes dedicated infrastructure, network security, and network device security.
- Personnel security, which includes background checks, reference checks, integrity checks, nondisclosure and confidentiality agreements, Internet usage, suppliers’ access to hardware, usage of mobile commuting, and housekeeping.
- Physical security, which includes access control, limited access, camera surveillance, and fire safety.

**(vii) Due Diligence and Selection of Service Providers**

A user organization should conduct an evaluation of and perform the necessary due diligence review for a prospective service provider prior to engaging the service provider. The depth and formality of this review will vary depending on: (1) the scope, complexity, location, and importance of the planned outsourcing arrangement; (2) the user organization’s familiarity with prospective service providers; and (3) reputation and industry standing of the service provider. Throughout
the due diligence review process, a user organization's financial team, technical consultants, operational experts, legal analysts, external consultants, and business staff must be engaged in the review and approval process.

Three major areas of due diligence review of a prospective service provider include:

1. Business background, reputation, and strategy
2. Financial performance and condition
3. Operations and internal controls

**Business background, reputation, and strategy** looks into seven areas of a service provider:

1. Its status in the industry, corporate history and qualifications, and accomplishments
2. Its reputation of management
3. Whether it conducts background checks when hiring employees
4. The qualifications and competencies of people to perform the service
5. Compatibility of the business model of the two companies
6. Required licenses and certifications for service staff
7. Any pending legal or regulatory compliance issues, including number of legal cases filed, complaints registered, and cases resolved and pending; the amount of fines and penalties assessed, announced, and protested; and the amount of fines paid and not paid.

**Financial performance and condition** looks into four areas:

1. Most recent financial statements and annual reports with regard to outstanding commitments, such as debt and other obligations, capital strength, liquidity, and operating results
2. Sustainability record in terms of number of years in service business and the percentage annual growth of market share
3. Adequacy of insurance coverage
4. Financial condition of any contractors and subcontractors employed

**Operations and internal controls** look into seven areas:

1. Compliance with applicable laws and regulations
2. Adequacy of operating standards, policies, procedures, and internal controls
3. Employee training programs and hiring controls, such as background checks
4. Business record retention and maintenance procedures
5. Security controls over data, equipment, and devices
6. Whether computer systems development and maintenance work is in-sourced (less risk) or outsourced (more risk)
7. Whether business continuity, resumption, and contingency plans are developed and tested (i.e., tested is less risky and not tested is more risky)
(viii) Contract Provisions and Considerations
User organizations should understand the service contract and legal issues associated with proposed outsourcing arrangements. The terms of service agreement with defined service levels should be included in the written contract developed and approved by the legal counsel prior to signing and execution. Internal auditors can review and evaluate the terms and conditions of the contract, including provisions for the breach of contract, remedies, and consequential actions. Specific topics in the written contract can include these:

- Scope of work, rights and responsibilities of each party, time frames, insurance coverage, compliance with laws and regulations, and the ability to subcontract service providers (domestic or foreign) after verifying their financial condition. Foreign-based service providers need to comply with U.S. laws as well as the laws in their own countries. Legal advice is required regarding the enforcement and ramifications of foreign contractual arrangements.
- Costs, fees, commissions, and compensation for services.
- Right to audit with access to audit reports from the servicer, including the frequency of the audit reports and on-site inspections by the auditors or others.
- Establishment and monitoring of performance standards for products, services, processes, people, and technology.
- Protecting user organizations’ confidential and sensitive information with proper security and privacy controls.
- Ownership and license issues, such as who owns the data generated by service providers, what data from a user organization service providers can use, whether a software escrow agreement is available for purchasing software from service providers.
- Indemnification of user organizations for any claims filed against the user organization resulting from the service provider’s gross negligence.
- Dispute resolution in terms of speed and satisfaction.
- Limits on liability established by service providers to make sure those limits are in line with the assumed risks.
- Customer complaints in terms of tracking and resolution.
- Business resumption and contingency plan of the service provider in terms of its responsibility to back up data; to develop, maintain, and test the contingency plans; and to submit the test results to the user organization.

- Default and termination conditions, including:
  - Defining what constitutes a default;
  - Acceptable remedies and opportunities for curing default;
  - Contract termination and notification procedures;
  - Preservation and timely return of user organization’s data, records, and materials;
  - Remedies for not meeting performance standards with damages paid;
  - Conditions when to transfer services to another service provider as a backup provision; and
  - Required notices to user organizations about changes in control and ownership; merger or acquisition plans; violations of laws, rules, and regulations; business failures and closures; and insolvency and bankruptcy of a service provider.
(ix) Benefits of Outsourcing
Organizations turn to outsourcing to improve performance (system and people) and to reduce operating costs. On the positive side, outsourcing offers solutions when there is a shortage of in-house skills, when a high-risk and high-overhead project needs to be managed, and when there is an unacceptable lead time to complete a project using company personnel.

The benefits from outsourcing usually focus on performance improvements and/or cost reduction. Another benefit is that it allows internal management to devote its time and resources more to the core business and the company’s future. Outsourcing prevents hiring additional employees to meet temporary needs. However, outsourcing does not mean surrendering control and internal management responsibility of subcontracted functions and projects to outside vendors.

Some of the organization’s IT employees could work for the outsourcing vendor. The key point here is to monitor the performance of the outsourced vendor during the contract period. Selection of an outsourcing vendor is no different from selecting other types of vendors. Selection factors such as proximity of the vendor, attitude of the vendor’s personnel, vendor’s reputation and knowledge, and the vendor’s financial condition and management’s integrity are important to consider.

The fixed-price-type service contract is best for the user organization because the price is known in advance. However, the fixed-price contract may not be feasible in all situations, especially when cost variables are uncertain and vendors may overbid because of perceived risk and because they have never done this kind of work before. An alternative is the incentive contract where (1) attainable targets are communicated to the contractor and (2) incentive arrangements are designed to motivate contractor efforts that might not otherwise be emphasized and discourage contractor inefficiency and waste. Another type of contract is the share-in-savings arrangement, which includes not only sharing in costs and savings but also providing training and education to the supplier.

The contract should spell out vendor performance-level guarantees, the remedies for nonperformance, and the right to audit clause. Contractual risks can be addressed or mitigated through terms and conditions, vendor certifications, evaluation factors for award, and risk mitigation requirements included in the statement of work.

From the economics point of view, the outsourcing approach provides an option to buy IT or business services from outsiders rather than from the organization’s IT or other departments. Users can perform make-or-buy analysis to see which approach would be more cost effective.

(x) Vendor Governance
Vendor governance requires a vendor to establish written policies, procedures, standards, and guidelines regarding how to deal with its customers or clients in a professional and businesslike manner. It also requires establishing an oversight mechanism and implementing best practices in the industry. Customer (user) organizations should consider these five criteria when selecting potential hardware, software, consulting, or contracting vendors:

1. Experience in producing or delivering high-quality security products and services on time and all the time
2. Track record in responding to security flaws in vendor products, project management skills, and cost and budget controls
3. Methods to handle software and hardware maintenance, end user support, and maintenance agreements
4. Vendor’s long-term financial, operational, technical, and strategic viability

5. Adherence to rules of engagement during contractual agreements, procurement processes, and product/service testing

(xii) Service-Level Agreements
Contractual agreements in procurement processes for outsourced vendors should include a service-level agreement (SLA). For example, the SLA represents the understanding between the cloud subscriber and cloud provider about the expected level of service to be delivered and, in the event that the provider fails to deliver the service at the level specified, the compensation available to the cloud subscriber. The overall scope of the service contract or service agreement includes the SLA, licensing of services, criteria for acceptable use, service suspension and termination, liabilities, guarantees, privacy policy, and modifications to the terms of service.

SLAs are focused approaches for computer center management to improve the quality of computing services to system users. The computer center management must define a set of user service levels or service objectives that describe application systems, transaction volume, processing windows, online system response times, and batch job turnaround times. Without well-defined service levels to monitor against actual performance determined in the resource utilization function, a computer system's capacity limit is difficult to identify.

Without SLAs, the computer center management will consider computer capacity at its limit when users begin to complain about computer performance. By monitoring performance against SLAs, computer center management can identify upcoming problems in meeting service objectives. In order to achieve these goals, computer center management needs to develop service-level objectives for internal use.

(xiii) Areas Needing Service-Level Objectives
Some examples of IT areas requiring service-level objectives are:

- System capacity during peak hours in terms of average central processing unit (CPU) usage, average demand paging rate, and maximum channel activity
- Number of online users, of online transactions per minute, and of batch jobs per hour
- Online system average response time in seconds by application
- Percentage of time the online system is available
- Turnaround time for test and production batch jobs processed under each job class by application

For each of these objectives, a range of minimum and maximum numbers should be identified. The rationale behind developing service-level objectives internally first is that they provide a basis for negotiating SLAs with the user community.

(xiv) Performance Metrics for Service Levels
After developing service-level objectives internally, IT management is ready to negotiate with each business user to develop formal SLAs in terms of performance metrics. Some examples of these metrics include:

- Number of complaints received from system users for each application system
- Average response times for each online application system
Turnaround times for each batch job by application system
System availability time (system uptime) by each application system
Accuracy limits in terms of number of errors by cause for each application system
Number of job reruns by each application system
Number of transactions to be processed during peak hours in each application system
Number of production problems by application system per week
Computer-report delivery times by application system
A plan for reporting service-level problems
Action priorities if services cannot be delivered
Scheduled meetings to discuss service levels between end users and computer center management
Number of job reruns and time lost due to job reruns
Number of abnormal terminations by application program per operating shift

It is important to remember that these SLAs are not static. They require periodic adjustment and refinement, such as at least once a year or preferably when renegotiating the agreement with customers (users).

(xiv) Third-Party Organizations
Third parties include external organizations such as business partnerships, joint ventures, licensing agreements, outsourcing arrangements, and supply chain exchanges (with acquirers, integrators, and suppliers). Note that there could be more than one supplier in an outsourcing arrangement or supply chain exchange. External organizations operate external systems to provide the needed software products and support services to internal user organizations.

The growing dependence on external service providers and new relationships being forged with those providers present new and difficult challenges for organizations, especially in the area of information system security. These challenges include:

- Defining the types of external services provided to the organization
- Describing how the external services are protected in accordance with the security requirements of the organization
- Obtaining the necessary assurances that the risk to organizational operations and assets, individuals, and other organizations arising from the use of the external services is acceptable

The assurance or confidence that the risk from using external services is at an acceptable level depends on the trust that the organization places in the external service provider. This leads to three security issues that must be addressed:

- Level of trust
- Level of control
- Chain of trust
In some cases, the **level of trust** is based on the amount of direct control the organization is able to exert on the external service provider with regard to employment of security controls necessary for the protection of the service and the evidence brought forth as to the effectiveness of those controls.

The **level of control** is usually established by the terms and conditions of the contract or SLA with the external service provider and can range from extensive (e.g., negotiating a contract or agreement that specifies detailed security control requirements for the provider) to very limited (e.g., using a standard contract or SLA to obtain commodity services, such as commercial telecommunications services).

In other cases, the level of trust is based on factors that convince the user organization that the requisite security controls have been employed and that a determination of control effectiveness exists. For example, a separately authorized external information system service provided to an organization through a well-established line of business relationship may provide a degree of trust in the external service within the tolerable risk range of management.

Ultimately, the responsibility for adequately mitigating unacceptable risks arising from the use of external information system services remains with the user organization’s management. Organizations require that an appropriate **chain of trust** be established with external service providers when dealing with the many issues associated with information system security. A chain of trust requires that the organization establish and retain a level of confidence that each participating service provider in the potentially complex consumer-provider relationship provides adequate protection for the services rendered to the organization.

The chain of trust can be complicated due to the number of entities participating in the consumer-provider relationship and the type of relationship between the parties (i.e., long or short supply chain). External service providers may also in turn outsource the services to other external entities, making the chain of trust even more complicated and difficult to manage. Depending on the nature of the service, it may be unwise for an organization to place significant trust in the service provider, not due to any inherent untrustworthiness on the provider’s part but due to the intrinsic level of risk in the service.

Where a significant level of trust cannot be established in the external services and/or service providers, the user organization (1) employs compensating security controls, (2) accepts a greater degree of risk, (3) does not obtain the service, or (4) performs business operations with reduced levels of functionality or no functionality at all.

The chain of trust is related to the level of confidence, level of trust, level of control, and degree of trust in that order.

\[
\text{Chain of Trust} = \text{Level of Confidence} \rightarrow \text{Level of Trust} \rightarrow \text{Level of Control} \rightarrow \text{Degree of Trust}
\]

**Managing Third-Party Organizations**

Managing third-party organizations and their systems is a difficult and complicated task because they are not under the direct control of the user organizations. Managing requires four steps:

1. Needs assessment (i.e., initial risk assessment and security requirements).

2. Service contract (i.e., request for information (RFI), request for proposal (RFP), or request for quotation (RFQ)), statement of work, contract negotiations, SLA agreement,
and due diligence). Before finalizing a service contract, a due diligence review should be performed, and these documents should be prepared: an RFP, a statement of work, and an SLA (in that order).

3. Security appraisal (i.e., system vulnerabilities, software patches and upgrades, security incidents, software disposal/decommissioning, and change management).

4. Third-party audit (i.e., review of operational systems of external service providers).

1.8 Project Management and Change Management

This section describes two major topics: project management techniques (e.g., program evaluation and review technique (PERT) and critical path method (CPM)) and change management methods.

(a) Project Management Techniques

In order for projects to be successfully implemented, they must be well managed. Many organizations apply a variety of project management techniques to optimize project success and enhance the likelihood of meeting project-specific as well as organization-wide goals. These techniques include monitoring project performance, establishing incentives to meet project goals, and developing a project management team with the right people and the right skills. All these techniques can help avert cost overruns, schedule delays, and performance problems common to many organizations.

It is important to develop performance measures and link project outcomes to business unit and strategic goals and objectives. The key is monitoring project performance and establishing incentives for accountability and using cross-functional teams to involve those with the technical and operational expertise necessary to plan and manage the project.

Typically, a project plan is used to manage and control project implementation. It includes performance measurement baselines for schedule and cost, major milestones, and target dates and risks associated with the project. By tracking cost, schedule, and technical performance, a project team is aware of potential problem areas and is able to determine any impact of the deviation and decide if corrective action is needed. Regular review of the status of cost, schedule, and technical performance goals by individuals outside the project team allows for an independent assessment of the project and verification that the project is meeting stated goals.

Major projects should include multidisciplinary teams, consisting of individuals from different functional areas and led by a project manager, to plan and manage projects. Typically, a core project team is established early in the life cycle of a project, and additional individuals with particular technical or operational expertise are added during appropriate phases of the project. The team must not only possess technical and operational expertise, but it must also be composed of the “right” people. The selection of the team members is critical—they must be knowledgeable, willing to trade off leadership roles, and able to plan work and set goals in a team setting. The successful team will have a high spirit, trust, and enthusiasm. A sense of ownership and the drive of the team committed to a project are key factors in the successful completion of a project. This integrated and comprehensive approach improves communication between upper management and project managers and among the various stakeholders in the project. It also increases the likelihood that potential problems will be identified and resolved quickly, thus increasing the chances that the project will remain on schedule and within budget.
(i) Why Project Management?
Management needs to know what parts of the project or program are most likely to cause serious delays. This knowledge will lead to management actions that will achieve the project or program objectives and deadlines.

When is project management preferred? The project management approach is the preferred method for dealing with projects defined once. The task is very complex and involves interdependence between a number of departments. The task has great significance to the organization. Onetime tasks can be accomplished with a minimum interruption of routine business.

Managers need to coordinate diverse activities toward a common goal. Management must devise plans that will tell with reasonable accuracy how the efforts of the people representing these functions should be directed toward the project’s completion. In order to devise such plans and implement them, management must be able to collect pertinent information to:

- Form a basis for prediction and planning
- Evaluate alternative plans for accomplishing the objective
- Check progress against current plans and objectives
- Form a basis for obtaining the facts so that decisions can be made and the job can be done

A single master plan for a project should include planning, scheduling, and controlling functions. The plan should point directly to the difficult and significant activities—the problem of achieving the objective. For example, the plan should form the basis of a system for management by exception. It should indicate the exceptions (red flags). Under such a system, management need act only when deviations from the plan occur.

A reporting system should be designed for middle to senior management to use. The monthly progress report calls for specific reestimates only for those events on critical paths and subcritical events. The report should accomplish these tasks:

- Preparing a master schedule for a project
- Revising schedules to meet changing conditions in the most economical way
- Keeping senior management and the operating department management advised of project progress and changes

Plans should be separated from scheduling. Planning is the act of stating what activities must occur in a project and in what order these activities must take place. Scheduling follows planning and is defined as the act of producing project timetables in consideration of the plan and costs. Controlling is ensuring that plans are accomplished. The correct sequence is

Planning — Scheduling — Controlling

Project structure is a characteristic of all projects that provides for all work being performed in some well-defined order. For example: In R&D and product planning, specifications must be determined before drawings can be made. In advertising, artwork must be made before layouts can be done. Exhibit 1.49 shows factors responsible for a successful performance of a project as well as symptoms of project management failures.
EXHIBIT 1.49 Successful Factors and Symptoms of Project Management Failures

<table>
<thead>
<tr>
<th>Factors Responsible for Successful Project Performance</th>
<th>Symptoms of Project Management Failures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization of the project</td>
<td>High costs</td>
</tr>
<tr>
<td>Authority of the project manager</td>
<td>Schedule overruns</td>
</tr>
<tr>
<td>Scheduling and planning techniques used</td>
<td>Poor-quality product</td>
</tr>
<tr>
<td>Project manager’s good relationship with senior</td>
<td>Failure to meet project objectives</td>
</tr>
<tr>
<td>management</td>
<td>Customer or user dissatisfaction with end result</td>
</tr>
<tr>
<td>Use of resources, including slack time</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Project Management’s Basic Guidelines

Basic guidelines for project management are listed next.

1. **Define the objective(s) of the project.** This includes defining management’s intent in undertaking the project, outlining the scope of the project, and describing the end results of the project including its effects on the organization.

2. **Establish a project organization.** This includes appointment of one experienced manager to run the project full time, organization of the project management function in terms of responsibilities, assignment of manpower to the project team, and maintenance of a balance of power between the functional department managers and the project manager.

3. **Install project controls.** This includes controls over time, cost, and quality.

(iii) Project Organization

Project organization is where the reporting relationships and the work location rest predominantly with the project manager. Three common types of project organization include the traditional structure, the matrix organization, and the hybrid form (see Exhibit 1.50).

EXHIBIT 1.50 Types of Project Organization

<table>
<thead>
<tr>
<th>Types of project organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional structure</td>
</tr>
<tr>
<td>Matrix organization</td>
</tr>
<tr>
<td>Hybrid form</td>
</tr>
</tbody>
</table>

In a **traditional structure**, the basic interrelationship is with the functional manager. A hierarchy of reporting relationships is followed. In a **matrix organization**, most of the personnel are directly responsible to the project manager for work assignments but remain physically located with their functional manager. Other forms of organization include combining a large project team with several small functional teams or basic functional teams with a small project task force.

Matrix team members must learn new ways of relating and working together to solve cross-functional problems and to attain synergy. According to Dr. Jack Baugh,\(^\text{15}\) the matrix management structure must be used when there is:


Original citation by Dr. Jack Baugh of Hughes Aircraft Company.
1. A rapid technological advancement, a need for timely decisions
2. A vast quantity of data to be analyzed
3. An increased volume of new products and services to be introduced
4. A need for simultaneous dual decision making
5. A strong constraint on financial and/or human resources

Baugh also cited reasons for using a matrix management structure. According to Baugh, such a structure:

1. Provides a flexible adaptive system
2. Provides timely, balanced decision making
3. Permits rapid management response to a changing market and technology
4. Trains managers for ambiguity, complexity, and executive positions
5. Helps in synergizing and motivating human resources

The hybrid form is the best possible option since it can achieve technical excellence and, at the same time, meet cost and schedule deadlines.

Project authority is a measure of the degree of control the project manager has over all the activities necessary to complete the project successfully. Delays can be reduced if the project manager can make decisions without having to wait for the approval of someone higher up. This type of delay is often the cause of schedule and cost overruns.

The authority of the project manager is seldom spelled out in formal directives or policies. The traditional forms of management—one person, one boss—is simply not adequate for completing projects.

A natural conflict can exist between the project manager and the functional manager. It is the influence rather than the authority that matters. What counts is the priority assigned to the project and the experience and personal characteristics of the project manager. There may not be any relation between the formal authority of the project manager and the actual success of the project.

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**KEY CONCEPTS TO REMEMBER: Most Common Reasons for Project Management Failures**

- The basis for a project is not sound.
- The wrong person is appointed as the project manager.
- Company management fails to provide enough support.
- Task definitions are inadequate.
- Management monitoring techniques are not appropriate.
- Project termination is not planned properly (i.e., to reduce adverse effects on the employee’s progress in the company after the project is completed).
- Redefinitions of the project’s scope are unclear.
- Large-scale design changes are occurring.
- Additional funding is not approved.
(iv) Problems in Project Management

Project managers face unusual problems in trying to direct and harmonize the diverse forces at work in the project situation. Their main difficulties arise from three sources: organizational uncertainties, unusual decision pressures, and inadequate senior management support (see Exhibit 1.51).

EXHIBIT 1.51 Nature of Project Problems

(A) Organizational Uncertainty

In a situation of organizational uncertainty, the working relationships between the project manager and the functional department managers have not been clearly defined by senior management. Uncertainties arise with respect to handling delays, cost overruns, work assignments, and design changes. Unless the project manager is skillful in handling these situations, senior management may resolve them in the interest of functional departments, at the expense of the project as a whole.

(B) Unusual Decision Pressures

When uncertainties are added to the situation, the project manager has to make decisions based on limited data and with little or no analysis. The project manager must move fast, even if it means making an intuitive decision that might expose him or her to senior management criticism. Decisions to sacrifice time for cost, cost for quality, or quality for time are common in most projects. These trade-offs are clear indications that the project manager needs support from senior management.

(C) Inadequate Senior Management Support

Senior management seldom can give the project manager as much guidance and support as his or her line counterpart gets. Delays in initial approval of the project by senior management, inability to resolve conflicts between the project manager and the functional department managers, and delays in allocating resources are the most common issues on which the project manager needs more attention from senior management. Otherwise, project performance can be hampered.

(v) Project Scheduling Techniques

The six project scheduling techniques discussed in this section are listed next.

1. Program evaluation and review techniques (PERT)
2. Critical path methods (CPMs)
3. Line-of-balance (LOB) method
4. Graphical evaluation and review technique (GERT)
5. Work breakdown structure (WBS)
6. Gantt chart

(See Exhibit 1.52.)
EXHIBIT 1.52 Project Scheduling Techniques

- Program evaluation and review technique (uses probabilities and three-time estimates, focus is on time)
- Critical path method (uses probabilities and a single-time estimate, focus is on cost)
- Line-of-balance technique (does not use probabilities, shows out-of-balance operating conditions)
- Graphical evaluation and review technique (uses probabilities, handles mutually exclusive activities)
- Work breakdown structure (does not use probabilities, provides a conceptual organization of a project)
- Gantt chart (does not use probabilities, focus is on presentation status)

(A) Program Evaluation and Review Techniques

Project management frequently uses network diagrams to plan projects, evaluate alternatives, and control large and complex projects toward completion. PERT requires extremely careful plans from the very outset of a project. These careful plans allow management to allocate resources to important areas before they become critical. Doing so will alert a manager to trouble areas or bottlenecks before they become major problems and sources of project overruns. PERT also helps to allocate resources but has no influence on the excellence of the end product.

PERT improves communication upward to the manager and the customer (client). PERT lets the supervisor believe that the project manager is doing a superior job, regardless of how well the project manager is actually performing.

PERT Features. Features of PERT are listed next.

- PERT manages one-of-a-kind programs as opposed to repetitive tasks. It develops a network diagram that identifies the sequence of events and their relationships to one another along with estimated start and completion times.

SENSITIVITY ANALYSIS AND PERT

Sensitivity analysis can be performed on the PERT network. This analysis provides the ability to check the feasibility of current schedules and to permit management to experiment with or evaluate the effects of proposed changes.

- Uncertainties involved in programs can be handled where no standard cost and time data are available.
- PERT includes a network comprised of events and activities. An event represents a specified program accomplishment at a particular instant in time. An activity represents the time and resources necessary to progress from one event to the next.
- Events and activities must be sequenced on the network under a highly logical set of two ground rules, which allow the determination of critical and subcritical paths. The ground rules are: (1) No successor event can be considered completed until all of its predecessor events have been completed; and
(2) no looping is allowed (i.e., no successor event can have an activity dependency that leads back to a predecessor event).

- Time estimates are made for each activity of the network on a three-way basis: optimistic, most likely, and pessimistic. The three time estimates are required as a gauge of the “measure of uncertainty” of the activity and represent the probabilistic nature of many tasks. The three estimates are then reduced to a single expected time and a statistical variance.

- Interrelationships of activities are depicted in a network of directed arcs (arcs with arrows, which denote the sequence of the activities they represent). The nodes, called events, represent instants in time when certain activities have been completed and others can then be started. All inward-directed activities at a node must be completed before any outward-directed activity of that node can be started. A path is defined as an unbroken chain of activities from the origin node to some other node. The origin node is the beginning of the project. An event is said to have occurred when all activities on all paths directed into the node representing that event have been completed.

**PERT Assumptions.** An assumption of PERT is that all activities are started as soon as possible. This assumption may not hold true when scarce resources must be allocated to individual activities.

**PERT Applications.** The development of a critical path network is accomplished by establishing the major milestones that must be reached. Construction of the network diagram requires identification and recording of the project’s internal time dependencies—dependencies that might otherwise go unnoticed until a deadline slips by or impacts other activities. A new activity can be added by identifying its successor and predecessor.

An ordered sequence of events to be achieved would constitute a valid model of the program. The network provides a detailed, systematized plan and time schedule before the project begins. As the project progresses, the time estimates can be refined. A top-down approach is taken when developing the network. The total project is fully planned, and all components of the plan are included.

**APPLICATIONS OF PERT AND CPM**

- Construction and maintenance of chemical plant facilities, highways, dams, buildings, railroads, and irrigation systems
- Planning of retooling programs for high-volume products in plants, such as automotive and appliance plants
- Introduction of a new product
- Installation of a computer system
- Acquisition of a company

Critical path scheduling helps coordinate the timing of activities on paper and helps avert costly emergencies. The network diagram must be developed in as much detail as possible so that discrepancies, omissions, and work coordination problems can be resolved inexpensively, at least to the extent that they can be foreseen.
Project diagrams of large projects can be constructed by sections. Within each section, the task is accomplished one arrow at a time by asking and answering these questions for each job:

- What immediately preceded this job?
- What immediately succeeds (follows) this job?
- What can be concurrent with this job?

If the maximum time available for a job equals its duration, the job is called critical. A delay in a critical job will cause a comparable delay in the project completion time. A project contains at least one contiguous path of critical jobs through the project diagram from beginning to end. Such a path is called a critical path.

**MEANING OF THE CRITICAL PATH**

Typically only about 10% to 15% of the jobs in a large project are critical. The primary purpose of determining the critical path is to identify those activities that must be finished as scheduled if the new program or project is to be completed on time. The critical path of those activities cannot be delayed without jeopardizing the entire program or project.

If the maximum time available for a job exceeds its duration, the job is called a **floater**. Some floaters can be displaced in time or delayed to a certain extent without interfering with other jobs or the completion of the project. Others, if displaced, will start a chain reaction of displacements downstream in the project.

The technological ordering is impossible if a cycle error exists in the job data (i.e., job a precedes b, b precedes c, and c precedes a). The time required to traverse each arrow path is the sum of the times associated with all jobs on the path. The critical path is the longest path in time from start to finish; it indicates the minimum time necessary to complete the entire project.

In order to accurately portray all predecessor relationships, dummy jobs often must be added to the project graph. The critical path is the bottleneck route; only by finding ways to shorten jobs along the critical path can the overall project time be reduced. The time required to perform noncritical jobs is irrelevant from the viewpoint of total project time.

**PERT Approach.** The status of a project at any time is a function of several variables, such as resources, performance, and time. Resources are in the form of dollars or what “dollars” represent—manpower, materials, energy, and methods of production; and technical performance of systems, subsystems, and components. An optimum schedule is the one that properly balances resources, performance, and time.

Information concerning the inherent difficulties and variability in the activity being estimated are reflected in the three numbers: The optimistic, pessimistic, and most likely elapsed time estimates should be obtained for each activity. The purpose of the analysis is to estimate, for each network event, the expected times (mean or average) and expected calendar time of occurrence.

When PERT is used on a project, the three time estimates are combined to determine the expected duration and the variance for each activity.
- **Optimistic**—An estimate of the minimum time an activity will take. This is based on everything going right the first time. It can be obtained under unusual, good-luck situations.

- **Most likely**—An estimate of the normal time an activity will take, a result that would occur most often if the activity could be repeated a number of times under similar circumstances.

- **Pessimistic**—An estimate of the maximum time an activity will take, a result that can occur only if unusually bad luck is experienced.

The expected times determine the critical path. The variances for the activities on this path are summed to obtain the duration variance for the project. A probability distribution for the project completion time can be constructed from this information. However, the variances of activities that do not lie on the critical path are not considered when developing the project variance, and this fact can lead to serious errors in the estimate of project duration.

An estimate of the length of an activity is uncertain. A stochastic model can be used to reflect this uncertainty. This model measures the possible variation in activity duration. It may take the form of a distribution showing the various probabilities that an activity will be completed in its various possible completion times. Alternatively, it may be nondistribution, such as range or standard deviation.

\[
\text{Expected time} = \frac{1}{6} (a + 4m + b)
\]

where

- \(a\) = Optimistic time
- \(m\) = Most likely time
- \(b\) = Pessimistic time

The expected activity times derived from a three-estimate, PERT-type calculation provide a more accurate estimate and allow the activity time variance to be calculated and included in estimates of project duration.

**APPLICATION OF PERT**

**Example**

A company is planning a multiphase construction project. The time estimates for a particular phase of the project are

- Optimistic: 2 months
- Most likely: 4 months
- Pessimistic: 9 months

**Question:** Using PERT, what is the expected completion time for this particular phase?

**Answer:**

\[
\text{Expected time} = \frac{1}{6} (a + 4m + b) = \frac{1}{6} (2 + 4 \times 4 + 9) = \frac{27}{6} = 4.5.
\]

The latest calendar time at which an event must be accomplished so as not to cause a slippage in meeting a calendar time for accomplishing the objective event is referred to as the latest time (denoted TL). The difference between the latest and expected times, \(\text{TL} - \text{TE}\), is defined as slack.
Slack can be taken as a measure of scheduling flexibility that is present in a workflow plan, and the slack for an event also represents the time interval in which it might reasonably be scheduled. Slack exists in a system as a consequence of multiple path junctures that arise when two or more activities contribute to a third.

**WHAT IS SLACK TIME?**

Slack time is free time associated with each activity. It represents unused resources that can be diverted to the critical path. Noncritical paths have slack time while critical paths have no slack time.

*Slack is extra time available for all events and activities not on the critical path.* A negative slack condition can prevail when a calculated end date does not achieve a program date objective established earlier.

The manager must determine valid means of shortening lead times along the critical path by applying new resources or additional funds, which are obtained from those activities that can afford it because of their slack condition. “Safety factor” is another name for “slack.” Alternatively, the manager can reevaluate the sequencing of activities along the critical path. If necessary, those activities that were formerly connected in a series can be organized on a parallel or concurrent basis, with the associated trade-off risks involved. Or the manager may choose to change the scope of work of a critical path alternative in order to achieve a given schedule objective.

When some events have **zero slack**, it is an indication that the expected and latest times for these events are identical. If the zero-slack events are joined together, they will form a path that will extend from the present to the final event. This path can be looked on as the critical path. Should any event on the critical path slip beyond its expected date of accomplishment, then the final event can be expected to slip a similar amount. The paths having the greatest slack can be examined for possible performance or resource trade-offs.

*When jobs or operations follow one after another, there is no slack.* The criteria for defining a subcritical event is related to the amount of slack involved in the event. Those events having as much as five weeks slack are considered subcritical.

PERT analysis permits a quantitative evaluation of conceivable alternatives. Each job in the project is represented by an arrow, which depicts the existence of the job and the direction of time flows from the tail to the head of the arrow. The arrows are then connected to show graphically the sequence in which the jobs in the project must be performed. The junctions where arrows meet are called events. These are points in time when certain jobs are completed and others must begin.

The difference between a job’s early start and its late start (or between early finish and late finish) is called total slack (TS). Total slack represents the maximum amount of time a job may be delayed beyond its early start without necessarily delaying the project’s completion time.

**KEY CONCEPTS TO REMEMBER:** Pert Time Dimensions

- **ES** = Earliest start time for a particular activity
- **EF** = Earliest finish time for a particular activity

(continued)
The manager examines the work demand and indicates if sufficient resources are available to accomplish all jobs by their early finish. If resources are insufficient, activities are rescheduled within their late finish, using project priority and available slack. Later, the manager is asked for additional resources or for a decision to delay an activity beyond its late finish.

Critical jobs are those on the longest path throughout the project. That is, critical jobs directly affect the total project time.

If the target date (T) equals the early finish date for the whole project (F), then all critical jobs will have zero total slack. There will be at least one path going from start to finish that includes critical jobs only—that is, the critical path. There could be two or more critical paths in the network, but only one at a time.

If T is greater (later) than F, then the critical jobs will have total slack equal to T − F. This is a minimum value; since the critical path includes only critical jobs, it includes those with the smallest TS. All noncritical jobs will have greater total slack.

Another kind of slack is free slack (FS). It is the amount a job can be delayed without delaying the early start of any other job. A job with positive total slack may or may not also have free slack, but the latter never exceeds the former. For purposes of computation, the free slack of a job is defined as the difference between the job’s EF time and the earliest of the ES times of all its immediate successors.

When a job has zero total slack, its scheduled start time is automatically fixed (i.e., ES + LS); to delay the calculated start time is to delay the whole project. Jobs with positive total slack, however, allow the scheduler some discretion in establishing their start times. This flexibility can usefully be applied to smoothing work schedules.

Peak load may be relieved by shifting jobs on the peak days to their late starts. Slack allows this kind of juggling without affecting project time.

**Possible Data Errors in PERT**

- The estimated job time may be in error.
- The predecessor relationship may contain cycle errors (job a is a predecessor for b, b is a predecessor for c, and c is a predecessor for a).
- The list of prerequisites for a job may include more than the immediate prerequisites (e.g., job a is a predecessor of b, b is a predecessor of c, and a and b both are predecessors of c).
Some predecessor relationships may be overlooked.

Some predecessor relationships listed may be spurious.

The errors in the PERT-calculated project’s mean and standard deviation will tend to be large if many noncritical paths each have a duration approximately equal to the duration of the critical path. However, the more slack time there is in each of the noncritical paths, the smaller will be the error.

One way to minimize errors and omissions is to continually back-check the data and challenge the assumptions. Exhibit 1.53 presents advantages and limitations of PERT.

**EXHIBIT 1.53  Advantages and Limitations of PERT**

<table>
<thead>
<tr>
<th>Advantages of PERT</th>
<th>Limitations of PERT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greatly improved control over complex development work and production programs.</td>
<td>Little interconnection between the different activities pursued.</td>
</tr>
<tr>
<td>Ability to distill large amounts of data in brief, orderly fashion.</td>
<td>Requires constant updating and reanalysis of schedules and activities.</td>
</tr>
<tr>
<td>Requires a great deal of planning to create a valid network.</td>
<td>Requires greater amount of detail work.</td>
</tr>
<tr>
<td>Represents the meaning of the management-by-exception principle.</td>
<td>Does not contain quantity information; only time information is available.</td>
</tr>
<tr>
<td>People in different locations can relate their efforts to the total task requirements of a large program.</td>
<td></td>
</tr>
<tr>
<td>“Downstream” savings are achieved by earlier and more positive action on the part of management in early project stages.</td>
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</tr>
</tbody>
</table>

The next list provides issues that should be considered during PERT implementation.

- The people and organization of a project are more important considerations than the use of a particular planning and control technique.
- Consideration should be given to managerial issues, such as project organization, personalities of project members, and operating schemes.
- There is a big difference between the criteria of success for the task to be accomplished and the criteria of success for the management system.
- The project manager is a miniature general manager. However, he or she usually lacks commensurate authority and depends on various management techniques to carry out his or her job.
- The project management approach is the preferred method to deal with one-time defined projects.
- A person making time estimates must have thorough understanding of the work to be done.
- Precise knowledge of task sequencing is required or planned in the performance of activities.
APPLICATION OF PERT

Example 1
The network in Exhibit 1.54 describes the interrelationships of several activities necessary to complete a project. The arrows represent the activities. The numbers above the arrows indicate the number of weeks required to complete each activity.

EXHIBIT 1.54 PERT Network

Question: What is the shortest time to complete the project?
Answer: The longest path from node (1) to node (8) is path 1−2−4−8. Since all other paths are shorter in duration than path 1−2−4−8, the activities along those paths can be completed before the activities along path 1−2−4−8. Therefore, the amount of time to complete the activities along path 1−2−4−8, which is 19 weeks (4 + 6 + 9), is the shortest time to complete the project.

Question: What is the critical path for the project?
Answer: The critical path is the sequence of activities that constrains the total completion time of the project. The entire project cannot be completed until all the activities on the critical path (the longest path) are completed. Path 1−2−4−8, which takes 19 weeks, is the critical path. Activities along each of the other three paths can be completed (each requires less than 19 weeks) before the activities along 1−2−4−8 can. The other three paths are: 1−2−5−8 (requires 4 + 5 + 8 = 17 weeks), 1−2−5−7−8 (requires 4 + 5 + 5 + 4 = 18 weeks), and 1−3−6−7−8 (requires 3 + 7 + 2 + 4 = 16 weeks).

Example 2
During an operational audit, an internal auditing team discovers the following document, titled Project Analysis.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time in Weeks</th>
<th>Preceding Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>A</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>B</td>
</tr>
<tr>
<td>F</td>
<td>4</td>
<td>B</td>
</tr>
<tr>
<td>G</td>
<td>1</td>
<td>C, E</td>
</tr>
<tr>
<td>H</td>
<td>5</td>
<td>D</td>
</tr>
</tbody>
</table>
Using the Project Analysis document, the audit supervisor prepares the PERT diagram shown in Exhibit 1.55.

**EXHIBIT 1.55 PERT Project Analysis**

![PERT Diagram]

**Question:** What is the earliest completion time that is indicated by the project analysis?

**Answer:** There are three paths.

- Path 1: $A\rightarrow B\rightarrow F = 3 + 3 + 4 = 10$ weeks
- Path 2: $A\rightarrow C\rightarrow G = 3 + 7 + 1 = 11$ weeks
- Path 3: $A\rightarrow D\rightarrow H = 3 + 4 + 5 = 12$ weeks

Path 3 has the earliest completion time of 12 weeks since it has the longest time to complete.

**Question:** What is the earliest time by which Node 4 would be reached?

**Answer:** There are two paths by which Node 4 can be reached.

- Path A: $A\rightarrow C = 3 + 7 = 10$ weeks
- Path B: $A\rightarrow B\rightarrow E = 3 + 3 + 2 = 8$ weeks

Path A has the earliest time of 10 weeks to reach Node 4 since it has the longest time.

**PERT Cost.** Once the network has been established, based on the project WBS, costs can be estimated. If the breakdown has been made satisfactorily, it will serve as both an estimating and actual cost accumulation vehicle. PERT cost adds the consideration of resource costs to the schedule produced by the PERT procedure. The basic PERT handles the problem of time uncertainty while PERT cost addresses cost uncertainty. Cost uncertainty as it relates to time can be handled by different cost estimates for three time differences. The ultimate objective is not only to improve planning and control but also to assess possibilities for trading off time and cost (i.e., adding or subtracting from one at the expense of the other).

There is an optimum time–cost point for any activity or job as indicated by the U shape of the curve drawn between total direct cost (on $y$-axis) versus time (on $x$-axis). It is assumed that total costs will increase with any effort to accelerate or delay the job away from this point in the case where resource application varies. Crashing the project involves shortening the critical path or paths by operating on those activities that have the lowest time–cost slopes.

At least three approaches are available to develop the cost estimates:

1. A single cost estimate of expected cost
2. Three cost estimates
3. Optimum time–cost curves
A single cost estimate of expected cost is based on the summation of the individual cost elements. The three-cost estimate approach determines the expected cost. The advantage of the three-cost estimate over the single-cost estimate is that the result is subject to probability analysis. With this expected cost, the manager cannot assume that he or she has the optimum time–cost mix.

The third approach to estimate is the optimum time–cost curve concept. This is differential costing with time as the variability factor. The intention of this approach is to optimize time and costs by using optimum estimated costs. It assumes there is a direct relationship between time and costs on any activity. This relationship can be expressed by a continuous curve. This method is also based on the concept that activities are subject to time–cost trade-offs. The optimum time–cost curve method is difficult to put into practice due to the need to develop continuous time–cost curves.

(B) Critical Path Method
The CPM is a powerful but basically simple technique for analyzing, planning, and scheduling large, complex projects. In essence, the tool provides a means of determining which jobs or activities, of the many that comprise a project, are critical in their effect on total project time and how best to schedule all jobs in the project in order to meet a target date at minimum cost. CPM is an extension of PERT.

Characteristics of Project for Analysis by CPM

- The project consists of a well-defined collection of jobs or activities that, when completed, mark the end of the project.
- The jobs may be started and stopped independently of each other, within a given sequence.
- The jobs are ordered in a technological sequence (e.g., the foundation of a house must be constructed before the walls are erected).

CPM focuses attention on those jobs that are critical to the project time. It provides an easy way to determine the effects of shortening various jobs in the project. It also enables the project manager to evaluate the costs of a crash program.

NORMAL TIME AND CRASH TIME

| Time estimates for both normal and crash options are used in the CPM method. Crash time is the time required by the path if maximum effort and resources are diverted to the task along this path. A balance can be obtained when a project manager knows what the normal time and the crash time would be. |

It is a costly practice to crash all jobs in a project in order to reduce total project time. If some way is found to shorten one or more of the critical jobs, then not only will the whole project time be shortened, but the critical path itself may shift and some previously noncritical jobs may become critical. It is physically possible to shorten the time required by critical jobs by: assigning more people to the jobs; working overtime; and using different equipment, materials, and technology.

When CPM is used in a project to develop a crashing strategy, two or more paths through the network may have nearly the same length. If the activity duration is allowed to vary, a decrease in the length of the critical path may not result in an equivalent decrease in the project duration because of the variance inherent in the parallel or alternate paths. These variations of activity
times can even allow the alternate path to become a critical path. Thus, simply allowing the activity times to vary slightly from their estimates in order to make the length of the paths different can cause serious errors in a CPM crashing strategy and lead to wasted resources and cost overruns.

**Characteristics of CPM Networks**

- CPM networks attempt to build the entire project on paper at a very early stage of the project—even when the scope is not defined, vaguely defined, or incorrectly defined. In a way, CPM is to project management what modeling or simulation is to economic studies, production problems, plant design, and transportation problems.
- CPM provides a graphic view of the entire project with completion dates, support activities, and costs affixed to every stage of the project.

---

**VALUE OF THE CRITICAL PATH TECHNIQUES**

Critical path techniques are as valuable on short- and middle-range planning jobs as they are on major and extremely complex projects.

- CPM’s single time estimate fails to consider the effects of variability in path-completion times on the crashing strategy.
- The CPM chart is an excellent tool for communicating scope as well as details of the job to other persons directly and indirectly concerned with the development and completion of the job’s various phases.
- The CPM chart serves as a permanent record and reminder of the substance of this communication to all management levels.
- The CPM chart shows the timing of management decisions.
- CPM enables the manager to measure progress (or lack of it) against plans and to take appropriate action quickly when needed. The underlying simplicity of CPM and its ability to focus attention on crucial problem areas of large projects make it an ideal tool for the senior manager.

**CPM versus PERT.** CPM and PERT methods are essentially similar in general approach and have much in common. However, important differences in implementation details exist. The two methods were independently derived and based on different concepts. Both techniques define the duration of a project and the relationships among the project’s component activities. An important feature of the PERT approach is its statistical treatment of the uncertainty in activity time estimates, which involves the collection of three separate time estimates and the calculation of probability estimates of meeting specified schedule dates.

CPM differs from PERT in two areas:

1. The use of only one time estimate for each activity (and thus no statistical treatment of uncertainty)
2. The inclusion, as an integral part of the overall scheme, of a procedure for time/cost trade-off to minimize the sum of direct and indirect project costs
Common Features of PERT and CPM

- They both use a network diagram for project representation. On the diagram, circles represent activities and arrows indicating precedence.
- They both calculate early and late start and finish times and slack time.

Exhibit 1.56 provides a comparison of CPM and PERT.

<table>
<thead>
<tr>
<th>CPM</th>
<th>PERT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPM uses a single deterministic time estimate to emphasize minimum project costs while minimizing consideration of time restraints. It is the choice of cost-conscious managers.</td>
<td>PERT uses three time estimates to define a probabilistic distribution of activity times that emphasizes minimum project duration while minimizing consideration of cost restraints. It tends to be used by time-conscious managers.</td>
</tr>
</tbody>
</table>

Although these two techniques are based on different assumptions, they are related to each other because of the obvious relationship between time and cost. The ideal network technique would combine the concepts of CPM’s crashing strategy with PERT’s probability distribution of activity times to derive the optimum project duration and cost.

(C) Line-of-Balance Technique

Line of balance (LOB) is a basic tool of project management and was an early forerunner of PERT and CPM. LOB was not as popular as PERT and CPM are. The most successful project management techniques involve methods such as CPM and PERT, which combine simplicity and clarity. These are managerial tools involving planning, scheduling, and control. CPM and PERT require complicated mathematical models while LOB does not.

- LOB can be performed manually and can be used on large production jobs, maintenance jobs, R&D jobs, and construction jobs.
- Little training is required to use the LOB technique.
- Complex, large-scale LOB problems may require a computer to solve.

LOB is a dynamic managerial tool that can show, at a glance, what is wrong with the progress of a project. It can also point to future bottlenecks. The tool is easy to develop and maintain, manually or by computer, and requires no equations or models. It forces the manager to make a plan for the program’s completion, and it presents graphical information that sometimes is overlooked in a large volume of data. It does not attempt to optimize operations, but it is a sound basic tool.

The main purpose of the LOB method is to prepare a progress study on critical operations at given times during the actual progress of the job. Each operation is checked against some target; that is, we find where each operation is with respect to where it ought to be. Operations that fall
short of target are pointed out for further analysis. LOB uses the principles of management by exception. *LOB allows the manager to pay special attention only to those activities that are both critical and do not conform to the schedule.*

The LOB technique involves four steps:

1. Develop an objective chart or delivery schedule.
2. Prepare a program chart or plan of operation.
3. Develop a progress chart including the LOB.
4. Perform the analysis.

The **objective chart** presents the cumulative delivery schedule of finished goods or services for the entire project in a graphical form. The LOB is graphically derived from the objective chart. It can also be calculated analytically, manually, or by computer.

The **program chart** is best constructed by working backward, starting with the delivery of the finished product as lead time zero. It shows the schedule of each of the critical operations with completion dates and the source and/or responsibility for each operation.

The **progress chart** is a flow process with all critical operations performed from receipt of raw materials to completion.

The objective chart and the program chart are constructed only once. Progress charts must be developed from scratch each time the project is analyzed. Progress charts therefore are good only for a specified date. The core of LOB is **performing analysis** of the progress chart. The analysis pinpoints out-of-balance operations. *It is customary to draw the objective chart, the program chart, and the progress chart on one sheet to get a big, quick picture of the entire project.***

LOB and PERT/CPM are complementary, although each can be used effectively by itself. The distinction between them is that PERT is primarily a planning and evaluation tool for one unit-type projects, such as R&D with one completion date. PERT’s major objective is to identify critical operations, but it can also be used as a control tool by pinpointing deviations from actual performance and rescheduling accordingly.

LOB monitors a project involving many units to be shipped at certain intervals. LOB can also be used in large projects with one completion date. LOB deals both with operations and components and inventories. PERT deals with only one unit and its critical operations. PERT in general requires a computer while LOB is essentially a graphic, manual tool.

LOB and PERT are related to each other. LOB can complement PERT in this way: Once the critical path has been identified, it can be used as part of the program or the production plan of LOB. Other thinking is that these two techniques can be integrated into a single management planning and control system that can be employed from planning stages through production and delivery for a given quantity of items.

*Major assumptions of LOB include:* The production method is independent of quantities, critical operations do not change with time, and lead time is constant or known with certainty. These assumptions can be related, making the LOB method more complex than PERT and CPM.
Reasons for LOB’s low popularity include:

- Lack of awareness of the technique and its potential applicability and advantages
- Management skepticism, which is common to all managerial techniques
- The lack of a canned computer program for LOB
- Lack of a sound delivery forecast, which is necessary and which is difficult to obtain, considering the difficulty of obtaining market demand and supply forecast
- Requires deterministic lead times (i.e., a single estimate) when, in fact, a range is better

<table>
<thead>
<tr>
<th>PERT VERSUS CPM VERSUS LOB</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERT considers the time domain only.</td>
</tr>
<tr>
<td>CPM considers cost information only.</td>
</tr>
<tr>
<td>LOB considers quantity information only.</td>
</tr>
<tr>
<td>PERT is good for production prototype construction, assembly, and test of final production equipment that is still high on the learning curve</td>
</tr>
<tr>
<td>PERT can be applied to smaller projects, single projects, large projects, and multiple projects</td>
</tr>
<tr>
<td>PERT, CPM, and LOB can be integrated to get maximum benefits</td>
</tr>
</tbody>
</table>

(D) **Graphical Evaluation and Review Technique**

The GERT system permits the modeling of a wide variety of situations not possible with traditional PERT/CPM models. Simulation programs can be used to implement GERT, since it uses stochastic networks (i.e., networks in which certain arcs, representing activities, have designated probabilities of occurrence). GERT allows the performance of alternative, mutually exclusive activities, which are not allowed in the PERT/CPM method. In GERT, activity performance times can be expressed as probability distributions. Heuristic sequencing rules are used to give good resource-feasible schedules.

(E) **Work Breakdown Structure**

The WBS was first intended to be the common link between schedules and costs in PERT cost application. Later it became an important tool for conceptual organization of any project. The WBS provides the necessary logic and formalization of task statements. It prepares the work packages, which usually represent the lowest division of the end items.

(F) **Gantt Chart**

The Gantt chart is a bar chart that is essentially a column chart on its side and is used for the same purpose. The horizontal bar chart is a tool that allows a manager to evaluate whether existing resources can handle work demand or whether activities should be postponed. The Gantt chart is used for milestone scheduling where each milestone has a start and completion date. A milestone represents a major activity or task to be accomplished (e.g., a design phase in a computer system development project).

The Gantt chart is a graphical illustration of a scheduling technique. The structure of the chart shows output plotted against units of time. It does not include cost information. It highlights
activities over the life of a project and contrasts actual times with projected times. It gives a quick picture of a project’s progress in regard to the status of actual time lines and projected time lines. Exhibit 1.57 presents advantages and disadvantages of PERT and Gantt charts.

**EXHIBIT 1.57  Advantages and Disadvantages of PERT and Gantt Charts**

<table>
<thead>
<tr>
<th>Advantages</th>
<th>PERT</th>
<th>Gantt chart</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>A good planning aid.</td>
<td>A good planning tool.</td>
</tr>
<tr>
<td></td>
<td>Interdependencies between activities can be shown.</td>
<td>A graphical scheduling technique that is simple to develop, use, and understand.</td>
</tr>
<tr>
<td></td>
<td>Network diagram is flexible to change.</td>
<td>Useful for large projects.</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Activity times are probabilistic.</td>
<td>Shows a sequence of steps or tasks.</td>
</tr>
<tr>
<td></td>
<td>A good scheduling tool for large, nonroutine projects.</td>
<td>Actual completion times can be compared with planned times.</td>
</tr>
<tr>
<td></td>
<td>A good tool in predicting resource needs, problem areas, and impact of delays on project completion.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disadvantages</th>
<th>PERT</th>
<th>Gantt chart</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disadvantages</strong></td>
<td>Difficult to apply to repetitive assembly line operations where scheduling is dependent on pace of machines.</td>
<td>Interrelationships among activities not shown on chart.</td>
</tr>
<tr>
<td></td>
<td>Large and complex projects are difficult to draw manually.</td>
<td>Inflexible to change.</td>
</tr>
<tr>
<td></td>
<td>Requires computer hardware and software to draw a complex network.</td>
<td>Activity times are deterministic.</td>
</tr>
<tr>
<td></td>
<td>Requires training to use the computer program.</td>
<td>Difficult to show very complex situations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cannot be used as procedure documenting tool.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Does not show critical path in chain of activities.</td>
</tr>
</tbody>
</table>

**WHAT ARE SOPHISTICATED TECHNIQUES FOR PROJECT MANAGEMENT?**

- PERT, GERT, and CPM techniques are more sophisticated scheduling methods due, in part, to the consideration of probabilities.
- LOB, WBS, Gantt charts, bar charts, and milestones are less sophisticated scheduling methods due, in part, to not considering the probabilities.
- GERT handles alternate, mutually exclusive activities, while PERT/CPM cannot.

If PERT is used, there may be a lower probability of a cost/schedule overrun because of its sophistication as a scheduling method compared to less sophisticated methods such as Gantt charts, milestone scheduling, line of balance, and bar charts. If there is a slack time, there is no need to use sophisticated and tight scheduling methods, such as PERT.
(vi) Project Controlling Methods
In any project, at least four major types of controls will be applied: time control, cost control, quality control, and earned value management (EVM) control. Sometimes other types of controls are also used (e.g., logs, checklists, and status reports).

**Time Control.** Project network scheduling begins with the construction of a diagram that reflects the interdependencies and time requirements of the individual tasks that make up a project. Work plans must be prepared in advance of the project. Once the overall schedule is established, weekly or biweekly review meetings should be held to check progress against schedule. Control must be rigorous, especially at the start, so that immediate corrective action is taken for missed commitments.

**Cost Control.** Periodic reports showing the budget, the actual cost, and variances are good starts for cost controls. It is necessary to break the comprehensive cost summary reports into work packages or major tasks and focus on major problems and opportunities. The cost reports should be distributed to technical and functional managers.

**Quality Control.** Quality control comprises three elements: defining performance criteria, expressing the project objective in terms of quality standards, and monitoring progress toward these standards. Examples of performance criteria include market penetration of a product line and processing time for customer inquiries. Both quantitative and qualitative measures need to be defined.

**EVM Control.** EVM control provides a standard means of objectively measuring work accomplished based on the budgeted value of that work—it is what you got for what it cost. EVM is a project management technique that integrates cost, schedule, and technical performance measures to monitor and control project resources and compile results into one set of metrics so that effective comparisons can be made. It also helps evaluate and control project risk by measuring project progress in monetary terms. It provides the project manager with a more complete picture of the health of the entire project, not just certain segments of the project.

EVM incorporates three vital aspects of effective project/program management: scoping, costing, and scheduling. EVM is a technique aimed at comparing resource planning to schedules and to technical, cost, and schedule requirements.

The EVM technique serves two distinct purposes: It encourages the effective use of internal cost and schedule management systems, and it affords the organization the ability to rely on timely data produced by those systems for determining product-oriented contracts status. In order to perform an EVM analysis, you need to start with a solid baseline schedule that accurately reflects how much work is planned for each time period. After this baseline is determined and captured, work becomes earned in hours and dollars as work is performed. This earned work is then compared to the initial resource allocation estimates in order to determine if the project or investment has utilized its resources meaningfully and cost efficiently.

**EXAMPLE OF APPLICATION OF EVM TECHNIQUE**

**Schedule and Cost Variances**

The percentage complete estimate method allows the project manager in charge of the work package to make a monthly or quarterly estimate of the percentage of completed work. These estimates are expressed as cumulative values against 100% of the milestone value. The earned value is then calculated by applying that percentage to the total budget for that work package.
Project A is authorized with a budget of $1,000,000 over a four-quarter, one-year time period. The planned value for the first quarter called for an accomplishment of 30%, or $300,000 \((0.30 \times 1,000,000)\) in the value of the work scheduled. Actual costs are amounted to $250,000. The earned value estimate is based on 20% of work completed, or $200,000 \((i.e., 0.20 \times 1,000,000)\).

\[
\text{Schedule variance} = \text{Earned value} - \text{Planned value} = 200,000 - 300,000 = -100,000
\]

\[(i.e., \text{a negative amount means the project is behind schedule)}\]

\[
\text{Cost variance} = \text{Earned value} - \text{Actual costs} = 200,000 - 250,000 = -50,000
\]

\[(i.e., \text{a negative amount means the project is experiencing a cost overrun)}\]

**Schedule and Cost Performance Indices**

\[
\text{Schedule performance index (SPI)} = \frac{\text{Earned value}}{\text{Planned value}} = \frac{200,000}{300,000} = 0.67
\]

\[
\text{Cost performance index (CPI)} = \frac{\text{Earned value}}{\text{Actual costs}} = \frac{200,000}{250,000} = 0.80
\]

A project with SPI and CPI of 1.0 is good, less than 1.0 is not good, and the largest negative value should be given a top priority to work on first.

**Forecast of Final Project Costs**

A range of final cost requirements can be forecast for project A using the SPI and CPI indices as follows:

- **Low-end forecast is:**

  \[
  \text{Total budget value}/\text{SPI} = \frac{1,000,000}{0.67} = 1,492,537 = 1.5 \text{ million (approximately)}
  \]

- **High-end forecast is:**

  \[
  \text{Total budget value}/(\text{SPI} \times \text{CPI}) = \frac{1,000,000}{(0.67 \times 0.80)} = \frac{1,000,000}{0.536} = 1,865,672
  \]

  \[
  = 1.9 \text{ million (approximately)}
  \]

A range of final cost projection between a minimum of $1.5 million and a maximum of $1.9 million is needed to complete project A.

EVM is most effective when implemented using a bottom-up approach. Such an approach dictates that information is planned and managed in small increments that can be quickly and accurately cumulated to view and manage the project as a whole. Examining small, manageable chunks is a more efficient way to identify problems and root causes, and allows the project manager to assess the health and risks of a project more accurately. Generally, small milestones are easier to plan for (their scope can be defined more specifically) and can be measured more objectively than large ones. Project managers should ensure that milestones (or submilestones) are as small and specific as possible in terms of scheduling. It is good to limit milestone duration to a single fiscal year (or less) instead of multiyear milestones.

**Other Types of Project Controls.** Since a project can have a number of people working on it for a long time, monitoring and control become essential management tools. Formal control techniques include: change-management policy, procedures, and forms; logs; checklists; and status reports. Phone conversations and face-to-face communications are some examples of informal control techniques. Where possible, formal control techniques should be practiced, since they provide some evidence as to what has been said and when to resolve a question or dispute.
(vii) Project Governance Mechanisms

Project governance mechanisms include establishing a project steering committee and a project oversight board and conducting a project management audit.

The **project steering committee** is a high-level committee to integrate several functions of the organization. The **project oversight board** is similar to the steering committee except that it is focused on a specific project at hand. The board:

1. Reviews the project request and scope.
2. Assesses the project impact.
3. Approves the project funding.
4. Challenges the costs, schedules, and benefits.
5. Monitors the project progress.
6. Reviews project deliverables.
7. Solves project-related problems.

Regarding the project scope, the board determines what is in scope and what is out of scope so that scope creep does not happen. Any changes in project scope are controlled by change management procedures.

(viii) Project Management Audit

The scope of a project management audit consists of: reviewing project planning, organizing, staffing, and directing activities; controlling tasks for effectiveness and efficiency; and determining whether project objectives and goals are achieved.

The major objective of the project management process, which is part of the software assurance process, is to establish the organizational structure of the project and assign responsibilities. The process uses the system requirements documentation and information about the purpose and criticality of the software, required deliverables, and available time and other resources to plan and manage the software development and maintenance processes. The project management process begins before software development starts and ends when its objectives have been met. The process overlaps and often repeats other software assurance processes. It establishes/approves standards, implements monitoring and reporting practices, develops high-level policy for quality, and cites laws and regulations for compliance. An audit program is suggested next.

A. Review the next 10 activities performed by the project manager in the project planning area.

1. Set objectives or goals; determine the desired outcome for the project:
   a. Analyze and document the system and software requirements; define the relationships between the system and software activities.
   b. Determine management requirements and constraints (resource and schedule limitations)
   c. Define success criteria; always includes delivery of software that satisfies the requirements, on time and within budget.
2. Plan for corrective action.

3. Develop project strategies—decide on major organizational goals (e.g., quality), and develop a general program of action for reaching those goals.

4. Develop policies for the project—make standing decision on important recurring matters to provide a guide for decision making.

5. Determine possible courses of action—develop and analyze different ways to conduct the project; anticipate possible adverse events and project areas; state assumptions; develop contingency plans; predict results, possible courses of action.

6. Make planning decisions—evaluate and select a course of action from among alternatives. This includes:
   a. Choosing the most appropriate course of action for meeting project goals and objectives.
   b. Making trade-off decisions involving costs, schedule, quality, design strategies, and risks.
   c. Selecting methods, tools, and techniques (both technical and managerial) by which the output and final product will be developed and assured and the project will be managed.

7. Set procedures and rules for the project—establish methods, guides, and limits for accomplishing the project activities.

8. Select scheduling process appropriate for development and maintenance methods.

9. Prepare budgets—allocate estimated costs (based on project size, schedule, staff) to project functions, activities, and tasks, and determine necessary resources.

10. Document, distribute, and update project plans.

B. Review the next six activities performed by the project manager in the project organizing area.

1. Identify and group required tasks—tasks are grouped into logical entities (e.g., analysis tasks, design tasks, coding tasks, test tasks) and are mapped into organizational entities.

2. Select and establish organizational structures—define how the project will be organized (e.g., line, staff, or matrix organization) using contractual requirements and principles of independent verification and validation.

3. Create organizational positions—specify job titles and position descriptions.

4. Define responsibilities and authorities—decide who will have the responsibility of completing tasks and who has the authority to make decisions related to the project.

5. Establish position qualifications—identify the qualities personnel must have to work on the project (e.g., experience, education, programming languages, tool usage).


C. Review the next eight activities performed by the project manager in the project staffing area.
1. Fill organizational positions—fill the jobs established during organizational planning with qualified personnel.

2. Assimilate newly assigned personnel—familiarize newly assigned personnel with any project procedures, facilities, equipment, tools, or plans.

3. Educate and train personnel as necessary.

4. Provide for general development of project staff members.

5. Evaluate and appraise personnel.

6. Compensate project personnel (e.g., salary, bonus).

7. Terminate project assignments—reassign or terminate personnel at the end of a project.


D. Review the next seven activities performed by the project manager in a project leading area.

1. Provide leadership—the project manager provides direction to project members by interpreting plans and requirements.

2. Delegate project authority.

3. Build project teams.

4. Coordinate and communicate project activities between in-house and contractor personnel.

5. Resolve project conflicts.

6. Manage changes after considering the inputs, outputs, costs/benefits.


E. Review the next five activities performed by the project manager in the project controlling area.

1. Develop standards of performance—select or approve standards to be used for the software development and maintenance activities.

2. Establish monitoring and reporting systems, such as milestones, deliverables, and schedules.

3. Analyze results by comparing achievements with standards, goals, and plans.

4. Apply corrective action to bring requirements, plans, and actual project status into conformance.

5. Document the controlling methods used.

(b) Change Management Methods

(i) Agents of Change

Organizations must change to survive in a competitive environment. This requires everyone in the organization to believe in and accept the change. Ideally, managers need to be architects or agents of change rather than victims of change. When introducing changes, managers often are
surprised that things do not turn out as planned. This is because the change process is not carried out properly. The change itself is not the problem. When managers are acting as agents of change, their company will be much more responsive, flexible, and competitive. In addition to managers, internal auditors can act as change agents due to their nature of work. Auditors facilitate change through their recommendations to management. Each recommendation auditors make requires some change in existing policies, procedures, and practices or creation of new ones.

(ii) How to Change
A corporation can change in a number of ways. These include:

- Reengineering business policies, processes, jobs, and procedures; outsourcing nonstrategic activities.
- Partnering with major suppliers and customers.
- Implementing total quality management programs.
- Redesigning the organizational structure to fit the business strategy.
- Renovating physical plants and facilities.
- Installing computer-based systems and technologies.
- Understanding its own products, services, markets, and customers and those of competitors.
- Installing performance measurement methods and reward systems.

PROMOTERS VERSUS RESISTORS OF CHANGE
People at the top of the organization usually promote change because they have clear vision and better goals to achieve.

People at the bottom of the organization usually resist change the least because they know how bad things really are at their level.

People at the middle of the organization usually resist change the most because they know neither top management goals nor how bad things really are at the bottom. They are in a confused stage since they know neither the top nor the bottom.

(iii) Types of Organizational Change
Organization psychologists David Nadler and Michael Tushman developed an instructive typology of organizational change describing four types of changes (see Exhibit 1.58).16

EXHIBIT 1.58 Typology of Organizational Change

<table>
<thead>
<tr>
<th>Type</th>
<th>Incremental</th>
<th>Strategic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipatory</td>
<td>Tuning 1</td>
<td>Reorientation 3</td>
</tr>
<tr>
<td>Reactive</td>
<td>Adaptation 2</td>
<td>Re-creation 4</td>
</tr>
</tbody>
</table>

As the exhibit shows, **anticipatory changes** are any systematically planned changes intended to take advantage of expected situations (e.g., following demographics). **Reactive changes** are those necessitated by unexpected environmental events (e.g., responding to competitor’s action). **Incremental changes** involve subsystem adjustments needed to keep the organization on its chosen path (e.g., adding a third shift in a manufacturing plant). **Strategic changes** alter the overall shape or direction of the organization (e.g., switch from building houses to apartments by a construction contractor).

The four specific types of organizational change that result from the previous exhibit are tuning, adaptation, reorientation, and re-creation (see Exhibit 1.59).

### EXHIBIT 1.59 Specific Types of Organizational Change

<table>
<thead>
<tr>
<th>Change Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuning</td>
<td>Decreased complexity, low integrity, low risk</td>
</tr>
<tr>
<td>Adaptation</td>
<td></td>
</tr>
<tr>
<td>Reorientation</td>
<td>Increased complexity, high integrity, high risk</td>
</tr>
<tr>
<td>Re-creation</td>
<td></td>
</tr>
</tbody>
</table>

In this exhibit, **tuning** is the most common form of organizational change covering preventive maintenance and continuous improvement. The major thrust of tuning is to actively anticipate and avoid problems rather than passively waiting for things to go wrong before taking action. *Managers should seek change, not just expect change.*

**Adaptation**, like tuning, involves incremental changes. The difference is that the changes are in reaction to external problems, events, or pressures. The **reorientation** change is anticipatory and strategic in scope. It is also called frame bending because the organization is significantly redirected while continuing its original mission. **Re-creation** is a type of change that is reactive and strategic in scope. It is also called frame breaking because the new organization is completely different from the organization of the past.

**(iv) Resistance to Change**

Organizational change comes in all forms, sizes, and shapes and with various degrees of impacts and consequences for employees. Some of the most common reasons for resistance to change are listed next.

- Surprise
- Inertia
- Misunderstanding
- Emotional side effects
- Lack of trust
- Fear of failure
- Personality conflicts
- Lack of tact
- Threat to job status or security
- Breakup of work groups

Management faces the challenge of foreseeing and neutralizing resistance to change, as the resistance is both rational and irrational.

Management theorists have offered at least six options to overcome resistance to change:

1. Education and communication
2. Participation and involvement
3. Facilitation and support
4. Negotiation and agreement
5. Manipulation and co-optation
6. Explicit and implicit coercion

Situational appropriateness is the key to success.

- **Education and communication.** This option promotes prevention rather than cure. The idea here is to help employees understand the true need for a change as well as the logic behind it. Various media may be used, including face-to-face discussions, formal group presentations, and special reports or publications. **Advantages:** Once persuaded, employees will help with the implementation of the change. **Drawbacks:** Education and communication can be time consuming if many employees are involved.

- **Participation and involvement.** Personal involvement through participation tends to defuse rational and irrational fears about a workplace change. Involvement in the design and implementation of a change makes one become an owner of the change process and its success. **Advantages:** Participation and involvement lead to commitment from employees. **Drawbacks:** Participation and involvement can be time consuming if participators design an inappropriate change.

- **Facilitation and support.** Support from management in the form of special training, job stress counseling, and compensatory time off can be helpful when fear and anxiety are responsible for resistance to change. **Advantages:** No other approach works as well with adjustment problems. **Drawbacks:** Facilitation and support can be time consuming and expensive and still can fail.

- **Negotiation and agreement.** Management can neutralize resistance to change by exchanging something of value for cooperation. **Advantages:** Negotiation and agreement are relatively easy ways to avoid major resistance. **Drawbacks:** Negotiation and agreement can be too expensive in many cases if others are alerted to negotiate for compliance.

- **Manipulation and co-optation.** Manipulation occurs when managers selectively withhold or dispense information and consciously arrange events to increase the chance that a change will be successful. Co-optation normally involves token participation of employees, and the impact of their input is negligible. **Advantages:** It can be a relatively quick and inexpensive
solution to resistance problems. **Drawbacks:** The process can lead to future problems if people feel manipulated.

- **Explicit and implicit coercion.** Managers who cannot or will not invest the time required for the other strategies can force employees to go along with a change by threatening them with termination, loss of pay raises or promotions, transfer, and so forth. **Advantages:** Coercion is speedy and can overcome any kind of resistance. **Drawbacks:** This process can be risky if it leaves employees mad at the initiators.

**(v) Factors to Consider during the Change Process**

Internal auditors should consider the following factors during their audit work:

- A real paradigm shift is needed for changes to take place. Excuses like “It is company policy” and “We have no resources” no longer work. Forward-looking people are needed.
- Motivating stakeholders (employees, customers, and suppliers) can have a multiplier effect on the change initiative. Stakeholder involvement in problem solving and knowledge sharing is vital.
- The active performance measures are not always obvious. They should be made explicit.
- During the change implementation process, expect setbacks and roadblocks. Address them on a case-by-case basis.
- Communicating honestly is important. Act straightforward with all stakeholders.
- Use the grapevine to a project’s advantage; do not let the project be abused by it.
- Empower employees so they feel that they have real influence over standards of production, quality, and service. Empowering people brings significant changes in employees’ behavior. However, managers who do the empowering must also change. Empowerment means that employees have the correct knowledge and appropriate tools to do things well, not just have the authority to do the job.
- Identify the barriers to change. If possible, dismantle them; at the least, deal with them.
- Today’s change projects require border crossing of departments, divisions, suppliers, and customers. Borderless projects should be encouraged since border-bound projects like to maintain their own turf.
- A goal-focused and results-oriented performance measurement system is needed to institutionalize the changes since performance measures are a primary strategy deployment tool. Do not settle for a single measurement; instead, opt for a set of measures.
- Understand and consider the cultural differences at the workplace. Do not discount them.

**(vi) Organizational Development**

Organizational development (OD) is a systematic approach to planned change programs intended to help employees and organizations function more effectively. OD combines the knowledge from various disciplines, such as behavioral science, psychology, sociology, education, and management. OD is a process of fundamental change in an organization’s culture. For OD programs to be effective, not only must they be tailored to unique situations, but they also must meet the seven common objectives in order to develop trust. **Problem-solving skills, communication, and cooperation are required for success.**
1. Deepen the sense of organizational purpose and align individuals with that purpose.
2. Strengthen interpersonal trust, communication, cooperation, and support.
4. Develop a satisfying work experience capable of building enthusiasm.
5. Supplement formal authority with authority based on personal knowledge and skill.
6. Increase personal responsibility for planning and implementing.
7. Encourage personal willingness to change.

Organization development brings out pros and cons.

**Pros:** General management lacks a systematic approach and is often subject to haphazard, bits-and-pieces management style. OD gives managers a vehicle for systematically introducing change by applying a broad selection of management techniques as a unified and consistent package. This approach leads to greater personal, group, and organizational effectiveness.

**Cons:** The seven common objectives listed above are not new. They have been addressed by one or another management techniques.

(A) OD Process

Social psychologist Kurt Lewin recommended that change agents unfreeze, change, and then refreeze social systems related to three major phases or components of OD.\(^\text{17}\)

Unfreezing phase → Change phase → Refreezing phase

Unfreezing involves neutralizing resistance by preparing employees for change. Change involves implementing the change strategy. Refreezing involves systematically following up a change program for permanent results.

(B) Unfreezing Phase

The objective of the unfreezing phase is to assess the situation and suggest an appropriate change strategy. The scope of work includes making announcements, holding meetings, and launching a promotional campaign in the organization’s newsletter and on bulletin boards. The goal is to deliver a clear message to employees about the change. Management needs to avoid creating unrealistic expectations such as miracles.

During the unfreezing phase, management may choose to diagnose the situation by using several approaches, such as:

- Reviewing records (personnel or financial) for signs of excessive absenteeism, cost overruns, budget variances.
- Interviewing employees with specific questions about their job and the organization.
- Mailing survey questionnaires for opinions and suggestions.
- Observing employees at work, since people tend to say one thing and do another.

\(^\text{17}\) Ibid.
After the data are collected and compiled, it is good to compare the results with past results to see how things have changed. This would help in mapping a future course of action.

(C) Change Phase

The objective of the change phase is to implement the change strategy through enhanced collaboration and cooperation. In this phase of intervention, the wheels of change are set in motion. “Intervention” here means that a systematic attempt will be made to correct an organizational deficiency uncovered through diagnosis.

Six popular OD interventions designed to increase effectiveness are listed next.

1. Life and career planning
2. Skill development
3. Role analysis
4. Team building
5. Survey feedback
6. Grid OD

These six interventions are grouped into three categories: individual, group, and entire organization targets, as shown in Exhibit 1.60.

EXHIBIT 1.60 Organization Development Interventions

<table>
<thead>
<tr>
<th>Individual</th>
<th>Group</th>
<th>Entire organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life and career planning</td>
<td>Role analysis</td>
<td>Survey feedback</td>
</tr>
<tr>
<td>Skill development</td>
<td>Team building</td>
<td>Grid OD</td>
</tr>
</tbody>
</table>

Individual Interventions. The overall objective of life and career planning is to get individuals to define their personal goals for growth and development and to plan ways to achieve them. Here an assumption is made that organizational growth and development is a function of individual growth and development. The overall objective of skill development is to place emphasis on learning how to do a job in terms of delegation, problem solving, conflict resolution, and leading. Skill development deals with content rather than process.

Group Interventions. The overall objective of role analysis is to define a prescribed way of behaving. A systematic clarification of interdependent task and job behavior is made. The overall objective of team building is to emphasize interactive group processes, the “how” of effective group behavior. This intervention is the most widely used HR development technique.
Entire Organization Interventions. The overall objective of survey feedback is to inform employees where they stand in relation to others on important organizational issues so that constructive problem solving can take place. Effective feedback should be relevant, understandable, descriptive, verifiable, controllable, comparative, and inspiring. The overall objective of grid OD is to present a package covering several OD interventions arranged in an orderly and coherent fashion. OD grid is based on Blake and Mouton’s leadership grid, a popular OD approach.

(D) Refreezing Phase
The objective of the refreezing phase is to address unanticipated problems and side effects and to maintain positive changes. The effectiveness of change strategy is also evaluated. The scope includes follow-up and monitoring to ensure lasting change.

Maintaining Positive Changes. The goal is to induce employees to behave differently and positively. This calls for more cooperation, more collaboration, and more productivity among employees. Some of ways to maintain positive changes include top management support, peer group support, and a formal reward and punishment system, all of which lead to a supportive climate for change on the job.

Evaluating the OD Program. An objective evaluation of results is desired even though it is difficult, time consuming, and expensive. According to a statistical analysis conducted by Neuman, Edwards, and Raju:

- Combined interventions were more effective at improving employee attitudes and satisfaction than were single-technique interventions.
- Team building was the most effective OD intervention for improving attitudes and satisfaction.
- OD interventions tend to have a stronger influence on attitudes than on satisfaction.
- The empirical linkages between OD interventions and productivity are not strong.

1.9 Business Contracts
This section discusses three major topics: law of agency, law of sale, and law of contracts. Regarding contracts, it recognizes the various forms and elements of contracts, including requirements of a contract (e.g., formality and consideration), classification of contracts (e.g., unilateral and bilateral), and damages resulting from a contract (e.g., compensatory and consequential). In addition, this section presents several topics related to contracts, such as product reviews and warranties, ultra vires and intra vires legal actions, and contractual issues with IP assets.

(a) Law of Agency
The law of agency or agency law deals with business duties, relationships, and obligations between a principal and his or her agents. Agency law establishes the ground rules (boundaries) about what a principal or agent can and cannot do to fulfill duties, responsibilities, and obligations. Usually, agents can be one or more individuals whereas the principal can be only one person.

Both the law of agency and the law of contracts apply to procurement because purchasers (buyers) enter into contracts with suppliers, vendors, and contractors as an agent and employee.

- **Law of Agency**
  - Company (principal) → Buyer (agent)
  - Company (principal) → Salesperson (agent)
  - Company (principal) → Employee (agent)
  - Company (principal) → Consultant/Contractor (agent)
  - Shareholder (principal) → Manager (agent)

Three types of authority can exist between the principal and the agent: actual authority, apparent authority, and ratified authority. Both principal and agent have their own duties to perform.

- **Actual authority**, whether explicit or implicit, occurs when the principal gives the authority to the agent with consensus agreement. The principal is bound to this authority and cannot deny it.

- **Apparent authority** (also called agency by estoppel) occurs based on the principal’s words or conduct, and the principal cannot deny it if third parties relied on it. Apparent authority is based on impressions of the third parties.

- **Ratified authority** occurs when the principal accepts the liability from third parties even if the agent acted without authority.

**Duties of a principal** require duty to compensate an agent, duty to reimburse the agent, duty to indemnify the agent, and duty to cooperate with the agent.

**Duties of an agent** require duty of performance to a principal, duty of notification to the principal, and duty of accountability to the principal. In addition, an agent should not involve in self-dealing, usurp an opportunity, compete with the principal, or misuse confidential information, and should not maintain a dual-agency relationship (i.e., one agent reporting to two principals at the same time).

**b) Law of Sale**

The sale of personal property is a large part of commercial activity. Article 2 of the Uniform Commercial Code (the Code, or UCC) governs such sales in all states except Louisiana. The Code has its own contract law. Common law governs all general contracts outside the scope of the UCC’s contract law.

A sale consists in the passing of title to goods from seller to buyer for a price. A contract for sale includes both a present sale of goods and a contract to sell goods at a future time. The Code essentially defines goods and products as tangible personal property. Personal property is any property other than an interest in real property (land and any attachments to it such as buildings).

**Example 1:** Examples of personal property covered by the UCC transactions include the purchase of a TV set, an automobile, or a textbook because they represent a sale of goods.
Example 2: The Code does not apply to employment contracts, service contracts, insurance contracts, contracts involving real property, and contracts for the sale of intangible assets (e.g., trademarks, patents, and copyrights). These transactions continue to be governed by general contract law.

(c) Law of Contracts

Every business enterprise, whether large or small, will enter into contracts with its employees, its suppliers of goods and services, and its customers in order to conduct its business operations. Thus, contract law is an important subject for business managers. Contract law is also basic to other fields of law, such as agency, partnerships, corporations, sale of personal property, commercial paper, and secured transactions. Note that contracts are primarily governed by state common law.

Law of contracts or general contract laws can be applied to business contracts where they are governed by state common law. A contract is a binding agreement between two or more parties that the courts will enforce. It is a promise or a set of promises for the breach of which the law gives a remedy, cure, relief, or the performance of which the law in some way recognizes a duty. A promise manifests or demonstrates the intention to act or to refrain from acting in a specified manner.

Those promises that meet all of the essential requirements of a binding contract are contractual and will be enforced. All other promises are not contractual, and usually no legal remedy is available for a breach of or a failure to properly perform these promises. The remedies provided for breach of contract include compensatory damages, equitable remedies, reliance damage, and restitution. Thus, a promise may be contractual (and therefore binding) or noncontractual. In other words, all contracts are promises, but not all promises are contracts.

When properly executed, business contracts can turn into purchase orders, invoices, and payments between the contracting parties.

Business Contracts → Purchase Orders → Invoices → Payments

(i) Definition of a Contract

Contracts are legal documents that describe terms and conditions under which two or more willing parties agree to commit, honor, and discharge their respective duties and obligations to each other as defined in the contract (i.e., work products and deliverables). It describes penalties for breach of contract and remedies for damages.

(ii) Requirements of a Contract

In most cases, an oral contract is binding and enforceable. However, in a limited number of instances, contracts must be in writing. Moreover, for a contract to be valid, there must be an absence of invalidating conduct, such as duress, undue influence, misrepresentation, or mistake. It is always a good practice for a contract to be in writing because it avoids miscommunications and misunderstandings.

The parties can be principals or qualified agents. The parties cannot engage in any fraudulent activities. The use of force or coercion to reach an agreement is not acceptable in signing a contract because both parties must enter into the agreement on their own free will. Both parties must indicate a willingness to enter into the agreement and be bound by its terms.
A promise meeting all of these requirements is contractual and legally binding. However, if any requirement is unmet, the promise is noncontractual.

The five basic requirements of a contract include:

1. Mutual assent (agreement by offer and acceptance).
2. Consideration (either express or implied mutual obligation).
3. Legality of object and subject matter (must be for a legitimate purpose, not for criminal and illegal purposes, or not against the public policy). If the purpose is illegal, the resulting contract is null and void.
4. Capacity (only competent parties can have the full capacity to contract; adjudicated incompetents have no capacity to contract; and minors, incompetent persons, and intoxicated persons have limited capacity to contract).
5. Formality (i.e., in writing).

**Mutual Assent.** The parties to a contract must manifest by words or conduct that they have agreed to enter into a contract. The usual method of showing mutual assent is by offer and acceptance. An offer is a proposal or expression by one person that he or she is willing to do something for certain terms. A contract does not exist until the offer is formally accepted, either verbally or in written form. The offer and acceptance have to match. If they match, there is an agreement leading up to a contract. If they do not, it is more like a negotiation, to which someone responds with a counteroffer rather than an acceptance, which continues until both parties reach an agreement or a meeting of the minds.

**Consideration.** Each party to a contract must intentionally exchange a legal benefit or incur a legal detriment as in inducement to the other party to make a return exchange. Consideration is a form of mutual obligation. In the business world, mutual promises in a contract of sale, whether express or implied, are generally sufficient consideration.

**Legality of Object and Subject Matter.** The purpose of a contract must not be criminal, illegal, or otherwise against public policy. If the purpose is illegal, the resulting contract is null and void. The performance of a party in regard to the contract must not be an unlawful act if the agreement is to be enforceable. However, if the primary purpose of a contract is legal, but some terms contained within the agreement are not, then the contract may or may not be itself be illegal, depending on the seriousness of the illegal terms and the degree to which the legal and illegal terms can be separated.

**Capacity.** The parties to a contract must have contractual capacity. Certain persons, such as adjudicated incompetents, have no legal capacity to contract, while others, such as minors, adjudicated incompetents, and intoxicated persons, have limited capacity to contract. All others have full contractual capacity. The parties can be principals or qualified agents. The parties cannot engage in any fraudulent activities. The use of force or coercion to reach an agreement is not acceptable in signing a contract because both parties must enter into the agreement on their own free will. Both parties must indicate a willingness to enter into the agreement and be bound by its terms.

**Formality.** In addition, though in a limited number of instances a contract must be evidenced in writing to be enforceable (i.e., formality), in most cases an oral contract is binding and enforceable. Moreover, there must be an absence of invalidating conduct, such as duress, undue influence,
misrepresentation, or mistake. A promise meeting all of these requirements is contractual and legally binding. However, if any requirement is unmet, the promise is noncontractual.

(iii) Classification of Contracts
Contracts can be classified based on several characteristics, such as method of formation, content, and legal effect. The standard classifications are express or implied contracts; bilateral or unilateral contracts; valid, void, voidable, or unenforceable contracts; and executed or executory contracts. These classifications are not mutually exclusive. For example, a contract may be express, bilateral, valid, executory, and informal.

Express and Implied Contracts. A contract formed by conduct, is an implied or, more precisely, an implied-in-fact contract. In contrast, a contract in which the parties manifest assent in words is an express contract. Both are contracts, equally enforceable. The difference between them is merely the manner in which the parties manifest their assent.

Bilateral and Unilateral Contracts. When each party is both a promisor (a person making a promise) and a promisee (the person to whom a promise is made), the contract is called a bilateral contract. A unilateral contract is one where only one of the parties makes a promise.

Insurance contracts are considered unilateral because only the insurance company (insurer) makes a promise under the contract. The insurer promises to pay a benefit upon the occurrence of a certain event, such as an auto accident, death, or disability. Applicants do not make any promise; they can even elect to stop paying premiums if they desire. The insurer will, however, have the right to cancel the policy if premiums are not paid.

Valid, Void, Voidable, and Unenforceable Contracts. A valid contract is one that meets all of the requirements of a binding contract. It is an enforceable promise or an agreement. A void contract is an agreement that does not meet all of the requirements of a binding contract. It has no legal effect, and it is merely a promise or agreement. An example is an agreement entered by a person whom the courts have declared incompetent. A contract that is neither void nor voidable may nonetheless be unenforceable. An unenforceable contract is a contract for the breach of which the law provides no remedy. After the statutory time period has passed, a contract is referred to as unenforceable rather than void or voidable.

Executed and Executory Contracts. A contract that has been fully carried out and completed by all of the parties to it is an executed contract. By comparison, the term “executory contract” applies to contracts that are still partially or entirely unperformed by one or more of the parties.

Aleatory Contracts. Insurance contracts are considered to be aleatory because the outcome is affected by chance and may be unequal. It is possible that there is an element of chance for both parties involved in the contract, and the dollar values exchanged may not be equal.

Conditional Contracts. Insurance contracts are conditional contracts; the payment of benefits by the insurance company is conditioned upon the insured or owner paying the premium.

Doctrine of Promissory Estoppel. In certain circumstances, the courts enforce noncontractual promises under the doctrine of promissory estoppel in order to avoid injustice. A noncontractual promise is enforceable when it is made under circumstances that should lead the promisor to reasonably expect that the promisee, in reliance on the promise, would be induced by it to take definite and substantial action or to forbear, and the promisee does take such action or does forbear.
**Quasi Contracts.** Quasi (meaning “as if”) contracts are not contracts at all. A quasi contract is based neither on an express nor on an implied-in-fact contract. Rather, a quasi contract is a contract implied in law, which is an obligation imposed by law to avoid injustice. Quasi contracts sometimes are used to provide a remedy when the parties enter into a void, an unenforceable, or a voidable contract that is avoided. In such a case, the law of quasi contracts will determine what recovery is permitted for any performance rendered by the parties under the invalid, unenforceable, or invalidated agreements.

**(iv) Damages Resulting from Business Contracts**

Courts award various damages, mostly monetary in nature, to an injured claimant (plaintiff) from suffering caused by another party (defendant) that breached any contractual terms and conditions. These awards are paid to an individual or organization for loss or injury. The rules for awarding damages vary with the type of claim filed (breach of contract claim vs. tort claim) and location and the type of jurisdiction (i.e., state or federal). Damages are of four major types: compensatory, consequential, liquidating, and punitive damages.

A **compensatory damage** is a direct (normal) and actual damage paid to compensate the claimant (victim) for loss suffered as a result of another party’s breach of duty. Compensatory damages paid by the party that breached the contract are called expectation damages in the contract law involving business contracts. The goal is to make the victim whole and satisfied.

A **consequential damage** is an indirect and special damage awarded due to loss of product or service, loss of profits, or loss of operating revenue if the court decides that such damages are reasonable, foreseeable, or expected of the parties at the time of contract formation. Note that the U.S. Supreme Court has held that consequential damages are not available in the federal courts.

A **liquidating damage** clause in a contract will be not enforced if it amounts to a penalty (i.e., penal damages). The clause will be enforced only if it involves a genuine attempt to quantify a loss in advance and is a good-faith estimate of economic loss. Courts have ruled that excessive liquidating damages are equal to penal damages.

A **punitive damage** is a noncompensatory damage that may be awarded to a plaintiff in order to deter a defendant. Punitive damages are awarded that are over and above compensatory damages and are subjected to the limitations imposed by the due process of law. Punitive damages may be awarded in the case of fraud and product liability cases.

**CALCULATION OF COMPENSATORY AND CONSEQUENTIAL DAMAGES**

**Example**

John (the seller) and Tom (the buyer) entered into a contract for the sale and purchase of Item K for $12,000. Later, John finds out that Tom wants to resell the item to Gary, a reseller, for a 10% profit after the purchase. John breaches the contract and sells the item directly to Gary instead of to Tom. The market price of Item K at the time of breach is $13,000. Now Tom sues John for breach of the contract. How much Tom can expect in compensatory damages and consequential damages, if anything?

\[
\text{Compensatory damage} = \text{Market price} - \text{Contract price} = \$13,000 - \$12,000 = \$1,000
\]

\[
\text{Consequential damage} = \text{Profit percentage of the contract price} = 10\% \text{ of } \$12,000 = \$1,200
\]
(d) Other Topics Related to Contracts

This section discusses several miscellaneous topics, such as product reviews by consumers, ultra vires and intra vires legal actions, letter of intent, customers agree not to sue a company, product warranties, and contractual issues with IP assets.

(i) Product Reviews by Consumers

Regarding product reviews, before the U.S. Congress passed the Consumer Review Fairness Act of 2016, a company might sue customers who wrote honest but negative reviews about a company’s product or service or claim they had to pay much more than the advertised price for the product. This act made such actions illegal.

The Consumer Review Fairness Act says businesses cannot use contracts that prevent customers from writing a truthful comment or penalize customers for writing negative reviews. If a business, including an online business, uses contract terms or conditions that limit a customer’s right to comment, it is breaking the law.

An ethical question that can be raised with product reviews by customers is whether a seller (company) can buy post-sale feedback from a buyer (customer). The seller could pay the buyer in several ways, such as a gift card, cash card, reward points, vacation, travel trip, or discounts on future purchases. Another ethical question is whether product reviews are written by real customers (good and bad reviews), paid or unpaid ghost customers (good reviews only), a seller’s employees (good reviews only), a competitor’s employees (bad reviews only), or a bot software (good and bad reviews).

(ii) Ultra Vires and Intra Vires Legal Actions

Sometimes, lower-level managers may take business-related actions with or without the explicit authority and power given to them by upper-level managers. Examples of these actions could be dealing with outside contractors, suppliers, vendors, consultants, other businesses, and government authorities. The law views the validity of these actions differently, as follows:

- Actions taken without proper authority are called ultra vires (i.e., beyond the power). These actions can be construed by law as invalid actions.
- Actions taken with proper authority are called intra vires (i.e., within the power). These actions can be construed by law as valid actions.

(iii) Letter of Intent

A letter of intent drawn between two or more parties could be a binding contract depending on how it is written. This means that if the letter is very detailed and specific with names, dates, action plans, and locations, it could be binding. If the letter is general and vague, then it is not binding.

(iv) Customers Agree Not to Sue a Company

A contract requiring customers not to sue a company during their lifetime for any reason in exchange for a gift card, a small cash amount, or other token rewards is illegal and unenforceable.

(v) Product Warranties

A retail or manufacturing company must adhere to the Magnuson-Mass Warranty Act of 1974, which governs consumer product warranties. The act requires manufacturers and sellers of consumer products to provide consumers with detailed information about warranty coverage. In addition, it affects both the rights of consumers and the obligations of warrantors under written warranties.
Two types of warranties exist: product warranty and service contract.

(A) Product Warranty
When a customer makes a major purchase of a product, the manufacturer or retailer (seller) makes an important promise to stand behind the product. It’s called a warranty. Although not required by law, written warranties come with most major purchases. U.S. federal law requires that warranties be available for customers to read before they buy, even when the customers are shopping by catalog or on the Internet. Three essential elements of warranties include type (i.e., limited or full), time (i.e., 30 days or 90 days), and coverage (i.e., what parts and repairs covered, personal use versus business use, and what damages are covered). For example, consequential damage of spoiled food resulting from a freezer breakdown at a home and the time and expense incurred in getting damage repaired are not usually covered by warranties.

(B) Service Contract
When a customer buys a car, an appliance, or an electronic device, a service contract is called an extended warranty. But there is an important difference: A normal warranty cost is included in the price of a product whereas a service contract cost is not part of the product price. Instead, the service cost is an extra or add-on cost that might not be worth the price. Some service contracts duplicate the warranty coverage that the manufacturer provides; some cover only part of the product; and some make it nearly impossible to get repairs when a customer needs them.

(C) Express Warranty
Express warranty is a type of guarantee given by a manufacturer or retailer for a specific product purchased by a customer. The express warranty document describes the terms and conditions of the warranty in a clear and complete manner so customers know what is included in or excluded from the warranty. The cost of an express warranty is included in the price of a product.

(D) Implied Warranty
An implied warranty is created by state law, and all states have these warranties. Almost every purchase a customer makes is covered by an implied warranty. The most common type of implied warranty—a warranty of merchantability—means that a seller promises that the product will do what it is supposed to do (e.g., a car will run and a toaster will toast). Here, the seller assures customers that the product a customer buys meet all standards for the ordinary purposes for which such product was designed and used in the manner described in the product manual.

Another type of implied warranty is the warranty of fitness for a particular purpose. This applies when a customer buys a product on the seller’s advice that it is suitable for a particular use. For example, a seller who suggests that a customer buy a certain sleeping bag for zero-degree weather warrants that the sleeping bag will be suitable for zero degrees.

If a customer’s purchase does not come with a written warranty, it is still covered by implied warranties unless the product is marked and sold “as is,” or the seller otherwise indicates in writing that no warranty is given. The cost of an implied warranty is included in the price of a product.

(E) Exclusive Warranty
A seller or servicer can make an exclusive warranty to a customer for a high-priced product, a custom-made product, or a special service work. It is so exclusive that no other customers would get the same type of warranty. Exclusive warranties can be expensive because they are for special products or services. The cost of an exclusive warranty is included in the price of a product.
(F) Quasi Warranty
A quasi warranty is not a full and complete warranty. It may lack the full strength and coverage of a regular warranty. “Quasi” means partial or limited, perhaps with lower warranty cost. The cost of a quasi warranty is included in the price of a product.

(G) Oral Warranty
If a salesperson makes a promise orally, such as that the company will provide free repairs, get it in writing. Otherwise, a customer may not be able to get the warranty service that was promised. The cost of an oral warranty is not included in the price of a product because the warranty never became official.

(H) Extended Warranty
A seller offers an extended warranty to a customer when the customer is buying a car, an appliance, or an electronic device. This extended warranty is called a service contract. Both service contracts and warranties provide repair or maintenance for a specific time. The cost of an extended warranty is not included in the price of a product because it is a separate cost item.

(vi) Contractual Issues with IP Assets
This section defines intellectual property (IP) assets, risks and best practices in IP assets, software escrow arrangements, source code vulnerabilities, software licensing practices, software piracy, copyright laws, penalties in contracts, and acceptance testing of contracts.

(A) Intellectual Property Assets
Intellectual property (IP) assets consists of copyrights, trademarks, service marks, patents, trade secrets, and know-how (i.e., talent, skill, knowledge, expertise, technology, management, engineering, design, development, and implementation). The amount of IP assets has a direct relationship to the level of innovation in a country. This means, the larger the IP asset pool, the greater the levels of innovation. Computer software is copyrightable and it is a part of IP assets and so it must be protected.

Major IP risks include:

- Softlifting (copying), stealing, and selling of IP software and data by insiders (employees) and outsiders (hackers). Softlifting can occur when employees silently and illegally copy a company’s licensed computer software using “bring your own device” (BYOD) for whatever reason.
- Employee turnover making employee accountability a difficult task
- Lack of employee training and awareness about IP assets and their value
- Inadequate policies on employee hiring and termination practices, including job previews and exit interviews addressing IP policies
- Lack of purchase of IP liability insurance to protect against infringement claims such as mitigation damages and legal expenses
- Source code vulnerability in terms of not having a solid software escrow arrangement and not having a clear access to source code

Software escrow arrangement represents something (e.g., a paper document, a digital document, software source code, a lockbox key, or an encryption key) that is delivered to a third person to be given to the grantee only upon the fulfillment of a condition or a contract.
Source code vulnerability means the source code can become an entry point into computers, similar to mobile devices, which can be a target for hackers to launch attacks. This is a risk, not the major risk.

Source code vulnerability does not apply to internally developed software because the developing company owns and keeps the source code in its possession. No need to obtain the source code from outside developers. Source code vulnerability is not possessing or not accessing source code (i.e., a computer program) which is vital to running, operating, and maintaining a computer system.

Source code vulnerability applies to commercially developed software, off-the-shelf software, and open-source software, and other outside sources. The outside developer owns the source code and does not give the code to its customers so a vulnerability exists to his customers. The buying customer needs to obtain a copy of the source code to run and maintain his computer systems in case the commercial developer goes out of business.

- Infringement claims and costs from violating IP laws (i.e., lawsuits, court fines, and penalties). Infringement claims address costs incurred when the rights of the IP asset owners are ignored or violated (e.g., patents and trade secrets)
- Not conducting a software piracy audit periodically to assess the level and severity of piracy in a company

**Best Practices in IP include:**

- **Purchasing an IP liability insurance policy** is a good risk strategy because this policy can cover litigation expenses and infringement costs and protect the IP assets.

- **Conducting a due diligence review of IP assets** such as a source code review is a good business practice and should be conducted at the beginning a contract and on an ongoing basis. This may include vetting a third-party source code before signing a contract, before loading the code, before hosting the software, and before paying any bills to the third-party.

- **Updating employee hiring and terminating programs** is a good company policy so employees are aware of the rules and restrictions placed on the IP assets at the time of hiring and at the time of termination through exit interviews and cancellation of access rights to IP assets. A confidentiality agreement and a conflict-of-interest document needs to be signed by every employee.

- **Limiting employee access to IP assets** is the best security strategy based on an employee’s job duties and need-to-know principle. Here, use of a Digital Rights Management (DRM) software is good so it can restrict access to IP asset files.

- **Training employees in IP laws, rules, and regulations**

**Laws Protecting IP Assets.** Major laws protecting IP assets include the following:

**Computer Software Copyright Act.** Computer Software Copyright Act includes computer programs in the list of tangible writings protected by copyright law. The creator (owner) of a copyrightable software program obtains automatic copyright protection. This choice can protect computer software from infringement claims.
**Digital Millennium Copyright Act.** The Digital Millennium Copyright Act (DMCA) criminalizes production and dissemination of technology, devices, or services that are used to circumvent measures that control access to copyrighted works and criminalizes the act of circumventing an access control, even when there is no infringement of copyright itself. The DMCA also heightens the penalties for copyright infringement on the Internet. DMCA implements treaties of the World Intellectual Property Organization (WIPO). This choice can protect computer software from infringement claims.

**Invisible digital watermarking.** Watermarking is a type of marking that embeds copyright information about the copyright owner. Digital watermarking is the process of irreversibly embedding information into a digital signal. Watermarking can be visible (i.e., information is shown in a picture, video, text, or logo) and invisible (i.e., information is hidden). Invisible digital watermarking protects copyright materials which are intended to prevent or deter unauthorized copying of digital media. Invisible watermarking can protect computer software from infringement claims.

**(B) Software Licensing Practices**

Several variations exist in software licensing practices. The next list indicates how software is licensed for personal computers (PCs), local area networks (LANs), and workstations:

- Major characteristics of the application, whether it is a single-user or multiple-user application
- Major classification of software agreements, such as single-user program or multiple-user software
- Multiuser software is further subdivided into site licenses, per-server licenses, per-PC licenses, and number-of-users licenses.
- Maximum number of concurrent users. Regardless of the machine in use, a LAN software license can be bought only for the number of employees who would use the software simultaneously. Either a LAN operating system or a utility program can monitor concurrent access to the software on a network.
- Floating licenses. In a client-server environment, often a single copy of a software program is bought, and a client license is obtained for each workstation. In this arrangement, the specified number of licenses is bought and only required workstations can use it. It does not matter who uses the workstations as long as the number of users does not exceed the number contracted for. Floating licenses are distributed by the server when a license request is received from a client.

Requirements for a successful and complete software contract negotiation include:

- The basis for the license per CPU machine
- Specifying most-favored-customer status generally through price concessions
- Arbitration clauses where disputes are submitted for binding arbitration
- Cancellation clauses with time periods and charges required
- Software fixes, upgrades, and future options
- Responsibility for the independent or subcontractors hired and provided by the vendor
Responsibility for inherent defects in the software or hardware

Insurance requirements on the software product or the hardware device

Software and hardware maintenance requirements

Notification of unauthorized use or possession of vendor software

Document and software reproduction rights and limitations

Computer virus damage, detection, and prevention requirements

Access to source code and its modifications

Global use of software and hardware

Legal and contractual issues when end users directly acquire or use software from third parties or software publishers include:

- The end user licensing agreement is a legal contract between a buyer or acquirer (end user) and a seller (third parties or software publishers). It spells out the terms and conditions for using the software. The agreement might say that only the buyer can install the software on the buyer’s computer for personal use, that the buyer agrees to third-party monitoring of the software, or that the buyer allows access to parts of the buyer’s computer.
- The licensing agreement can affect the buyer’s online security, privacy, flexibility, and freedom. Specifically, the buyer should be concerned about agreements that allow the software publisher or third parties to:
  - Monitor the buyer’s Internet activity.
  - Collect the buyer’s personal information.
  - Use or share the buyer’s computing resources or information.
  - Hold the buyer accountable for the software agreements governing third-party software components.
- Most agreements limit the buyer’s ability to sue the third party or the publisher for any damages cause by using the software.
- The use of free software or peer-to-peer (P2P) file-sharing software can be risky because it might require the buyer to exchange some personal information in order to use the software.
- Cascading end user licensing agreements can be very risky due to several unknown and intermediate firms involved in the production and distribution of the final software that the buyer is acquiring or using. There could be a primary software vendor, an upstream third-party software vendor, or a downstream third-party software vendor; each vendor may force the buyer to accept its own licensing agreements. The primary software vendor might not fully know about the use of upstream or downstream vendors’ software components that went into the final software and the terms and conditions required of these third-party software licensing agreements.

(C) Software Piracy

The vast majority of the software involved in software piracy legal cases is off-the-shelf, PC software, such as word processing, spreadsheets, graphics, and databases. The issue is illegal
use, copying, and distribution of software both inside and outside the organization. Here “illegal” means that a user has not paid for the software.

Software piracy policies are needed to protect the organization from legal suits by owners. The policy should include:

- Prohibiting illegal copy and use of software.
- Developing a software inventory management system that includes a list of popular application programs. This list can be compared to the organization’s purchase orders, original software diskettes, or original documentation manual.
- Periodically checking PC hard disks for illegally copied software.
- Making illegal copying of software grounds for employee dismissal.
- Requiring all employees to sign a statement that they will not use illegal software at work and not use the illegal software taken from home to work.
- Prohibiting copying of internally developed software.
- Prohibiting pirated externally developed software from being brought into the organization.
- Monitoring all sensitive computer programs against illegal copying.

(D) Copyright Laws

Copyright laws protect software. The act of illegally (not paying for) copying, duplicating, or using the software is called software piracy. Internet piracy involves illegally gaining access to and using the Internet. Many companies on the Internet receive customer fees for research, services, information (e.g., sports and market analysis), and products. When unauthorized people use such services illegally, Internet firms lose revenues. Both software piracy and Internet piracy are increasing.

Copyright laws give protection to authors for almost anything they create that can be expressed in tangible form. Under the law, only authors or copyright owners may make copies unless permission is granted to others. When authors sell the copyright, the new owner takes over all the rights and privileges of authors.

Computer programs are copyrightable. Source code, microcode, and object code can be copyrighted. Blank forms can be copyrighted if they convey some information by their organization and have considerable originality. Similarly, computer terminal screens can be copyrighted if they are part of a computer program, and vice versa. However, procedures, concepts, and principles cannot be copyrighted.

One computer program is said to be an infringement on another when the alleged infringing product and the copyrighted product contain many similar design features and functions. Although the structure, sequence, and organization of a computer program are protected by copyright, the physical order of the subroutines and their calling sequences are not protected.

Input formats are copyrightable in some courts but not in others. Statistical formulas are not copyrightable when they are used in an input format. Even innocent or unintentional infringers may be liable for using a copyrighted material without the written permission of the owner.
Legal penalties for copyright infringement may include injunction, punitive damages, and possible criminal prosecution. However, penalties do not include payment of actual damages as well as any profits. Attorneys' fees and costs may be awarded.

**Fair use** is a defense against a charge of copyright infringement. Fair use depends on the:

- Amount of material and economic impact of the material that was “taken.”
- Nature of the copyrighted work.
- Nature and purpose of the use (i.e., whether it is commercial or not).

When a teacher copies substantial portions of a text for students, it is not a fair use. If what is copied is a small portion of the text, it would come under fair use. *Selling illegal copies of software for profit would not be fair use, whereas making one backup copy for archival purposes would be fair use.*

When consultants, software developers, and employees are doing work for an organization, the organization becomes the owner of the work products. In order for an organization to claim product ownership, the work should be a part of an employee's job description.

**E) Penalties in Contracts**

If the customer/client refuses to pay due to nonperformance by a vendor/contractor, can the contractor “electronically repossess” the software that he or she developed/maintained for or supplied to the customer? The question is: Who is right?

Even where it is clear that the client wrongfully refused to pay for the contractor’s work, electronic repossession of software is not always justified. The contractor/developer's claim for payments due does not automatically include a right to repossess or disable the software, especially without going to the court. One exception is when the contractor is the owner or has a personal property interest in the software product. Disabling of computer software could interrupt business operations and customer services.

Even where the vendor has an arguable right to “repossess” or disable the software, the manner in which the repossession is executed may itself be wrongful. If a contractor/developer must access the customer/client’s computer in order to remove or disable the software, this may constitute a violation of federal and/or state computer crime statutes.

If a contractor disables the client’s software, the client can sue the contractor for trespass, intentional interference with contractual relations, and breach of contract.

Automatic disabling mechanisms, such as time/logic bombs; drop-dead devices; Trojan horses; access keys; and unauthorized program code inserted into the computer system to be activated by the system date on the computer; by turning up a counter; or by occurrence of some specific event or condition are all illegal.

Software-disabling mechanisms by vendor/contractor require advance notice to the client (i.e., clients must be notified prior to entering into a software agreement).

Courts do not appreciate the idea that business operations are at the mercy of, or slaves to, a computer. The courts would prohibit the vendor from activating the drop-dead device if prior notice is not given to the customer. However, courts would allow a vendor to activate a
drop-dead device where notice of the device was included in the contract. In either case, such contractual protection will not protect the vendor/contractor if the vendor itself is in default (i.e., nonperformance).

(F) Acceptance Testing of Contracts
The next list provides guidelines for acceptance testing of software contracts.

- A well-drafted contract will not guarantee the quality of software development and maintenance work, but it can provide the developer a strong incentive to do the job right, and it can give the client some legal protection in the event there is a problem.
- Every software acquisition or development contract should include one element: the right to conduct an acceptance test. Successful completion of an acceptance test should be a condition that must be met before final payment is made to the contractor or vendor. If the software does not perform properly, the final payment should be withheld until the contractor/vendor corrects the problem, refunds the amounts previously paid, fixes the software without pay, or provides some other remedy.
- Defining what constitutes acceptance testing is a major question and concern. Here the buyer or the client needs to evaluate both the performance and the reliability of the software. It is important that the specifications contained in the contract be clear, thorough, and complete since the test results are measured against these specifications.

The contract should define the obligations of each party during the acceptance test. The contract should specify, for example:

- Whether the test is done by the client, vendor, third party, or in combination.
- Who supplies or prepares the test data.
- Who corrects software problems during the test.
- How long postinstallation support is provided.
- What happens if the software fails or is defective or inoperable. The fallback plan must be specified.
- How the software acceptance is to be communicated.
- When the warranty begins.

When the software does not work as expected, the customer can:

- Return the software.
- Cancel the contract.
- Obtain a refund of all or partial sums paid.
- Accept the defective software at a reduced price.

1.10 Big Data and Data Analytics
This section discusses five major topics: big data, data counting methods, data analytics, data mining, and big-data audit.
(a) Big Data

Simply stated, the term “big data” means vast amounts of data collected from a variety of sources. It is big in terms of many data volumes, several datasets, and many data types. Data volumes are related to data files stored in databases and mass storage devices (e.g., redundant array of independent disks [RAID]). Datasets include several data elements, such as customer name and account number. Data types mean alphabetic, numeric, alphanumeric, and special characters. The term “big data” is subjective, depending on the size and complexity of an organization. New and actionable insights can be deduced from the big data. Here, data analytics are the major topic and focus in data analysis and extraction methods, as shown in the next table:

<table>
<thead>
<tr>
<th>Big Data</th>
<th>Data Analysis and Extraction Methods</th>
<th>New Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured data</td>
<td>Data analytics</td>
<td>New information</td>
</tr>
<tr>
<td>Unstructured data</td>
<td>Statistical analyses</td>
<td>Actionable insights and inferences</td>
</tr>
<tr>
<td>Semistructured data</td>
<td>Data mining methods</td>
<td>Meaningful actions</td>
</tr>
<tr>
<td>Sanitized data</td>
<td>Simulation techniques</td>
<td>New results and decisions</td>
</tr>
<tr>
<td>Data patterns and trends</td>
<td>Forecasting methods</td>
<td>New value uncovered/created</td>
</tr>
</tbody>
</table>

(i) Data Life Cycle

Similar to a PLC, data has its own life cycle showing how data is discovered, created, generated, deployed, and used from beginning to the end.

Data Life Cycle = Discover + Deploy

Here, “Discover” focuses on tasks such as prepare, explore, and model, and “Deploy” focuses on tasks such as implement, act, and evaluate.

Another way of viewing the data life cycle is to see how data turns into results and decisions. This is shown next.

Data → Analytics → Insights → Results → Decisions

Data is subjected to analysis to yield new insights, results, and decisions. Here, the term “data” refers to collecting or generating data in a form that can be processed. “Analytics” means cleaning, normalizing, aggregating, extracting, and analyzing the data. “Results” means improving decisions, actions, and outcomes to realize new benefits. “Decisions” means (1) acquiring new customers, suppliers, and vendors; (2) increasing sales, revenues, and profits; (3) decreasing costs; (4) signing new business contracts; (5) developing new business partners and strategic alliances; and (6) above all, gaining a competitive edge.

Big data does not necessarily mean a good data; it could be bad data. Consequences are:

Good Data → Good Results, Outcomes, and Decisions
Bad Data → Bad Results, Outcomes, and Decisions
What makes data good data or bad data is related to data quality, data security, and data privacy. Data owners and data stewards within an organization manage and control the data quality, security, and privacy.

(ii) Data Owners and Stewards
Big data needs owners and stewards to manage and control the data assets on an ongoing basis to reduce risks facing data.

A data owner is a person or department responsible for safeguarding or securing data with security controls, classifying data (sensitive or not sensitive), and defining data access rules (grant or deny).

A data steward or data custodian is a person or department delegated the responsibility for managing a specific set of data resources (e.g., data volumes, files, and elements). This person defines, specifies, and standardizes the data assets of an organization within and across all functional areas. There can be several data owners and data custodians protecting data assets. Data owners and stewards establish acceptable use policies and access rules because data usage rules stem from data usage policies.

Acceptable use policies require that a system user, an end user, or an administrator (e.g., system, security, and network administrator) agrees to comply with such policies prior to accessing computer systems, internal networks, and external networks (the Internet). Acceptable use is based on authorized access.

For example, in a cloud computing environment, subscribers ensure that all subscriber personnel read and understand the provider’s acceptable use policy and negotiate an agreement for resolution of agreed-on policy violations in advance with the provider. The agreement also includes a process for resolving disputes over possible policy violations.

Two concepts related to acceptable use policies and access rules are rules of behavior and rules of engagement.

Access rules are clear action statements dealing with expected user behavior in a computer system. Access rules reflect security policies and practices, business rules, information ethics, system functions and features, and individual roles and responsibilities, which collectively form access restrictions.

Rules of behavior are conditions established and implemented concerning use of, security in, and acceptable level of risk of the system. Rules will clearly delineate responsibilities and expected behavior of all individuals with access to the system. The organization establishes and makes readily available to all information system users a set of rules that describes their responsibilities and expected behavior with regard to information system usage. Rules of behavior are established to control the behavior of employees on computer systems.

Rules of engagement are detailed guidelines and constraints regarding the execution of information security testing. These rules are established before the start of a security test. The rules give the test team authority to conduct the defined activities without the need for additional permissions. Rules of engagement are established to control the behavior of contractors, vendors, and suppliers during their work for an organization.

(iii) Data Analytics Process
A structured and standard methodology is needed for performing data analysis to yield consistent results and insights. A five-step analytical procedure is suggested here:
1. Define the question and hypothesis.
2. Obtain relevant data from known data sources.
3. Clean and normalize the selected data.
4. Conduct data analysis.
5. Communicate analytical results and outcomes.

**Step 1: Define the Question and Hypothesis**
This step requires formulating a basic question and its associated hypothesis that can be tested by data analysis. For example, a retailer might put a question as follows: How does the merchandise return policy affect current and future sales? The corresponding hypothesis might look like this: A rigid return policy with a shorter period could decrease sales while a flexible return policy with a longer period could increase sales.

**Step 2: Obtain Relevant Data from Known Data Sources**
This step requires identifying relevant data needed from all data sources to test the hypothesis. For example, retailers can look at their past sales and past return policies and can gather similar information from other retailers to study.

**Step 3: Clean and Normalize the Selected Data**
Before data mining software tools are applied, the target raw datasets must be cleaned and normalized to remove missing, erroneous, or inappropriate data. **Data cleansing methods** purify data or filter inappropriate data and include log management functions, such as log filtering, log correlations, and log analysis. One reason to perform data cleansing is due to data mingling. In data mingling, data related to some event, incident, or activity is mixed with data unrelated to that event, incident, or activity, thus making these two data types often indistinguishable. Data mingling can be attributed to inadequate labeling and limited memory storage. The comingling of data will make the task of an auditor, analyst, or investigator more challenging because it is difficult to know which data caused an event or incident. Thus, data mingling problems make the data unclean.

**Data normalization methods** convert clean data into a standardized format and label it consistently. One of the most common uses of normalization is storing computer transaction dates and times (system clocks) in a single format (e.g., synchronizing time stamps of 12-hour format or 24-hour format with different time zones in a country or continent). Converting data to consistent formats and labels makes data analysis and reporting much easier.

**Data wrangling software** also cleans and normalizes raw data because it refines and reshapes raw data into actionable and usable data.

In summary, the data cleansing and data normalizations actions are performed in a preprocessing prior to data mining step as shown:

<table>
<thead>
<tr>
<th>Preprocessing</th>
<th>Data Mining</th>
<th>Postprocessing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data</td>
<td>Software tools</td>
<td>Insights and decisions</td>
</tr>
<tr>
<td>Data cleansing</td>
<td>Data analytics</td>
<td>Results and reports</td>
</tr>
<tr>
<td>Data normalization</td>
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<td></td>
</tr>
</tbody>
</table>


**Step 4: Conduct Data Analysis**

After raw data is cleansed and normalized, the data analyst can analyze the data to test different hypotheses by developing different data models to identify retail sales patterns and to show how they are correlated with the merchandise return policy. For example, a retailer found out that a rigid return policy (e.g., 15 days are allowed to return merchandise after purchase) decreased sales while a flexible return policy (e.g., 30 days are allowed to return merchandise after purchase) increased sales. This is because customers want a longer period to determine whether to keep or return a product based on how it works. So, customers want to buy from a retailer with a flexible return policy, resulting in increased sales, and customers do not want to buy from a retailer with a rigid return policy, resulting in decreased sales. The same thing can be said about shipping terms for merchandise where free shipping increases sales and no free shipping decreases sales.

**Step 5: Communicate Analytical Results and Outcomes**

The last step is to convert the discovered data analytical results and outcomes into the retailer’s strategy and put it into operational use. The retailer changed its merchandise return policy to a flexible policy of 30 days. These results can be communicated to management through the use of data visualization tools, such as charts, graphs, tables, or exhibits.

**(iv) Data Analysis and Internal Auditors**

Data analysis can help internal auditors meet their auditing objectives, such as detecting changes or vulnerabilities in business processes that could expose an organization undue and unplanned risks. The data sources can be fully manual, semiautomated or semimanual, and fully automated. A specific audit objective in analyzing data is to identify fraud, errors, inefficiencies, or noncompliance.

Examples of analytical tests to find patterns and trends in data include:

- Calculation of basic statistical parameters (e.g., averages, standard deviations, variance, highest and lowest values [ranges], excessively high values or low values, and control totals) to identify outlying transactions.
- Numeric digit testing using Benford's law of first-digit test to identify statistically unlikely occurrences of specific digits in naturally occurring datasets. Benford’s law gives the expected frequencies of the first digits in tabulated data and finds that the first digits are not all equally likely. There is a biased skewness in favor of the lower digits. This means that the digit 1 has a higher likelihood of occurring as the first digit than the digit 9.
- Data match testing of names, addresses, and account numbers in disparate systems and locations.
- Data duplicate testing of payments, payroll, customer claims, or expense reports line items.
- Data gap testing to identify missing numbers in sequential data.
- Date checking tests where time stamps are used to identify transaction posting times or data entry times to determine their appropriateness and correctness.

**(v) Data Mapping and Data Matching Tools**

Data mapping involves laying out a clear data path containing related data elements of interest to achieve an end goal of identifying data relationships.

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**Data matching** is a computer matching technique that can prevent improper payments and detect fraudulent activities by comparing data from several, related computer systems. Here data from several different data files (i.e., internal and external) are matched to verify the eligibility prior to payment; improper payments are stopped when they happen. Hence, data matching is both a preventive and a detective control. The goal is to identify data inconsistencies across several computer data files.

Applications of data mapping and matching tools in government include stop payments of:

- Social Security benefits to dead people
- Maternity benefits to a male employee
- Overtime hours to a terminated employee
- Weekly wages to an imposter employee
- Invoices of a phony vendor

**(vi) Why Use Big Data?**

Traditionally, organizations relied heavily on internal data for decision-making purposes but soon found out that these internal sources are too limited to grow their businesses. Later, organizations realized that they can discover and explore vast amounts of external data that allow them to gain additional insights to grow their businesses. This so-called big data came from internal and external sources. Other names given for big data are data mart, data mall, data highway, data lakes, data hounds, data bazaar, data stash, and data tsunami.

Big Data = Internal Data + External Data = New Opportunities

Big Data → Big Decisions

Big Data → New Insights → New Strategies → New Decisions → New Actions

Big Data = New Data Asset = New Strategic Asset

Big Data → Assurance Procedures and Consulting Services

For internal auditors, utilizing big data can reveal new insights, which, in turn, will allow them to make new recommendations to management that will result in new improvements for the organization, resulting in an additional or incremental value.

**(vii) Nature and Types of Big Data**

Big data can be structured and well organized or it can be unstructured and very disorganized. Whether data is organized or disorganized is attributed to its source. However, valid and useful data can be found in both structured data and unstructured data; the only question is how much and where. In comparison, one can say internal data is structured data and external data is unstructured data. Big data can also come in a semistructured format from external sources. It has been said that more than 80% of business data is unstructured data.

Big Data = Structured Data + Unstructured Data + Semi-structured Data

Internal Data = Structured Data

External Data = Unstructured Data + Semi-structured Data
Structured data consists of internal data sources with fixed-form format; data warehouses; traditional and fixed data structures; database files (e.g., relational or hierarchical); flat data files; interconnected computer systems and data sources; data that is easy to manage and control; validated data; data that uses a standard data structure; data owners and data stewards are known; and data that uses incompatible data file formats.

Unstructured data consists of external data sources with free-form format; nontraditional data structures; nonfixed data structures; disconnected computer systems and data sources; data that is not easy to manage and control; nonvalidated data; data that does not use a standard data structure; data whose owners and stewards are unknown; and data that uses incompatible data file formats.

Semistructured data consists of external data sources with fixed-form format: Extensible Markup Language (XML), Hypertext Markup Language (HTML), and Extended Hypertext Markup Language (XHTML). XML is a metalanguage with a flexible text format designed to describe data for electronic publishing. The web browser interprets the XML, and the XML takes over the HTML for creating dynamic web documents. HTML is a markup language that is a subset of standard generalized markup language (SGML). It is used to create hypertext and hypermedia documents on the web that incorporate text, graphics, sound, video, and hyperlinks. HTML is a mechanism used to create dynamic web pages on the Internet. XHTML is a unifying standard that brings the benefits of XML to HTML. XHTML is the new web standard and should be used for all new web pages to achieve maximum portability across platforms and browsers.

(viii) Sources of Big Data
When comparing different sources of data, internal data sources provide structured data and external data sources provide unstructured and semistructured data.

Structured data sources include internal source documents, such as sales orders and invoices; purchase requests and orders (procurement records); operating expenses; production and service records; materials and labor records; finished goods inventory records; payments to employees and vendors (employee payroll and vendor invoices); charge card transactions; cash receipts; payments from customers (receivable receipts); operating budget and capital budget records; contracts; and customer merchandise returns.

Unstructured data sources include external sources, such as public online, search engine, private online, and research websites; public libraries; governmental agency websites, social media websites, website blogs, online chats, publicly posted videos and audios, electronic mail, office memos, reports, and notes; white papers and research studies; spreadsheet data; text messages (short messaging service [SMS] and multimedia messaging service (MMS)); and human language, audio, and video. Specifically, unstructured data consists of multimedia files, image files, sound files, and unstructured text files.

Semistructured data sources include web documents and web pages.

Another way of classifying big data is by where it is found, such as government data (more reliable), proprietary data (a company’s internal data, which is more reliable), open source data (i.e., Internet-based, which is not reliable), research data (more reliable), industry data (more reliable), and anonymous data (less reliable).

In summary:

- Structured data is found in data tables, data records, and computer flat files.
- Unstructured data is found in human languages, audio, and video.
— Semistructured data is found in XML and HTML web languages.
— Raw data is found in customer orders and POS terminals.
— Complex data is found in databases (e.g., relational or hierarchical) and legacy systems.
— Social media data is found in blogs, tweets, and posts.
— Machine-generated data is found in electronic sensors, retail merchandise (RFID) tags, mobile devices, and the Internet of Things (IoT) technologies.

(ix) Characteristics of Big Data
According to the IIA’s Global Technology Audit Guide, big data can have seven dimensions, characteristics, or attributes, which are discussed next.\(^{20}\)

(A) Seven Vs of Big Data
1. **Volume** is the amount of data being created; it is vast compared to traditional data sources.
2. **Variety** of data comes from all types of formats. This can include data generated within an organization as well as data created from external sources, including publicly available data.
3. **Velocity** means data is being generated extremely quickly and continuously.
4. **Veracity** means data must be able to be verified based on both accuracy and context.
5. **Variability** means big data is extremely variable and always changing.
6. **Visualization** means translating vast amounts of data into readily presentable graphics and charts that are easy to understand and are critical to end user satisfaction where these graphs and charts may highlight additional insights. Data visualization software tools are available to bring out these insights in the form of pictures, graphs, exhibits, tables, and storyboards because raw analytic results from big data are often hard to read and interpret. *Datafication*, the process of putting information in an easily searchable and analyzable format, is a prerequisite to data visualization. Examples of datafication efforts include turning paper documents into electronic health and medical records to allow searches, electronically indexing paper documents to allow searches, and electronically indexing websites to allow searches. The idea is that when data is put in a searchable and analyzable format, it can be presented easily.
7. **Value** means organizations, societies, and consumers can all benefit from big data. Value is generated when new insights are translated into actions that create positive outcomes.

**In summary**, business insight (value of data) and speed (velocity of data) are the main business drivers of investment in big data. Variety of data continues to outweigh volume and velocity as the technical drivers behind big data investment.

(B) Virtual Data Tsunami
According to the United States Government Accountability Office, big data is a “virtual data tsunami.” It is a twenty-first-century development consisting of volume, variety, and velocity characteristics that allow management performing new analytics, improving cognitive computing systems, and building advanced machine-learning technologies.\(^{21}\)

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New analytics are tools for examining large amounts of varied data to uncover subtle or hidden patterns, correlations, and other insights, such as market trends and customer purchasing preferences.

The term “cognitive computing systems” refers to computing systems that perform human cognitive functions like memory, recall, judgment, inference, and learning.

Advanced machine learning technology is an artificial intelligence (AI) discipline that allows computers to handle new situations via analysis, self-training, observation, and experience, all with minimal “supervision” by humans.

(C) Return on Data
The real value of big data does not come from a mere collection of data from several sources. Instead, the real value comes from data usage and application, which can lead to major insights and better decisions. Because big data (data asset or strategic asset) is put to so many good uses and with so many benefits, a return on data (ROD) metric can be calculated for value-measuring purposes. ROD indicates how data assets of an organization are utilized effectively and efficiently (i.e., 10% or 40%). ROD is calculated as follows:

\[
\text{ROD} = \left( \frac{\text{Dollar benefits from big data}}{\text{Dollar investment in big data}} \right) \times 100
\]

(D) Technologies in Big Data
Big data requires deployment of new technologies that are different from traditional technologies used to simply process day-to-day business transactional, financial, and operational data. New technologies require new software (either developed in house or acquired from outside), new hardware, and new employees with new technical skills. The reason for deploying new technologies to process and handle big data is that big data comes from disparate and disconnected systems from inside and outside of an organization. A proof of concept is required to illustrate the value of deploying a new technology and to obtain management commitment, support, and funding.

Examples of technologies used in big data are listed next.

- Company’s online websites
- Company’s databases, data warehouses, and data marts
- Data mining software tools to identify patterns and trends in big data
- Data visualization software
- Data dashboard software
- Search engine websites (e.g., Google, Yahoo, and Bing)
- Mobile website operating systems (Apple’s iOS and Google’s Android)
- Text messaging services (e.g., SMS and MMS)
- Electronic mail services (e.g., individual or group)
- Mobile device technologies (e.g., smartphones and digital tablets)
- Social media websites (e.g., Facebook and Twitter)
General research websites (e.g., Pew Research Center, Forrester, Aberdeen, and Gartner)

Cloud-based data storage

Active data backup storage

Inactive data archived storage

Advanced technologies (e.g., sensors and cameras used in retail, RFID tags, tags on products in manufacturing and retail, the IoT, machine learning, AI, cognitive computing systems that learn by themselves, augmented reality, virtual reality, and robots)

(E) Risks in Big Data
Like other types of internal data, such as financial data or operational data, big data is not immune to risk. In fact, risks in big data are magnified due to its combination of internal sources and external sources and when the big data is compared to internal sources alone. General risks in big data are data quality, data security, data privacy, and data governance.

Examples of specific risks in big data are listed next.

- Discovering wrong data and bad data leading to wrong and bad decisions
- Digging deeper into data, thus creating an “analysis paralysis” situation leading to a situation of being analytics rich but information poor
- Proceeding with invalid data patterns and trends, assuming that they are valid patterns and trends, thus wasting resources
- Lack of data governance standards leading to poor-quality data and information
- Lack of data quality standards leading to wrong decisions
- Lack of information quality standards leading to bad decisions
- Lack of data security and privacy control guidelines leading to data breaches
- Inability to apply the right technology to big data, thus wasting resources and missing opportunities

(x) Other Topics Related to Big Data
Next we focus on several topics related to big data, including data governance standards, data reliability standards, data quality standards, information quality standards, data security policies and controls, and data insurance policies all due to their relative importance to management.

(A) Data Governance Standards
Data governance standards address several oversight-related issues, such as data ownership and usage policies; data classification and declassification schemes; data cleansing, separation, and normalization; data security policies and controls; and data backup, retention and recovery methods. Data governance standards include data access, data separation, data integrity, data regulations, data cleansing and disposition, and data recovery.

(B) Data Reliability Standards
Data reliability, especially as it relates to computer-processed data, means that data are reasonable complete, accurate, consistent) and valid. Complete refers to the extent that relevant data records are present and that the data fields in each record are populated appropriately. Accurate refers to the extent that recorded data reflect the actual underlying information, Consistent, a subcategory
of accurate, refers to the need to obtain and use data that are clear and well defined enough to yield similar results in similar analyses. For example, if data is entered at multiple sites, inconsistent interpretation of data entry rules can lead to data that, taken as a whole, is unreliable. **Valid** refers to whether the data actually represents what is being measured. So, analysts must consider risks associated with the possibility of using insufficiently reliable data.

(C) Data Quality Standards

**Data** is a collection of facts and figures, and it is raw. Data is transformed into information in the course of data processing activities. The perception of quality depends on the purpose for which data or information is to be used. For information to be useful, it should be available where, when, and in the form it is needed, and with costs equal to or less than the benefits to be derived from it. The concept of *information economics* dealing with information costs and information benefits should be used here.

For data or information to be of any use to management, it should possess certain data quality dimensions and information quality elements and standards, which are described next.

Achieving a **data excellence goal** must be the top priority of a business data analyst who collects, compiles, interprets, and presents data results to business managers and executives. The data excellence goal needs to be applied to regular business data as well as statistical data, whether it is generated internally or externally.

Achieving the goal of data excellence is not a one-time task; instead, it must be an ongoing task where the data is continuously and constantly monitored and improved in all seven dimensions of quality: relevance, accuracy, credibility, timeliness, accessibility, interpretability, and coherence.

1. The **relevance** of a data reflects its ability to satisfy the needs of users. This depends on its utility in adding to the users’ knowledge with regard to the topics of greatest importance to them. The evaluation of relevance is subjective and varies according to users’ needs. The basic question here is: Is the data what the user expects?

2. **Accuracy** represents the level at which the data or information correctly describes the phenomenon it has been developed to measure. It is normally expressed in terms of the error in the statistical data, which can, in turn, be broken down into different components. The basic question here is: Is the data reliable?

3. The **credibility** of data or information refers to the confidence level that users have in the analyst or entity producing the data or statistic. It is normally based on the reputation of the producer as demonstrated over time, which, in turn, relates to factors such as the objectivity, technical independence, professionalism, and transparency shown by the producer during the course of analytical activities. Its basic question is: Is the data producer trustworthy?

4. The **timeliness** of a data refers to the time it takes to disseminate the data with regard to the reference period, requiring a timetable for releasing data and measuring performance. The timelines of data have a significance impact on its relevance, meaning data that is presented late may not be relevant. In addition, there is a clear trade-off between data timeliness and accuracy. The basic question here is: Does the user receive the data in time and on schedule?

5. The **accessibility** of data reflects the ease with which it can be identified and utilized by a user. Accessibility therefore depends on the means with which the data is made available.
to the user, either on paper medium or electronic medium; the search procedures required, whether they are too long and convoluted; the user’s ability to make use of the data in meeting needs; the existence of barriers to access (approvals, cost, and time); and the availability of user support services (hourly, daily, or weekly). The basic question here is: Is the data reachable?

6. **Interpretability** reflects the ease with which users can understand the basic characteristics of the data and thereby evaluate its utility for their own needs. Some fundamental factors of interpretability include the adequacy of data provided within the coverage limits, the comparability of data over time, the methods used to collect and generate data, and the accuracy of data. The basic question here is: Is the data understandable?

7. **Coherence** relates to the degree to which particular data is logically connected and mutually consistent with other related data. Coherence implies that the same term should not be used without explanation for different data items, different terms should not be used without explanation for the same data item, and variations in methodology that might affect data values should not be made without explanation. The use of standard concepts, definitions, and classifications increases the coherence of the data or information supplied by various sources, while changes in methodology can impede the comparability of the same parameter over time. The basic question here is: Is the data consistent and reconcilable with other data?

(xii) **Information Quality Standards**

**Information quality** is composed of three elements: utility, integrity, and objectivity. Quality will be ensured and established by management at levels appropriate to the nature and timeliness of the information to be disseminated.

Information Quality = Utility + Integrity + Objectivity

**Utility** means that disseminated information is useful to its intended users. “Useful” means that the content of the information is helpful, beneficial, or serviceable to its intended users or that the information supports the usefulness of other disseminated information by making it more accessible or easier to read, see, understand, obtain, or use. Where the usefulness of information will be enhanced by greater transparency, care is taken that sufficient background and detail is available to maximize the usefulness of the information.

**Integrity** refers to security, which is the protection of information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification. Integrity also means information is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information.

**Objectivity** consists of two distinct elements: presentation and substance. The presentation element includes whether disseminated information is presented in an accurate, clear, complete, and unbiased manner and in a proper context. The substance element involves a focus on ensuring accurate, reliable, and unbiased information. In a scientific, financial, or statistical context, the original and supporting data will be generated, and the analytic results will be developed, using sound statistical and research methods.

Two standards or concepts related to information quality include reproducibility and transparency. **Reproducibility** means that the information is capable of being substantially reproduced, subject to an acceptable degree of imprecision. For information judged to have more (less) important impacts, the degree of imprecision that is tolerated is reduced (increased).
Transparency is at the heart of the reproducibility standard in that transparency provides information in sufficient background and detail to maximize the usefulness of such information. The level of such background and detail is commensurate with the importance of the particular information, balanced against the resources required (i.e., cost, time, people, hardware, software, tools, and techniques), and is appropriate to the nature and timeliness of the information to be disseminated.

In summary:

- Data quality dimensions include relevance, accuracy, credibility, timeliness, accessibility, interpretability, and coherence.
- Information quality elements and standards include utility, integrity, objectivity, reproducibility, and transparency.

(xii) Data Security Policies and Controls

Data security policies and controls address various issues, such as rules of behavior, rules of enforcement, access rules, acceptable use policies, rules of engagement, and access agreements for employees and nonemployees (e.g., vendors, consultants, contractors, and third parties). Here, the common issues include: (1) controlling an individual's behavior, whether this individual is internal or external to an organization; (2) describing consequences for noncompliance with rules; and (3) making these rules official through issuing policy documents. The goal is to reduce the potential damage to computer systems and property and to minimize harm to people.

(xiii) Data Insurance Policies

Unfortunately, several organizations in the public and private sectors have experienced data security breaches and cyberattacks (e.g., ransomware) by hackers. The average total cost of a data security breach has been estimated at $4 million, and only 15% of organizations have purchased commercial insurance to protect against data security breaches and cyberattacks.

Because data is a strategic asset and a valuable commodity, it should be protected with an insurance policy covering data security breaches, cyberattacks, data losses, data stealing, and protection of customers' personal data.

(b) Data Counting Methods

Raw data has value in providing actionable insights and inferences that can be turned into meaningful actions in terms of new decisions and results in achieving a competitive advantage. After raw data under consideration is sanitized or cleaned and before data mining techniques are applied to big data, such data must be organized and counted for its intended purposes. According to the Stevens' power law developed by Stanley Stevens, four types of scales can be used to define how data or things can be coded, scaled, ordered, measured, ranked, arranged, grouped, organized, or otherwise counted. These four data scales are the nominal, ordinal, interval, and ratio scales. Moreover, organized data can be converted into indices, quartiles, percentiles, and outliers, which have several applications in business. Each type of data scale is discussed next.

(i) Nominal Scales

Nominal scales are easy to understand, are nonnumeric, and are mutually exclusive (i.e., no overlap) as they are used to label, name, or code variables such as data or things. They have no inherent order to data values. Nominal scales can be expressed in a dichotomous manner, such
as male or female, yes or no, true or false, or accept or reject. Here, either “true” or “false” can be labeled as “1” or “2,” indicating that there is no order to the data values.

Example: A human resources department can determine the number of female employees and the number of male employees in a company’s workforce. These gender numbers can be tracked over a time period to see if one gender is increasing or decreasing in number over the other gender.

(ii) Ordinal Scales
Ordinal scales are nonnumeric, have inherent order to data values, and the difference between each value is unknown. A disadvantage of ordinal ranking is that it does not show quantities.

Examples: The marketing department can conduct customer surveys to determine the number of customers who are very unsatisfied (1) or very satisfied (5) or very unhappy (1) or very happy (5). Here the scale is from 1 through 5, implying an order to data values. Ordinal scales are also used to rank first, second, or third place in student grades, games, sports, and competitive awards.

(iii) Interval Scales
Interval scales are numeric values with an order and a space (gap) values where the difference between each value is known. Statistical analysis (e.g., computing mean, mode, median, standard deviation, and variance) can be conducted with interval scale data.

Example: Interval scales are used to measure temperature either in Celsius (C) or Fahrenheit (F) degrees. Because temperatures do not have a true zero value, ratios cannot be computed.

(iv) Ratio Scales
Ratio scales are the ultimate goal of data because they are numeric; they show the order of values and data relationships; the difference between data units is known; and they have “true zero” values. Hence, they are good for applying descriptive statistics (e.g., computing mode, median, quartiles, and outliers) and inferential statistics (e.g., testing hypotheses, deriving estimates, and drawing inferences). Ratio variables can be subject to basic mathematical calculations, such as adding, subtracting, multiplying, and dividing. Height and weight measurements can be done with ratios. In addition, ratios can be used to measure length, mass, energy, and statistical data.

Examples: Popular ratios in business include ROI, return on sales, return on assets (ROA), and return on equity. Popular ratios in economic statistics shown as indices are the CPI, producer price index, and wholesale price index.

(A) Indices, Quartiles, Percentiles, and Outliers
Indices are index numbers that compare two specific measurements in two time periods, such as current period and base period, and the result is expressed as a ratio. A simple index number represents an individual product. The CPI data and the population census data are the two most watched, measured, and monitored economic statistics in any country. For example, the CPI is computed as follows:

\[
CPI = \left( \frac{\text{Current price}}{\text{Base price}} \right) \times 100
\]

Current price per item = (Base-year price) × (Current CPI / Base CPI)
**Examples:** Several indices are given as examples next.

- The annual percentage change in a CPI is used as a measure of inflation. CPI is a price index at the retail store level.
- The index of industrial production represents an aggregate of a quantity index.
- A composite index number or an aggregate index number represents a group of products.
- The producer price index represents price changes to acquire raw materials, intermediate materials, and finished goods. Here, the producer can be a farmer or manufacturer or simply a processor.
- The wholesale price index represents the price index for finished goods at the wholesale level.

**Quartiles** are three data points that divide the data into four equal groups where each group consists of a quarter of the data.

- The first quartile (lowest quartile) is defined as the middle number between the smallest number and the median of the data. It is called the 25th percentile because it splits off the lowest 25% of data from the highest 75% of data.
- The second quartile is defined as the median of the data. It is called the 50th percentile because it cuts the data in half.
- The third quartile (upper quartile) is defined as the middle value between the median and the highest value of the data. It is called the 75th percentile because it splits off the highest 25% of data from the lowest 75% of data.
- The interquartile range (IQR) shows extreme values (outliers) that can skew the data. It is a relatively robust statistic compared to the traditional range and standard deviation. The IQR helps to establish boundaries with lower fence (bounds) and upper fence levels. Any data falling outside these defined bounds is considered an outlier.

**Example:** Quartiles are used to express wages, salaries, income levels, tax payments, and student grades (i.e., grade point average). A median salary of $100,000 for a highly technical employee can be said to fall in the second quartile.

**Percentiles** simply divide the data into 100 pieces; they are not dependent on the distribution of the data. Percentiles are a measure of data dispersion similar to standard deviation and range. Usually percentiles are expressed as 25, 50, 75, 90, or 95. When we say 70th percentile, we mean 70% of data is below the mean and 30% of data is above the mean. Quartiles use percentiles, but they are not the same. Quartile 1 means the 25th percentile; quartile 2 means the 50th percentile (median).

**Outliers** are data points that are outside of the expected point estimates or range estimates. They can be abnormal data points that should be looked at for further analysis to determine causes or origins.

**Example:** If a monthly utility bill for natural gas usage is expected to fall within a range of $100 and $150 based on historical data, an actual gas bill of $400 for a month can be called as an outlier.
In summary:

- Nominal, ordinal, interval, and ratio scales all count the frequency of occurrence of data or things.
- Nominal scales are qualitative variables with no inherent order to data or things.
- Ordinal, interval, and ratio scales have an inherent order to data or things.
- Nominal variables are used to name, code, or label data or things.
- A nominal variable is a qualitative variable where data attributes have no inherent order.
- An ordinal variable is a qualitative variable where data attributes are ordered and the difference between adjacent attributes is unknown or unequal.
- An interval variable is a quantitative variable where data attributes are ordered but for which the numerical difference between adjacent attributes is interpreted as known or equal.
- Interval variables provide the order of values plus the ability to quantify the difference between variables. They do not have true zero values.
- A ratio variable is a quantitative variable where data attributes are ordered, spaced equally, and with a true zero point.
- Ratio variables provide the order of values plus interval values plus the ability to calculate ratios. They do have true zero values.
- Indices, quartiles, percentiles, outliers, and interquartile ranges are examples of descriptive statistics.

(c) Data Analytics

Data analytics involve applying quantitative and qualitative tools and techniques to big data in order to gain new insights and new opportunities. Several types of data analytics exist, including these:

- Predictive analytics
- Embedded data analytics
- Fraud data analytics
- Streaming data analytics
- Social media data analytics
- Web-based data analytics
- Text-based data analytics
- Open-source data analytics
- Data modeling analytics
- Visual analytics
- Descriptive analytics
- Prescriptive analytics
- Cognitive analytics
User behavior analytics
Customer analytics
Benford’s law of first-digit test

(i) Predictive Analytics
Predictive analytics are the process of estimating future outcomes based on the analysis of past data and/or current data. They describe what could happen.

For example, the U.S. Department of Health and Human Services has applied the following analytic techniques to identify improper payments and fraudulent activities perpetrated by healthcare providers (bad actors) in its Centers for Medicare & Medicaid Services:

- A rules-based technique filters fraudulent claims and associated behaviors with rules. It identifies providers that bill using a Medicare identification number that was previously stolen and used improperly.
- An anomaly-based technique detects individual and aggregated abnormal patients versus a peer group. It identifies providers that bill for more services in a single day than the number of services that 99% of similar providers bill in a single day.
- A predictive-based technique assesses the known fraud cases. It identifies providers that have characteristics similar to those of known bad actors.
- A network-based technique discovers knowledge using associative link analysis. It identifies providers that are linked to known bad actors through addresses or phone numbers.

For example, retail industry can use these predictive analytics:

- Estimating what customers will buy what products and from what markets
- Store customer foot traffic analysis through sensors and cameras
- Customer orders online
- Actual sales transactions
- Customer merchandise returns
- Online shopping cart abandonment
- Customer financial chargebacks
- New store location
- Cross-store merchandise locator
- Endless aisles of inventory
- Estimating customer retention rates and defection rates

These predictive analytics can be applied to any industry:

- Identifying new revenue opportunities by products or by markets
- Forecasting workforce requirements by type and skill
- Identifying the factors leading to employee satisfaction and productivity
- Identifying factors for customers’ filing a fraudulent claim
- Discovering the underlying reasons for employees’ attrition rates
- Predicting what type of customers will default on a loan payment or credit card payment
- Predicting employee turnover rates
- Predicting equipment breakdowns before they disrupt operations

(ii) Embedded Data Analytics
Many organizations use embedded data analytics, such as data visualization tools, reporting routines and methods, and data dashboards, in their business-oriented application systems. The embedded analytics provide a real value to end users of such systems. Embedded analytics are a part of predictive analytics as they predict future events and outcomes. In contrast, traditional data analytics present past events and outcomes.

(iii) Forensic Data Analytics
The focus of fraud-related forensic data analytics is on fraud prevention, detection, and response (correction). Forensic data analytics use tools such as data visualization, text mining, web-scraping tools, data dashboards, statistical analysis (e.g., discovery sampling), link analysis, and social media. These tools are in addition to the older, traditional tools of inspecting, tracing, observing, counting, reconciling, comparing, and contrasting. Usually business rules, such as a dollar amount of claims or frequency of claims, are used to detect fraud.

(iv) Streaming Data Analytics
Streaming data analytics are performed in real time and in memory where they collect data from electronic sensors to produce time-series data. The use of streaming analytics increases as machine-generated data sources increase. Temporal analysis, which is based on the concept of time and which is a part of streaming data analytics, helps to understand different scenarios that are based on changing times. For example, the selling, activating, or redeeming thousands of gift cards within a short period of time (e.g., three to four hours) in a retail store can be an indication of fraud or a sudden surge of activity is an application of streaming data analytics. This unusual activity in gift cards is a red flag.

Data stream processing presents current events as they are occurring. In contrast, traditional data analytics present past events and embedded data analytics predict future events.

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Traditional Data Analytics ➔ Show Past Events
Streaming Data Analytics ➔ Show Current Events
Embedded Data Analytics ➔ Show Future Events
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(v) Social Media Data Analytics
Social media analytics take thousands and thousands of data items from online posts, followers, fans, page views, reviews, comments, pins, and mentions in various social media websites to evaluate marketing campaigns, advertisements, and promotions and to conclude what marketing efforts worked and what did not work.

(vi) Web-Based Data Analytics
Web scraping is a web-based data extraction and data mining approach. For example, it can search Twitter, a social media network, and look for keywords relating to fraud. Web mining is a data mining technique for discovering and extracting information from web documents. Web mining explores both web content and web usage.
(vii) **Text-Based Data Analytics**

Text analytics focus on prescriptive analytics and descriptive analytics where they concentrate on written materials and mobile text messages using SMS and MMS. Text analytics also include information from web call-center notes, comment fields posted on social media platforms, traditional reports, customer inquiries, web chats, and regular books. Text-based data are unstructured data and are useful to mine for fraud-related words on various data sources.

(viii) **Open-Source Data Analytics**

Open-source analytical tools and techniques are available, including open-source software, interoperable systems, and data-sharing facilities at low or no cost. The open-source algorithms can be consolidated in a central location to allow ease of access across several organizations to identify fraud, waste, and abuse. Moreover, the use of open-source tools could lessen the challenge of developing licensing agreements for proprietary software tools. Open-source data libraries can help in audits, inspections, and investigations.

(ix) **Data Modeling Analytics**

Data modeling analytics involve building data models, using simulation models, and testing them with what-if questions to see their answers in the form of changing outputs (outcomes) when inputs to the model changes.

(x) **Visual Analytics**

Visual analytics use data visualization tools, such as line, bar, scatter, bubble, and pie charts, to present relationships among big data in an easy-to-understand format. Senior managers prefer visual analytics, similar to data dashboards.

(xi) **Descriptive Analytics**

Descriptive analytics describe what already happened and include content analysis and context analysis.

**Content analysis** is a set of procedures for transforming unstructured written material into a format for analysis. It is a methodology for structuring and analyzing unstructured written material in documents and reports. For example, two or more documents can be analyzed to discover fraud-related content using specific words, symbols, names, events, outcomes, and addresses.

**Example:** Using text-data analytics, governmental agencies are looking at social media platforms for specific words or comments to: identify terrorist activities; discover fraudulent activities in social security benefit payments and other social assistance programs to citizens, and pinpoint fraud, waste, and abuse in healthcare payments.

**Context analysis** is useful because data can be contextual, meaning some data is related to a specific context (in context). Hence, a pool of data must be separated between in-context data and out-of-context data to analyze data trends and patterns. Examples of in-context data involve insurance companies analyzing claims data during natural disasters; and retail companies analyzing sales data during holiday shopping seasons, during special weeklong promotions (e.g., blast sales, flash sales, or tent sales), and during a season (in-context) and outside of the season (out of context) if the focus is on seasonal sales.

(xii) **Prescriptive Analytics**

Prescriptive analytics help management decide what should happen and thrive on big data. When faced with a number of potential decisions, prescriptive analytics analyze for the best possible outcome.
Examples:

- Optimal allocation of a company’s stock market portfolio after considering expected returns and dividends
- Airline companies determining ticket prices after considering travel variables, such as customer demand, travel timings, travel locations, and holidays (for example, ticket prices are higher during holidays)

(xiii) Cognitive Analytics

Cognitive analytics use artificial intelligence (AI) technology as it applies to cybersecurity, healthcare, transportation, and finance areas. The AI group of technologies such as machine learning and natural language processors can provide clear insights into problems with greater confidence, speed, and accuracy. For example, the AI technology can be used in cybersecurity in performing threat-hunting and threat-defending exercises, in healthcare in diagnosing a patient’s health risks, in transportation in predicting airline delays, and in finance in estimating the reasons for late bill payments from customers and business partners and how to improve and speed up accounts receivable collection frequency.

(xiv) User Behavior Analytics

User behavior analytics studies an online user’s (shopper’s) behavior to show that user’s activity trails such as the number of browser-clicks made, the types of website navigation paths visited, the variety of product purchases made, and the number of online advertisements viewed. All this user activity data is used to compute the click-to-conversion time metric, which indicates the amount of effort and time a user put in before a product was purchased online. Performing user behavior analytics is a part of electronic commerce improvement program.

(xv) Customer Analytics

Customer analytics, which is a part of customer relationship management (CRM) analytics, looks at a customer’s online transactions to study customer demographics, online shopping patterns, and the Internet usage activity so predictive analytics can be applied to determine potential sales and profits from customers. In addition, marketing management can capture a customer’s profile (e.g., age, gender, location, income, occupation, education, and shopping habits and interests) without a direct contact with the customer. Conducting customer analytics is a part of electronic commerce improvement program.

(xvi) Benford’s Law of First-Digit Test

As part of fraud investigations, internal auditors can apply Benford’s law of first-digit test to detect unusual data patterns arising from human errors, data manipulations, or fraudulent transactions. If the first digit in a financial account number or business transaction number is 1, chances are that it is a naturally occurring number (i.e., fraud-free). If the first digit is 9, good chances are that it might be purposefully assigned number (i.e., fraudulent) to perpetrate fraud. The law looks to see whether the first digit is 1 or 9 because the digit 1 occurs 30% of the time and the digit 9 occurs only 5% of the time. In general, lower numbers (1 to 5) are usually freer of fraud than higher numbers (6 to 9), which are known to be fraudulent on the scale of 1 to 9.

The following conditions apply:

The number is fraud-free if digits 1, 2, 3, 4, and 5 are present. They occur in combination 78% of the time.

It is fraudulent if digits 6, 7, 8, and 9 are present. They occur in combination 22% of the time.
If actual first-digit analysis indicates that digits 6 through 9 occur more often than their expected frequency, it is an indication of fraud or other irregularities, and further investigation as to their causes is required.

(d) Data Mining

(i) Data Mining Defined

Data mining is the application of database technologies and advanced data analytics to uncover hidden patterns, trends, correlations, outliers, anomalies, and subtle relationships in data and to infer rules that allow for the prediction of future results and outcomes. Data mining analyzes data for relationships that have not been discovered previously and other insights not suggested by a priori hypotheses or explicit assumptions. For example, data insights might apply to retail marketers in identifying trends in terms of customer buying preferences and customer shopping behaviors.

Today, mining can be performed on many types of data, including structured, unstructured, textual, Web, multimedia, and semistructured data (e.g., XML and HTML). Data mining overlaps with a wide range of analytical activities, including data profiling, databases, data warehouses, data marts, virtual databases, online analytical processing (OLAP), structured query language (SQL), statistical analyses, data modeling, and predictive data analytics.

Both private sector and public sector organizations are increasingly using data mining applications to achieve their purposes.

(ii) Data Mining in Private Sector

Private sector organizations are using data mining applications to explore new business opportunities with the sole goal of growing their business. A list of major purposes includes:

- Improving service or performance in increasing sales, revenues, and profits (major purpose)
- Detecting fraud, waste, and abuse
- Analyzing intelligence and detecting terrorist activities
- Analyzing scientific and research information
- Detecting criminal activities and patterns

A minor purpose of data mining is to improve employee, customer, and vendor safety.

Broadly speaking, private sector applications of data mining include customer relationship management, market research, retail, supply chain, medical analysis and diagnostics, financial analysis, and fraud detection.

(iii) Data Mining in Public Sector

Public sector organizations are using data mining applications for a variety of purposes ranging from improving service or performance to analyzing and detecting terrorists’ patterns and activities. A list of major purposes includes:

- Improving service or performance levels to citizens (major purpose)
- Detecting fraud, waste, and abuse, such as improper payments
- Analyzing scientific and research information for new drugs and new medical treatments

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Managing human resources for promotions, pay scales, pay grades, contractor security clearances, and employee background checks

Detecting criminal activities or patterns, such as identity theft cases

A minor purpose is analyzing intelligence and detecting terrorist activities using Internet sources.

Broadly speaking, public sector applications of data mining focus on detecting financial fraud and abuse in procurement card and credit card programs and analyzing intelligence and detecting terrorist activities.

(iv) Privacy Concerns over Data Mining

A number of privacy concerns about mined or analyzed personal data exist, including worries about these issues:

- The quality and accuracy of the mined data
- The use of the data for other than the original purpose for which the data were collected without consent of the individual
- The protection of the data against unauthorized access, modification, or disclosure
- The right of individuals to know about the collection of personal information, how to access that information, and how to request a correction of inaccurate information

(v) Technologies in Data Mining

Seven technical topics presented in this section include databases, virtual databases, data warehouses, data marts, OLAP, SQL, and advanced technologies such as AI and machine learning.

(A) Databases

A database contains files with facts and figures on various types of information, such as sales, costs, and personnel. These files are collectively called the firm’s database. A database is a collection of related data about an organization, intended for sharing of this data by multiple users. A database management system (DBMS) is comprised of software, hardware, and procedures. The DBMS acts as a software controller enabling different application systems to access large numbers of distinct data records stored on direct access storage devices (e.g., disks).

The DBMS handles complex data structures and should be compatible with the operating system environment. Unauthorized access to data elements is a major concern in a database system due to concentration of data. The DBMS provides a user interface with the application system through increased accessibility and flexibility by means of data views.

A data model describes relationships between the data elements and is used as a tool to represent the conceptual organization of data. A relationship within a data model can be one to one (e.g., between patient and bed in a hospital environment; at any given time, one bed is assigned to one patient), one to many (e.g., between hospital room and patients; one hospital room accommodates more than one patient), and many to many (e.g., between patient and surgeon; one surgeon may attend to many patients and a patient may be attended by more than one surgeon).

The primary purpose of any data model is to provide a formal means of representing information and of manipulating the representation. A good data model can help describe and model the application effectively. A DBMS uses one or more data models, such as relational, hierarchical, network, object, or distributed.
(B) Virtual Databases
A virtual database is created when data from multiple database sources is integrated to provide a total perspective on a specific topic. It is virtual in that such database does not exist physically but is created on demand. For example, an auditor comparing performance of a multiplant organization can use virtual database technology to view key operating and financial ratios of plants side by side.

(C) Data Warehouses
Data warehouses have several definitions and purposes. The purpose of a data warehouse is information retrieval and data analysis. It stores precomputed, historical, descriptive, and numerical data. It involves a process of extracting and transferring operational data into informational data and loading it into a central data store, or warehouse. Once loaded, users can access the warehouse through query and analysis tools. The data warehouse can be housed on a computer different from the production computer.

A data warehouse is a storage facility where data from heterogeneous databases are brought together so that users can make queries against the warehouse instead of against several databases. The warehouse is like a big database. Redundant and inconsistent data are removed from the databases, and subsets of data are selected from them prior to placing them in a data warehouse done automatically or manually, or a combination. Usually, data warehouses contain summary data, correlated data, or data that is otherwise massaged.

Data integrity and security issues are as applicable to warehouses as they are to databases. An issue is: What happens to the warehouse when the individual databases are updated?

Data modeling is an essential task for building a data warehouse along with access methods, index strategies, and using query languages. For example, if the data model is relational, then an SQL-based language is used. If the data model is object-oriented, an object-based language may be appropriate.

Metadata management is another critical technology for data warehousing. Metadata includes mapping between the data sources (databases) and the warehouse. Another issue is whether the warehouse can be centralized or distributed.

(D) Data Marts
A data mart is a subset of a data warehouse (i.e., a mini-data warehouse). It brings the data from transaction processing systems to functional departments (i.e., finance, manufacturing, and human resources) or business units or divisions. Data marts are scaled-down data warehouses. Data marts place targeted business information into the hands of more decision makers.

(E) Online Analytical Processing
OLAP programs are available to store and deliver data warehouse information from multidimensional databases. These programs allow users to explore corporate data from a number of different perspectives, such as product, geography, time, and salesperson.

OLAP servers and desktop tools support high-speed analysis of data involving complex relationships, such as combinations of a company’s products, regions, channels of distribution, reporting units, and time periods. Access to data in multidimensional databases can be very quick because the data is stored in structures optimized for speed, and the databases avoid using SQL and index processing techniques. In other words, multidimensional databases have greater retrieval speed and longer update times.
Consumer goods companies (e.g., retail) use OLAP to analyze the millions of consumer purchase records and transactions captured by electronic scanners at the checkout stand. This data is used to spot trends in purchases and to relate sales volume to store promotions (coupons) and store conditions (displays). The data in OLAP is generally aggregated, giving information such as total or average sales in dollars or units. Users can examine the OLAP’s hierarchical data in the time dimension, such as sales by year, by quarter, by month, by week, or by day.

**(F) Structured Query Language**
The primary components of an SQL database are schemas, tables, views, parser, optimizer, executor, access rights checker, and access rights grantor or revoker. A schema describes the structure of related tables and views. Tables, which consist of rows and columns, hold the actual data in the database. Each row is a set of columns; each column is a single data element. Views are derived tables and may be composed of a subset of a table or the result of table operations (e.g., a join of different tables). A parser is a program that breaks input into smaller chunks so that a program can act on the information.

SQL is a standard query language for a DBMS; SQL also is used to query and update the data managed by the DBMS. The SQL standard, which is used by most commercial DBMSs, includes specific requirements for enforcing discretionary access controls.

**(vi) Advanced Technologies**
Advanced technologies such as AI, machine learning, expert systems, neural networks, and text mining are part of overall umbrella of AI where they are used in answering questions from retail shopping customers and recognizing human voice or speech with pay-by-phone systems.

Neural networks learn by training. They can be used or reused in reviewing credit card transactions to detect anomalies and fraudulent activities. Text-mining tools are used to scan unstructured documents, such as emails, web pages, and audio/video files, and to scan structured data found in databases or data warehouses.

**Summary of Technologies Used in Data Mining with Their Purposes**
- A database contains raw data collected from daily business transactions.
- A data warehouse contains massaged, cleansed, and normalized data.
- End users query many points with heterogeneous databases.
- End users query only a single point with homogeneous data warehouses.
- A data warehouse provides summary data for the entire business.
- A data mart provides detailed data for a specific function of a business (a mini-data warehouse).
- Data mining is an end user tool to select information from a data warehouse.
- Data mining is an auditing tool to detect fraud, intrusion incidents, and security problems in a data warehouse.
- Advanced technologies, including AI, machine learning, expert systems, neural networks, and text mining, are used to perform sophisticated analysis.

**(vii) Applications in Data Mining**
**Data mining** is the process of asking (posing) a series of questions (queries) against a database or data warehouse containing large amounts of data to extract some meaningful, relevant, and
useful information to perform management analysis. A data warehouse or data mart itself does not attempt to extract information from the data it contains. A data mining tool is needed to extract data.

Data mining applications are best suited to data-intense organizations with millions of customers' data collected in their databases or data warehouses. Examples of data-intense organizations include retailers, market research firms, governmental agencies, online order takers, casinos, travel agencies, vacation cruise line firms, hotels, rental car companies, and airline companies. There is no end to the data mining applications; the imagination of the person requesting the data analysis work is the only limit.

Data mining applications software is available from a number of vendors. Off-the-shelf software generally makes these applications easier to use and less expensive than custom-built software.

Data mining is data analysis, data fishing, data snooping, and data drilling in order to get to the bottom of the vast amounts of data (big data) collected by organizations during their business operations. Another name for data mining is data analytics.

**WHAT IS WEB MINING?**

Web mining is a data mining technique for discovering and extracting information from web documents. Web mining explores both web content and web usage.

To analyze data, find relationships between data elements, and draw meaningful conclusions that can be incorporated into its decision-making process, management uses various quantitative techniques, such as regression analysis, factor analysis, cluster analysis, sampling, and other statistical methods. The ultimate goal of data mining is to improve business operations and increase profits.

Data mining can be applied to databases as well as to data warehouses and data marts. A warehouse structures the data in such a way so as to facilitate query processing. Data mining is a set of automated tools that convert the data in the warehouse into some useful information. It selects and reports information deemed significant from a data warehouse or database.

Before data mining software tools are applied, the target data (raw datasets) must be cleansed (sanitized) and normalized to remove missing, erroneous, or inappropriate data. Here, data mining tools can discover data relationships and data clusters (i.e., groupings of similar data items). Data mining also uncovers patterns and trends in data.

There are several types of data mining applications, including data classifications, data sequencing, data dependencies, and deviation analysis. Data records can be grouped into clusters or classes so that patterns in the data can be found. Data sequencing can be determined from the data. Data dependencies, such as relationships or associations between the data items, can be detected. Deviation analysis can be performed on data. Fuzzy logic, neural networks, and set theory are some techniques used in data mining tools.

Data mining techniques can also be used for intrusion and fraud detection and to audit the databases. Data mining tools can be used to detect abnormal patterns in data, which can provide clues to fraud. A security problem can be created when a user poses queries and infers sensitive
hypotheses. That is, the inference problem occurs via a data mining tool. A data mining tool can be applied to see if sensitive information can be deduced from unclassified information legitimately obtained. If so, then there is an inference problem. An inference controller can be built and placed between the data mining tool and the database to detect user motives and prevent inference problems from occurring. Since data mining tools are computationally intensive, parallel processing computers are used to carry out the data mining activities.

Harrah’s Casino and Hotel in Las Vegas, an entertainment company, is a big user of data mining applications. Interested customers (guests) are given an electronic card before gambling. This card collects data on guests’ gambling actions in terms of what games they play, how much time they spend on each type of game, what games they lose or win, how many times they visit the casino in a year, how many days they stay in the hotel for each visit, whether they come alone or with family, and their personal income. For example, if a guest’s personal income is very high, this application recommends that the guest play high-stakes games with very attractive incentives and rewards. Different incentive and reward programs are available for guests with more typical personal income. This application is a win-win situation in that the casino makes additional profit on the guest and the guest enjoys extra perks (royal treatment) that he or she would not have received otherwise.

Other examples of application of data mining are listed next.

- Market segmentation, where data mining identifies the common characteristics of customers who buy the same products
- Customer defection, where data mining predicts which customers are likely to leave the company
- Fraud detection, where data mining identifies which transactions are most likely to be fraudulent
- Direct marketing, where data mining identifies which prospects are the target for mailing
- Market basket analysis, where data mining identifies what products or services are commonly purchased together
- Trend analysis, where data mining reveals the difference between a typical customer this month versus last month.

(e) Big-Data Audit

In addition to asking traditional questions about data quality, data security, data sources, and data privacy during a big-data audit, internal auditors should ask intense and deep questions about data models, use of IP assets, audit resources, and audit team structure. These questions are consistent with rating the big data as a high-risk audit area and due to the popular saying “Garbage in, garbage out,” especially in relation to data sources and data models. Questions to ask about data sources and data models are listed next.

Data Sources

- Are data sources known, unknown, valid, invalid, questionable, reputable, illegitimate, unethical, clean, or dirty sources?
- Are data timelines recent or old? (Recent data is more relevant than the old data.)
- Are data sanitized to remove erroneous (bad), inappropriate, and irrelevant data?

- Are the selected data elements for data extraction from databases, data warehouses, or data marts suitable in achieving the business objective of data mining applications?

**Data Models**

- Has a pilot model been developed on a small-scale size prior to launching a final model on a full-scale size? (Pilot models require fewer resources than final models.)

- Does the model-building process follow a structured approach with clear phases, such as model development, model testing, model implementation, and model termination?

**Model development** focuses on data collection and preparation (garbage in, garbage out) and validation of data sources to identify missing, biased, or incomplete data; out-of-range numeric data; or out-of-time frame data (data quality). Model development assures model quality and data quality.

**Model testing** focuses on validating the model’s processing logic and rules and interpretation of test results to ensure that the model’s results are the expected results. Model testing assures model validation.

**Model implementation** focuses on placing the tested pilot model on a full-scale basis and operationalizing and institutionalizing it. Model implementation produces model results, outputs, and outcomes.

**Model termination** focuses on whether the current model is appropriate to process current or old data. Data currency changes as business conditions change. The nature of current business problems to be solved can change since the model was developed. New data requires new models, and old models can be terminated or retired.

**(i) Use of Intellectual Property Assets**

Big data can come from two sources: private and public, where public data is free and private data is not. Private data or software may be owned by someone or some organization with associated IP rights (i.e., copyrights, trademarks, service marks, and patents) that should be respected and paid for where applicable. Internal auditors should determine whether such IP rights are protected, acknowledged, and paid for with written permission obtained from the IP owners. Here the goal is to protect the rights of the IP asset owners, thus reducing reputation risk. Many times, “acceptable use” of IP assets is permitted by asset owners without written permission as long as users properly acknowledge and credit that use.

In general, the nature of IP rights could be of three types: unlimited data rights, limited data rights, and restricted software rights.

1. **Unlimited data rights.** A company is given the rights to use, modify, reproduce, display, release, or disclose technical data or computer software in whole or in part, in any manner, and for any purpose, whatsoever, and to have or authorize others to do so.

2. **Limited data rights.** A company is permitted to use, modify, reproduce, release, perform, display, or disclose technical data, in whole or in part, within the company. The company must obtain the express permission of the party providing the technical data to release or disclose it outside the company.
3. **Restricted software rights.** A company is given the rights to use computer software with only one computer at one time and to make the minimum number of copies of the computer software required for archive, backup, or modification purposes. The company may modify restricted rights software, subject to restrictions, and release or disclose restricted rights software outside the company in limited situations.

**(ii) Audit Resources**

Conducting a big-data audit is technical in nature. As such, it requires a mix of technical skills and competencies from internal and external sources. Internal audit management must ensure that the internal audit resources are in-sourced (audit staff), cosourced (nonaudit internal staff), or outsourced (external talent) with SMEs, consultants, and contractors for a successful completion of the audit project work. Nonaudit staff can include marketing, operations, and other internal staff.

Audit Resources = In-Sourced Audit Staff + Cosourced Nonaudit Staff + Outsourced Staff

**(A) Audit Team**

Internal audit management must ensure that the data analytics team, consisting of legal staff, IT staff, and a statistical analyst, selects the data analytics tools (i.e., software and hardware). For example, (1) legal staff can advise the data analytics team about legal requirements to protect privacy of data or access to the external data; (2) IT staff can help in developing data analytic tools and to avoid duplicative software and hardware purchases; and (3) a statistician can help educate the team about the merits and applications of each type of statistical method.

**(B) Audit Applications**

Imagination is the only limit to audit applications of big data, data analytics, and data mining. Examples of audit applications are listed next.

- The Office of Inspector General (OIG) of the U.S. Housing and Urban Development (HUD) developed an analytical methodology using data visualization tools to track default rates as early indicators of trends in the housing mortgage market.
- The OIG of HUD tracked how hurricane storm surges (e.g., Sandy) affected the HUD public housing assets.
- The OIG of the U.S. Department of Defense identified a vendor charging nearly $1 million to ship two flat washers costing 20 cents each. The vendor was convicted of conspiracy, sentenced to prison time, and ordered to pay restitution.
- The OIG of the U.S. Department of Health and Human Services in partnership with the Centers for Medicare & Medicaid Services used link analysis, a part of data analytics, to discover overpayment or improper payment fraud to healthcare providers linked with known bad actors (bad providers) through addresses or phone numbers.
- The OIGs of several federal government agencies detected credit card fraud using data mining tools.
- Internal auditors can use statistical analyses, such as regression, factor, cluster, link, and correlation analysis, to detect fraudulent transactions.
- Internal auditors can use data analytics and data mining software tools to assess the overall control environment after identifying systemic breakdowns in controls.
- Internal auditors can use data analytics techniques and data mining software tools to assess data integrity and security controls over databases, data warehouses, and data marts.
- Internal auditors can use big-data analytics as a part of their analytical reviews conducted during audit planning and engagement work.

1.11 Business Intelligence

This section defines business intelligence (BI), discusses how the BI is collected, presents applications of BI data, and discusses data visualization tools.

(a) Business Intelligence Defined

Business intelligence (BI) is collecting and analyzing internal data and external data to provide new insights that were not apparent before. Business specialists, not technology specialists, must gather the BI information because the business specialists know their vital information needs and wants and are the end users and beneficiaries of the BI efforts. These new insights are then incorporated into new strategies and built into new decisions, resulting in new results. Although most businesses collect BI information in the past, the need for increasing efforts to explore new BI information is growing due to heavy global competition, to exploit new business opportunities, and to gain a competitive advantage in the marketplace. Simply stated, gathering BI can lead to new business development opportunities and growth in current business and its absence can lead to business downturns slowly and business declines eventually.

(b) Traditional Ways of Collecting BI Data

In the past, organizations collected BI information in several discrete ways, including by department or function, by manager or executive, and by business unit or division—all independent ways with no collaboration, coordination, or integration. Ad hoc analysis emerged. These isolated or siloed efforts are useful in local decisions, not in corporate decisions. An organization’s resources are wasted due to duplication of efforts, inconsistent results, and wrong decisions.

Traditionally, stand-alone spreadsheet software and/or end user—developed specific application software were used in collecting and analyzing BI information. For example, spreadsheets are used in financial budgeting, project costing, product costing, payroll, word processing, basic analytical calculations and comparisons (e.g., ratios and data ordering), and others. The IT staff was helping and guiding end users in introducing and developing specific software products to meet their specific, local needs. However, these spreadsheet software products had limited capabilities and problems, such as lack of: data governance; data standardization; data sanitization (data cleansing and normalizing); data integrity, security, and privacy; user-friendly interfaces; verified controls; documentation regarding formulas used and assumptions made; and tracing of results (outputs) to original data sources. Consequently, noticeable errors were made during data entry and data processing operations, which were not detected or corrected. The use of copy-and-paste feature in spreadsheets increased errors due to its magnification effect. Moreover, the data sources in the spreadsheet could not be trusted, verified, controlled, and traced.

In summary, problems in using stand-alone spreadsheets can arise: (1) through improper usage of spreadsheet software; (2) due to inadequate planning, design, and documentation of spreadsheet application; and (3) due to human errors. The consequences of these problems and errors are significant as the outputs of spreadsheet are used in decision making.
(c) Modern Ways of Collecting BI Data

Today, several sources of BI information exist, including government, open-source (Internet-based), proprietary (i.e., a company’s internal data), research, industry, simulated, and anonymous data. Information from all these sources is called big data, and software companies have developed several tools, called business analytics, to utilize such big data. Big data and business analytics are the backbone of the today’s BI efforts where core business users and the IT staff work together in developing new analytical software tools to derive maximum value from the big data.

Today, the term “business analytics” is a well-accepted, easily recognized, and a comprehensive term for all types of businesses (e.g., proprietorships, partnerships, or corporations), although software vendors have introduced several new terms, such as collaborative analytics, agile analytics, guided analytics, advanced analytics, and self-service analytics. The trend in business analytics is moving toward self-service analytics where end users perform their own analytics using big data, collaborate and coordinate with others, and share their results with others. Efficiencies are gained with self-service analytics through better utilization of resources such as unified software investment, time savings, knowledge sharing, and better decisions.

(d) Technologies Supporting Self-Service Analytics

Self-service analytics are user-driven in a business function or department, not analyst-driven in an IT function or department. End users are encouraged and empowered to do their own self-service analytical tasks and share the results with others. End users need to switch from the use of individual spreadsheets to the use of unified business analytics software. Intuitive and user-friendly data queries are built into the self-service analytics software. In this regard, several emerging technologies, described next, support the scope, nature, and size of self-service analytics.

- Cloud technology with massive cloud-based data warehouses where big data are located and stored
- Embedded analytics where the analytical software is build directly into business applications software that end users work with daily in providing a seamless user experience
- Machine learning algorithms that iteratively and interactively learn from data through repetitive processes and guide end users to the next operations
- Natural language processors with search capabilities that can understand an end user’s regular spoken words or languages in locating the required data or information
- Dashboard software with drill-down and drag-and-drop features that can bring new insights and better clarity in business results
- Data visualization software tools that can present the requested data analytical results in a clear and concise manner through charts, graphs, tables, maps, and exhibits

(e) Applications of BI Data

Today, applying BI information to business decision making is no longer a theoretical exercise; it is a reality. All applications start with a “question” and a “hypothesis” that can be tested by data analysis.

For example, a retail company could ask: Is the bad cold weather affecting consumer shopping? The corresponding hypothesis could be: Long-lasting cold temperatures are reducing the number of shoppers coming into stores.
Several applications of business analytics include statistical modeling; simulation of equipment breakdowns; data clustering analysis in marketing; data correlation analysis in cost estimations; forecasting of sales, inventory, cash, and profits; relationships between multiple variables using regression analysis; resource optimization techniques in transportation and manufacturing; and data mining to understand customer preferences and buying habits.

According to Accenture, several companies are already benefitting from the use and application of business analytics using the BI information.

- CVS Health used government health data to provide consumers with personalized recommendations for preventive healthcare services such as vaccinations and health screening tests.
- Starbucks used demographic data on the number of local smartphone users (potential customers) to determine whether mobile applications (apps) discounts will be most impactful.
- Best Buy used government data to innovate a market segmentation strategy where each customer represents a different consumer segment with specific buying habits. Best Buy used these data-driven profiles to restructure its offline (in-store) and online buying experiences.
- The Kellogg Company, which is in the food manufacturing business, used government data to improve operations and spur product innovation. Consequently, it increased revenues, decreased costs, and better met its customer needs.
- Walmart is using machine learning technology to improve customer experience inside its retail stores, detecting unhappy customers with facial recognition software. It is also using a combination of government data and machine learning to optimize its truck delivery routes.

(f) Data Visualization Tools

Data visualization software tools help in data presentation and include several reporting and information dissemination methods to report data results to management for action and decisions. These methods include various charts and graphs, such as column, bar, Gantt, pie, part-to-whole, line, area, layer, radar, and tabular charts; box plot, histograms; Pareto charts; bullet charts, scatter diagrams; dashboards; pivot tables; contingency tables; responsibility assignment matrixes (RACI diagrams); spaghetti plot, maps, decision tables, and decision trees.

The basic purpose of a chart or graph is to give a visual comparison between two or more things. For example, changes in budget from one year to the next may be represented in a graph. One significant reason for visualizing a comparison is to reinforce its comprehension. Charts and graphs are used to dramatize a statement, a fact, a point of view, or an idea. They are data presentation tools and visual aids assisting in the quick comprehension of simple and complex data, statistics, or problems. A chart should explain itself in silence; it should be completely understood without the assistance of a caption. The caption must act only as reinforcement to its comprehension.

Column Chart

The column chart is most commonly used for demonstrating a comparison between two or more things. The column chart is vertical.

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**Bar Chart**
The bar chart is essentially a column chart on its side, and is used for the same purpose. The bar chart is horizontal. It is a tool that allows a manager to evaluate whether existing resources can handle work demand or whether activities should be postponed. The bar chart looks like a Gantt chart.

**Gantt Chart**
A Gantt chart is a graphical illustration of a scheduling technique. The structure of the chart shows output plotted against units of time. It does not include cost information. It highlights activities over the life of a project and contrasts actual times with projected times using a horizontal (bar) chart. It gives a quick picture of a project’s progress in terms of actual time lines and projected time lines. The Gantt chart looks like a bar chart.

The Gantt chart is used for milestone scheduling where each milestone has start and completion dates. A milestone represents a major activity or task to be accomplished (e.g., design phase in a computer system development project).

**Pie Chart**
The pie chart is used to represent a 100% total of two or more items. It is not recommended to use in part-to-whole analysis, but it can be used in drawing maps, such as a website’s traffic. Pie charts look like Pareto charts, but they are not the same.

**Part-to-Whole Chart**
The part-to-whole chart shows the percentage of a part in relation to its whole. For example, a retailer’s marketing department can conduct the part-to-whole demographic analysis to show how customers’ age groups are distributed in each market region, such as South, North, East, and West.

**Line Chart**
The line chart is exceptionally impressive when comparing several things but could present a visual problem if the comparisons are too many or too close in relation to one another. **Advantages:** It is simple to draw. **Disadvantages:** If the lines are close to each other, it is difficult to distinguish some of the plotted points.

**Area Chart**
An area chart uses the same data as the line chart but presents it in an area format, which is easy to visualize.

**Layer Chart**
The layer chart is linear in appearance but has a different representation. It depicts the accumulation of individual facts stacked one over the other to create the overall total. This chart is more complex than the others, since it illustrates much more. In addition to showing the comparison of layers that add up to the total, this type of chart also shows how each group of layers relates to subsequent groups. Layer charts require more work to prepare than the other charts. There is more arithmetic involved, and a good deal of concentration is required to draw layer charts.

**Radar Chart**
The radar chart is a visual method to show in graphic form the size of gaps in a number of areas, such as current performance versus ideal (expected) performance and current budget versus previous budget.
**Tabular Chart**

The tabular chart is used to represent items of interest. It requires a fair amount of study in order to grasp the full meaning of the figures. This is because it takes longer to digest the meaning of an itemization of compiled figures than if the same figures are presented graphically.

**Box Plot**

A box plot is a part of data distribution analysis to show how quantitative values are distributed across a full range of quantitative values. An example of the box plot application is distribution of patient treatment length in time for each type of treatment category, such as most urgent, less urgent, and nonurgent services. Here, the key indicator, such as number of minutes per patient, is shown in a box format in terms of quartiles, percentiles, low values, middle values, and high values. The two dimensions are time on the y-axis and treatment category on the x-axis.

**Histogram**

A histogram is an alternative to a box plot showing data distributions with a different perspective. An example of the histogram application is distribution of patient treatment length in time for each type of treatment category, such as most urgent, less urgent, and nonurgent services. The histogram can reveal peak and nonpeak treatment times. Here, the number of patients in each category is displayed on the y-axis and the time in minutes on the x-axis.

From a statistics viewpoint, a histogram is a graphic summary of variations in a dataset. It shows data patterns that are difficult to notice in a simple table of numbers. A histogram is a vertical bar chart providing a frequency distribution of measured data. It looks like a normal Bell curve.

**Pareto Charts**

Pareto charts can be drawn to separate the vital few items from the trivial many items. They are based on the 80/20 rule, that is, 20% of items contribute to 80% of problems. These charts are problem-solving tools. A Pareto chart looks like a pie chart, but they are not the same.

**Bullet Charts**

Bullet charts are good to compare two variables, such as sales dollars and salesperson. Actual sales data and target (quota) sales data can be compared for each salesperson to visualize which salesperson meets the assigned target sales quota (i.e., above or below the quota). Here, two charts are combined with a bar chart showing actual sales dollars on the horizontal x-axis and a vertical reference line (quota line) on the vertical y-axis.

**Scatter Diagram**

A scatter diagram or scatter plot is used to determine whether a relationship exists between an independent variable (vertical, y-axis) and a dependent variable (horizontal, x-axis) as shown in a graph. It detects correlation or trends between two measured factors or variables of interest, such as product price (y-axis) and sales quantity (x-axis) and sales quantity (y-axis) and net profit or gross profit (x-axis). Note that a correlation, whether it is positive or negative, does not guarantee a true relationship; it only suggests a potential relationship.

**Dashboards**

Dashboards are presented in several forms, including numerical, graphical, and interactive formats. They use drill-down and drag-and-drop features. In general, data dashboards are a collection of performance indicators showing an object’s or a device’s status and quality levels in colors. They provide a concise and visual summary of overall performance. An example is showing an automobile’s performance in terms of its speed, revolutions per minute, oil pressure, and temperature.

A data dashboard is a color-coded visual presentation of vital data used in developing a strategy or a plan. Data can be presented in several ways, such as tables, figures, charts, graphs, maps,
exhibits, slides, audios, and videos. Data can also be presented at different times, such as on demand or as scheduled. A dashboard can be created using a drag-and-drop facility available on mobile devices and desktop/laptop computers.

Dashboards are of two types: static (basic) and interactive (advanced). Static dashboards show traditional reports that are mainly financial focused (e.g., sales, revenues, costs, and profits). Basic interactive dashboards show information about customers’ buying habits and cross-sales to them. Advanced interactive dashboards can have built-in simulation models to do what-if type of analyses (i.e., sensitivity analysis).

Today, some organizations present only structured data on their dashboards. Better insights and rewards can be achieved if they show structured data, unstructured, and semistructured data on their dashboards because it gives them a big-picture perspective of their business.

**Data filters** can be built into dashboards so data can be sliced from different perspectives or drilled down to a more detailed level using various parameters, such as: transaction date, month, quarter, or year; cost data by contract; revenue or profit data by a retail store; sales data by a market region; or quarterly performance by a business segment. Data filters provide the ability to explore data at multiple levels and to customize user-driven data analysis. Data filters show only the requested data and ignore the rest of the data not requested.

**Pivot Table**
A pivot table (or pivot chart) is a second, revised table in rows and columns containing reformatted data using the raw data from the first, original table in rows and columns.

First Table ➔ Original Table

Second Table ➔ Pivot Table

The basic data values are the same between the original table and the pivot table. However, the pivot table contains sorted, rearranged, and summarized data, providing better insights. For example, a retail marketing manager can create a pivot table showing which salesperson has the highest sales dollars in a given month or quarter from the original sales data tables. Exhibit 1.61 compares the first, original table with the second, pivot table.

**EXHIBIT 1.61** Comparison between the First and the Second Pivot Table

<table>
<thead>
<tr>
<th>First, Original Table</th>
<th>Second, Pivot Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presents discrete raw data in columns and rows found in spreadsheets</td>
<td>Presents summarized data after sorting, counting, grouping, averaging, and summarizing data in columns and rows. Spreadsheets, data visualization programs, or business intelligence software can be used to create pivot tables.</td>
</tr>
<tr>
<td>Cannot answer the question “How many product units were sold in each market region for each ship date?”</td>
<td>Can answer the question “How many product units were sold in each market region for each ship date?”</td>
</tr>
</tbody>
</table>
| Can be used in data mining applications. Descriptive statistics can be applied to compute standard deviation and variance. Simplifies complex data found in OLAP servers using data query tools. | }
Contingency Table
A contingency table is a type of table presented in a matrix format displaying frequency distribution, showing their statistical probabilities. Contingency tables (cross-tabulations) are used in business intelligence, market research, and customer surveys where interrelations and interactions between two or more variables can be studied to obtain greater insights of data. Due to its statistical focus, a contingency table shows a measure of association between variables. For example, a table can be put together showing how male and female customers prefer to purchase Product A and Product B from a retailer.

Responsibility Assignment Matrix
A responsibility assignment matrix (or RACI diagram) deals with four items: responsible (the “R”), accountable (“A”), consulted (“C”), and informed (“I”). Typically, a task is associated with one or more roles using the RACI diagram. Simply stated, the RACI diagram connects people to their assigned jobs, duties, tasks, activities, or projects so they can complete them.

The RACI diagram describes and clarifies participation by several individuals assuming various roles in completing the assigned tasks or deliverables required in a project, process, or facility. It can be applied either in one business function or department or across functions or departments.

Spaghetti Plot
A spaghetti plot (chart, diagram, or map) is a workflow system to visualize data flows through a system where flows appear as noodles. This plot is used to: track product routing and material movement through a factory; reduce inefficiencies in an office, factory, or warehouse workflow system; and show the effects of medical drugs on test patients during a new drug trial, among others. The results of a spaghetti plot can be useful in streamlining or simplifying workflow to save resources, such as time, money, materials, and energy.

Maps
Maps are used to show geographical data, such as a location (city or country) and an activity. They are often paired with pie, line, or bar charts. An example of application of maps is a distribution of website traffic by country for the number of blogs visited.

Decision Table
A decision table documents rules used to select one or more actions based on one or more conditions. These conditions and their corresponding actions can be presented either in matrix or tabular form. Decision rules are used in decision tables where a sentence in the table is called a “rule.” Each rule shows conditions that must be considered, their relationships to each other, and the decision instructions (actions).

A decision table is a tabular means of analyzing decision alternatives (courses of actions) and states of nature (outcomes). The alternatives are listed on the left side, the states of nature are listed across the top, and the payoffs (i.e., conditional values) are listed in the body of the decision table.

Decision Tree
A decision tree is a graphical representation of possible alternative decisions, events, or states of nature resulting from each decision with its associated probabilities and outcomes of the events or states of nature. The decision problem displays the sequential nature of the decision-making situation. The decision tree has nodes, branches, and circles to represent junction boxes, connectors between the nodes, and states-of-nature nodes, respectively.
The decision tree approach is suitable for multiple sequential decisions, where later decisions are based on the outcome of prior ones. The approach includes decision alternatives, states of nature with their respective probabilities, and payoff amounts for each combination of decision alternatives and states of nature.

The expected monetary value (EMV) is computed by working backward (i.e., by starting at the right of the tree and working back to decision nodes on the left of the tree). The decision node leading to the state-of-nature node with the highest EMV will be chosen. Decision trees are used in evaluating capacity planning and capital investment decisions.

**Which Data Visualization Tool Is Used for What and When?**

- Line charts, area charts, and bar charts show trends and patterns over a time period where the “time” dimension is put on the x-axis and the “amount” dimension is put on the y-axis to measure a relationship between time and amount.
- A bar chart is good for comparison and ranking of the measured values.
- A combo chart is a combination of a line chart and a bar chart to identify trends.
- A scatter plot is good for identifying relationships between the measured values.
- The part-to-whole chart shows the percentage of a part in relation to its whole (e.g., Part A is 20%, Part B 30%, and Part C is 50%).
- The pie chart should not be used in conducting part-to-whole analysis due to difficulty in visualizing the parts. However, a bar chart can be used in maps for a better visualization.
- Maps show geographical data, such as a location (city or country) and an activity. Maps are often best used when paired with another chart, such as a pie, line, or bar chart.
- It is good to put the most important data on the x-axis or y-axis and to put the least important data on color, size, or shape attributes.

**1.12 Business Functions**

The manufacturing industry and the service industry are the two major industries in any nation’s economy after excluding the agriculture and defense industries. The retail industry possesses elements of both manufacturing and service where the retailer becomes a manufacturer when it manufactures and sells its own store brands (private labels) to customers. Examples of store brands include Kirkland Signature brand for Costco, the up&up brand for Target, and the Great Value brand for Walmart.

This section focuses on the manufacturing industry and service industry, including the retail industry. Regardless of the industry, three common core business functions (primary functions) include: (1) the operations function (i.e., manufacturing operations to produce goods or service operations to render services to customers), (2) the marketing function (marketing and sales) to market and sell those goods and services, and (3) the finance function (accounting and finance) to invest money in those goods or services and to receive revenue and profits from making and selling those goods and services. These three core functions drive a company’s mission and vision and generate revenues, incur costs, and make profits. Further, the sales function can be considered a subset of the marketing function whereas accounting function can be considered
as a subset of finance function. For example, (1) marketing management develops the marketing strategy and sales management executes that strategy; and (2) finance management raises money and accounting management tracks how that money was spent. Note that marketing and sales are the two sides of a coin similar to accounting and finance.

Many noncore business functions (support functions) exist; they help the core functions to succeed and include human resources management, quality management, IT, engineering, R&D, legal, internal audit, public relations, and other functions. These support functions do not bring any sales, revenues, and profits but facilitate them.

Manufacturing operations, service operations, marketing and sales function and quality management function are further discussed next.

(a) Manufacturing Operations

Manufacturing (production) strategies include increasing productivity, decreasing costs, and improving quality by adding value to inputs (raw materials) through the transformation process and producing quality outputs (products or goods). This strategy fits with the concept that consumers purchase their products from the company that offers them the most value for their money. The manufacturing strategy should fit with the overall business strategy, such as less time to market new products, cost minimization, improved quality, and greater market share. Several topics discussed in the manufacturing operations include workflow analysis; bottleneck management; theory of constraints; production process flows; inventory management techniques and concepts; inventory types and costs; just-in-time systems, and production scheduling and control systems.

(i) Workflow Analysis

Workflow analysis looks at the overall flow of work to find ways to improve this flow. It can reveal value-added and non-value-added activities (e.g., waste and delays) and identify interdependence among departments. The outcome would be eliminating the non-value-added activities and waste and improving efficiency and effectiveness. Assembling tasks, whether subassembly or final assembly, and process time are value-added activities of a manufactured product, while other activities are non-value-added activities. Examples of non-value-added activities from a customer’s viewpoint include inspection time, move time, reporting time, governmental compliance time, storage time, wait time, and queue time.

Analyzing and updating workflow systems would make organizations undergo huge managerial and cultural changes, help employees apply business rules, enable process reengineering, provide parallel processing of documents, eliminate information float or overload, and ensure that established policies and procedures are followed. Workflow software allows business processes to be redesigned and streamlined and automatically routes work from employee to employee.

Interdependence means the extent to which departments depend on each other for resources or materials to accomplish their tasks. Low interdependence means that departments can do their work independent of each other and have little need for interaction, consultation, or exchange of materials. High interdependence means departments must constantly exchange resources and materials.

Three types of interdependence influence organization structure: pooled, sequential, and reciprocal. Pooled interdependence is the lowest form of interdependence among departments. Work
does not flow between units. Each department is part of the organization and contributes to the common good of the organization, but it works independently. When interdependence is of serial form, with parts or documents produced in one department becoming inputs to another department, sequential interdependence exists. Here departments exchange resources and depend on others to perform well. Management requirements for sequential interdependence are more demanding than for pooled interdependence. These requirements include coordination, communication, integrators, and task forces. The highest level of interdependence is reciprocal interdependence. This exists when the output of operation A is the input to operation B, and the output of operation B is the input back again to operation A. The outputs of departments influence those departments in reciprocal fashion. Management requirements for complex reciprocal interdependence include greater planning, coordination, communication, permanent teams, and frequent adjustments in work and its associated plans.

(ii) Bottleneck Management

A bottleneck is a constraint in a facility, function, department, or resource whose capacity is less than the demand placed on it. For example, a bottleneck machine or work center exists where jobs are processed at a slower rate than they are demanded. Another example is where the demand for a company's product exceeds the company’s ability to produce the product.

Bottlenecks influence both product profitability and product price. The contribution margin per bottleneck hour or the value of each bottleneck hour should be analyzed. This measure is better than the normal contribution margin per unit. The contribution margin per hour of bottleneck can be used to adjust the product price to better reflect the value of the product's use of a bottleneck. Products that use a large number of bottleneck hours per unit require a higher contribution margin than products that use few bottleneck hours per unit.

(iii) Theory of Constraints

The theory of constraints (TOC) is a manufacturing strategy that attempts to remove the influence of bottlenecks on a process. According to Dr. Eliyahu M. Goldratt, TOC consists of three separate but interrelated areas: logistics, performance measurement, and logical thinking. Logistics include drum-buffer-rope scheduling, buffer management, and VAT analysis. Performance measurement includes throughput, inventory and operating expense, and the five focusing steps. Logical thinking process tools are important in identifying the root problems (current reality tree), identifying and expanding win-win solutions (evaporating cloud and future reality tree), and developing implementation plans (prerequisite tree and transition tree).

**Drum-buffer-rope scheduling** is the generalized process used to manage resources to maximize throughput. The drum is the rate or pace of production set by the system's constraint. The buffers establish the protection against uncertainty so that the system can maximize throughput. The rope is a communication process from the constraint to the gating operation that checks or limits material released into the system to support the constraint.

**Buffer management** is a process in which all expediting in a factory shop is driven by what is scheduled to be in the buffers (constraint, shipping, and assembly buffers). By expediting this material into the buffers, the system helps avoid idleness at the constraint and missed customer due dates. In addition, the causes of items missing from the buffer are identified, and the frequency of occurrence is used to prioritize improvement activities.

**VAT analysis** is a procedure for determining the general flow of parts and products from raw materials to finished products (the logical product structure). A “V” logical product structure
starts with one or a few raw materials, and the product expands into a number of different products as it flows through divergent points in its routings. The shape of an “A” logical product structure is dominated by converging points. Many raw materials are fabricated and assembled into a few finished products. A “T” logical product structure consists of numerous similar finished products assembled from common assemblies, subassemblies, and parts. Once the general parts flow is determined, the system control points (gating operations, convergent points, divergent points, constraints, and shipping points) can be identified and managed.

The **five focusing steps** is a process to continuously improve organizational profit by evaluating the production system and the marketing mix to determine how to make the most profit using the system constraint. The steps consist of:

1. Identifying the constraint to the system.
2. Deciding how to exploit the constraint to the system.
3. Subordinating all nonconstraints to the system.
4. Elevating the constraint to the system.
5. Returning to Step 1 if the constraint is broken in any previous step, while not allowing inertia to set in.

(iv) **Production Process Flows**

Three operational process flow measures include flow time, inventory, and throughput. They are interrelated in that defining targets on any two of them defines a target for the third.\(^{25}\)

\[
\text{Inventory} = \text{Throughput} \times \text{Flow time}
\]

The basic managerial levers for process improvement are:

- Decrease in flow time
- Increase in throughput
- Decrease in inventory and waiting time
- Control process variability
- Manage process flows and costs

(A) **Levers for Managing Flow Time**

Levers for managing flow time include decreasing the work content of a critical path by shortening the length of every critical path in these ways:

1. Reduce the work content of an activity on the critical path.
   - Eliminate non-value-adding aspects of the activity (i.e., work smarter).
   - Increase the speed at which the activity is done (i.e., work faster) by acquiring faster equipment and/or by increasing incentives to work faster.
   - Reduce the number of repeat activities (i.e., do it right the first time).

2. Work in parallel.
   ☐ Move work from a critical path to a noncritical path (i.e., perform work in parallel rather than in sequence).
   ☐ Move work from a critical path to the “outer loop” (i.e., either preprocessing or post-processing).

3. Modify the product mix.
   ☐ Change the product mix to produce products with smaller work content with respect to the specified activity.

(B) Levers for Managing (Increasing) Process Throughput
Levers for managing (increasing) throughput of a process are listed next.

1. Decrease resource idleness.
   ☐ Synchronize flows within the process to reduce starvation and set appropriate size of buffers to reduce blockage.

2. Increase net availability of resources to increase effective capacity.
   ☐ Improve maintenance policies.
   ☐ Perform preventive maintenance outside periods of scheduled availability.
   ☐ Institute effective problem-solving measures that reduce frequency and duration of breakdowns.
   ☐ Institute motivational programs and incentives to reduce employee absenteeism and increasing employee morale.

3. Reduce setup waste.
   ☐ Reduce the frequency of setups, and reduce the time required for a single setup.

4. Increase theoretical capacity.
   ☐ Decrease unit load on the bottleneck resource pool (e.g., work faster, work smarter, do it right the first time, change production mix, subcontract or outsource, and invest in flexible resources).
   ☐ Increase the load batch of resources in the bottleneck resource pool (i.e., increase the scale of resources).
   ☐ Increase the number of units in the bottleneck resource pool (i.e., increase scale of process).
   ☐ Increase the scheduled availability of the bottleneck resource pool (i.e., work longer).
   ☐ Modify the production mix.

(C) Levers for Reducing Inventory and Waiting Time
Levers for reducing inventory and waiting time are listed next.

1. Reduce cycle inventory (i.e., reduce batch size).
   ☐ Reduce setup or order cost per batch or reduce forward buying.

2. Reduce safety inventory.
   ☐ Reduce demand variability through improved forecasting.
☐ Reduce replenishment lead time and its variability.
☐ Pool safety inventory for multiple locations or products through either physical or virtual centralization of specialization or some combination thereof.
☐ Exploit product substitution.
☐ Use common components.
☐ Postpone product differentiation closer to the point of demand.

3. Manage safety capacity.
   ☐ Increase safety capacity.
   ☐ Decrease variability in arrivals and service patterns.
   ☐ Pool available safety capacity.

4. Synchronize flows.
   ☐ Manage capacity to synchronize with demand.
   ☐ Manage demand to synchronize with available capacity.
   ☐ Synchronize flows within the process.

5. Manage customers’ psychological perceptions.
   ☐ Reduce the cost of waiting in a line by managing customers’ perceptions.

**D) Levers for Controlling Process Variability**
Levers for controlling process variability are listed next.

1. Measure, prioritize, and analyze variability.
   ☐ Check key performance measures over time.

2. Utilize feedback control to limit abnormal variability.
   ☐ Set control limits of acceptable variability in key performance measures.
   ☐ Monitor actual performance and correct any abnormal variability.

3. Decrease normal process variability.
   ☐ Design for processing (i.e., simplify, standardize, and mistake-proof).

   ☐ Utilize robust design to minimize process variability.

**E) Levers for Managing Process Flows and Costs**
Levers for managing process flows and costs are listed next.

1. Manage flows in a plant.
   ☐ Process structure with cellular layout.
   ☐ Information and material flow using demand pull system.
   ☐ Level production with batch size reduction.
   ☐ Quality at source with defect prevention and decentralized control.
   ☐ Supplier management with partnerships and incentives.
Supply consistency through maintenance of safety capacity.
Employee involvement and empowerment.

2. Manage flows in a supply chain.
Reduce information and material flow times using technology and efficient logistics.
Reduce fixed costs of ordering and quantity discounts.
Share information on customer demand and product availability.
Coordinate forecasts between affected parties.
Stabilize prices.

3. Improve processes.
Utilize continuous improvement and reengineering.
Utilize increased visibility, incentives, plan-do-check-act (PDCA) cycle, and benchmarking.

(v) Inventory Management Techniques and Concepts

From the viewpoint of inventory management, demand is of two types: independent demand and dependent demand. Independent demand inventory systems are based on the premise that the demand or usage of a particular item is independent of the demand or usage of other items. Examples include finished goods; spare parts; material, repair, and operating (MRO) supplies; and resale inventories.

(A) Independent Demand Inventory Systems
Independent demand inventory systems are “pull” systems in that materials are pulled from the previous operation as they are needed to replace materials that have been used. For example, finished goods are replaced as they are sold. These types of inventory systems answer the question of when to place the replenishment order and how much to order at one time. Reorder point models and fixed/variable order quantity models (e.g., economic order quantity [EOQ]) are examples of independent demand inventory systems as they review inventory either continuously or periodically.

(B) Dependent Demand Inventory Systems
Dependent demand inventory systems are based on the premise that the demand or usage of a particular item is dependent on the demand or usage of other items. Examples include raw materials, work-in-process (WIP) inventories, and component parts.

(C) Inventory Levels and Profit Levels
A company manages its inventory by using various methods and approaches (e.g., EOQ). Inventory consists of raw materials, work in process, and finished goods. Efficient inventory management is needed to support sales, which is necessary for profits. Benefits such as high turnover rate, low write-offs, and low lost sales can be attributed to efficient inventory management. These benefits, in turn, contribute to a high profit margin, a higher total asset turnover, a higher rate of ROI, and a strong stock price. Inventory management is a major concern for product-based organizations (e.g., manufacturing and retail), since 20% to 40% of their total assets is inventory. For that reason, poor inventory control will hurt the profitability of the organization.

(vi) Inventory Types and Costs
This section presents several topics: types of inventory, costs of inventory, investments in inventory, management views on inventory, inventory ordering and reordering techniques, ABC
inventory analysis with inventory counts, inventory management methods, inventory costing methods, and inventory estimation methods.

(A) Types of Inventory

Inventory represents the single largest investment in assets for most manufacturers, wholesalers, and retailers. These are the six primary types of inventory:

1. Raw materials inventory (basic and bulk items)
2. WIP inventory (semifinished inventory)
3. Finished goods inventory
4. MRO supplies inventory
5. In-transit inventory

Raw materials inventory includes the basic inputs to the organization’s production process. This inventory is cheapest, because the organization has not yet invested labor and other efforts and costs in it. Examples of raw materials inventory (ingredients) for a baking shop include eggs, flour, sugar, butter, oil, and food flavoring agents, such as vanilla extract and fennel seeds.

WIP inventory includes the materials moving through the various stages of the production process that are not yet fully converted to finished products. A WIP inventory for an automobile manufacturing plant includes engines, wheels, tire assemblies, and dashboards waiting to be installed.

Finished goods inventory includes products that have passed through the entire production process but have yet to be sold. Finished goods are the fully completed products that are available for future or current shipment and to fill future customer orders. Finished goods are highly visible inventory and expensive, because the organization has already invested in raw materials, labor, and other costs (overhead costs) to make the finished product. Note that finished goods levels change as production levels go up and down and as sales levels go up and down. New cars parked in the storage lot of an automobile factory or at a car dealership are examples of finished goods inventory.

MRO supplies inventory includes the items used to support production and other factory operations (miscellaneous supplies). These items are not physically part of a finished product but are critical for the continuous operation of a plant, equipment, or office. Examples of MRO supplies inventory include office supplies, spare parts, tools, cleaning clothes and liquids, paper towels, and computers.

In-transit inventory is in transit to a customer or is located throughout distribution channels. Most consumable goods inventory is either on trucks or on grocery store shelves. In fact, grocery stores provide shelf space for products but do not own any inventory. The supplying company or distributor owns the inventory and receives payment when a consumer buys a product. In-transit inventory is carried to distributors and retailers using trucks, trains, air cargos, sea cargoes, and other transportation methods.

Cross-docked inventory refers to products that are unloaded from an inbound truck coming from a manufacturer at one dock of a retailer’s warehouse and are reloaded onto an outbound truck at a different dock of the same warehouse within a short time. The outbound truck is going to retail stores based on the stock keeping unit code on a product’s package. In other words,
products are coming from a manufacturer and immediately going to retail stores without being stored in the warehouse.

A cross-docking approach to inventory can optimize materials handling and movement costs in a warehouse because these in-transit products do not require storage as they are shipped from a manufacturer to a retailer as outbound deliveries. This expedited approach ships goods to customers as quickly as possible.

Benefits to the cross-docking inventory approach include:

- No delays from the manufacturer to the retailer, which helps improve customer satisfaction.
- No storage space required, which leaves more space for other products to store.
- No labor costs involved as there is no need for picking, sorting, and storing of cross-docked products in the warehouse.

However, there are some risks associated with the cross-docked inventory approach: Warehouse employees or truck drivers can steal the products during the dock changeover without any accountability, and these products cannot be tracked and monitored in the same way as other products. Products suitable to the cross-docking approach are perishable items (e.g., fruits and vegetables), high-quality products that do not require incoming inspection; products that are pretagged and preticketed with bar codes and RFID tags; staple products with constant demand that are consumed quickly; prepicked and prepackaged customer orders coming from other manufacturers or warehouses; and sales promotional products that are ready and waiting for sale at retail stores.

**(B) Costs of Inventory**

Inventory is not cheap, and various costs are associated with inventories due to their direct relationships with production activities. The cost structure, consisting of variable costs and fixed costs, affects the amount and type of investment needed. Four types of inventory-related costs are carrying or holding costs, ordering costs, stock-out costs, and quality costs.

1. **Carrying costs**

   Carrying (or holding) costs are the costs associated with carrying a given level of inventory. These costs rise in direct proportion to the average inventory carried or held. The components of carrying costs include:

   a. The costs of capital tied up in inventory
   b. The opportunity cost associated with not being able to use the capital for other investment
   c. Warehouse storage and handling costs
   d. Insurance premiums
   e. Property taxes
   f. Depreciation
   g. Pilferage, spoilage, spillage costs
   h. Property damage costs
   i. Obsolescence costs due to deterioration from wear and tear
The holding of inventory may create other costs. Examples include duties, tooling costs, exchange rate differentials, packaging costs, transportation and logistics costs, and administrative costs.

Carrying costs vary with the level of inventory, which makes these costs variable. Fixed costs are not included as part of inventory carrying costs, because inventory levels typically have no effect on a fixed cost, at least in the short run. For most industries, inventory carrying costs typically range from 15% to 25% of the value of the total inventory.

**EXAMPLE**

Carrying cost of inventories is calculated as follows:

\[
\text{Inventory carrying cost} = \text{Average inventory in units} \times \text{Unit price} \times \text{Carrying cost per year}
\]

If a company averages 1,000 units in inventory, for which the unit price is $1.00 per unit and the annual carrying cost is 25%, the total inventory carrying cost per year for that level of inventory is $250 (i.e., \((1,000 \times 1 \times 0.25) = 250\)).

2. **Ordering costs**

Ordering costs are the costs associated with placing an order and are fixed regardless of the average size of inventory. The components of ordering costs include the cost of placing orders and production setup and shipping and handling costs.

Ordering costs are a composite of the costs associated with the release of a material order. These costs may include the cost of generating and sending a material release, transportation costs, and any other cost connected with acquiring a good. If a firm produces an item or good itself, the ordering cost will also include machine setup costs. Examples of inventory ordering costs include salaries of the buyers and their staff; cost of paper, postage, telephone, and transportation; and receiving costs of materials.

**EXAMPLE**

Ordering cost of inventories is calculated as follows:

\[
\text{Total ordering costs} = \text{Fixed costs associated with ordering inventories} \times \text{Number of orders per year}
\]

If a company incurs $20 for fixed costs associated with ordering inventories and if it places 15 orders per year, the total ordering costs are $300 (i.e., \(20 \times 15 = 300\)).

**HOLDING COSTS VERSUS ORDERING COSTS**

**Holding costs** are the costs associated with carrying a given level of inventory; these costs are dependent on the size of the inventory. They include interest cost for the capital tied up in inventory, opportunity cost associated with not being able to use the money for investment, insurance fees, taxes, pilferage and damage, as well as other warehouse overhead costs.

**Ordering costs** are the costs associated with placing an order and include salaries of the purchasers, paper, postage, telephone, transportation, and receiving costs.
3. Stock-out costs

Stock-out costs are costs of running short of inventory and require safety stock as a cushion. This means that safety stock reduces a stock-out situation. However, safety stock increases carrying and investment costs and decreases stock-out costs. The components of stock-out costs include the loss of sales, the loss of customer goodwill, and problems or delays in production schedules. Stock-outs or out-of-stock situations have an opportunity cost due to inability to meet customer demand and from consequent loss of sales revenue and profits. Stock-outs at a retailer can cause a rippling effect in the entire supply chain, called a bullwhip effect.

WHAT IS THE BULLWHIP EFFECT?

The bullwhip effect, also known as the Forrester effect, refers to a rippling and magnifying effect on inventory levels due to changes in product demand levels between producers and suppliers. This means that a small change in demand at the first downstream supplier (DS-1) creates a big change in the demand at the first upstream supplier 1 (US-1) and generates a huge demand at the producer, as shown below.

US-1 → US-N → Producer ← DS-N ← DS-1

The bullwhip effect results in unnecessary over-orders, overproduction, overstorage, over-buildup of inventory, and excessive inventory costs and investments due to an excess of caution exhibited by all levels in the supply chain. In other words, the bullwhip effect is a result of a just-in-case exaggeration of demand incorrectly assumed by all partners in the supply chain, thus reflecting chaos and uncertainty. In a way, the bullwhip effect represents uncontrolled and uncoordinated activities in the inventory channel as well as in the supply chain.

4. Quality costs

Quality costs include any costs associated with nonconforming goods produced. The total cost of inventory ownership is more than simply the ordering and carrying costs because it should include the cost of poor quality. Quantifying the cost of poor quality is difficult, but it can help identify the causes of quality-related problems. Examples of quality costs due to producing and shipping defective inventory include field-site failure costs, rework costs, losses due to poor product yields, inspection time and costs, lost production, and product warranty and recall costs.

(C) Investment in Inventory

The investment in the finished goods inventory is hiding in working stock and safety stock. The amount of this investment depends on the actual level of inventory carried. The relevant question is how many units of each inventory item the retail firm should hold in its stock. A relevant metric here is gross margin return on inventory investment (GMROII) or gross margin return on inventory (GMROI), where higher numbers are preferred. This is calculated as:

\[ \text{GMROII} = \text{GMROI} = \frac{\text{Gross margin amount}}{\text{Average inventory at cost}} \times 100 \]

Two types of stock concepts must be understood: working stock and safety stock. The actual level of finished goods inventories carried will equal the sum of the working stock and safety stock.
**Working stock** is needed to meet normal, expected production and sales demand levels. Producing more goods than are currently needed increases the firm’s carrying costs and exposes it to the risk of obsolescence if demand should fall. Remember that demand for sales is uncertain. Working stock is a basic stock or cycle stock where inventory levels go up and down due to sales activity and inventory ordering and reordering activities.

**Safety stock** is needed to guard against changes in sales rates or delays in production and shipping activities that could result in a stock-out situation. Safety stock is additional stock beyond the working stock and meets when demand is greater than expected. The additional costs of holding safety stock must be balanced against the costs of sales lost due to inventory shortages. Safety stock will not affect reorder quantities as it is the inventory level at the time of reordering minus the expected usage while the new goods are in transit.

Another name for safety stock is buffer stock; it provides a safety cushion for working stock to prevent stock-outs when demand exceeds the sales forecast.

The goal is to minimize both the cost of holding safety stock and the cost of stock-outs. Production bottlenecks lead to stock-outs. Factors to be considered in controlling stock-outs include time needed for delivery, rate of inventory usage, and safety stock.

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**SAFETY STOCK VERSUS STOCK-OUTS**

Safety stock is the amount of extra stock that is kept to protect against stock-outs. Running out of an inventory item is called a stock-out situation. Safety stock is the inventory level at the time of reordering minus the expected usage while the new goods are in transit.

Economic order quantity is not relevant to stock-outs. Production bottlenecks lead to stock-outs. Factors to be considered in controlling stock-outs include time needed for delivery, rate of inventory usage, and safety stock.

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(D) **Management Views on Inventory**

There have been serious debates whether inventory is an asset or a liability of a company. Since inventories need to be available prior to sales, an increase in production to meet increased sales requires an increase in notes payable (a liability account). Since assets (inventories) are increasing, liability (notes payable) must also increase at the same time. This means that inventory is both an asset and a liability at the same time.

From an accounting point of view, inventory is an asset of a company because the company makes money by selling the inventory to customers. A company’s marketing department also views inventory as an asset. Owners and investors may see the inventory as a liability.

There are conflicting views about the status of inventories within the management team of a manufacturing or retail company due to different goals they have. Examples of these conflicting objectives include:

- Sales managers prefer large inventories so they can sell more when needed.
- Production managers prefer large production runs to gain production efficiencies.
- Warehouse managers prefer minimum inventory to optimize storage space.
- Purchasing agents prefer large lot purchases to save money on total purchases due to volume discounts.
- Finance managers prefer low inventories and small production runs to reduce inventory funding.
- Chief executives want more production, more sales, more profits, and higher market stock prices.

**(E) Inventory Ordering and Reordering Techniques**

In this section, we discuss optimal order quantities and how to calculate reorder points.

Inventory managers face two decision rules in the management of inventories: how much to order and when to order that will result in the lowest possible total inventory cost. The how-much-to-order decision rule can be satisfied with the use of an EOQ. This decision rule involves selecting an order quantity that draws a compromise between (1) keeping smaller inventories and ordering frequently (results in high ordering costs) and (2) keeping large inventories and ordering infrequently (results in high holding costs). The when-to-order decision rule can be satisfied with the use of a reorder point.

**Optimal Order Quantity.** How many units should be ordered or produced at a given time is a major question faced by the inventory manager. Either too much or too little inventory is not good. An optimum inventory level is designed and is found through the use of the EOQ model. EOQ provides the optimal, or least-cost, quantity of inventory that should be ordered. If a company’s cost of ordering per order increases while carrying costs per order remain the same, the optimal order size as specified by the EOQ model would increase.

EOQ cost characteristics are listed next.

- The point at which the total cost curve is minimized represents the EOQ, and this, in turn, determines the optimal average inventory level. Here, total cost is the sum of ordering and carrying costs.
- Some costs rise with larger inventories whereas other costs decline.
- The average investment in inventories depends on how frequently orders are placed.
- Ordering costs decline with larger orders and inventories due to reduced order frequency.

If $Q$ is the order quantity, then the how-much-to-order decision involves finding the value of $Q$ that will minimize the sum of holding and ordering costs.

$$Q = \text{EOQ} = \sqrt{\frac{2D \cdot C_o}{Ch}}$$

Where

- $D =$ annual sales demand in units
- $C_o =$ cost of placing one order
- $Ch =$ cost of holding (or carrying) one unit in inventory for the year
Note that the data needed to calculate EOQ includes: the volume of product sales, the purchase price of the products, the fixed cost of ordering products, and carrying costs. It does not include the volume of products in inventory, inventory delivery times, delays in transportation, or quality of materials.

Due to the square root sign, a given increase in sales will result in a less-than-proportionate increase in inventories, and the inventory turnover ratio will thus increase as sales grow.

**EXAMPLE: CALCULATION OF OPTIMUM ORDER SIZE**

A retail firm expects to sell 1,000 units of product 576 during the coming year. Ordering costs are $100 per order, and carrying costs (holding costs) are $2 per unit per year. Using the EOQ model, what is the optimum order size?

The optimum order size is 316, as shown below. The answer is to find the square root of \( (2 \times 100 \times 1,000) / 2 \). This is the square root of 100,000, or 316.

**Reorder Points.** Another major problem facing the inventory manager is at what point inventory should be ordered or produced. The point at which stock on hand must be replenished is called the “reorder point.” It is also the inventory level at which an order should be placed. The formula is

\[ \text{Reorder point} = \text{Lead time} \times \text{Usage rate} \]

Where lead time = time lag required for production and shipping of inventory

Usage rate = usage quantity per unit of time (Note: the time period should be the same in both lead time and usage rate—days, weeks, or months.)

**EXAMPLE: CALCULATION OF REORDER POINT**

A retailer’s usage rate (sales) for product 576 is 25 units per week. If the lead time for the same product is four weeks from suppliers, what is the reorder point for product 576?

\[ \text{Reorder point} = \text{Lead time} \times \text{Usage rate} \]

\[ \text{Reorder point} = 4 \times 25 = 100 \text{ units} \]

This means that the retailer will reorder product 576 when its current inventory level is 100 units.

A complication in the calculation of the reorder point arises when we introduce a concept of goods in transit. This situation occurs when a new order must be placed before the previous order is received. Goods in transit are goods that have been ordered but have not been received. A goods-in-transit situation exists if the normal delivery lead time is longer than the time between orders. The formula for a reorder point when goods in transit is considered is:

\[ \text{Reorder point} = (\text{Lead time} \times \text{Usage rate}) - (\text{Goods in transit}) \]
**EOQ Assumptions.** There are two major assumptions of EOQ. First, the demand for an item is constant. Since the constant demand assumption is not realistic, managers would have to be satisfied with the near-minimum-cost order quantity instead of a minimum-total-cost order quantity. Second, the entire quantity ordered arrives at one point in time. Again, this may not be realistic because some vendors will deliver partial shipments. Managers usually add a judgmental value-based order quantity to the EOQ suggested order quantity to accommodate unrealistic assumptions of constant demand rate by the EOQ model.

Specific assumptions of the EOQ model are listed next.

- Sales can be forecasted perfectly. This is unrealistic.
- Sales are evenly distributed throughout the year. This is not realistic. What about seasonal or cyclical demands?
- Orders are received without delay. This is also unrealistic.
- Fixed costs, carrying costs, and purchase prices are all fixed and independent of the ordering procedures. This is not possible either.

**EOQ Cost Characteristics**

- The point at which the total cost curve is minimized represents the EOQ, and this, in turn, determines the optimal average inventory level. Here, total cost is the sum of ordering and carrying costs.
- Some costs rise with larger inventories whereas other costs decline.
- The average investment in inventories depends on how frequently orders are placed.
- Ordering costs decline with larger orders and inventories due to reduced order frequency.

**Sensitivity Analysis and EOQ.** It is good to know how much the recommended order quantity would change if the estimated ordering and holding costs had been different. Depending on whether the total annual cost increased, decreased, or remains the same, we can tell whether the EOQ model is sensitive or insensitive to variations in the cost estimates.

**Effects of Inflation on Inventory Management.**

There is no evidence that inflation either raises or lowers the optimal level of inventory of firms in the aggregate. Inflation should be considered, however, since it will raise an individual firm's optimal inventory holdings if the rate of inflation is above average, and vice versa.

Decision rules and consequences of inflation are listed next.

- For moderate inflation, it is safe to ignore inflation and the benefit is not worth the effort.
- For relatively constant inflation, subtract the expected annual rate of inflation from the carrying cost percentage ($Ch$) in the EOQ model and recalculate the EOQ. Since the carrying cost will be smaller, the recalculated EOQ and the average inventory will increase.
For higher inflation, the higher the rate of inflation, the higher the interest rates will be. This will cause the carrying cost to increase and thus lower the EOQ and average inventories.

**(F) ABC Inventory Control System**

ABC is a method of classifying inventory based on usage and value. Expensive, frequently used, high stock-out cost items with long lead times are most frequently reviewed in an ABC inventory control system. Inexpensive and infrequently used items are reviewed less frequently.

ABC inventory analysis is a method of classifying on-hand inventory based on usage and value. It applies the Pareto principle (20% critical few and 80% trivial many) to inventory. Expensive, frequently used, high stock-out cost items with long lead times (A items) are most frequently reviewed. Inexpensive and infrequently used items (B and C items) are reviewed less frequently. To classify the inventory based on annual dollar volume, the annual demand of each item is multiplied with its cost per unit.

Class A items (i.e., approximately 20% of stock items) have a high annual dollar volume representing approximately 80% of the total dollar usage.

Class B and C items (i.e., together approximately 80% of stock items) have a medium annual dollar volume for Class B items and a low annual dollar volume for Class C items, together representing approximately 20% of the total dollar usage.

**Example:** Retailers often develop and monitor a never-out list of products that must be available at all times because they are the best sellers with high sales volume and high margins. Hence, these products are separately planned and controlled from the rest of the products and qualify as A items in the ABC analysis of inventory system.

**Example:** A retail firm uses an ABC inventory control system. About 10% of inventory items are classified into group A. Another 20% are in group B. The remainder items are in group C. Which classification is most likely to hold the greatest number of days of supply?

a. Group C  
b. Group B  
c. Group A  
d. All groups are likely to have an equal number of days of supply

Choice a is the correct answer. Group C items are low-dollar-value items and receive less management attention. Extensive use of models and records is not cost effective. It is cheaper to order large quantities infrequently. Group A items are high-dollar value, and management would try to keep investment in such items low. Therefore, by definition, choices b, c, and d are incorrect.

**Inventory Counts.** Cycle counting is a continuing reconciliation and audit of inventory items with inventory records. It is an alternative to the annual physical inventory exercise and uses the inventory classifications developed through ABC analysis. With cycle counting procedures, stock items are counted, records are verified, inaccuracies are documented, and corrective actions are taken to ensure integrity of the inventory system. Cycle counting focuses on tracing inventory from
book to floor and from floor to book and reconciling the differences and making the necessary adjustments. The frequency of cycle counting depends on the type of inventory item. The cycle counting policy might be as follows:

- “A” stock items may be counted once a month.
- “B” stock items may be counted once every three months.
- “C” stock items may be counted once every six months.

The number of stock items of each classification to be counted each working day can be computed as follows:

- Stock quantity for class A divided by the cycle counting policy days gives the number of items to be counted per working day.
- Stock quantity for class B divided by the cycle counting policy days gives the number of items to be counted per working day.
- Stock quantity for class C divided by the cycle counting policy days gives the number of items to be counted per working day.
- Add the number of items to be counted per working day for A, B, and C classes.

(G) Inventory Management Methods

At least six inventory management methods exist for a retailer, including manufacturer-managed inventory, retailer-managed inventory, vendor-managed inventory, consignment-based inventory, just-in-time (JIT) inventory, and buyback inventory. Each method is discussed next.

1. Manufacturer-managed inventory is the inventory located in a manufacturer’s factory, warehouse, or distribution center. A manufacturer participates in vendor-managed inventory, consignment-based inventory, and JIT inventory practices. The manufacturer forecasts a retailer’s sales demand or the forecast is given to the manufacturer, who creates production plans based on the forecasts to supply the retailer. Some manufacturers sell their finished goods directly to wholesalers who, in turn, sell them to retailers. Sometimes manufacturers sell their finished goods directly to retailers, depending on the product. Inventory risks solely rest with manufacturers due to their ownership of inventory. Manufacturers could experience stock-out situations due to little or no safety stock, resulting in back orders.

2. Retailer-managed inventory is the inventory located at a retailer’s stores, warehouses, distribution centers, and fulfillment centers. When retailers need new inventory, they place the order and receive the inventory from manufacturers, wholesalers, suppliers, or distributors, depending on the product. Retailers could experience stock-out situations if the inventory order-and-delivery cycle is delayed for some reason and if there is little or no safety stock, resulting in back orders. Inventory risks solely rest with retailers due to their ownership of inventory. Retailers take out insurance policies to cover any losses due to fire and theft.

3. Vendor-managed inventory is a partnership arrangement between a retailer and major suppliers where suppliers monitor sales and inventory levels of their products in all stores and automatically replenish low inventories to prevent stock-out situations without much involvement of the retailer’s procurement staff.
It is an inventory practice where a supplier or vendor manages the inventory at a retailer’s store or warehouse. The vendor works in the store to track inventory sales and stock balances and to place replenishment orders based on the retailer’s previous or blanket order instructions. Any unused or unsold inventory goes back to the supplier. Advantages of this practice to retailers are that (1) they do not need to order and track the inventory because the vendor takes care of it; (2) stock-out situations are minimized; (3) overall inventory levels in the supply chain are reduced; and (4) the size of the bullwhip effect is decreased. Inventory risks solely rest with vendors due to their ownership of inventory. Chances of stock-out situations are smaller because some safety stock is held. It may or may not result in back orders. Walmart, the Home Depot, and other big-box retailers use vendor-managed inventory.

4. **Consignment-based inventory** is the inventory located at a retailer’s store or warehouse and is not owned by the retailer. Instead, it is owned by a manufacturer (first party) and held by a second party, such as a distributor or supplier. Unused or unsold inventory is returned to the second party. The ownership risk solely rests with the manufacturer until the inventory is sold by the retailer. When the retailer sells the inventory, it becomes an accounts receivable item for the manufacturer and an accounts payable item for the retailer. Chances of stock-out situations are smaller because some safety stock is held. It may or may not result in back orders.

5. **JIT inventory** means that retailers receive inventory only when they need it, not before or not after. Hence the name “just-in-time inventory.” JIT inventory avoids early inventory purchase costs and reduces storage costs, thus increases the ROI and ROA. Because there is no safety stock because the retailer operates with lower levels of inventory on hand, the retailer could face stock-out situations if the inventory delivery is delayed for some reason. This stock-out situation results in back orders. Therefore, it is good to have a backup supplier to cover emergencies when a single-source supplier cannot deliver. Inventory risks solely rest with the manufacturer or supplier due to their ownership of inventory. Toyota Motor Corporation invented the JIT management philosophy and perfected it. Now Toyota sends new orders to suppliers for automobile parts or components to make new cars only when it receives new car orders from car dealers or customers.

6. **Buyback inventory** is a contractual arrangement between a retailer and a supplier where the supplier buys back all unsold or slow-moving inventory from the retailer. Here, there are no risks to the retailer because the retailer never bought the inventory to begin with; the supplier faces all the risks from unsold merchandise. The supplier could be a manufacturer, vendor, wholesaler, dealer, agent, distributor, or broker. Of course, not all retail products qualify for buyback arrangements; only certain products, such as fashion items, music CDs, movie CDs, and books are eligible for buyback agreements. For example, fashion items could be outdated (i.e., go out of style) where many customers are not interested in buying them anymore and textbooks could be old versions, which are not being used for any course.

In addition, buyback inventory is mostly applicable to brand-new products introduced into the marketplace for retailers to out to determine customer response and feedback. Sometimes these new products could be competing products, such as fruit yogurt, where there are already several competing products in the market either from the same supplier or from different supplier.
In summary:

- Inventory risks solely rest with manufacturers due to their ownership of inventory in manufacturer-managed inventory situations. Manufacturers could experience stock-out situations.
- Inventory risks solely rest with retailers due to their ownership of inventory in retailer-managed inventory situations. Retailers could experience stock-out situations.
- Inventory risks solely rest with vendors due to their ownership of inventory in vendor-managed inventory situations. Chances of stock-out situations are smaller.
- Inventory risks solely rest with manufacturers due to their ownership of inventory until inventory is sold by retailers in consignment-based inventory situations. Chances of stock-out situations are smaller.
- Inventory risks solely rest with manufacturers or suppliers due to their ownership of inventory in the JIT inventory situation. Retailers could face stock-out situations if the inventory delivery is delayed.
- Inventory risks solely rest with suppliers and retailers bear no risks with buyback inventory because retailers never bought this inventory to begin with. Suppliers face all risks from unsold merchandise.

(H) Inventory Costing Methods

Manufacturing companies have four types of inventory: raw materials, work in process, finished goods, and supplies. Inventory is the largest current asset of a manufacturing company balance sheet. In contrast, retail companies have two types of inventory: finished goods purchased from manufacturers and operating supplies represent the largest current asset of a retailer’s balance sheet. A major objective of accounting for inventories for manufacturers or retailers is the proper determination of income through the process of matching appropriate costs against revenues at the end of each accounting period. Doing this requires calculating what costs are to be included in the cost of goods sold (cost of sales) item and what costs are to be assigned to the inventory on-hand item at the end of an accounting period.

Five inventory costing methods are used based on differing inventory flow assumptions:

1. **Specific identification method**, where the cost of the specific items sold is included in the cost of goods sold, while the costs of the specific items on hand are included in the inventory. This method is used for valuing jewelry, fur coats, automobiles, and high-priced furniture. **Advantage**: Accuracy where cost flow matches the physical flow of the goods. **Disadvantage**: It requires detailed recordkeeping and elaborate manual and/or computer systems.

2. **Average cost method**, where the items in inventory are priced on the basis of the average cost of all similar goods available during the period. The weighted-average method or moving-average technique is used for calculating the ending inventory and the cost of goods sold. **Advantage**: It is simple to apply and it is objective. **Disadvantage**: The inventory is priced on the basis of average prices paid, which is not realistic.
**EXAMPLE: APPLICATION OF AVERAGE COST METHOD**

MPS Retailer has purchased the following quantities of men’s belts in three batches of merchandise during the month of January.

<table>
<thead>
<tr>
<th>Date</th>
<th>Quantity</th>
<th>Price per Belt</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 10</td>
<td>20 belts</td>
<td>$10 each</td>
</tr>
<tr>
<td>January 15</td>
<td>25 belts</td>
<td>$8 each</td>
</tr>
<tr>
<td>January 20</td>
<td>10 belts</td>
<td>$7 each</td>
</tr>
</tbody>
</table>

Assume that a total of 50 belts are sold in January. What are the cost of goods sold for January and valuation of ending inventory in January under the average cost method?

Average cost of all purchases = \( (20 \times 10) + (25 \times 8) + (10 \times 7) = (200 + 200 + 70) / 55 = 8.55 \)

Cost of goods sold for January = \( (50 \times 8.55) = 428 \)

Valuation of ending inventory = \( (5 \times 8.55) = 43 \)

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**3. First-in, first-out (FIFO) method**, where goods are used in the order in which they are purchased; the first goods purchased are the first used. FIFO assumes that the oldest products are sold first. The inventory remaining must represent the most recent purchase with current costs. Cost flow matches the physical flow of the goods, similar to the specific identification method. Ending inventory contains the newest inventory with current costs.

*Advantage:* The ending inventory is close to current cost and provides a reasonable approximation of replacement cost on the balance sheet when price changes have not occurred since the most recent purchases.

*Disadvantage:* Current costs are not matched against current revenues on the income statement. The oldest costs are charged against the more current revenue, which can lead to distortions in gross profit and net income. This creates transitory or inventory profits (i.e., paper profits).

**EXAMPLE: APPLICATION OF FIFO METHOD**

MPS Retailer has purchased the following quantities of men’s belts in three batches of merchandise during the month of January.

<table>
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<tr>
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<th>Quantity</th>
<th>Price per Belt</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>January 20</td>
<td>10 belts</td>
<td>$7 each</td>
</tr>
</tbody>
</table>

Assume that a total of 50 belts are sold in January. What are the cost of goods sold for January and valuation of ending inventory in January under the FIFO method?

Cost of goods sold for January = \( (20 \times 10) + (25 \times 8) + (5 \times 7) = (200 + 200 + 35) = 435 \)

Valuation of ending inventory = \( (5 \times 7) = 35 \)
4. **Last-in, first-out (LIFO) method**, where the cost of the last goods purchased are matched against revenue. LIFO assumes that the newest products are sold first. The ending inventory would be priced at the oldest unit cost. LIFO is the most commonly used method. The LIFO method matches the cost of the last goods purchased against revenue, and the ending inventory is costed at the oldest units remaining in the inventory. In other words, in LIFO, the inventory with current costs becomes part of the cost of goods sold for the current period, and this cost of goods sold is matched against revenues and sales for that current period. Ending inventory contains the oldest inventory with oldest costs.

**Advantages:**
- During periods of inflation, current costs are matched against current revenues and inventory profits are thereby reduced. Inventory profits occur when the inventory costs matched against sales are less than the inventory replacement cost. The cost of goods sold is understated and profit is considered overstated.
- Lower tax payments. The tax law requires that if a firm uses LIFO for tax purposes, it must also use LIFO for financial accounting and reporting purposes.
- Improved cash flow due to lower tax payments, which could be invested for a return unavailable to those using FIFO.

**Disadvantages:**
- Lower profits reported under inflationary times. The company’s stock could fall.
- Inventory is understated on the balance sheet because the oldest costs remain in ending inventory. This understatement of inventory makes the firm’s working capital position appear worse than it really is.
- LIFO does not approximate the physical flow of the items.
- LIFO falls short of measuring current cost (replacement cost) income, though not as far as FIFO.
- Manipulation of income at the end of the year could occur by simply altering a firm’s pattern of purchases.

**EXAMPLE: APPLICATION OF LIFO METHOD**

MPS Retailer has purchased the following quantities of men’s belts in three batches of merchandise during the month of January.

<table>
<thead>
<tr>
<th>Date</th>
<th>Quantity</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>January 20</td>
<td>10 belts</td>
<td>$7 each</td>
</tr>
</tbody>
</table>

Assume that a total of 50 belts are sold in January. What are the cost of goods sold for January and valuation of ending inventory in January under the LIFO method?

Cost of goods sold for January = (10 × $7) + (25 × $8) + (15 × $10) = ($70 + $200 + $150) = $420

Valuation of ending inventory = (5 × $10) = $50
5. **Next-in, first-out (NIFO) method** is not currently acceptable for purposes of inventory valuation. NIFO uses replacement cost. When measuring current cost income, the cost of goods sold does not include the most recently incurred costs; rather, the cost that will be incurred to replace the goods that have been sold.

**I) Other Methods of Costing Inventory**

Generally, **historical cost** is used to cost the period-ending inventories and cost of goods sold. In certain circumstances, though, departure from cost is justified. Two other methods of costing inventory include net realizable value and lower of cost or market.

With **net realizable value**, damaged, obsolete, or shopworn goods should never be carried at an amount greater than net realizable value. Net realizable value is equal to the estimated selling price of an item minus all costs to complete and dispose of the item.

The **lower of cost or market method** involves writing down the inventory to reflect loss if its value declines below its historical cost. A departure from the historical cost principle is required when the future utility of the item is not as great as its original cost. When the purchase price of an item falls, it is assumed that its selling price has fallen or will fall. The loss of the future utility of the item should be charged against the revenues of the period in which the loss occurred. “Market” in this context generally means the replacement cost of the item.

However, **market cost is limited by a floor and ceiling cost**. Market cannot exceed net realizable value, which is the estimated selling price minus the cost of completion and disposal (ceiling). Market also cannot be less than net realizable value minus a normal profit margin (floor). Lower of cost or market can be applied to each inventory item, each inventory class, or to total inventory.

**J) Inventory Estimation Methods**

A retail organization may estimate its inventory to compare with physical inventories to determine whether shortages exist, to determine the amount of inventory destroyed in a fire or stolen, or to obtain an inventory cost figure to use in monthly or quarterly (interim) financial statements. There are two methods of estimating the cost of ending inventory:

1. **Gross margin method**, which establishes a relationship between gross margin and sales; prior-period gross margin rates are used to estimate the current inventory cost. The gross margin method is based on the assumption that the relationship between gross margin and sales has been fairly stable. Gross margin rates from prior periods are used to calculate estimated gross margin. The estimated gross margin is deducted from sales to determine estimated cost of goods sold. Estimated cost of goods sold is then deducted from cost of goods available for sale to determine estimated inventory cost.

2. **Retail inventory method**, which establishes a relationship between prices and costs. The cost/price ratio is used to estimate the current inventory cost.

The retail inventory method is used by organizations that mark their inventory with selling prices. These prices are converted to cost using a cost/price (cost-to-retail) ratio. The cost/price ratio is simply what proportion cost is to each sales dollar. This ratio is applied to ending inventory stated at retail prices to estimate the cost of ending inventory.

The proper treatment of net additional markups and markdowns in the cost-to-retail ratio calculation is to include the net additional markups in the ratio and to exclude net markdowns. This approach approximates the lower-of-average-cost-or-market valuation.
(vii) Just-in-Time Systems

(A) JIT Strategy

JIT is a production strategy to continuously improve productivity and quality. It is based on the belief that small could be better, not “more” is better. An effective JIT strategy encompasses the entire PLC from the acquisition of raw materials to delivery of the end product to the final customer. The scope includes topics such as JIT purchasing, processing, inventory, and transportation. Each topic is discussed next.

JIT is based on these management principles:

- Eliminate waste.
- Produce to demand and one at a time.
- Think long term.
- Develop, motivate, trust, and respect people.
- Achieve continuous improvement.

JIT is made possible when the focus is quality at the source, and the tools used are statistical process control, fail-safe, and problem-solving methods. “Quality at the source” means producing perfect parts every time and all the time. The major benefits of JIT strategy are improved productivity, quality, service, and flexibility; and reduced costs, inventory investment, lead times, lot sizes, and physical space.

(B) JIT Purchasing

JIT purchasing requires a partnership between a supplier and a customer, which is a major departure from traditional purchasing. JIT supplier relations call for long-term partnerships with single-source suppliers that provide certified quality materials while continuously reducing costs. The JIT supplier’s manufacturing processes must be under statistical process control, and its capability should be certified by the customer. Statistical process control charts serve as the documentation to ensure that the process stayed in control during the time the parts were made.

JUST-IN-TIME PURCHASING

Under JIT purchasing, competitive bidding may not occur prior to selecting a supplier because sole-sourcing, single-sourcing, or dual-sourcing approaches are utilized. The supplier is selected based on quality, commitment to excellence, and performance, not cost.

A JIT supplier is expected to support the production flow with frequent, small-lot shipments that can be used immediately by the customer. Usually, no inspection is required at the receiving side of the materials.

A JIT supplier will have to become a JIT producer with the idea of pushing costs out of the supply chain, not passing costs down to the next supplier. Since JIT suppliers are considered partners, customers must notify JIT suppliers of plant disruptions, temporary shutdowns, or anticipated engineering changes so that suppliers can make adjustments to production schedules and inventory plans. Doing this requires sharing of information and open communications.
Traditional Purchasing Practices versus JIT Purchasing Practices

- Traditional purchasing practices call for infrequent, large-lot shipments.
- JIT purchasing practices call for frequent, small-lot shipments.
- Traditional purchasing practices call for inspection, since they focus on continuous checking by the customer. These practices are reactive due to their after-the-fact focus.
- JIT purchasing practices call for no inspection, since they focus on continuous improvement by the supplier. JIT is proactive due to its before-the-fact focus.

(C) JIT Production Processing

JIT production processing requires setup reduction, focused factory, group technology, uniform scheduling and mixed model scheduling, and the pull system. The objective here is to produce many varieties of products in small quantities on short notice. Manufacturing flexibility is the hallmark of the JIT production processing strategy.

Setup Reduction. Traditional production systems require large lot sizes due to excessive setup or changeover time. JIT suggests reduced setup time so that lot sizes are reduced or evolve to lot size of 1 with the first piece made right every time. The goal is to accomplish any setup in single minutes (i.e., in less than 10 minutes). Setup reduction requires eliminating equipment downtime and machine adjustments as much as possible combined with good housekeeping in the manufacturing plant.

With reduction in setup time comes many other benefits, such as:

- Increased quality due to closer tie-in between the machine operator and the setup.
- Increased productivity and profitability due to elimination of many non-value-added activities associated with moving, storing, inspecting, and reworking.
- Reduced manufacturing lead time resulting in lower inventories and associated physical space requirements.
- Reduced scrap, lowering unit costs.

Focused Factory. Focused factory is a concept where the plant layout is dedicated to a single product family that maximizes overall productivity and quality while minimizing space and resource requirements. It is intended to physically link all the involved manufacturing operations together to minimize the distance between them, minimize the complexity, maximize task integration, and enhance interaction between workers. This approach eliminates waste and increases communications.

Group Technology. While focused factory is a macro approach, group technology is a micro approach in which equipment is laid out to produce a family of parts, one at a time, by physically linking all possible operations in the process. It can be viewed as self-contained, integrated parts factories within the focused factory.

Group technology uses a cell concept, where the shape of the cell is a U or C. The starting and ending points are near each other to save walking time. The idea is that a single worker performs every operation, in the proper sequence, to make one finished unit at a time. All operations are close together as much as possible with little or no staging space between workstations. A worker
in a group technology cell not only performs every operation in the process but also sees how they relate to one another. This improves productivity and quality.

**GROUP TECHNOLOGY VERSUS TRADITIONAL TECHNOLOGY**

- Group technology is a low-volume, high-mix work center for an entire family of similar parts.
- Traditional technology is a high-volume, single-part work center.

**Uniform and Mixed Model Scheduling.** Uniform scheduling calls for smaller lot sizes, essentially making every part every day. It is a variable flow management concept instead of trying to coordinate “lumps” of production. It provides level loading for manufacturing operations, building the same product mix every day during a given month. Levels may change from month to month, and hence the term “variable” flow. Under uniform scheduling, the interval between like units is called “cycle time.” The shorter the cycle time, the faster the parts will be made.

Mixed model scheduling is employed to produce the same parts every hour. Yet production levels will change from month to month to meet customer demand.

**Pull System.** Conventional scheduling systems push orders through the production shop, making it difficult to synchronize the diverse activities required to produce the end products. This method results in either excess inventory or insufficient inventory.

Like uniform scheduling, the pull system is based on the variable flow manufacturing principle to make parts repetitively in a low-volume production. The pull system links every process in the plant using simple signaling cards to synchronize production with changing customer demands. It uses a production signal to authorize the machine center to produce parts that have been taken from the storage area next to it. It uses a withdrawal signal as a permission to consume.

**PUSH SYSTEM VERSUS PULL SYSTEM**

- The push system is based on a fixed-flow manufacturing principle.
- The pull system is based on a variable-flow manufacturing principle.
- The traditional (push) production system has a contingency (i.e., safety stock) mentality.
- The JIT (pull) production system has a no-contingencies (i.e., no safety stock) mentality.

The pull system uses standard lot sizes and employs standard-size containers to enhance visual control on the factory floor. This sets the stage for a “precision” mentality. The pull system ensures that the right parts will be in the right place at the right time with a minimal investment in inventory. The pull system provides better production control for less cost.

**(D) JIT Inventory**

A misconception about JIT is that it is just a program to reduce inventory. Fortunately, JIT does more than that. JIT purchasing is called “stockless inventory”; the customer has no inventory to stock, as it is used up in the production right after it was received. The major goal is to reduce or eliminate work-in-process inventory so that all raw materials are consumed in the production process.
(E) JIT Transportation
While JIT purchasing is the starting point of a JIT cycle, JIT transportation is the execution part of the JIT cycle. JIT transportation is the physical linkage between the inside and the outside processes. It is a process that starts at a supplier location and ends at a customer location. It requires the analysis of all transport events and elimination of the non-value-added events. The basic value-added events include:

1. Move load to dock at a supplier location.
2. Load carrier.
3. Move load to customer location.
4. Return empty trailer to terminal.
5. Unload by the customer.
6. Move load to assigned customer location.

Similar to the JIT supplier–customer partnership, JIT transportation requires that all three parties—supplier, carrier, and customer—work together more closely than ever before. With frequent, small quantities moved each time, the traffic at both the supplier and the customer plants will increase, creating a demand for rapid load and unload capabilities.

To support JIT flow of production, frequent deliveries will be required. This means receiving parts at a specific customer location on specific days at specific times during those days.

Reusable containers and small delivery windows are new approaches. Reusable containers save money when compared with expendable containers. Small delivery windows means rapid loading and unloading, which can be enhanced by using point-of-use doors, driver self-unloading, and innovative equipment, such as portable ramps and end-loading trailers.

(F) JIT Partnerships
JIT partnerships are needed between suppliers and purchasers of raw materials, parts, and components to remove waste and to drive down costs for mutual benefit. Long-term partnerships are better than short-term ones, so a few suppliers can invest money to improve quality.

(G) JIT Quality
JIT quality is realized as JIT forces down inventory levels, meaning fewer bad units are produced, which, in turn, means fewer units must be reworked, thus improving quality. As JIT shrinks queues and lead times, it creates an early warning system for quality problems and production errors. As JIT quality is increased, there is less need for safety stock (inventory buffers) to protect against unreliable quality levels and unpredictable customer demand levels.

(H) JIT Scheduling
JIT scheduling improves the ability to meet customer order due dates, reduces inventory with smaller lot sizes, and reduces work in process. Two techniques include level schedules and kanban. A level schedule means each day’s production quantity meets the demand for that day, using frequent small batches. A kanban system moves parts through production via a “pull” from a signal. Kanban uses a card system giving authorization for the next container of material to be produced.

(I) JIT Layout
An efficient JIT layout reduces waste in the form of minimizing the movement of materials on a factory floor or paper in an office because these movements do not add value. The benefits
of a JIT facility include distance reduction, increased operational flexibility, employees working closer to each other, and reduced space and inventory.

(I) JIT and Lean Operations
This subsection presents interactions between lean operations, JIT, TPS, MRP, and EOQ.

Lean operations mean identifying customer value by analyzing all the activities required to produce a product and then optimizing the entire process to increase value from the customers’ perspective. The highlights of lean operations include understanding what the customer wants and ensuring that customer input and feedback are obtained to increase value to that customer. Lean operations adopt a philosophy of minimizing waste by striving for perfection through continuous learning, creativity, and teamwork, which can be equally applied to manufacturing and service industries.

Both JIT and the Toyota production system (TPS) have an internal focus on jobs, employees, work practices, materials, and training. Lean operations have an external focus on the customer. Lean operations need both JIT and TPS techniques and more.

Materials requirements planning (MRP) is suitable for managing raw materials, components, and subassemblies, which have dependent demands that may be calculated from the forecasts and scheduled production of finished goods. In other words, the order for component inventory is placed based on the demand and production needs of other items that use these components.

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**NORMAL INVENTORY DEDUCTION METHOD VERSUS BACKFLUSH INVENTORY DEDUCTION METHOD**

- In a normal inventory deduction method, the amount of component parts used in an assembly operation is deducted from its inventory records based on a planned or scheduled production count of end products. MRP system uses this method by exploding the bill of materials list for planning purposes.
- In a backflush inventory deduction method, the amount of component parts used in an assembly operation is deducted from its inventory records based on an actual count of end assemblies produced. This method works backward from end products to raw materials or component parts and uses the bill of materials list for explosion into individual items.

**Benefits of MRP** include reduced investment in inventory, improved workflow, reduced shortage of raw materials and components, and reliable delivery schedules.

**DETERMINISTIC INVENTORY VERSUS PROBABILITY INVENTORY**

- Deterministic inventory models assume that the rate of demand for the item is constant (e.g., EOQ)
- Probabilistic inventory models assume that the rate of demand for the item fluctuates and can be described only in terms of probabilities.

In addition to considering dependent demand in the determination of net requirements for components, an MRP system also determines when the net requirements are needed by using the time-phasing concept. This concept works by starting with the time that the finished product
must be completed and working backward to determine when an order for each component must be placed based on lead times.

The approach to determining net requirements whenever a dependent demand situation exists is:

\[
\text{Net component requirement} = \text{Gross component requirement} - \text{Scheduled receipts} - \text{Number of components in inventory}
\]

Where Gross component requirement = Quantity of component needed to support production at the next higher level of assembly

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**EOQ VERSUS MRP**

- The EOQ model focuses on finished goods inventories, which have an independent demand from customers or from forecasts.
- The demand for raw materials and components in the MRP model is directly dependent on the demand for the finished goods in the inventory system.

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**(viii) Production Scheduling and Control Systems**

This section discusses three types of production scheduling and control systems: JIT production systems, traditional production systems, and kanban production and inventory systems.

**(A) Just-in-Time Production Systems**

JIT represents a management philosophy whose objective is to eliminate all sources of waste, including unnecessary inventory. The basic principle of JIT is to produce the right products in the right quantity at the right time in the right place. JIT’s primary goal is to minimize production inventory levels while providing needed raw materials, parts, and components just before they are used. To facilitate this goal, JIT purchasing places the orders such that delivery immediately precedes usage.

With JIT, products are manufactured or assembled only when they are needed. This means that the number of parts produced or purchased at any one time should be just enough to produce one unit of the finished product. Therefore, inventories are better managed to the extent that they are not needed or at least are minimized.

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**JIT AND RISK**

JIT requires fundamental changes in traditional production systems. These changes encompass production layout, material flows, setup times, employee attitudes, and work culture. A risk of JIT is the critical dependency on a few vendors.

JIT requires a commitment to continuously improve activities and the quality of products while eliminating all non-value-added activities and work-in-process inventory. Lead times, waiting time for materials or other delays, and inspection are grouped as non-value-added activities.
Production flow in a JIT system is demand-pulled through the plant by the downstream workstations ordering subassemblies and parts from upstream workstations. These pull orders are controlled by a kanban system, which is a system of cards and empty bins. Kanban is explained later in the section.

JIT can be viewed as an intermediate step toward more advanced manufacturing technologies, such as computer-integrated manufacturing. Producing one unit of a finished product at a time allows the implementation of strict quality control standards. The worker under JIT is fully responsible for ensuring that the subassemblies that are received or produced are error free. If errors are detected, production stops and errors are immediately corrected. Therefore, the JIT system relies on employee involvement in production operations, quality control, and productivity improvements.

KEY CONCEPTS TO REMEMBER: Benefits of JIT

- Increased inventory turnover measured as sales divided by inventory. Increased inventory turnover is an indication of increased productivity.
- Increased production rates due to little or no waiting time and increased productivity.
- Lower storage space due to lower inventory levels required.
- Lower spoilage costs due to high-quality products.
- Lower material handling costs since the materials are delivered directly to the assembly floor.
- Reduced production lead times due to shorter setup times and better coordination with suppliers.
- Reduced indirect labor since most or all non-value-added activities are removed.
- Reduced warranty claim costs due to better-quality products.

The total quality control system developed by W. Edwards Deming is an integral part of the JIT philosophy. Frederick Taylor’s principles of scientific management influenced the development of the JIT system. Reduction of waste, zero inventories, quality circles, and the use of computer robotics are seen as management tools to increase efficiency and output—a theme familiar to scientific management and JIT production systems.

Raw material and WIP inventories are reduced significantly, thereby decreasing carrying costs and floor space requirements. JIT production systems are most appropriate in repetitive assembly type manufacturing, such as automobiles or appliances.

The JIT system requires the setting of daily production targets, so that feedback on worker performance is timely. Workers are given more responsibility for building perfect quality into the product and producing the desired quantity. Detailed variance reports are no longer needed in JIT systems because defects become fewer and fewer.

JIT promotes work simplification procedures and relies on few suppliers to deliver raw materials and parts on time. Competitive bids are not common. Close ties tend to develop between two parties (customers and suppliers) as they work closely together to improve quality and to implement the JIT philosophy. JIT requires mutual trust between vendor and customer. The customer places greater reliance on the vendor to perform and deliver as expected.
(B) Traditional Production Systems

Traditional production systems practice a “push” production system concept where each worker produces a subassembly at his or her own pace and passes the output to the next worker until the final product is completed. A WIP inventory is commonly maintained at each workstation. Plant workers are controlled by work standards and motivated by a piece-rate incentive system. This approach leads to producing quantity rather than quality products. Workers have little or no incentive to correct errors or problems.

Workers are encouraged to make good-quality products, not punished for the production of poor-quality work. Under a traditional production system, quality control is the responsibility of a quality control inspector, not the production worker. This quality control inspection is not done quickly enough to trace production problems. Inspection is not done continuously; it is often done for the finished goods only.

Work standards or standards of performance are established by using either imposition or participation techniques, where the latter approach is more motivating for the worker than is the former. A performance report is issued periodically. A variance investigation occurs when significant discrepancies exist between the standard and the actual output. Investigation could reveal that either the worker is inefficient or the standard is not set properly. Exhibit 1.62 shows a comparison between traditional production systems and JIT production systems.

EXHIBIT 1.62 Characteristics of Traditional Production Systems and JIT Production Systems

<table>
<thead>
<tr>
<th>Characteristics of Traditional Production Systems</th>
<th>Characteristics of JIT Production Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality is seen as a hit-or-miss event, and there is no explicit commitment to continuous improvement and production of quality products.</td>
<td>Quality is a planned event, and there is an explicit commitment to continuous improvement and production of quality products.</td>
</tr>
<tr>
<td>The system is evolutionary.</td>
<td>The system is revolutionary since long-held beliefs are discarded.</td>
</tr>
<tr>
<td>More WIP is maintained.</td>
<td>Little or no WIP is maintained.</td>
</tr>
<tr>
<td>There is no reliance on employee involvement and participation in decision making.</td>
<td>Systems rely on high employee involvement and participation in decision making.</td>
</tr>
<tr>
<td>The quality control inspector is responsible for the quality of the product.</td>
<td>The production worker is responsible for ensuring the quality of the product.</td>
</tr>
<tr>
<td>The push system begins with the first worker on the assembly line dictating the flow of work.</td>
<td>The pull system begins with the last worker on the assembly line dictating the flow of work.</td>
</tr>
<tr>
<td>Workers are compensated based on a piece-rate incentive system.</td>
<td>Workers are compensated based on a group incentive system.</td>
</tr>
<tr>
<td>Inventory investment is increased.</td>
<td>Inventory investment is decreased.</td>
</tr>
<tr>
<td>Need for detailed variance reports is great due to many defects. Reports are more useful as problem detectors.</td>
<td>There is little or no need for detailed variance reports due to fewer defects. Reports are less useful as problem detectors.</td>
</tr>
<tr>
<td>Long production runs and long setup times are typical.</td>
<td>Short production runs and short setup times are common.</td>
</tr>
</tbody>
</table>
(C) Kanban Production and Inventory Systems

Working under a pull system, production procedures and work instructions are communicated by a system of signals sent among workers through the use of a series of cards called “kanbans.” The JIT production system and kanban inventory system work together. In kanban, the last workstation is informed of the day’s production needs; all other workstations respond to the kanban cards and containers (i.e., all other workstations are pulled in).

KEY CONCEPTS TO REMEMBER: Benefits of the Kanban Inventory System

- Paperwork-free system
- Product made to order
- Diminished need to take physical inventory for income determination purposes
- Lower finished goods inventory amounts
- Simple procedures for taking physical inventory, when needed
- Lower WIP inventory amounts
- Zero or fewer defective products

After the kanban system informs the final assembly production needs, each workstation then “orders” products or parts from the preceding workstation. This chain moves back to the point of purchasing raw materials. One condition is that a workstation cannot produce unless an order has been placed.

Two kinds of kanban cards are used for posting and tracking inventory activity and to communicate among workers at the workstation: move cards and production cards (see Exhibit 1.63).

EXHIBIT 1.63 Kanban Card Types

<table>
<thead>
<tr>
<th>Kanban card types</th>
<th>Move card</th>
<th>Production card</th>
</tr>
</thead>
</table>

The move card allows the worker to take one standard container of a specific part from one work center to another. The production card tells another production work center to produce the number of parts that will fit a standardized container. There is only one card with each container at any point in time.

The number of Kanban containers needed to operate in a JIT production environment is calculated as follows:

\[
\text{Number of Kandan containers needed} = \frac{\text{Demand during production lead time in units} + \text{the required safety stock in units}}{\text{container size in units}}.
\]
MRP is a widely used computerized system that operates under the push principle, while kanban represents the pull system. The newer version of MRP is MRP II, which takes the bill of materials for the products to be produced and calculates all subassembly and raw materials needed by time and quantity. Then the workstations are informed as to the number of units to be produced. This method is equated to the push system where the work is pushed through the plant.

(b) Service Operations
In this section, service strategy is defined and five service management principles are explained.

(i) Service Strategy
Service strategy is to provide an excellent service to current customers, acquire new customers, and prevent customer defection of existing customers.

(ii) Service Management Principles
Service strategy focuses on customers and on satisfying their needs, which will result in a loyal customer base. Winning customers in the marketplace means competing on several dimensions. Customers base their purchase decisions on many variables, including price, convenience, reputation, and safety. The importance of a particular variable to a firm’s success depends on the competitive marketplace and the preferences of individual customers. There can be at least five principles of service management, including:

Principle 1: Streamline internal service processes to improve their efficiency and effectiveness
This principle requires analyzing value-added activities and non-value-added activities within current processes and eliminating most or all non-value-added activities. It also requires adding new value-added activities to increase overall value. Implement total quality management principles, quality tools, poka-yoke (a Japanese term for mistake-proofing), fishbone diagrams, root cause analysis, and Kaizen (continuous improvement)

Principle 2: Create a true and sustainable value for customers and clients
The value creation process must not be a one-time and temporary exercise; instead, it must be a continuous and permanent process. Potential or existing customers or clients must be able to notice the value and suggest ways to improve the value process so all parties can benefit. By involving customers in the product/service design, development, testing, and implementation work can help in value creation.
Principle 3: Deliver the promised services on time and within budget

This principle requires stopping all the delays and obstacles in delivering services to customers or clients. It requires innovative ideas and approaches to see how fast the service can be delivered to the promised customer or client. Delivery cost is not the primary concern here; instead, customer satisfaction should be. Errors in the delivery cycle should be eliminated or reduced to a minimum. Customer surveys and follow-up are needed by implementing poka-yoke technique and other remedial actions.

Principle 4: Correct problems in the delivered services to increase customer satisfaction

Customers or clients do not like a rework of their original product because the company promised to deliver the original product with built-in quality. Rework cost is not the primary concern here; instead, customer satisfaction until the problem is corrected should be.

Principle 5: Convert one-time customers into repeat and loyal customers

It has been said that it is easier and cheaper to keep an existing customer than to find a new one. Retaining customers or clients is not an easy task for any service firm as it requires constant monitoring of what went wrong or what went right during the entire value creation cycle and fixing the wrong things in a timely manner so customers notice it explicitly and become repeat and loyal customers.

Service organizations should treat repeat and loyal customers by paying special attention to them in the form of incentives, discounts, and rewards. It is challenging to manage customers’ expectations, perceptions, and experiences between a service provider and a service receiver. A gap can exist between expected service quality performance and perceived service quality performance.

(c) Marketing and Sales Function

Marketing and sales functions go together as they are complementary and supportive of each other. If marketing is considered a front-end operation (planning), then, sales is considered as the back-end operation (implementation) to complete the marketing and sales cycle. Topics discussed include marketing and sales strategy, marketing channels management, brand management, service marketing, marketing administration, and types of marketing programs.

(i) Marketing and Sales Strategy

World-class marketing and sales management have a clear sales and marketing strategy. They strive to satisfy customers with the products and services that customers need and want, meet or beat the competition, and increase revenues, cash flows, and profits for the company. They also integrate marketing and sales functions for maximum synergy, efficiency, and effectiveness.

The combined marketing and sales strategy involves deploying major financial and human capital resources to develop a superior, distinctive, and difficult-to-imitate competitive advantage that the company can claim as its own based on superior product design and technology, superior distribution system, superior cost structure, and superior brand reputation. This combined strategy should contain important elements such as target markets, product positioning, product/service features and functions, flexible pricing, distribution channels, promotion programs (i.e., marketing mix), and above all customer service.
In other words, this combined strategy focuses on markets, products, services, customers, and competitors. It is a functional strategy, similar to a financial or manufacturing strategy. Marketing management and senior management of a company must ask the following fundamental questions and must seek and receive honest answers for each question.

- What business are we in?
- Is our business model realistic?
- What are we selling? Is it a product, service, or both?
- What is our product or service profiles, including their good or bad reputation?
- What are our strengths and weaknesses from our viewpoint and from the viewpoint of our customers, competitors, and the government? What are the gaps between these viewpoints?
- Who are our customers, including their profiles, preferences, strengths, and weaknesses?
- Who are our major and minor competitors, including their strengths and weaknesses?
- What is our competition doing? Are we better or worse than our major competitors?
- Which marketing mix strategies are most effective to us?
- How and when we will measure and make a satisfactory return on sales, return on investment, return on assets, and return on equity?

Because marketing function and sales function are the two sides of a coin with one mission and one vision, they go hand in hand and should work toward accomplishing their company’s goal first then accomplishing their individual functional goals. Company goals precede functional goals, meaning the company is first and the function is next, which is an example of the goal congruence concept.

Management experts say that marketing managers and executives should be leaders in developing marketing strategy while sales managers and executives are followers in executing and implementing that strategy. Sometimes marketing and sales functions can be in conflict with each other due to miscommunications, cross-communications, misunderstandings, turf-building practices, organizational politics, and differences in management’s operating styles and philosophies, all leading to marketing blunders, missteps, and lies, which should be avoided at all costs and at all times.

**Linkages between Sales and Marketing.** Although the heads of the marketing and sales functions work for the same department and report to the same chief marketing officer, they often have conflicting and diverse roles and responsibilities due to the nature of their jobs. The chief marketing officer and the chief executive officer should do the following to fulfill the defined roles and responsibilities of marketing and sales management to provide a stronger linkage between these two functions:

- Pay close attention to the voice of the customer (i.e., shopper-customer). Sales and marketing managers should carefully listen to and deeply understand external customers’ needs, wants, and expectations and provide products and services that truly meet those needs, wants, and expectations. Examples of other external customers include manufacturers (producers), suppliers, vendors, investors, lenders, regulators, and union members. The same thing applies to understanding the needs of internal customers (i.e., managers and nonmanagers in departments or functions within a retail organization). The voice of the shopper-customer can be listened through or heard from customers’ feedback through surveys, focus groups,
and emails; comments, likes, and reviews posted to social media platforms; and complaints and compliments received during a consumer’s purchase decision-making process (i.e., during pre-purchase, purchase, and post-purchase activities).

- Understand that marketing management finds the sales leads and that the sales management converts those leads into real sales and supports both existing and new customers. Automate the lead management process as much as possible to increase efficiency and effectiveness.
- Understand that sales leads are the “touch points” between marketing and sales functions.
- Understand that sales management focuses on short-term results while marketing management focuses on long-term results. Both functions must coexist in harmony and consistency.
- Salespeople should increase face-to-face time with their customers and spend not so much time on phone calls, emails, voice mails, efaxes, and websites. The key is to increase the number of touch points between salespeople and customers as they establish a solid business relationship.
- Salespeople should increase the selling time and decrease the nonselling time with customers because the former is a value-added activity whereas the latter is a non-value-added activity.
- Sales management should remove customer “pain points” and “hassle points” experienced when dealing with a company and focus on increasing both up-selling and cross-selling activities with customers.
- Building a one-to-one business relationship with the customer is an example of a guided selling process.
- Marketing should develop product usage scenarios, and sales staff should receive training on product usage.
- Marketing and sales must work together to develop sales campaigns for pushing a product.
- Marketing should develop “proof points” to convince potential customers and these should be given to sales staff. These proof points include customer success stories, press releases, customer testimonials, product demonstrations, and focused presentations.
- Implement sales force automation technologies to increase the overall effectiveness of salespeople by reducing the sales cycle time, by completing all sales calls on time, and by speeding the resolution of customer inquiries. This requires that customer data be available to the entire sales staff in real time.
- In summary, the marketing function feeds the sales function with new sales leads and prospects. The sales function, in turn, feeds the marketing function with new business opportunities. These business relationships establish a solid linkage, and this cycle continues between the marketing function and the sales function.

Marketing → Sales → Marketing → Sales

(ii) Marketing Channels Management

It takes a considerable amount of time, money, and effort to set up marketing channels of sales and distribution. Because of this heavy commitment of resources, once decisions are made about channels of sales and distribution, they are not easy to retract. Yet these decisions are very critical to the success of the firm. Decisions based on inaccurate or incomplete information can be very costly. Channels of sales and distribution for consumer and industrial goods provide the user with time, place, and possession value (utility). Thus, an efficient channel is one that delivers the
product when and where it is wanted at a minimum total cost. Marketing intermediaries exist to bring about product exchanges between buyers and sellers in a reasonably efficient manner.

**Marketing Intermediaries.** The primary role of intermediaries is to bring supply and demand together in an efficient and orderly manner. Since it would be very difficult for each consumer to deal with each manufacturer directly for products, considering product complexity and the distance between sellers and buyers, the need for intermediaries becomes apparent. Marketing intermediaries can perform product exchange functions more cheaply and more efficiently than manufacturers can. Also, competition among intermediaries will result in lower costs to consumers. There are many types of marketing intermediaries, many of which are specialized by function and industry. Major types of marketing intermediaries include middlemen, merchant middlemen, agents, wholesalers, retailers, brokers, sales agents, distributors, jobbers, and facilitating agents.

**Channels of Distribution.** A channel of distribution is the integration of intermediaries through which a seller markets products to users or consumers. Agents, wholesalers, and retailers are called intermediaries or middlemen. Channels with one or more intermediaries are referred to indirect channels.

**Degree of Control Desired.** The degree of control desired by the seller is proportional to the directness of the channel. When the market is concentrated in a limited geographic area, with many small buyers, the seller selling directly can influence the buyer significantly with his or her own policies and procedures. Seller control is somewhat diluted when indirect channels are used and control is more indirect rather than direct. Indirect control can be exercised through sharing promotional expenditures, providing sales training, and sharing the computer-based application system for quick response.

**Total Distribution Cost.** A total cost concept is suggested for the channels of distribution to avoid suboptimization. The concept states that a channel of distribution should be viewed as a total system composed of interdependent subsystems, with the objective to optimize total system performance. Cost minimization is a part of total system performance. Major distribution cost factors to be minimized include these:

- Order processing and transportation costs
- Cost of lost business (an opportunity cost due to inability to meet customer demand)
- Inventory carrying cost including storage space charges, cost of capital invested, taxes, insurance, obsolescence, and deterioration
- Packaging and materials handling costs

Other factors that must be considered include level of customer service desired, sales volume, profit levels, and the marketing mix desired.

**Channel Flexibility.** Channel flexibility involves forecasting and/or adapting the channels of distribution in relation to changing buyer habits and population moves, such as inner cities to suburbs or north to south relocation. Changing from individual stores to shopping centers and malls is also a consideration. Under changing conditions, establishing a new channel of distribution is not that easy and takes time, money, and effort.

**Selecting Intermediaries.** The two basic methods of selecting intermediaries (middlemen) are pushing and pulling. Pushing a product through the channel means using normal promotional
effort—personal skills and advertising—to help sell the whole marketing mix to possible channel members. This is a common approach with the producer working through a team to get the product to the user. By contrast, pulling means getting consumers to ask intermediaries for the product. This involves distributing samples and coupons to final consumers. If the promotion works, the intermediaries are forced to carry the product to satisfy customer needs.

**PUSH VERSUS PULL**

- Pushing a product through the channel means using normal promotional effort—personal skills and advertising.
- Pulling a product means getting consumers to ask intermediaries for the product.

(A) Managing Channels of Distribution

From a management point of view, entire channels of distribution should be treated as a social system since each party plays a defined role and each has certain expectations of the other. The interaction with each other is very critical for all parties involved, and the behavioral implications of channel parties are many.

The channels of distribution do not manage themselves. Someone needs to manage or exert primary leadership in each channel. Although there are exceptions, channels controlled by the manufacturer seems to dominate. Even though the question of managing channels of distribution is obvious, the answer is not, as indicated by the following arguments:

- Some marketers believe the brand manufacturer or owner should be the channel leader. This is because the owner has the most to lose if the system fails, has the most technical expertise, and has greater resources than others.
- Some marketers believe the retailer should be the channel captain or leader, since the retailer is the closest link to the consumer and therefore can better judge consumer needs and wants.
- Some marketers argue that wholesalers should seek to gain channel control.
- Some marketers suggest that the locus of control should be at the level where competition is greatest.
- Some marketers believe that the most powerful member, whether it is a manufacturer, wholesaler, or retailer, should assume channel leadership.

(B) Retail Channels

Retail Channels Defined. A retail channel is a place, an avenue, or a mechanism where customers can research and purchase merchandise of their choice. Varieties of channels are available to customers, including physical stores (in-store and offline), pure-play online stores (online only), a retailer’s online stores (web stores), social media platforms (social sites), cloud networks, mobile commerce (mobile devices), online catalog stores, call centers (product advisors and technical support), electronic mail, text (SMS/MMS), wearable commerce, shop-from-home commerce, make-at-home commerce, electronic commerce (business to business and business to customer), kiosks, and smart vending machines.

Psychologists have determined that most customers prefer to touch and feel products in a store before making the final purchase decision. Despite the various channel choices available, most customers prefer physical store experience, followed by online shopping experience, and
followed by mobile channel experience. Note that these channel choices may change due to a retailer’s technology implementation levels, consumer disposable income levels, consumer buying preferences, customers’ computer savviness, population changes (demographics), and above all changing consumer mind-sets.

**Strategic Move Defined.** Moving from a single channel to an omnichannel presents many benefits to retailers and customers alike. Major benefits include increased sales revenues to retailers and pleasant shopping experience to customers. Unfortunately, not all retailers have reached the omnichannel (an integrated channel) stage, because doing so requires heavy investment and management foresight. A retailer using a single channel today is similar to a customer buying a black-and-white TV set today; both have no future.

**Channel Evolution.** Channel evolution started with a single channel (physical store), moved to multiple channels (physical store and online store) and cross-channels (moving from an online store to a manufacturer’s or supplier’s website), and finally stayed with omnichannel. It has been reported that most customers visit all channels (i.e., channel hopping) during a holiday season to find the right product at the right price.

Single Channel  ➔ Multiple Channels  ➔ Cross-Channels  ➔ Omnichannel

**Single channel** means using only one channel, whether offline or online, to make a purchase. This is a channel with limited capabilities due to limited products and prices. Retailers operating with a single channel cannot survive in the long term due to the limited scope and options of the channel.

**Example:** A customer visits a nearby retailer’s physical store to inquire about a specific product’s availability and price. The customer learned that the product is available and the price is reasonable. Later or at the same time, the customer buys the product from the same retailer. This example describes a single-channel scenario because there is only one place—the physical store—to purchase.

**Multiple channels** mean using more than one channel of the same retailer or channels of other retailers to make a purchase.

**Example:** A customer first visits a nearby retailer’s physical store to inquire about a specific product’s availability and its price. This is a single channel of a retailer’s physical store. Later the customer checks the same retailer’s website for the same product and its price. This is a single channel of the same retailer’s online store. Later, the customer visits the websites of two other retailers and call centers to check and compare the same product and its prices. This is an example of multiple channels because the customer visited more than one siloed channel operating separately, such as physical store, websites, and call centers.

**Cross-channels** mean using any combination of channels, such as a retailer’s physical store, pure-play online store (online only), retailer’s online store, call center, catalog store, mobile site, manufacturer’s website, and supplier’s website, to make a purchase. What matters is the type, number, and variety of channels visited to make the final purchase. Visiting the same channel more than one time counts as only one channel.

**Example:** A customer first visits a nearby retailer’s physical store to look at a product, places an order on his mobile device, schedules a delivery date to his home on his mobile
device, and checks the order status on the retailer’s website. This example describes a cross-channel scenario.

**Omnichannel** means using only one channel that will reach several channels and integrates them into one seamless channel. This method provides a seamless brand experience delivered across all points of brand websites, interactions, and relationships. This is the best and ideal channel because it eliminates problems and delays in visiting several stores and websites. In other words, only one uniform resource locator (URL) is used in one shopping session for all websites instead of several URLs for several websites, knowing that one URL is required for to visit one website.

In summary, all individual retail channel strategies are converging into omnichannel strategies to provide a seamless and hassle-free shopping experience to customers during their product ordering, payment, and shipping (delivery) stages.

**Example:** Amazon’s use of a one-click buy button strategy is an example of implementing an omnichannel strategy (meaning it uses one URL, instead of several URLs). It means customers need not enter their basic information for each order and need not visit several websites (URLs) to place an order, make a payment, change or cancel an order, or receive email order notifications and confirmations. In a one-click strategy, all these actions or steps are done in the background and in one seamless Amazon’s website.

**(iii) Brand Management**

In this section, topics such as the brand image, brand types, brand assets, and brand equity are discussed.

**(A) Brand Image**

Product and service brands are strategic and economic assets of a company, similar to physical assets, such as buildings and equipment. These strategic and economic assets generate sales revenues when they are sold to customers. Because of their revenue-generating ability, a company’s brand images should be developed, protected, and sustained.

Business organizations must build a strong brand image by:

- Crafting the brand identity in the form of describing the customer value proposition and understanding the views of a customer about a company.
- Analyzing all the touch points that a customer comes in contact with in regard to the company’s products, services, and functions. The touch points, whether direct or indirect, revolve around topics, issues, products, and services.
- Removing all unnecessary hand-offs and delays at the touch points.
- Obtaining continuous feedback from customers so the brand continues to evolve and to anticipate customer needs.
- Ensuring that a brand’s image is properly communicated to social media platforms and protecting its image when inappropriate negative comments are posted on the social media.

**(B) Brand Types**

There are two types of brands: national brands and private brands. Manufacturing companies create national brands, which are sold in almost every retail store. Some retailers and dealers create their own private brands, which are known as local, store, own, dealer, and generic brands (private labels). Retailers become manufacturers when they create their own private
brands. Private brands offer cost savings to customers over national brands when the product’s features and quality levels are the same between the two brands. Retail sales worldwide can be approximated to 80/20 rule (Pareto principle) meaning that 80% of total retail sales come from national brands and 20% of total sales come from private brands.

**Examples of national brands:** Tide detergent, Dove soaps and shampoos, Palmolive dishwashing liquid, Charmin toilet tissues and paper towels, Levi’s jeans, and Colgate/Crest toothbrushes and toothpastes.

**Examples of private brands:** up&up brand for Target Company, Great Value brand for Wal-Mart, HDX brand for the Home Depot, Geek Squad computer services for Best Buy, Kirkland Signature brand for Costco wholesaler, and 365 brand for Whole Foods Market.

**Other Brands.** Terry O’Reilly, the host of *Under the Influence* radio program broadcast on National Public Radio, presents the following list of other types of brands.

Enviable brands include Water Displacement-40 (WD-40) spray, Heinz Ketchup, Kraft’s Macaroni & Cheese dinner, Canada Dry Ginger Ale, Car-Freshners, Converse Sneakers, and Mr. Potato Head.

21st-century brands include iRobot Roomba vacuum cleaners, smartphones, digital tablets, app stores, e-readers (Kindle), Facebook, YouTube, Twitter, Instagram, Netflix, e-cigarettes, wearables (GoogleGlass and smartwatches), the IoT, and reality TV shows.

Billion-dollar brands include Kraft’s Oreo cookies and various Procter & Gamble products, such as Tide detergent, Gillette Fusion blades, Pampers, Crest toothpaste, Charmin, Head & Shoulder shampoo. Billion-dollar fashion brands include Chanel, Ralph Lauren, Louis Vuitton, and Georgio Armani.

The world’s oldest brands include Faber pencil and eraser, Stella Artois beer, Molson beer, the Hudson’s Bay Company (a retailer in Canada), A & W Root beer, Tabasco sauce, and Chevrolet Suburban automobile.

Limited edition or special-edition products include Chevrolet Camaro Special Hot Wheels Edition, Dolce & Gabbana’s Animalier Bronzer cosmetics, Warhol’s Campbell soup cans with Warhol-inspired artwork, vodka-based liquor called Oddka, and Jack Daniel’s Sinatra Select whiskey.

Strange brands are those that are unexpected: Pizza Hut Cologne, Burger King Flame Body spray, Marine Corps Devil Dog Cologne, Marine Corps Hot Sauce, Zippo’s Fragrance for Him and Her, Coty’s Vespa Fragrance for Him and Her, and Play-Doh Cologne.

Zombie brands are brands that were once popular, disappeared, and then came back later. These brands include Brim Coffee, Sony Walkman, Aqua Velva Aftershave, Brylcreem Original Men’s Hair Cream, Salon Selectives Shampoo, and Eastern Airlines.

Mocking brands are brands that imitate or copy competing brands, resulting in actions, reactions, counteractions, reprisals, and retaliations between the parties involved. Examples of mocking brand examples include Miller High Life beer mocking Anheuser Busch during Super Bowl TV commercials; Jaguar car mocking Mercedes cars, then Mercedes mocking Jaguars; Samsung phone and tablet mocking the Apple phone and tablet, then Apple mocking Samsung right back; and Apple mocking Microsoft and Microsoft eventually retaliating.
**C) Brand Assets and Brand Equity**

The terms “assets” and “equity” are accounting terms used in financial statements, such as a retailer’s balance sheet where “assets” mean cash and inventory and “equity” mean owner’s investment in a company. In contrast, the terms “brand assets” and “brand equity” are marketing terms used by marketing departments to signal their internal value to retailers; these values are not shown on the retailer’s financial statements. Inventory or merchandise assets were purchased, acquired, and paid for through a normal course of business transactions with external parties. Brand assets were developed and improved internally. Accounting standards require that assets must be acquired with external proof of buying and selling between two or more parties in an objective manner. Brand assets do not meet this standard of objectivity, as they are acquired subjectively and developed internally.

Brand loyalty increases brand assets, meaning loyal customers can create and sustain a brand’s assets due to their continued commitment and loyalty through buying that branded product repeatedly. Branded assets are very valuable to the companies that own them because they generate sustainable revenues and profits during their product lives. Brand equity is built around and through the loyal customers. Examples of valuable branded assets include the Tide detergent brand for the P&G and the 365 brand for Whole Foods.

**Brand Assets.** Brand assets include strategic, operational, and technical assets. Some brands are in a strong position in one or all three types of assets. Some brands may have higher tangible assets (using modern, advanced, and efficient equipment, machinery, buildings, manufacturing plants, retail stores, warehouses, and distribution centers); some brands may have higher intangible assets (e.g., IP assets such as copyrights, product trademarks, service trademarks, and patents); and other brands may have a combination of tangible and intangible assets. A brand’s good name, strong reputation, and goodwill are part of its intangible assets.

Brand assets include brand-building elements and brand-defensive elements. When combined, these elements provide real value to targeted customers. Brand assets grow as brand awareness grows; assets include a brand’s name and image with its visibility, associations, and loyalty factors. A SWOT analysis should be performed along with fit-gap analysis to get a big-picture perspective about a brand.

**Brand Equity.** Brand equity drives sales in many ways through brand awareness, brand image, brand responses, and brand relationships. Brand equity is closely related to the number of customers who are devoted to a brand. Some brands have a higher degree of awareness, acceptability, and preference than others. Brand awareness drives a brand’s equity, which, in turn, consists of brand loyalty and brand associations. A set of assets (i.e., strengths) and liabilities (i.e., weaknesses) is linked to a brand where the goal is to increase the former and decrease the latter. In addition to brand names, logos and slogans lead to building a brand’s equity. Although brand equity is not shown in a company’s financial statements, similar to human equity, it is reflected in the acquisition price of a company as a premium the brand commands in the market (represented as goodwill).

**iv) Service Marketing**

The global economy, especially the U.S. economy, is becoming more service-oriented than before. Some manufacturing organizations are strictly product-oriented whereas some service organizations are purely service-oriented. Yet there are some manufacturing and service organizations that are both product- and service-oriented. The major issue in service marketing is controlling service employees’ costs (i.e., wages and salaries, employee benefits, and employee travel-related...
costs). The challenging goal is to reduce overall service costs while improving service quality and responding to customers.

In view of the size and importance of service economy, considerable innovation and ingenuity are needed to make high-quality services available at convenient locations for consumers. The actual services offered by service providers often fall behind the opportunities available due to these obstacles: a limited view of marketing, a lack of competition, a lack of creative management, a concept of “no obsolescence,” and a lack of innovation in the distribution of services.

A service gap can exist when a customer’s expected service is different from the actual service.

\[
\text{Service Gap} = \text{Expected Service} - \text{Actual Service}
\]

The goal of the service marketing management is to remove or minimize service gaps in the service chain as much and as soon as possible and to make customers happy. In addition, the “moments of failure” should be minimized to make customers satisfied or delighted.

**(v) Marketing Administration**

The scope of marketing administration includes several topics, such as sales contract management, market research, advertising and promotion, data mining, and marketing budgets.

**(A) Sales Contract Management**

A contract is a formal and legal document between two parties (buyer and seller), and it is binding on both parties in a court of law. Marketing and sales management handle various sales contracts with their customers involving huge amounts of money. Sales contracts increase revenues, which affects both the top line (i.e., revenues) and the bottom line of the income statement (i.e., profits). The Uniform Commercial Code applies to sales contracts because it deals with the sale of goods, and the sales staff sells goods to customers.

Both sales and supply contracts require a systematic approach to reduce the overall contract cycle time, which runs from contract initiation to contract execution. Because the contract amounts are large, the contract time frames are long, and the contracting parties are several; hence, violation of any contractual terms and conditions can lead to legal, financial, and reputation risks.

**(B) Market Research**

One of the major uses of market research is to segment markets. Market segmentation is a powerful and well-developed marketing tool. A properly segmented market can improve marketing, distribution (logistics), and manufacturing efficiency and can generate additional profits and/or market share. Market segmentation research, especially baseline segmentation research, must be carefully planned and executed. A mis-segmented market is often worse than a market that is not segmented. Foreign firms often enter a domestic market by segmenting the market, uncovering an underserved niche market, and then concentrating their marketing and financial resources on that niche market.

Another use of market research is using focus groups to understand consumer buying experiences in using the current products and to obtain their insights about new products and services that a company is planning to introduce.

**(C) Advertising and Promotion**

Just as markets are segmented, advertising is also segmented according to TV spot commercials, print ads, radio ads, outdoor (billboards) ads, company website banner ads, emails, and direct
mail. Advertisers and advertising researchers have not reached consensus on the best way to test advertising or measure its effectiveness.

Most advertising testing is done with TV spot commercials because they are the most expensive forms of advertising to produce. Print ads are also frequently tested, though not as often. Occasionally radio ads, outdoor (billboards) ads, and even website banner ads are tested too. Direct mail is tested, but by small-batch mailings where the evaluation is based on direct response measures. Website banner ads that have a click-through response feature can also be tested.

In order to test an ad, one has to create a stimulus to expose to respondents. The validity and accuracy of their responses is only as good as the stimulus. Clearly, the most valid stimulus is the ad in its final, finished form. For simple print ads, this is not much of a problem. For expensive TV spot commercials, however, testing the ad only after it has been produced largely defeats the purpose of doing ad testing.

In order, from roughest to most finished form, the following are the recommended types of stimuli to test TV spot commercials: storyboards (hand-drawn ideas), roughs (prototypes), and finished ads (what consumers see). It is rare that ad testing is done with finished ads first due to heavy costs involved.

**Traditional Advertising.** Big retailers spend huge amounts of money for product advertisements and promotions with the hope of increasing sales revenues and profits, expressed as a certain percentage of the total marketing budget.

The scope of traditional advertising includes print ads in newspapers and magazines; outdoor ads (billboards, street and park benches, bicycles, motor vehicles, door-to-door flyers and leaving flyers in public places, such as libraries and restaurants); radio ads; TV ads with spot commercials; press releases; direct mailing of coupon and rebate books, flyers, and sample products to potential customers; and most of all, word-of-mouth from customers, friends, and family.

According to a survey by Influence Central (www.influence-central.com), the value of using traditional media and advertisement is on the decline. It says that seeing a TV advertisement impacts the decision to buy in just 1.9% of consumers; while 2.2% of consumers decide to buy a product after seeing an article or mention of it in a newspaper or magazine. This survey also said more than 80% of consumers use social media and digital advertisements for product advice and marketing promotions, resulting in a big impact.

**Example:** Beauty retailers such as Kiehl’s and Urban Decay do not use expensive traditional media, as they operate with a very low budget for traditional advertisements and promotions. However, these retailers are successful due to word-of-mouth advertising from their customers.

**Digital Advertising.** The scope of digital advertising includes the Internet; a retailer’s website banner ads and press room; mobile sites; mobile apps; social media platforms and blogs; mobile devices (e.g., digital phones, tablets, and notebook computers); emails; text messages; eFaxes; webinars; online chat rooms; mobile alerts and notifications; viral advertising and marketing; user-generated content; user recommendations; and blogger recommendations.

There is a direct relationship between user reviews, comments, and recommendations posted in a social media about a product and customer conversion rates and who posted them. In general, an
increased number of reviews leads to higher conversion rates and vice versa. Reviews, testimonials, endorsements, and recommendations posted by famous bloggers have a bigger positive impact on conversion rates than reviews and recommendations posted by normal users.

**Example 1:** Sephora, a beauty retailer, claims to get five times more user reviews, comments, and recommendations than its competitors. Consequently, it increased its customer conversion rates significantly.

**Example 2:** Famous bloggers, especially in fashion and beauty retail, can exercise tremendous influence on millions of subscribers to social media platforms, such as YouTube and Instagram. Millions of these subscribers (customers and followers) trust these famous bloggers. These famous bloggers have a big positive impact on a brand’s name and a company’s sales.

**Traditional Advertising versus Digital Advertising.** Many elements of traditional marketing easily translate into digital marketing, such as price, product, place, and promotion. However, there are clear and major differences between traditional advertising and digital advertising regarding cost, speed, reach, and communication channels, as shown next.

<table>
<thead>
<tr>
<th>Traditional advertising</th>
<th>Digital advertising</th>
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<tr>
<td>Expensive, slow, and does not reach all the intended audience at the right time and at the right place. It uses a one-to-many communication channel. This is especially true with print media, such as newspapers and magazines as well as radio and TV.</td>
<td>Inexpensive, fast, reaches all the intended audience very quickly. It uses a one-to-one communication channel. This is especially true with social media because there is a direct communication line to the customer.</td>
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**Viral Advertising.** Viral advertisements and viral videos are examples of new advertising methods using the Internet as the communication media. The word “viral” here refers to a computer virus that infects and spreads other computers at a great speed. Viral advertising has the same effect as computer virus in terms of speed, benefit, and damage to some.

Viral videos are short films lasting 90 seconds or longer, made with low cost and large-scale reach with fast delivery in mind. The number of video views in a time period (e.g., zero to thousands to millions of views per hour or per day) is a measure of a viral video’s success or failure. Marketing management can use viral advertising to introduce a new product or improvements to existing products. Individuals can also upload videos to the Internet for fun and revenge. The video is not viral until it spreads.

There are no ground rules in terms of who can post (upload) what types of videos and under what conditions. Some videos are good in message and meaning while others are bad in content and taste. Similarly, some videos are viewed by millions while others have no viewers. Viral advertising or marketing campaigns deal with messages forward to a friend, incentivized viral, stealth, and buzz or word of mouth.

**Digital Promotions.** Digital promotions include digital coupons and digital gift cards. The old days of cutting and clipping coupons from various sources is over with the introduction of paperless digital coupons. The same is true with digital gift cards due to their convenience. Digital
coupons are very popular among deal hunters, bargain hunters, and cost-conscious shoppers; there is nothing wrong in saving money.

Most retailers undertake extensive promotional campaigns to entice current and new customers to come into their online and offline stores for purchase with sales coupons and gift cards with staggered expiration dates based on the amount of purchase. The goal of these promotions is to increase sales through increased conversion rates.

Example 1: Target, a mass merchandise retailer, is enjoying the highest total average daily visits. This success is due, in part, to its price-matching policy. Target also added vendor-issued coupons (manufacturers’ coupons) to its Cartwheel app, which is very popular with customers due to its personalized recommendations, interactive store maps to locate saved items, and proximity-based messages.

Example 2: Safeway, a food supermarket retailer, increased its coupon distribution due, in part, to its rewards program, which personalizes deals based on a customer's purchase history. This means that the higher the purchase amounts, the greater the amount of rewards, which is a good motivation and incentive.

Example 3: Walgreens, a pharmacy retailer, enables its customers to redeem paperless (digital) coupons from the retailer and manufacturers for both online and offline purchases. Walgreens combines the digital coupons with a customer's rewards card.

Example 4: Lord & Taylor, a division of the Hudson's Bay Company, has introduced mobile couponing to provide relevant coupons to customers at any point in time. Customers with its app receive push notifications when they come within 500 meters of a store. The app combines a location technology with mobile coupons.

Example 5: The Home Depot, Sephora, Starbucks, Dunkin Donuts, and Cheesecake Factory are ranked at the top of the digital gifting experience list.

Product Placement and Advertising. Celebrity endorsements, movies, and public media (e.g., magazines, TV programs, newspapers, and radio announcements) show, present, discuss, and promote brand-name products as silent salespeople. For example, advertising agencies, representing the owners of brand-name products (advertisers), will pay an agreed amount to movie producers or studio owners for showing or mentioning their products in movies. Just as celebrities have agents, brand-name products have product agents. It is a documented fact that sales for these products increase after they are shown or mentioned in movies. Note that it is still worth the gamble for the advertisers to get their products out in front of a captive and captivated audience as it is a risk-reward balancing act. There is always a risk that product placement may not work.

Example 1: Brand-name products placed or mentioned in movies and public media include fashion clothes, expensive cars, luxury watches, home furniture, home appliances, sunglasses, shoes, handbags, alcohol, restaurants, and others.

Whether a particular product placement in a specific public media is a success or failure depends on how that product ad is created and communicated to its intended audiences and how that ad was received by such audiences. Some ads can be good or bad. Product placement in advertisements is based on the cross-promotions concept, meaning one party is helping another party in terms of creating new sales, revenues, and profits. In the end, it is a win-win outcome for both parties.
Example 2: Brand-name products that were successful due to their placement in movies include Ray-Ban sunglasses worn by Tom Cruise in the movie Risky Business; Reese’s Pieces in the movie E.T. the Extra-Terrestrial; Taco Bell restaurant after its mention in the movie Demolition Man; Budweiser beer receiving an award for Overall Product Placement in Hollywood in 2014; BMW, which replaced James Bond’s usual Aston Martin, and Heineken beer, which replaced his usual vodka martini, in James Bond movies.26

Truth in Advertising and Trust in Advertising. Truth in advertising leads to trust in advertising as they are linked to each other; the former comes first and establishes the latter. Note that truth in advertising deals with legal matters (legal factors) whereas trust in advertising deals with human matters (people factors).

Truth in Advertising. The FTC defines and enforces “truth in advertising” laws to protect consumers from fraud and deception from misleading and confusing advertisements. Federal law says that any ads that target consumers, whether they are on the Internet, radio or television, or anywhere else, must be truthful, not misleading, and, when appropriate, backed by scientific evidence. Ads can appear anywhere, such as newspapers, magazines, the Internet, electronic mail, regular mail, billboards, or buses. The FTC focuses on advertising claims that can affect consumers’ health or their pocketbooks in the areas of food, over-the-counter drugs, dietary supplements, alcohol, tobacco, high-tech products, and the Internet.

When the FTC finds a case of fraud perpetrated on consumers, it files actions in federal district court for immediate and permanent orders to stop scams, prevent fraudsters from perpetrating scams in the future, freeze their assets, and get compensation for victims.

Example 1: Wrigley, a major U.S. chewing gum maker, was ordered to pay $7 million in 2010 to compensate consumers and pay court costs due to misleading advertisement about its Eclipse gum containing a new ingredient that can kill germs that cause bad breath. Eclipse ads incorrectly said that products of Wrigley’s competitors merely masked bad breath.

Example 2: Kellogg, a major U.S. food manufacturer, was ordered to discontinue all Rice Krispies advertising that claimed the cereal could boost a child’s immune system, which the courts found dubious. Prior to this, Kellogg was barred from claiming that Frosted Mini-Wheats boosted kids’ attentiveness by 20%.

Example 3: General Mills Company, a major U.S. food manufacturer, was limiting its customers’ legal options for suing the company. In 2015, it posted an alert on its website stating that customers would give up their right to sue the company if they download a coupon or if they post “liked” the company on Facebook. This means that any such customer who had a dispute with the company and who filed a complaint against it would be treated and negotiated with informally via emails, not formally and legally. The company removed this statement from its website after customers complained. A lesson the company learned was never underestimate the power of customers and always be legal and ethical.

Trust in Advertising. Trust between people, products, and companies can be created and lost. It can take a very long time to earn trust, a very short time to lose it, and may never be restored.

26 Terry O’Reilly, Under the Influence radio program, National Public Radio.
According to Terry O’Reilly, trust in marketing transactions is based on relationships between sellers and buyers of goods and services. His radio program cites the following examples:\(^{27}\)

**Example 1:** The most trusted industry in the United States was technology, followed by tourism, retail, consumer products, and telecommunications. The advertising industry was near the bottom of the list.

**Example 2:** In a study done by the Advertising Standards Council, most people believe in ads placed in newspapers as number one, billboards as number two, followed by radio, magazines, and television in that order. Ads on the Internet were at the bottom of the list.

**Example 3:** Chris Zanes, the founder of Zanes Cycle Company in Connecticut, built his business of selling and repairing bicycles purely based on trust and relationships between his company and his customers. He allows customers to take test rides on their bikes without charging them and without asking for any identification. In fact, when customers offer to leave their driver’s licenses, they were politely refused. Five thousand bikes are taken for a test ride every year, and only five bikes are lost due to theft annually. Zanes believes that he is in the trust and relationship business, not in the bike business, and that his customers will return that trust by becoming loyal, lifelong customers and by referring family and friends over and over again.

*Marketing and the Laws.* Marketers must respect the promotion laws (dealing with sweepstakes, games of chance, and skill contests), trademark laws, copyright laws, and advertising laws (dealing with free offers, discount offers, television ads, radio and print ads, solicitation letters and e-faxes, telemarketing calls, email and direct mail offers, viral marketing campaigns, and website offers). Various federal, state, and local laws and regulations govern these areas. Both the FTC and the Federal Communications Commission actively enforce federal laws and regulations.

**(D) Data Mining**

Data mining is the process of asking (posing) a series of questions (queries) against a database or data warehouse containing large amounts of data to extract some meaningful and relevant information to perform management analysis.

Data mining applications are best suited to data-intensive organizations with data from millions of customers in their databases or data warehouses. Examples of data-intensive organizations include retailers, market research firms, governmental agencies, online order takers, casinos, travel agencies, vacation cruise line firms, hotels, rental car companies, and airline companies. There is no end to the data mining applications; they are only limited by the imagination of the person requesting the data analysis work.

Data mining applications software is available from several vendors such as HP, IBM, Microsoft, Oracle, SAS, and many others. This off-the-shelf software is relatively easier to use and less expensive than custom-built software.

Data mining is data analysis, data fishing, data snooping, and data drilling in order to get to the bottom of the vast amounts of data (big data) collected by organizations during their business operations. Another name for data mining is data analytics.

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\(^{27}\) Ibid.
Management uses various quantitative techniques, such as regression analysis, factor analysis, cluster analysis, sampling, and other statistical methods, to analyze data, find relationships between data elements, and draw meaningful conclusions that can be incorporated into its decision-making process. The ultimate goal is improving business operations and increasing profits.

**(E) Marketing Budgets**

Holding a current market share or growing the market share requires financial resources in the form of a marketing budget, which is based on the strategic market plan and the marketing-mix strategy.

Three kinds of marketing budgets exist: percentage of sales, customer mix, and bottom-up. A top-down budget is not recommended as it is a budget imposed by top management onto marketing management without considering specific marketing tasks. The bottom-up budget is a self-control budget after considering the specific marketing tasks.

The **percentage-of-sales budget** is based on previous years’ data and experience levels, adjusted higher for the growth strategy and lower for the harvest strategy (i.e., no growth strategy). This kind of budget is simple to develop, but its accuracy is low.

The **customer-mix budget** includes the cost of acquiring new and retaining current customers. This kind of budget is logical to develop, but the cost data is difficult to obtain. This budget amount can be expressed as a percentage of sales for comparative purposes.

A **bottom-up budget** requires specifying each marketing task required and determining the amount needed to accomplish that task. It is good to divide the budget into as personnel expenses and non-personnel expenses to facilitate comparison between time periods and to provide better control. This budget amount can also be expressed as a percentage of sales for comparative purposes.

**(vi) Types of Marketing Programs**

Several types of marketing programs are discussed in this section, including personalized, relationship, alliance, cause, loyalty, and event marketing.

**(A) Personalized Marketing**

Personalized marketing, a new approach in retail marketing, means a retailer is paying attention to or taking care of each and every customer very sincerely and seriously to ensure that customer’s specific needs and wants are fulfilled to satisfaction. It is an example of one-to-one marketing, and it is a tall order to fulfill due to the huge customer base involved and the variety of customer needs that must be addressed. Because of the large number of customers, an automated approach can help in this area.

An automated approach is mainly facilitated by beacon (sensor) technology with a Wi-Fi communication network installed in a retail store linked to a customer’s mobile devices. Interested customers agree to access terms and conditions and register a mobile connection to the retailer’s beacon technology system. When registered customers enter a store equipped with such technology and walk around, the system sends push alerts and notifications to their mobile devices that they are carrying with them. The system offers special discounts and coupons on the mobile devices to encourage customers to make additional purchases.

Personalized marketing is also called location-based marketing, direct marketing, and targeted marketing because the personalization acts follows wherever customers go with their mobile devices in
a retailer’s facility and all the marketing promotions are targeted at those customers one at a time. Location-based marketing deploys location-based technology and uses mobile-proximity technology. Personalized marketing is a new trend in retail business; it benefits customers most directly.

**Personalized Marketing = Beacon Technology + Location-Based Marketing**

Today, more than ever, customers expect retailers to provide personalized marketing programs, not mass marketing programs. Customers want retailers to deal with them based on one customer at a time with customized approaches, as if they are the only customer for that retailer. Customers want retailers to treat them as special, royal, and loyal. For example, luxury shoppers need or expect a personalized service or experience from retailers because they buy high-priced items.

Regarding personalization, there is a gap between what retailers believe they are delivering and what customers are actually receiving or experiencing. A survey reported that 93% of retailers believe that personalization is their strategic focus yet only 25% of customers say they actually received a consistent and personalized experience across all retail channels. This is because customers want to receive a consistent, focused, and personalized experience from all retail channels, including receiving personalized advertisement messages, product offers and recommendations, product promotions, and price incentives, as shown next.

**Personalization Gap = Personalization Expected − Personalization Received**

Note that the personalization gap increases when a customer’s expectations increase and when that customer’s disappointments increase and vice versa.

**(B) Relationship Marketing**

Relationship marketing is treating and pampering loyal customers, prime customers, and major customers differently from regular or average customers. These loyal customers are treated with special care and attention because they bring continued and assured sales and profits to a retailer. Relationship marketing requires creating mutual value that is sustainable because both loyal customers and retailers receive benefits and values. This can happen only when a retailer’s sales associates keep in contact with loyal customers periodically, announcing new products, ordering products, shipping orders, and following up, including dealing with product returns. In a way, the sales associate’s role is that of a personal assistant. This type of relationship marketing is known by many names, such as a targeted, direct, smart, one-to-one, and personalized marketing. Such marketing can turn regular customers into loyal customers.

A customer relationship management (CRM) computer application system operating on a desktop or laptop computer or on smartphones and tablets enables associates to fulfill the role of personal sales assistant.

There is a difference between personalized marketing and relationship marketing, as explained next.

- Personalized marketing can be applied to any type of customers: regular, average, major, and loyal customers. Personalized marketing contains some aspects of relationship marketing.
- Relationship marketing can be applied to only one type of customer—loyal customers. It would be expensive and time-consuming to maintain that kind of relationship with all customers. Relationship marketing contains some aspects of personalized marketing.
(C) Alliance Marketing

Alliance marketing is a type of partnership between two or more for-profit companies operating in different and unrelated businesses. Marketing partnerships are established in the form of strategic alliances between retailers and nonretailers for a mutual benefit in terms of increased cross-sales, increased customer base, and increased customer traffic, all resulting in increased revenues, margins, and profits. In short, strategic alliances are business collaborations and partnerships with a common purpose and goal. Partnership marketing is a form of affinity marketing. It is a new trend in retail business that results in win-win outcomes for all parties.

In general, a strategic alliance arrangement occurs when a large and highly established company with proven products, markets, and distribution channels wishes to invest its money in a small and emerging company in the areas of new R&D activities that could help the large company grow. Another variation of a strategic alliance arrangement is establishing a business partnership between two firms for mutual benefit and to reach a win-win outcome. It requires honest commitment, trust, and a common direction for the future. This business arrangement is not a legal partnership but a strategic alliance or strategic partnership.

(D) Cause Marketing

Cause marketing is a type of partnership between for-profit corporations and not-for-profit organizations for mutual benefit. For-profit corporations commit to support the not-for-profit organizations in terms of raising funds for the latter using the formers’ reputation and goodwill. It is a win-win situation for both entities because the partnership satisfies individual goals and needs of both entities. Cause marketing is not a philanthropic activity for the for-profit corporation because it does not explicitly donate money to the needy not-for-profit organization.

Cause marketing is good for for-profit corporations because giving something back to society is a part of their corporate social responsibility. Moreover, cause marketing gives great visibility and lasting goodwill to sponsoring for-profit corporations. The partnership arrangement can cause for-profit corporations’ revenues and profits to increase.

Cause marketing is good for not-for-profit organizations because it enables these organizations to fulfill their mission of serving society and its citizens. Without the partnership arrangement with the for-profit corporation, the not-for-profit would not have the funds to fulfill its mission. The partnership arrangement can cause not-for-profit organizations’ financial resources to increase.

The mutual benefit is shown below:

Cause Marketing = Funds to Not-for-Profit Organizations
Cause Marketing = Goodwill to For-Profit Corporations

Surveys have shown that 70% of customers prefer to do business with companies that commit to good causes and that 90% of customers would switch from one product brand to another if it was associated with a good cause.

(E) Loyalty Marketing

Retailers of all sizes and locations implement loyalty programs with incentives and rewards to retain existing customers for life and to turn regular customers into loyal customers, all to achieve customer sustainability goals. The airline industry initiated loyalty programs through frequent flyer mileage rewards. Later, the retail industry adopted loyalty programs for customers.
Innovation is required in creating and executing loyalty programs because knowing what it takes to get customers excited is the crux of loyalty programs. The sky is the limit when it comes to creating innovative ways of attracting, pampering, and protecting loyal customers because they bring predictable and consistent sales revenues, margins, and profits to a retailer. Loyal customers are few in number compared to regular customers, but they are stronger financially with a greater buying power than other types of customers. Loyal customers have a big impact in increasing a retailer’s revenues, margins, and profits. Loyal customers also are called prime, preferred, and honored customers.

Loyal Customers ➔ Prime Customers
Loyal Customers ➔ Preferred Customers
Loyal Customers ➔ Honored Customers

Loyalty or reward cards can give loyal customers a variety of incentives to buy from a retailer. These incentives include points, miles, coupons, rebates, special offers and deals, and even free merchandise just for shopping with that retailer. Customers feel that they are getting repeat values from repeat purchases, and retailers feel that they are getting repeat values through repeat sales. This is a win-win situation for both the customer and the retailer. Note that brand loyalty is related to brand assets, meaning loyal customers can create and sustain a brand’s assets due to their continued commitment and loyalty through buying that branded product repeatedly.

There is an inverse relationship between the loyalty scores customers give to retailers and customer churn rates (customer turnover or defection). This means that the higher the loyalty scores are, the lower the customer churn rates would be. One way to keep loyalty scores high is to make customers delighted with each purchase they make and to seek out continued feedback from customers to identify gaps in their unmet needs.

Various survey results indicated the following:

- 62% of retailers have increased their budgets for the loyalty programs.
- 35% of middle-class shoppers said they do not want to join a fee-based loyalty program because generic point-based rewards (free programs) are good enough for them.
- Most popular loyalty programs are found in food supermarkets (food retailers).
- Most millennials are willing to join a fee-based rewards program at their favorite retailer. They said rewards in fee-based programs are better than the no-fee rewards.

According to a special report by Boston Retail Partners in 2015, customer experience and engagement is ranked as the first priority for retailers and the customer loyalty program is ranked as the second priority. Here, the idea is that if the customer experience is superior and customer engagement is exciting, then regular customers would automatically join a loyalty program. The report also indicates that most retailers offer traditional coupons and discounts; only few retailers are giving personalized offers to customers.

Because loyalty programs focus on one-to-one marketing concept, it requires retailers to take care of one customer at a time with specialized and personalized approaches. This approach requires customer identification and recognition methods so that retailers can customize the customer experience and engagement tasks.
Event marketing is a type of marketing program where a corporation supports and sponsors various local, regional, and national programs in various areas, such as social, educational, sports, music, cultural, art, and healthcare events; research programs for chronic diseases; fundraising for good causes, such as disaster relief; and other philanthropic and charitable activities. Event marketing represents good corporate citizenship with goodwill and a positive reputation in the eyes of general public in a specific community. Moreover, event marketing reflects a smart advertising strategy with high visibility and a big positive impact on the corporation.

(d) Quality Management Function

This section discusses several topics: drivers of quality, employee empowerment, quality definition, cost of quality (COQ), Six Sigma program, quality metrics, quality tools, statistical process control techniques, quality loss function (QLF), and inspection.

(i) Drivers of Quality

Drivers of quality include customers; suppliers; vendors; employees; products; services; organizational culture and ethics; organizational policies, procedures, and standards; and total organizational focus and commitment. Note that these drivers can either increase or decrease quality, depending on which direction they move, up or down.

(ii) Employee Empowerment

Employee empowerment means involving employees in every step of a production or service process to solicit their input. It is based on the idea that employees who are close to the action would better know the shortcomings of a system, machine, or process than those who are not. Quality circles are part of employee empowerment in managing quality.

Empowerment happens when higher-level employees (e.g., executives and senior managers) decide to distribute and share their power and authority—not their responsibility and accountability—with lower-level employees to make decisions in a timely manner. The reason for empowerment is to put the power where the real action is taking place in the organization—with lower-level employees—so there are no delays in producing products and delivering services to customers. Note that employee empowerment is not a blank check for employees to do anything they want without checking with their supervisors or managers. Empowerment puts upper limits on what employees can do on their own. Exhibit 1.64 compares critical items before and after empowerment.

EXHIBIT 1.64 A Comparison between Before Empowerment and After Empowerment

<table>
<thead>
<tr>
<th>Comparative Items</th>
<th>Before Empowerment</th>
<th>After Empowerment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Concentrated in few and hoarded by few</td>
<td>Distributed to and shared by many</td>
</tr>
<tr>
<td>Decision-making approach</td>
<td>Command and control</td>
<td>Participative</td>
</tr>
<tr>
<td>Response to customers</td>
<td>Slow</td>
<td>Fast</td>
</tr>
</tbody>
</table>

(iii) Quality Defined

Quality has many definitions because it is viewed from many perspectives. Six criteria are presented next.
1. **Judgment-based criteria** are synonymous with superiority or excellence, which is abstract, subjective, and difficult to quantify.

2. **Product-based criteria** assume that higher levels or amounts of product characteristics are equivalent to higher quality and that quality has a direct relationship with price.

3. According to **user-based criteria**, quality is fitness for intended use or how well a product performs its intended function. It is basically dictated by user wants and needs.

4. **Value-based criteria** focus on the relationship of usefulness or satisfaction of a product or service to price. This means a customer can purchase a generic product at a lower price if it performs the same way as the brand-name product.

5. **Manufacturing-based criteria** refer to conformance to specifications (e.g., engineering or manufacturing) that are important to customers. Taguchi, a Japanese statistician, opposes the manufacturing-based definition of quality due to built-in defects to be produced at a higher cost.

6. **Customer-driven quality criteria** refers to meeting customer needs or exceeding customer expectations. This definition is simple and powerful; hence, most companies use it.

A Japanese professor, Noriaki Kano, suggested three classes of customer requirements in understanding customer needs in the marketplace: dissatisfiers, satisfiers, and delighters. Customers are **dissatisfied** when the features that they assumed or expected are not present in a product. Customers are **satisfied** when the features that they wanted are present in a product, although those features are not expected. Customers are **delighted** when the features that they did not assume or expect are present in a product because the features exceed their expectations.

**(iv) Cost of Quality**

The COQ means the price of nonconformance to standards, policies, or procedures. COQ is the cost of doing things wrong, which results in poor quality of products or services. COQ is really the cost of poor quality.

Four categories of COQ are discussed next.

1. **Prevention costs** are associated with reducing the potential for producing defective products or rendering poor-quality services in the first place. Examples include quality improvement programs, employee training and education, investment in equipment and facilities, operator inspection costs, supplier ratings, supplier reviews, supplier certification, product design reviews, pilot projects, prototype tests, vendor surveys, quality-related design costs, purchase-order technical data reviews, and quality department review costs.

2. **Appraisal costs** are associated with evaluating products, processes, parts, or services. Examples include material testing, product testing, production line inspection, quality checks, purchasing appraisal costs, qualifications of supplier product, equipment calibration, receiving and shipping inspection costs, production tests, and product quality audits.

3. **Internal failure costs** are associated with producing defective products or rendering poor-quality services before delivering them to customers. Examples include repair, redesign, reinspection, rework, retesting, sorting, scrap, waste, machine downtime, employee fatigue, and employee carelessness.
4. **External failure costs** are associated with correcting defective products or poor-quality services after delivering them to customers. Examples include product returns, product warranty charges, product recalls, liability suits resulting from damage to customers, field service staff training costs, lost customer goodwill, and poor reputation to a firm.

A $1.00 investment in a prevention category will reduce many dollars of internal and external failure costs, which in turn will improve overall product or service quality many times over.

Quality costs can be reported as an index—the ratio of the current value to a base-period value—and expressed as a percentage or as a fraction. The **quality cost index** increases the understanding of the underlying cost data. Some common measurement bases include direct labor cost, manufacturing cost, sales dollars, and units of production.

**(v) Six Sigma Program**
This subsection defines Six Sigma, explains how to design for Six Sigma, and focuses on the key Six Sigma players.

**(A) Six Sigma Defined**
Six Sigma is a statistical concept to describe accuracy and quality levels in a process, product, or service that can lead to a competitive advantage in the marketplace. The word “sigma” is associated with the statistical term “standard deviation,” which is the distance from the mean (average).

Six Sigma is a strategy, discipline, system, program, and tool to achieve quality improvement continuously, to solve problems, to improve functions and features of a product or service, to reduce cost and time, and to increase customer satisfaction.

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**MEANING OF DIFFERENT SIGMA LEVELS**

- Three Sigma means 66,800 defects in a million parts produced.
- Four Sigma means 6,210 defects in a million parts produced.
- Five Sigma means 230 defects in a million parts produced.
- Six Sigma means 3.4 defects in a million parts produced.
- The goal of reaching Six Sigma from Three Sigma is a challenging one as reaching the goal is a nonlinear process.

Six Sigma follows an improvement model called DMAIC (define, measure, analyze, improve, and control stage). *D* defines the project’s purpose, scope, and outputs, *M* measures the process and collects data, *A* analyzes the data to ensure repeatability and reproducibility, *I* improves or redesigns the existing process, and *C* controls the new or modified process for increased performance.

Implementing a Six Sigma program requires a strong commitment from employees and management in terms of time, training, and expertise.

Six Sigma redefines quality performance as **defects per million opportunities (dpmo)**. It is calculated as:

\[
dpmo = (\text{Defects per Unit}) \times \frac{1,000,000}{\text{Opportunities for Error}}
\]
where

\[
\text{Defects per Unit} = \frac{\text{Number of Defects Discovered}}{\text{Number of Units Produced}}
\]

**EXAMPLES OF TOOLS AND TECHNIQUES USED IN THE DMAIC MODEL**
- **Define stage:** brainstorming, cause-and-effect diagram, and process mapping
- **Measure stage:** cause-and-effect diagram and process mapping
- **Analyze stage:** regression and correlation analysis and process mapping
- **Improve stage:** brainstorming, simulation, design of experiments, and process mapping
- **Control stage:** mistake-proofing (poka-yoke), statistical process control, and control charts

**EXAMPLES OF TOOLS AND TECHNIQUES USED IN THE DCOV MODEL**
- **Define stage:** Kano model, quality function deployment, and regression and conjoint analysis
- **Characterize stage:** design of experiments and TRIZ (a problem-solving tool)
- **Optimize stage:** design of experiments, simulation, mistake-proofing, and control charts
- **Verify stage:** design walkthroughs and reviews and product tests

**Design for Six Sigma**

Design for Six Sigma (DFSS) is a proactive approach to prevent problems from occurring in the first place and/or in resolving problems after they occur. The focus is on functional and quality improvement at the early design stage. An approach to DFSS is established in terms of **DCOV** model, which stands for define, characterize, optimize, and verify.

DFSS is similar to other design concepts, such as design for manufacturability (e.g., lean production and standard parts), design for low cost (e.g., overhead costs, supply chain costs, and quality costs), design for faster production (e.g., flexible manufacturing and concurrent engineering), design for faster marketing (e.g., time to market, quality function deployment, and voice of the customer), design for safety and ergonomics (e.g., safe products and human factors), design for a better environment (e.g., pollution control and recycling), and design for serviceability (e.g., postsales activities, such as ease of repair and maintenance).

**Six Sigma Players**

Several Six Sigma players exist in the planning and implementation of the Six Sigma program in an organization, including **White Belts** (at the bottom), Green Belts, Yellow Belts, Black Belts, Master Black Belts, Project Champions, and Senior Champions (at the top of the Six Sigma hierarchy). All of these players assume defined roles and responsibilities and need specific training of varying lengths to make the Six Sigma program a success.

**White Belts** are hourly employees who need basic training in Six Sigma goals, tools, and techniques to help Green Belts and Black Belts on their projects.
Green Belts are salaried employees who have a dual responsibility in implementing Six Sigma in their function and in carrying out their regular duties in that function. They gather and analyze data in support of a Black Belt project and receive a simplified version of Black Belt training.

Yellow Belts are seasoned salaried employees who are familiar with quality improvement processes.

Black Belts are salaried employees who have a full-time responsibility in implementing Six Sigma projects. They require hard skills and receive extensive training in statistics and problem-solving and decision-making tools and techniques, as they train Green Belts. Black Belts are very important to Six Sigma’s success.

Master Black Belts are also salaried employees who have a full-time responsibility in implementing Six Sigma projects. They require soft skills, need some knowledge in statistics, and need more knowledge in problem-solving and decision-making tools and techniques, as they train Black Belts and Green Belts.

Senior Champions are sponsors and executives in a specific business function. They manage several Project Champions at the business unit level, who in turn manage specific projects. Senior Champions develop plans, set priorities, allocate resources, and organize projects. Project Champions deploy plans, manage projects that cut across the business functions, and provide managerial and technical guidance to Master Black Belts and Black Belts. All champions require soft skills.

### WHICH SIX SIGMA PLAYER DOES WHAT?

- White Belts help Green Belts and Black Belts.
- Green Belts help Black Belts.
- Black Belts help Master Black Belts.
- Master Black Belts help Project Champions.
- Project Champions help Senior Champions.
- Senior Champions decide what gets done. Project Champions, Master Black Belts, and Black Belts decide how to get it done.

(vi) Quality Metrics

Return on quality (ROQ) is similar to ROI in terms of measurement, requiring the same attention as ROI. Quality improvement initiatives have a direct financial impact, which cannot be ignored.

ROQ is similar to cost of quality (COQ) in terms of measurement except that COQ takes an internal perspective, such as costs and defects, and ROQ takes an external perspective, such as revenues and customer satisfaction.

The COQ means the price of nonconformance to standards, policies, or procedures.

Critical to quality (CTQ) is a quality measurement technique that dictates a product’s output specifications in terms of a customer’s needs, wants, and expectations, whether the customer is
internal or external to an organization. CTQ focuses on customer requirements, design and test parameters, mistake-proofing, quality robustness, and control charts.

<table>
<thead>
<tr>
<th>COMPARISON AMONG COQ, ROQ, AND CTQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>COQ takes an internal perspective.</td>
</tr>
<tr>
<td>ROQ takes an external perspective.</td>
</tr>
<tr>
<td>CTQ takes both internal and external customer perspectives.</td>
</tr>
</tbody>
</table>

ROQ measures expected revenue gains against expected costs associated with quality improvement initiatives. ROQ is computed as net present value (NPV) of benefits resulting from quality improvement initiatives divided by NPV of costs associated with quality improvement initiatives minus 1.0.

Return on quality (ROQ), expressed as a percentage, is computed as:

\[
\text{ROQ} = \frac{\text{(Net present value of quality benefits)}}{\text{(Net present value of quality costs)}} - 1.00
\]

The result is multiplied by 100 to get the percentage.

All benefits and costs are multiplied with the corresponding present value factors to result in NPV of benefits and costs respectively.

(vii) Quality Tools
Several quality tools exist that can be used to analyze processes, prioritize problems, report the results, and evaluate the results of a corrective action plan. There are seven quality control tools and seven quality management tools.

(A) Seven Quality Control Tools
1. **Check sheets** are used for collecting data in a logical and systematic manner.
2. A **histogram** is a frequency distribution diagram in which bars represent the frequencies of occurrences of the different variables being plotted.
3. A **scatter diagram** is a plot of the values of one variable against those of another variable to determine the relationship between them. These diagrams are used during analysis to understand cause-and-effect relationships between two variables. Scatter diagrams are also called correlation diagrams.
4. A **Pareto diagram** is a special use of the bar graph in which the bars are arranged in descending order of magnitude. The purpose of Pareto analysis, using Pareto diagrams, is to identify the major problems in a product or process or, more generally, to identify the most significant causes for a given effect. This allows a developer to prioritize problems and decide which problem area to work on first.
5. A **flowcharting** tool can be used to document every phase of a company’s operation, for example, from order taking to shipping in a manufacturing company. It is an effective way to break down a process or pinpoint a problem. Flowcharting can be done at both the summary level and the detailed level serving different user needs.
6. One form of a **cause-and-effect (C&E) diagram** is used for process analysis when a series of events or steps in a process creates a problem and the it major cause of the problem is not clear. Each process or subprocess is examined for possible causes; after the causes from each step in the process are discovered, significant root causes of the problem are selected, verified,
and corrected. C&E diagrams are also called fishbone or Ishikawa diagrams; they were invented as problem-solving tools.

Stratification helps the C&E diagram because it is a procedure used to describe the systematic subdivision of population or process data to obtain a detailed understanding of the structure of the population or process. It is not to be confused with a stratified sampling method. Stratification can be used to break down a problem to discover its root causes and can establish appropriate corrective actions, called countermeasures.

7. A control chart assesses a process variation. The control chart displays sequential process measurements relative to the overall process average and control limits. The upper and lower control limits establish the boundaries of normal variation for the process being measured.

(B) Seven Quality Management Tools

1. An affinity diagram is a data-reduction tool that organizes a large number of qualitative inputs into a smaller number of major categories. These diagrams are useful in analyzing defect data and other quality problems and are useful in conjunction with cause-and-effect diagrams or interrelationship digraphs.

2. A tree diagram can be used to show the relationships of a production process by breaking the process down from a few larger steps into many smaller steps. The greater the detail of steps, the more simplified they are. Quality improvement actions can progress from the rightmost side of the tree to the leftmost.

3. A process decision program chart is a preventive control tool that prevents problems from occurring in the first place and mitigates the impact of problems that do occur. In this way, it is a contingency planning tool. The objective of the tool is to determine the impact of the “failures” or problems on the project schedule.

4. A matrix diagram is developed to analyze the correlations between two groups of ideas with the use of a decision table. This diagram allows one to systematically analyze correlations. Quality function deployment is an extension of the matrix diagram.

5. An interrelationship digraph is used to organize disparate ideas. Arrows are drawn between related ideas. An idea that has arrows leaving it but none entering is a root idea. More attention is given to the root ideas for system improvement. The digraph is often used in conjunction with affinity diagrams.

6. Prioritization matrices are used to help decision makers determine the order of importance of activities being considered in a decision. Key issues and choices are identified for further improvement. These matrices combine the use of tree diagrams and matrix diagrams.

7. Activity network diagrams are project management tools to determine which activities must be performed, when they must be performed, and in what sequence. These diagrams are similar to program evaluation and review technique (PERT) and critical path method (CPM), the popular tools in project management. Unlike PERT and CPM, activity network diagrams are simple to construct and require less training to use.

(viii) Statistical Process Control Techniques

Management’s goal is to reduce causes of process variation and to increase process capabilities to meet customer expectations.

Process Variation. Variation is present in every process as a result of a combination of four variables:

1. Operator variation (due to physical and emotional conditions)

2. Equipment variation (due to wear and tear)
3. Materials variation (due to thickness, moisture content, and old and new materials)
4. Environmental variation (due to changes in temperature, light, and humidity)

Variation is either expected or unexpected, and it results from common, special, or structural causes.

Variation affects proper functioning of a process in that process output deviates from the established target. **Common causes** of variation affect the standard deviation of a process and are caused by factors internal to a process. These causes, which are present in all processes, are also called **chance** (random) **causes**. Chance causes are small in magnitude and are difficult to identify. Examples of common random causes include worker availability, number and complexity of orders, job schedules, equipment testing, work-center schedules, changes in raw materials, truck schedules, and worker performance.

**Special causes** affect the standard deviation of a process and are factors external to a process. Special causes, also known as assignable causes, are large in magnitude and are not so difficult to identify. They may or may not be present in a process. Examples of special (assignable) causes include equipment breakdowns, operator changes, new raw materials, new products, new competition, and new customers.

**Structural causes** affect the standard deviation of a process; they are factors both internal and external to a process. They may or may not be present in a process; they are a blend of common and special causes. Examples of structural causes include sudden sales/production volume increase due to a new product or a new customer, seasonal sales, and a sudden increase in profits.

A **control chart** is a statistical tool that distinguishes between natural (common) and unnatural (special) variations. The control chart method is used to measure variations in quality. The control chart is a picture of the process over time. It shows whether a process is in a stable state and is used to improve the process quality.

**Natural variation** is the result of random causes. Management intervention is required to achieve quality improvement or a quality system. It has been stated that 80% to 85% of quality problems are due to management or the quality system and that 15% to 20% of problems are due to operators or workers. Supervisors, operators, and technicians can correct the unnatural variation. Control charts can be drawn for variables and attributes.

The control chart method for variables is a means of visualizing the variations that occur in the central tendency and dispersion of a set of observations. It measures the quality of a particular characteristic, such as length, time, or temperature.

A **variable chart** is an excellent technique for achieving quality improvement. True process capability can be achieved only after substantial quality improvements have been made. Once true process capability is obtained, effective specifications can be determined. The sequence of events taking place with the control chart is shown next.

\[
\text{Variable chart} \rightarrow \text{Quality improvement} \\
\quad \rightarrow \text{Process capability} \\
\quad \rightarrow \text{Specifications}
\]

To improve the process continuously, **variable control charts** can be used to overcome the limitations of attribute control charts. Continuous process improvement is the highest level
of quality consciousness. Control charts based on variable data reduce unit-to-unit variation, even within specification limits. Variable data consist of measurements such as weight, length, width, height, time, and temperature. Variable data contain more information than attribute data. Variable control charts can decrease the difference between customer needs and process performance.

The attribute chart refers to those quality characteristics that conform or do not conform to specifications (specs). It is used where measurements are not possible, such as for color, missing parts, scratches, or damage. Quality characteristics for a product can be translated into a go/no-go decision.

Two types of attribute control charts exist: charts for nonconforming units and charts for nonconformities. A nonconforming unit is a product or service containing at least one nonconformity. A nonconformity is a departure of a quality characteristic from its intended level that is not meeting a required specification.

Two types of statistical errors in quality can occur, leading to incorrect decisions: Type I error is called producer’s risk (alpha risk), which is the probability that a conforming (good-quality) product will be rejected as a poor-quality product and not sold to customers. This product meets the established acceptable quality level. This error results in an incorrect decision to reject something when it is acceptable. Type II error is called consumer’s risk (beta risk), which is the probability that a nonconforming (poor-quality) product will be accepted as a good-quality product and sold to customers. This error results in an incorrect decision to accept something when it is unacceptable. Type II error occurs when statistical quality data fails to result in the scrapping or reworking of a defective product.

Stable and unstable processes are defined as follows. When only chance causes of variation are present in a process, the process is considered to be in a state of statistical control (i.e., the process is stable and predictable). When a process is in control (stable), there is a natural pattern of variation, and only chance causes of variation are present. Small variations in operator performance, equipment performance, materials, and environmental characteristics are expected and are considered part of a stable process. Further improvements in the process can be achieved only by changing the input factors (i.e., operator, equipment, materials, and environment). These changes require action by management through quality improvement ideas.

When an assignable cause of variation is present in a process, the process is considered to be out of statistical control (i.e., the process is unstable and unpredictable). When an observed measurement falls outside its control limits, the process is said to be out of control (unstable). This means that an assignable cause of variation is present. The unnatural, unstable variation makes it impossible to predict future variation. The assignable causes must be found and corrected before a natural, stable process can continue.

Process Capability. Process capability is the ability of a production process to manufacture a product within customers’ desired expectations. The process capability index (PCI), which
indicates whether a process is capable of meeting customer expectations, must be equal to or greater than 1.00 to meet customer expectations. A PCI of less than 1.00 means that the process does not meet customer expectations.

The PCI is computed in several ways:

\[
\text{PCI} = \frac{\text{UL} - \text{LL}}{6 \times \text{standard deviation of a process}}
\]

where \( \text{UL} = \) Upper specification limit
\( \text{LL} = \) Lower specification limit

The upper specification limit means that some data points will be above the central line in a control chart. The lower specification limit means that some data points will be below the central line in a control chart.

**Capability ratio (Cp)** is specification tolerance width divided by process capability. Specification tolerance width refers to variability of a parameter permitted above or below a nominal value. Cp is a widely used PCI.

**(ix) Quality Loss Function**
Taguchi believes that variation in a production process can be reduced by designing products that perform in a consistent manner, even under conditions of varying or adverse use. He emphasizes proactive steps at the design stage instead of late, reactive steps at the production stage.

Taguchi believes in pushing a process upstream to focus on product and process design, which is called **offline quality control**. This is contrary to **online quality control**, where traditional quality control activities take place downstream with the focus on final inspection procedures, sampling methods, and statistical process control techniques. Offline quality control methods reduce costs and defects.

Taguchi uses quality engineering and statistical experimental design methods to reduce all process and product variations from the target value with the goal of producing a perfect product. He views **quality engineering** as composed of three elements: system design, parameter design, and tolerance design.

Taguchi developed three related concepts using statistical experimental design: quality robustness, quality loss function (QLF), and target-oriented quality. The QLF measures quality in monetary units that reflect both short- and long-term losses.

**Quality robustness** means products are consistently produced despite adverse manufacturing and environmental conditions. The goal is to remove the effects of adverse conditions rather than removing the causes, which is more expensive to do. It is assumed that small variations in materials and process do not destroy the overall product quality.

A QLF identifies all costs associated with poor quality and shows how these costs increase as the product moves away from the target value. Examples of costs included in the QLF are customer dissatisfaction costs, warranty costs, service costs, internal inspection costs, equipment or product repair costs, scrap costs, and overall costs to society due to bad reputation and loss of goodwill. The QLF concept can be equally applied to products and services.

**Target-oriented quality** is a philosophy of continuous improvement, where the goal is to bring the product exactly on target, instead of falling within the tolerance limits, which are is
too simplistic and costly to customers. Traditionally, products are manufactured using conformance-oriented specifications with tolerance limits allowed. Taguchi opposes conformance to specification limits due to the built-in tolerance range, which allows defective products to be produced. He advocates manufacturing a perfect product at the desired specifications, with no tolerance limits and at a relatively low cost.

The QLF is computed as:

\[ L = D^2 \times C \]

where \( L \) = Loss to society
\( D^2 \) = Distance from the target value
\( C \) = Cost of the deviation at the specification limit

The smaller the loss, the more desirable the product. However, the farther the product is from the target value, the greater the loss. QLF is zero when a product is produced at the target value and rises exponentially as the product is produced to meet the tolerance limits.

**Q(2) Inspection and Quality at the Source**

Inspection is a means of ensuring that an operation or a process is producing at the expected quality level. The best processes have little variation from the standard level. Three basic issues relating to inspection (audit) are what to inspect, when to inspect, and where to inspect. The audit can take place at several places and several times:

- At supplier’s plant while the supplier is producing goods, such as raw materials, ingredients, parts, or components
- At company facility upon receipt of goods from the supplier
- During the company’s production processes, either in-house or outside
- Before delivery to the customer

Source inspection means individual employees are checking their own work with proper training and empowerment before they pass their work to the next employee, who is considered an internal customer. Inspectors may be using a checklist, a sampling plan, and controls such as fail-safe devices (poka-yoke) for mistake-proofing.

Inspection rules help inspectors to prioritize where inspection should be performed. The **inspection priority index** is computed as:

\[ \text{Inspection priority index} = \frac{\text{Cost of inspection}}{\text{Cost of failure}} \]

If the index is less than 1.0, that item should be inspected first; if the index is greater than 1.0, that item should be inspected last.

Two other inspection methods include **in-process inspection**, where all work is inspected at each stage of the production process, and the **\( N = 2 \) technique**, where the first and last pieces in a supplier’s shipment lot are checked to see whether they meet the specifications. If they do, then the entire shipment lot is accepted. The \( N = 2 \) technique is an alternative to **acceptance sampling**, where a lot is accepted if two or fewer defects are found and rejected if more than two defects are found.
**Quality at the source** is a defect- or error-prevention technique with greater visibility of immediate results and with a decentralized control where the first and local action is taking place at the source. The source could be: (1) where raw materials, ingredients, parts, and components are inspected as they are received, used, or stored; (2) where purchased parts and components are fabricated; or (3) where fabricated parts and components are assembled into a finished product with other items. It is always better to detect defects and errors at the beginning rather than at the end of a process. Quality at the source, which means finding defects or errors and taking immediate corrective action, requires employee training and empowerment.

### 1.13 Business Development Life Cycle

Business cycles and the causes of those cycles are discussed in this section. In addition, how business cycles affect consumer durable and nondurable goods is explained. Growth concepts between a company and a nation are compared. Four business cycle indicators—leading, coincident, lagging, and composite indicators—are presented. Key economic indicators are highlighted, and how a business forecasts its demand variables (i.e., sales and inventory) is explained.

**(a) Business Cycles**

Any nation (country) seeks economic growth, full employment, and price-level stability. However, achieving full employment and price-level stability is not steady or certain. In the United States, both unemployment and inflation have threatened or interrupted the long-term trend of economic growth.

The term “business cycle” refers to the recurrent ups and downs in the level of economic activity that extend over time. Economists suggest four phases of the business cycle: peak, recession, trough, and recovery (see Exhibit 1.65). The duration and strength of each phase is variable. Some economists prefer to talk about business fluctuations rather than cycles because cycles imply regularity while fluctuations do not.

**EXHIBIT 1.65 Business Cycle Phases**

<table>
<thead>
<tr>
<th>Phases of business cycle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak</td>
<td>Outputs and employment are at highest levels</td>
</tr>
<tr>
<td>Recession</td>
<td>Outputs and employment are declining</td>
</tr>
<tr>
<td>Trough</td>
<td>Outputs and employment are at lowest levels</td>
</tr>
<tr>
<td>Recovery</td>
<td>Outputs and employment are trying to reach highest levels</td>
</tr>
</tbody>
</table>

1. **Peak.** The economy is at full employment, and the national output is close to capacity. Price levels are likely to rise.

2. **Recession.** Both output and employment decline, but prices tend to be relatively inflexible in a downward direction. Depression sets in when the recession is severe and prolonged, and prices fall. In an economy experiencing a recession with low inflation, the central bank could stimulate the economy by purchasing securities in the secondary market, which will increase money supply.

3. **Trough.** Both output and employment bottom out at their lowest levels.
4. **Recovery.** Both output and employment expand toward full employment. As recovery intensifies, price levels may begin to rise prior to the realization of full employment and capacity production.

**(b) Causes behind Business Cycles**

Economists offer many theories for the four phases of the business cycle and the cycle’s impact on business activity. Examples are listed next.

- Innovations (e.g., computers, drugs, synthetic fibers, automobiles) have greater impact on investment and consumer spending and therefore on output, employment, and the price level. This innovation is not regular and continuous.
- Political and random events, such as wars, have a major impact on increasing employment and inflation. A slump follows when peace returns.
- The government’s monetary policy has a major impact on business activity. When a government creates too much money, inflation results. When a government restricts money supply, lower output and unemployment result.
- The level of total government expenditures has a major impact on the levels of output and employment.

**KEY CONCEPTS TO REMEMBER:**

- When total expenditure is low, output, employment, and incomes will be low. Less production will be profitable to the business.
- When total expenditure is high, output, employment, and incomes will be high. More production will be profitable to the business.
- Many businesses, such as retail, automobile, construction, and agriculture, are subject to seasonal variations (e.g., pre-Christmas, pre-Easter).
- Business activity is also subject to secular trends. The secular trend of an economy is its expansion or contraction over a long period of time (i.e., 25 or more years). Both seasonal variations and secular trends are due to noncyclical fluctuations.

**(c) Durable and Nondurable Goods**

It is important to note that various individuals and various segments of the economy are affected in different ways and in different degrees by business cycles. For example, consumer durable and consumer nondurable goods industries are affected in different ways, as explained next.

- **Consumer durable goods.** Those industries producing heavy capital goods and consumer durables (e.g., household appliances, automobiles), called hard goods industries, are highly sensitive to the business cycle. Both production and employment will decline during recession and increase during recovery.

  The reason for the sensitivity of the consumer durable industry to the business cycle is that consumers and producers alike can postpone the purchase of hard goods.
Producers do not invest in capital goods during a recession; they postpone investment until the economy gets better. Consumers also postpone the purchase of hard goods during a recession and extend the life of hard goods by repairing old appliances and automobiles rather than buying new models. Producers cut output and employment instead of lowering prices due to producers concentration in the industry. Price cuts could be modest, even if they occur.

- **Consumer nondurables.** Output and employment in nondurable consumer goods industries are less sensitive to the business cycle. This is because food and clothes, which are examples of the consumer nondurable industry, are necessities of life. These are called soft good industries. Because soft good industries are highly competitive and low concentration, they will cut prices instead of production and employment. Production decline would be modest, even if it occurs.

Financial managers need to develop financial forecasts and capital investment plans according to the phase of the business cycle the firm is going through and the type of industry to which the firm belongs (i.e., consumer durables or consumer nondurables).

**(d) Growth Concepts**

Another interesting concept is to compare the growth of a firm (company) with that of a nation’s economy. Four growth concepts emerge: supernormal, normal, zero, and negative growth (see Exhibit 1.66). Each growth concept is briefly explained next.

**EXHIBIT 1.66 Industry Growth Concepts**

<table>
<thead>
<tr>
<th>Industry growth concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supernormal growth (grow faster than the economy)</td>
</tr>
<tr>
<td>Normal growth (grow same as the economy)</td>
</tr>
<tr>
<td>Zero growth (no growth compared to the economy)</td>
</tr>
<tr>
<td>Negative growth (decline in growth compared to the economy)</td>
</tr>
</tbody>
</table>

1. **Supernormal growth** is the part of a firm’s life cycle in which its growth is much faster than that of the economy as a whole.

2. **Normal growth** is growth that is expected to continue into the foreseeable future at about the same rate as that of the economy as a whole. The growth rate of a firm is equal to the nominal gross national product (GNP), which is real GNP plus inflation.

3. **Zero growth** indicates that a firm experiences a 0% growth compared to the economy as a whole.

4. **Negative growth** indicates that a firm is experiencing a decline in growth compared to the economy as a whole.

**(e) Business Cycle Indicators**

Four types of business cycle indicators are used in economic forecasting of a country: leading indicators, coincident indicators, lagging indicators, and composite economic index. They all deal with timing of certain events taking place in an economy. Specifically, they signal peaks (highs)
and troughs (lows) in the business cycle. A nation's economic growth rate can go up and down as these indicators move up and down (upward and downward swings).

(i) Leading Indicators
Leading indicators change in advance of other variables. These are the least likely to be accurate. However, they are the most useful for business planning, because they provide information for action.

For example, capital goods purchases are a leading indicator for recession. The CPI is often used in planning for inflation and wages because it is a leading economic indicator.

The index of leading indicators is broadly representative of the economy as its components are drawn from six separate groups of cyclical indicators:

1. Labor force, employment, and unemployment
2. Sales, orders, and deliveries
3. Fixed capital investment
4. Prices
5. Personal income and consumer attitudes
6. Money, credit, interest rates, and stock prices

The leading index is useful primarily during times of uncertainty.

According to the U.S. Conference Board (www.conference-board.org), examples of leading indicators include:

- Average weekly hours for production workers in manufacturing, where an increase in these hours results in an increase in GNP
- Average workweek of production workers in manufacturing
- Average weekly initial claims for state unemployment insurance
- New orders for consumer goods and materials, adjusted for inflation
- Supplier or vendor performance levels (e.g., companies receiving slower and missed deliveries from suppliers)
- Manufacturers’ new orders for nonmilitary capital goods purchases, adjusted for inflation, and excluding aircraft
- New building permits issued and permits issued for new private housing units
- Index of stock prices of 500 common stocks
- Money supply (M2 adjusted for inflation)
- Interest rate spread on 10-year Treasury bonds minus federal funds
- Institute of Supply Management issues a purchasing managers’ index (PMI) for purchasing of materials going into manufacturing production
- Index of consumer expectations for business conditions
- Consumer price index (CPI)
Producer price index (PPI), where PMI is used, in part, to calculate the PPI
Leading credit index
PMI’s new orders index

_Diffusion indexes_ are highly correlated with growth rates expressed by leading indicators. That is, a low diffusion index is associated with low growth rates, and a high diffusion index is associated with high growth rates. When a diffusion index is 40%, it means that 60% of the leading indicators have fallen.

(ii) **Coincident Indicators**
Coincident indicators change at the same time as other variables change. Examples include inflation, unemployment, and consumer confidence. The coincident economic index is used primarily as a tool for dating the business cycle (i.e., determining turning points such as cyclical peaks and troughs). Manufacturing and trade sales volume will determine whether a business cycle is turning into peaks or troughs.

Examples of coincident indicators from the U.S. Conference Board (www.conference-board.org) include:
- Manufacturing and trade sales volume
- Employees on nonagricultural payroll
- Industrial production (i.e., durable goods and nondurable goods)
- Personal income minus transfer payments, where the latter includes government benefits paid to citizens such as Social Security, disability, annuities, welfare, and retirement

(iii) **Lagging Indicators**
Lagging indicators change after the other variables change. These are more accurate than the other indicators, but the information is much less useful for decision making. For example, unemployment figures are lagging indicators of recession.

Examples of lagging indicators from the U.S. Conference Board (www.conference-board.org) include:
- Average duration of unemployment in weeks and months
- Inventories to sales ratio for manufacturing and trade business
- Change in labor cost per unit of output in manufacturing
- Average prime interest rates from the central bank (lender bank) to borrower banks
- Commercial and industrial loan volume
- A ratio of consumer installment credit outstanding to personal income
- Change in CPI for services

(iv) **Composite Economic Index**
The composite economic index is one integrated index based on three individual indicators: leading, coincident, and lagging indicators. The composite economic indexes are the key elements in an analytic system designed to signal peaks and troughs in the business cycle. Composite
indexes are constructed to summarize and reveal common turning points and patterns in economic data in a clearer and more convincing manner than any individual component (i.e., leading, coincident, and lagging), primarily because they smooth out some of the volatility of individual components.

(f) Key Economic Indicators

Businesses use macroeconomic forecasts in making investment and production decisions. When they foresee an economic downturn, businesses may reduce their inventories. When prices are expected to rise quickly, businesses buy goods in advance and add to equipment and plant. These decisions are based on these key economic indicators: gross domestic product (GDP) gross national product (GNP), net national product (NNP), consumer price index (CPI), producer price index (PPI), balance of payments (BOP), and balance of trade (BOT).

(i) Gross Domestic Product

GDP is the total market value of final goods and services produced by a country in a given year. It measures total output of a country. The two main variables that contribute to increases in a nation’s real GDP are labor productivity and total worker hours. GDP is computed as follows:

\[ \text{GDP} = \text{Consumption} + \text{Investment} + \text{Government purchases} + \text{Net exports} \]

Where
- Consumption = Purchases by consumers
- Investment = Purchases by private sector firms
- Government purchases = Purchases by all levels of government
- Net exports = Net purchases by foreign sectors (i.e., net exports are equal to domestic exports minus domestic imports).

Economic growth is the sustained increase in real GDP over a long period of time. Real GDP takes price changes into account; nominal GDP takes current prices into account.

Real GDP per hour is a general indicator of hourly productivity. Real GDP per capita is an indicator of overall wealth in a country. Real GDP results from after adjusting for or incorporating the inflation. It is the usual measure of living standards across time periods in a country and between countries. Usually increases in productivity signal a potential for increases in a country’s standard of living.

The GDP deflator is the most appropriate inflation index to use when a company is attempting to estimate the inflation rate on all goods and services over a recent time period. This deflator is a measure of the average price level in a country’s economy. Exports and imports, as well as all components of nominal and real GDP, enter the calculations for GDP deflators.

Sharp swings in quarterly GDP deflators are often caused by changes in prices for oil, apparel, and computers as well as by annual wage increases for government employees and occasionally by drought or other disasters affecting crops and commodities.

GDP deflator is calculated as follows:

\[ \text{GDP deflator} = \frac{((\text{Nominal GDP}) / \text{Real GDP})}{100} \]
EXAMPLE

Real GDP in year 2018 is $50,000, which is the base year with an index of 100. Nominal GDP in year 2018 is $60,000. What is the GDP deflator for 2019, and what percentage did prices increase between the two years?

\[
\text{GDP deflator for 2019} = \left( \frac{\$60,000}{\$50,000} \right) \times 100 = 112
\]

\[
\text{Price increase} = \frac{(112 - 100)}{100} = 0.12 = 12\%
\]

(ii) Gross National Product

GNP is GDP plus total income earned worldwide by U.S. firms and residents. The sale of final goods is included in the GNP; the sale of intermediate goods is excluded from the GNP. *GNP is all inclusive and better than GDP due to its comprehensiveness.*

\[
\text{GNP} = \text{GDP} + \text{Worldwide income earned}
\]

The GNP price deflator is a measure of the change in prices for all final goods and services produced in the economy. This inflation index can be used to estimate the inflation rate on all goods and services over a recent time period.

KEY CONCEPTS TO REMEMBER: GNP

- The GNP is a measure of quantity, not quality. Hence, it measures national economic performance, market-oriented activity, and the size of national output, not improvements in product quality.
- GNP will rise with an increase in government purchases of services (i.e., government spending).
- GNP will fall following an increase in imports.
- An increase in the average hours worked per week of production workers would provide a leading indicator of a future increase in GNP.

(iii) Net National Product

NNP equals GNP minus depreciation. NNP is composed of the total market value of all final goods and services produced in the economy in one year minus the capital consumption allowance (i.e., depreciation).

\[
\text{NNP} = \text{GNP} - \text{Depreciation}
\]

*Depreciation* is a reduction in the accounting value (not the real value) of capital assets (e.g., buildings, machinery, and equipment) over a time period of one year due to physical wear and tear and technological obsolescence.

Economic growth is defined and measured in two ways: (1) as the increase in real GNP or NNP, which occurs over a specific period of time, or (2) as the increase in real GNP or NNP per capita, which occurs over a range of time period.
(iv) **Consumer Price Index**
CPI measures the cost of a fixed basket of goods chosen to represent the consumption pattern of a typical consumer. It is a statistic used to measure price changes in a market basket of selected items.

The CPI is one factor in setting the cost of living index (COLI) and cost of living adjustments (COLA) in a country. Critics of CPI argue that it overstates increases in the cost of living due to the constant composition of the market basket of items whose prices are measured. The chain-weighted index is a method for calculating changes in prices that uses an average of base years from neighboring years.

\[
\text{CPI} \rightarrow \text{COLI} \rightarrow \text{COLA}
\]

**WHAT IS INCLUDED IN THE CPI CALCULATION?**

Eight categories of the CPI include food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services (e.g., haircuts, college tuition, and bank fees).

Taxes directly associated with the prices of specific goods and services, such as sales and excise taxes, are also included. The CPI includes various governmental charged user fees, such as water and sewage charges, auto registration fees, and vehicle tolls. Taxes not directly associated with the purchase of consumer goods and services, such as income taxes and Social Security taxes, are excluded. In addition, the CPI does not include investment items, such as stocks, bonds, real estate, and life insurance, because they relate to savings, not daily living expenses.

Only urban residents (consumers) are included in the CPI calculation. Excluded from the population are rural residents outside metropolitan areas, all farm residents, the military personnel, and individuals in institutions.

**EXAMPLE**

Assume that in 2015 a business analyst is making $40,000 per year and five years later his income increases to $90,000. The CPI increases from 100 to 250 during this period. What is the real income in 2015 prices for the later years?

\[
\text{Inflation rate} = \frac{250 - 100}{250} = 0.60 = 60\%
\]
\[
\text{Real income} = \text{Nominal income} - \text{Inflation rate} = 100\% - 60\% = 40\%
\]

Therefore, real income in 2015 prices is:
\[
$90,000 \times 0.40 = $36,000
\]

(v) **Producer Price Index**
Producer price index (PPI) measures the price of a basket of commodities at the point of their first commercial sale by producers or manufacturers to consumers. Actually, PPI measures...
changes in net unit revenues received by U.S. producers. Taxes received by the government are not included. PPI includes sales promotions and rebates offered by manufacturers but does not include car dealer rebates offered to customers. The PPI attempts to capture actual transaction prices, not list prices. Purchasing managers’ index (PMI) is a composite index based on data from a monthly report on producers’ or manufacturers’ prices. PMI is an input into the calculation of PPI.

**CPI VERSUS PPI**

CPI reflects price changes occurring from a purchaser’s or consumer’s perspective whereas PPI measures price changes occurring from a seller’s or manufacturer’s perspective. The difference between CPI and PPI is due to processing, distribution, shipping, and selling costs and producer’s and distributor’s costs and profits. PPI does not include retailer’s costs and profits.

**(vi) Balance of Payments**

Balance of payments (BOP) deals with an accounting of money inflows and money outflows in a year for a country.

\[
\text{Money inflows} = \text{Price of exports} + \text{Other factors}
\]

\[
\text{Money outflows} = \text{Price of imports} + \text{Other factors}
\]

\[
\text{BOP} = \text{Money inflows} - \text{Money outflows} \pm \text{Other factors}
\]

Examples of other factors influencing the BOP are tourism, military expenditures, foreign investment, financial aid given to other countries, and financial aid received from other countries.

**(vii) Balance of Trade**

Balance of trade (BOT) is the simple ratio of a country’s exports to imports. Note that GNP decreases as imports increase.

\[
\text{BOT} = \frac{\text{Exports}}{\text{Imports}}
\]

**(g) Business Forecasting**

Business conditions relate to business cycles. Decisions such as ordering inventory, borrowing money, increasing staff, and spending capital are dependent on the current and predicted business cycle. For example, decision making in preparation for a recession, such as cost reduction and cost containment, is especially different and difficult. Also, during a recession, defaults on loans can increase due to bankruptcies and unemployment.

Timing is everything when it comes to making good cycle-sensitive decisions. Managers need to make appropriate cutbacks prior to the beginning of a recession. Similarly, managers cannot get caught short during a period of rapid expansion. Economic forecasting is a necessity for predicting business cycles and swings. Trend analysis, economic surveys, opinions, and simulation techniques are useful to managers trying to stay abreast of the latest economic developments.
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APPLICATIONS OF BUSINESS FORECASTING

The following is a list of applications of business forecasting, mainly to develop future estimates of important business factors or variables of interest to management.

- Sales in physical units, sales in dollars, sales by region, sales by quarter, and sales per year
- Operating costs, product costs, service costs, overhead costs, and payroll costs
- Cash flows (inflows and outflows), cash needs, debt needs, and dividend needs (i.e., dividend payout ratio)
- Earnings per share, dividends per share, and stock market price for share, and a company’s market share
- Operating budget needs and capital budget needs
- Impact of changes in interest rates, inflation rates, employment rates, and wage rates on earnings and profits
- Simulation of factory equipment breakdowns and key parts replacement times
- Performing sensitivity analysis (what-if analysis) to solve business problems in finance, manufacturing, and marketing

Businesses use economic forecasts in making investment and production decisions. When they foresee an economic downturn, they may reduce inventories. When prices are expected to rise quickly, they buy goods in advance and add to equipment and plant.

Statistical models are most successful when past circumstances can be used to predict future events. Economic models use historical data to develop predictive models. Current input to the model provides meaningful results only if the important factors retain the same proportional significance. During the energy crisis of the early 1970s, most economic models performed very poorly because key relationships had changed. Predictive models improved once new historical patterns emerged.

The opposite of forecasting economic events is measuring economic events. This historical information is important in evaluating and providing information for predicting the future. The business cycle is the up-and-down movement of an economy’s ability to generate wealth. Historical economic data show a clear pattern of alternating recessions and expansions. In between there have been peaks and troughs of varying magnitude and duration. Business cycles have a predictable structure but variable timing.

The simplest form of forecasting is the projection of past trends called extrapolation. Model building activities are examples of analytical techniques. A model breaks down a major problem into parts or subproblems and solves the parts sequentially. Some examples of applications of forecasting models in managerial accounting are pricing, costs, revenue, and inventory decisions.

For example, when forecasting purchases of inventory for a firm, factors such as knowledge of the behavior of business cycles, econometrics, and information on the seasonal variations in demand are important.

Models require a set of predetermined procedures. If there are no well-ordered and fully developed procedures, there is no need to model. That is, no procedure, no model. For example, a onetime crisis situation cannot be modeled due to lack of a preset procedure.
A key concept in all forecasting models dealing with probabilities is expected value. Expected value equals the sum of the products of the possible payoffs and their probabilities.

(i) Time-Series Analysis

Time-series analysis is the process by which a set of data measured over time is analyzed. Decision makers need to understand how to analyze past data if they expect to incorporate past information into future decisions. Although the factors that affect the future are uncertain, the past often offers a good indication of what the future will hold. The key is to know how to extract the meaningful information from all the available past data.

All time series contain at least one of four time-series components: long-term trend, seasonal, cyclical, and random or irregular components. Time-series analysis involves breaking down data measured over time into one or more of these components. Time-series analysis is similar to regression analysis in that both techniques help to explain the variability in data as much as possible. The four components of time-series analysis help explain that variability (see Exhibit 1.67). The purpose of time-series analysis is to use these components to explain the total variability in past data. The problem is how best to separate each component from the others so that each can be analyzed clearly.

EXHIBIT 1.67 Components of Time Series

(A) Long-Term Trend

The trend component is the long-term increase (growth) or decrease (decline) in a variable being measured over time. An example is annual sales over the past 10 to 15 years. Because long-term forecasting is becoming increasingly important due to severe global competition, the trend component in time-series analysis is important to all organizations.

Long-term growth patterns have a wide variety of shapes, such as the first-degree, exponential, and Gompertz curves. The easiest method to fit trend lines to a series of data is to graph the data and draw the trend line freehand. Another way of fitting a trend line to a set of data is to use the least square regression method.

(B) Cyclical Component

In addition to the seasonal component, data can contain certain cyclical effects. Cyclical effects in a time series are represented by fluctuations around a long-term trend. These fluctuations are thought to be caused by pulsations in factors such as interest rates, money supply, consumer demand, market conditions, and government policies. Cyclical fluctuations repeat themselves in a general pattern in the long term but occur with differing frequencies and intensities. Thus, they can be isolated but not totally predicted. Firms affected by cyclical fluctuations are those vulnerable to unexpected changes in the economy. The effect is different each time the fluctuation occurs.

Cyclical variations in time-series data do not repeat themselves in a regular pattern as do seasonal factors, but they cannot be considered random variations in the data either.
Organizations hardest hit by the cyclical component are those connected with items purchased with discretionary income (e.g., big-ticket items, such as home appliances and automobiles). Because consumers can postpone purchasing these items, organizations that produce them are most affected by economic downturns.

The cyclical component is isolated by first removing the long-term trend and seasonal factors from the time-series data. Then statistical normal values are calculated by multiplying the trend value by the seasonal index values. Finally, the cyclical component, which also contains the irregular component, is determined for each time period.

(C) Seasonal Component
The seasonal component represents those changes in a time series that occur at the same time every year. An example is peak sales occurring once in the spring and once in the fall.

Some organizations (e.g., toy stores, food processors, lumber mills) are affected not only by long-term trends but also by seasonal variations. The demand for products or services is highly dependent on the time of year. Organizations that face seasonal variations are interested in knowing how well or poorly they are doing relative to the normal seasonal variation. The question is whether the increase or decrease is more or less than expected, or whether it occurs at more or less than the average rate.

A seasonal index known as the ratio to moving average can be calculated to measure seasonal variation in a time series. A 12-month moving average is used here. Seasonal variation affects the overall planning process, especially in labor requests, inventory levels, training needs, and periodic maintenance work.

Some prefer to eliminate irregular components in the data by taking the normalized average of the ratio to moving averages. A requirement prior to separating the irregular components from the data is to make sure that the ratio to moving averages is stable from year to year. Another assumption to be made prior to eliminating irregular components is that the irregular fluctuations are caused by purely random circumstances.

(D) Random or Irregular Component
The random or irregular component is the one that cannot be attributed to any of the three components already discussed (long-term trend, seasonal, and cyclical components) (see Exhibit 1.68). Random fluctuations can be caused by many factors, such as economic failures, weather, political events.

Minor irregularities show up as sawtooth-like patterns around the long-term trend. Individually they are not significant, but collectively they can be significant and can cause problems or many organizations.
Major irregularities are significant one-time, unpredictable changes in the time series due to such extended and uncontrolled factors as war, oil embargoes, summer droughts, or severe winter storms.

Almost all industries and organizations are affected by irregular components. Agriculture, insurance, and mining companies will be more interested in this component. Minor irregularities can be smoothed out by using a moving average method. The goal is to eliminate as much as possible the irregular influences so that the true seasonal and cyclical components can be recognized and used. A random component is unwanted. Buying insurance coverage is one way to mitigate risks resulting from major irregular fluctuations.

(ii) Time-Series Models
The scope of time-series models includes the naive (intuitive) approach, moving averages, exponential smoothing, and trend projection. The naive approach assumes that demand in the next period will be equal to demand in the most recent period. The moving-averages method uses an average of the most recent periods of data to forecast the next period. The exponential smoothing method uses a weighted-moving-average technique in which data points are weighted by an exponential function. The trend projection method fits a trend line to a series of historical data points and then projects the line into the future.

The following formulas are related to time-series models:

Moving average = (Sum of demand in previous n periods) / n

New forecast using exponential smoothing = (Last period’s forecast) + alpha (Last period’s actual demand – Last period’s forecast)

where alpha = a weight (smoothing constant) with a value between 0 and 1 (The value of alpha can be high if more weight is given to recent data and can be low if more weight is given to past data.)

Trend line using the least-squares method = y = a + b x

where y = intercept (height)
b = slope (angle of the line)

Examples: Business applications of time-series forecasting methods include these types of forecasting: sales (demand), profit, cash, bank interest rates, foreign currency exchange rates, and inventory.

Time-series analysis use past data points to project future data points and have four components: trends (upward or downward data movement), seasonality (data patterns that repeats itself periodically in weeks and months), cycles (data patterns that occur every several years that tied into the business cycles), and random variation (no data patterns shown as bumps or blips in the data caused by chance and unusual conditions; hence cannot be predicted).
(iii) Regression Analysis

Regression analysis is a statistical technique used to measure the extent to which a change in the value of one variable, the independent variable, tends to be accompanied by a change in the value of another variable, the dependent variable.

Most measures of associations are nondirectional; that is, when calculated, it is not necessary to indicate which variable is hypothesized to influence the other. Measures of association show to what degree, on a 0 to 1 scale, two variables are linked.

<table>
<thead>
<tr>
<th>DEFINITION OF KEY TERMS: Regression Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis of covariance. A method of analyzing the differences in the means of two or more groups of cases while taking account of variation in one or more interval ratio variables.</td>
</tr>
<tr>
<td>Analysis of variance. A method for analyzing the differences in the means of two or more groups of cases.</td>
</tr>
<tr>
<td>Asymmetric measure of association. A measure of association that makes a distinction between independent and dependent variables.</td>
</tr>
<tr>
<td>Auxiliary variable. Another name for “independent variable.”</td>
</tr>
<tr>
<td>Correlation. A synonym for “association.” Correlation is one of several measures of association. Correlation means the interdependence between two sets of numbers or a relation between two quantities, such that when one changes, the other changes. Simultaneous increasing or decreasing of quantities is called positive correlation; when one quantity increases while the other decreases, it is called negative correlation.</td>
</tr>
<tr>
<td>Dependent variable. A variable that may, it is believed, be predicted by or caused by one or more other variables called independent variables. It will show the effect.</td>
</tr>
<tr>
<td>Discriminant analysis. A tool for discriminating between effective and ineffective policies or procedures. It is based on subjective assessment (not on statistics) and discrete values.</td>
</tr>
<tr>
<td>Explanatory variable. Another name for “independent variable.”</td>
</tr>
<tr>
<td>Independent variable. A variable that may, it is believed, predict or cause fluctuation in a dependent variable.</td>
</tr>
<tr>
<td>Primary variable. Another name for “dependent variable.”</td>
</tr>
<tr>
<td>Regression. The line of average relationship between the dependent (or primary) variable and the independent (or auxiliary) variable.</td>
</tr>
<tr>
<td>Regression analysis. A method for determining the association between a dependent variable and one or more independent variables.</td>
</tr>
<tr>
<td>Regression coefficient. A measure of change in a primary variable associated with a unit change in the auxiliary variable. An asymmetric measure of association; a statistic computed as part of a regression analysis.</td>
</tr>
<tr>
<td>Regression estimate. An estimate of a population parameter for one variable that is obtained by substituting the known total for another variable into a regression equation calculated on the basis of the sample values of the two variables. Note that ratio estimates are special kinds of regression estimates.</td>
</tr>
<tr>
<td>Symmetric measure of association. A measure of association that does not make a distinction between independent and dependent variables.</td>
</tr>
</tbody>
</table>
Managers often need to determine the relationships between two or more variables prior to making a decision, for predicting and planning purposes, or when analyzing a problem. When two variables are involved, simple linear regression and correlation analysis are the statistical tools most often applied for decision making. They provide a basis for analyzing two variables and their relationship to each other.

When more than two variables are involved, multiple regression analysis will be useful. Where only one independent variable is involved in the analysis, the technique is known as simple regression analysis; where two or more independent variables are involved, the technique is called multiple regression analysis (see Exhibit 1.69).

**EXHIBIT 1.69 Simple Regression and Multiple Regression**

- For two variables: Use simple linear regression analysis or Correlation analysis
- For more than two variables: Use multiple regression analysis

The basic diagram, or scatter plot, can be used to depict potential relationships between a dependent variable \( Y \) (e.g., sales) and an independent variable \( X \) (e.g., advertising). The scatter plot provides a visual feel for the relationship between variables (qualitative measurement). A dependent variable is the variable whose variation is of interest. An independent variable (or explanatory variable) is a variable used to explain variation in the dependent variable. Three possible relationships can emerge from scatter plots: linear, curvilinear, and no relationship (see Exhibit 1.70).

**EXHIBIT 1.70 Scatter Plot Relationships**

- Scatter plot relationships
  - Linear (as \( X \) changes, \( Y \) tends to change in a straight-line manner)
  - Curvilinear (as \( X \) changes, \( Y \) increases at an exponential rate)
  - No relationship (when \( X \) increases, sometimes \( Y \) decreases, and other times \( Y \) increases)

1. **Linear relationship.** As \( X \) changes, \( Y \) tends to change in a straight line or nearly straight-line manner. The change can be positive (\( Y \) increases as \( X \) increases) or negative (\( Y \) decreases as \( X \) increases).

2. **Curvilinear relationship.** As \( X \) increases, \( Y \) increases at an exponential rate (e.g., as production increases, overtime is increasing at an exponential rate). As \( X \) increases, \( Y \) increases at a diminishing rate (e.g., when advertising is allowed to grow too large, diminishing returns will occur for sales).

3. **No relationship.** When \( X \) increases, sometimes \( Y \) decreases; other times, \( Y \) increases.
In addition to qualitative measurement (i.e., visual feel), quantitative measurement using the correlation coefficient is needed to measure the strength between two variables. The correlation coefficient can range from a perfect positive correlation (+1.0) to a perfect negative correlation (−1.0). If two variables have no linear relationship, the correlation between them is 0. Consequently, the more the correlation differs from 0, the stronger the linear relationship between the two variables. The sign of the correlation coefficient indicates the direction of the relationship but does not aid in determining its strength.

**EXAMPLE**

Given four values of correlation coefficient −0.15, −0.75, 0.19, and 0.35, which value indicates the weakest linear association between two variables?

**Answer:** The value −0.15 has the weakest linear association because it is farther from −1.0 than the other choices.

**USES OF REGRESSION ANALYSIS**

Two basic uses of regression analysis are as a descriptive tool and as a predictive tool. Some examples of using the descriptive tool are listed next.

- To describe the relationship between a loan’s term (number of months) and its dollar value in a bank. A positive linear relationship might exist between time and amount in which smaller loans would tend to be associated with shorter lending periods whereas larger loans would be for longer periods.
- To explain the meaning of economy as viewed by economists.
- To describe the factors that influence the demand for products as presented by market researchers.

Some examples of using the predictive tool are listed next.

- To predict manufacturing production levels
- To forecast annual tax revenues
- To predict inventory levels

Determining whether the linear relationship between sales and advertising is significant requires us to test whether the sample data support or refute the hypothesis that the population correlation coefficient is 0. A $t$-statistic is used to test the hypothesis that the population coefficient is 0.

The correlation does not imply cause and effect, since two seemingly unconnected variables often are highly correlated. When a correlation exists between two seemingly unrelated variables, the correlation is spurious at best. Even in the case of sales and advertising, one might be tempted to say that a cause and effect exist, but in reality there is no guarantee of a cause-and-effect (C&E) situation.

**(A) Simple Linear Regression Analysis**

When the relationship between the dependent variable and the independent variable is a straight line (linear), the technique used for prediction and estimation is called the simple linear regression model. Exhibit 1.71 shows simple linear regression where the plotted data represents the heights of boys of various ages. The straight line represents the relationship between height (the dependent variable) and age (the independent variable) as disclosed by regression analysis. If
the change in the dependent variable associated with a change in the independent variable does not occur at a constant rate, the relationship can be represented by a curved line and is referred to as curvilinear.

EXHIBIT 1.71 Simple Linear Regression

The simple linear regression model is represented by the next equation:

\[ Y_i = \beta_0 + \beta_1 X_i + e_i \]

where \( Y_i \) = value of the dependent variable

\( \beta_0 \) = Y-intercept (a regression coefficient defining the true population model)

\( \beta_1 \) = slope of the regression line (a regression coefficient defining the true population model)

\( X_i \) = value of the independent variable

\( e_i \) = error term or residual (a random component)

The random component is the difference between the actual \( Y \) value and the value of \( Y \) predicted by the model, and \( i \) could be positive or negative, depending on whether a single value of \( Y \) for a given \( X \) falls above or below the regression line. These \( e_i \) values will have a mean of 0 and a standard deviation called the standard error of the estimate. If this standard error is too large, the regression model may not be very useful for prediction.

Here the regression model connects the averages of dependent variable \( Y \) for each level of independent variable \( X \). The regression line, a straight line, is determined by two values, \( \beta_0 \) and \( \beta_1 \).
Managers would like to estimate the true linear relationship between dependent and independent variables by determining the regression model using sample data. A scatter plot can be drawn with the sample data to estimate the population regression line. The least squares criterion is used to select the best line since many possible regression lines exist for a sample of data. According to the least squares criterion, the best regression line is the one that minimizes the sum of squared distances between the observed \((X,Y)\) points and the regression line. The residual is the difference between the true regression line and the actual \(Y\) value.

**(B) Assumptions of the Simple Linear Regression Model**

Assumptions of the simple linear regression model are listed next.

- Individual values of the dependent variable, \(Y\), are statistically independent of one another.
- For a given \(X\) value, there can exist many values of \(Y\). Further, the distribution of possible \(Y\) values for any \(X\) value is normal.
- The distribution of possible \(Y\) values has equal variances for all values of \(X\).
- The mean average of the dependent variable, \(Y\) can be connected by a straight line. The result is called the population regression model.

Some major considerations in using regression analysis as a predictive tool are listed next.

- Conclusions and inferences made from a regression line apply only over the range of data contained in the sample used to develop the regression line. The applicable range of data is called the relevant range of data. Any predictions beyond the relevant range of data lead to overpredictions. Thus, the range of data in the sample should cover the range of data in the population. Only then will a true relationship between the dependent variable and the independent variable emerge.
- A significant linear relationship existing between two variables does not imply that one variable causes the other. Although there may be a C&E relationship, managers should not infer the presence of such a relationship based only on regression and/or correlation analysis. Other factors, such as judgment, experience, and knowledge of the specific area of interest, should also be considered.
- A C&E relationship between two variables is not necessary for regression analysis to be used for prediction. It is important to make sure that the regression model accurately reflects the relationship between the two variables and that the relationship remains stable.
- A high coefficient of determination \((R^2)\) does not guarantee that the regression model will be a good predictor. The \(R^2\) applies only to the sample data—measuring the fit of the regression line to the sample data—not to any other data.

The least squares regression line minimizes the sum of squared residuals. This value is called the sum of squares error (SSE). It represents the amount of variation in the dependent variable that is not explained by the least squares regression line; the amount of variation in the dependent variable that is explained by the regression line is called the sum of squares regression (SSR).

\[
SSR = TSS - SSE
\]

where \(TSS = \) total sum of squares explaining the amount of total variation in the dependent variable
The percentage of the total variable in the dependent variable that is explained by the independent variable is called the coefficient of determination ($R^2$). $R^2$ can be a value between 0 and 1.0. $R^2$ indicates how well the linear regression line fits the data points $(X, Y)$. The better the fit, the closer $R^2$ will be to 1.0.

### Interpretation of Coefficient of Determination ($R^2$)
- $R^2$ is 1.0 when there is a perfect linear relationship between two variables.
- $R^2$ will be close to zero when there is a weak linear relationship or no linear relationship at all.

When $R^2$ is 1.0, it corresponds to a situation in which the least squares regression line would pass through each of the points in the scatter plot. The least squares criterion ensures that $R^2$ will be maximized. $R^2$ applies only to the sample data used to develop the model.

### Application of Regression Analysis

XYZ Company derived the following cost relationship from a regression analysis of its monthly manufacturing overhead cost:

\[
C = 80,000 + 12M
\]

where $C =$ monthly manufacturing overhead cost

$M =$ machine hours

The standard error of estimate of the regression is $6,000. The standard time required to manufacture a case of the company's single product is four machine hours. XYZ applies manufacturing overhead to production on the basis of machine hours, and its normal annual production is 50,000 cases.

**Question:** What is the estimated variable manufacturing overhead cost for a month in which scheduled production is 5,000 cases?

**Answer:** In the cost equation $C = 80,000 + 12M$, $80,000$ is the fixed cost component and $12M$ is the variable cost component. That is, $12 \times 5,000$ cases $\times$ 4 machine hours per case $= 240,000$.

**Question:** What is the predetermined fixed manufacturing overhead rate?

**Answer:** Since $80,000$ is the fixed component per month, we need to multiply this by 12 to obtain one-year fixed cost. The predetermined overhead rate per machine hour is $(80,000 \times 12) / (50,000 \times 4) = 4.80$.

The linear regression equation, $Y = 15.8 + 1.1(x)$, was used to prepare the next data table.

<table>
<thead>
<tr>
<th>Actual X</th>
<th>Predicted Y</th>
<th>Actual Y</th>
<th>Residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15.8</td>
<td>10</td>
<td>-5.8</td>
</tr>
<tr>
<td>1</td>
<td>16.9</td>
<td>18</td>
<td>1.1</td>
</tr>
<tr>
<td>2</td>
<td>18.0</td>
<td>27</td>
<td>9.0</td>
</tr>
<tr>
<td>3</td>
<td>19.1</td>
<td>21</td>
<td>1.9</td>
</tr>
<tr>
<td>4</td>
<td>20.2</td>
<td>14</td>
<td>-6.2</td>
</tr>
</tbody>
</table>
Question: What do you conclude from the data table?

Answer: The best description of the data is that the relationship is not linear. A linear equation was used with a nonlinear relationship. If the relationship was linear, the results of actual Y would have been higher than or equal to 15.8; it is not. Two values (10 and 14) are less than 15.8, indicating a nonlinear relationship.

(C) Multiple Regression Analysis

Regression analysis is used for prediction and description to determine the relationship between two or more variables. The multiple regression analysis technique analyzes the relationship between three or more variables and is an extension of simple regression analysis. In simple regression analysis, there is only one independent variable. In multiple regression analysis, there is more than one independent variable. Exhibit 1.72 presents a comparison between simple regression and multiple regression analysis.

EXHIBIT 1.72 Comparison between Simple Regression and Multiple Regression

<table>
<thead>
<tr>
<th>Characteristics of Simple Regression</th>
<th>Characteristics of Multiple Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales is a dependent variable, and advertising expenditures are an independent variable.</td>
<td>House price is a dependent variable. Square footage of house, age of house, number of bedrooms, and number of bathrooms are examples of independent variables.</td>
</tr>
<tr>
<td>The model is an equation for a straight line in a two-dimensional space.</td>
<td>The model forms a hyperplane through multidimensional space.</td>
</tr>
<tr>
<td>Each regression coefficient represents a slope and involves a matrix algebra.</td>
<td>Each regression coefficient represents a slope and involves a matrix algebra.</td>
</tr>
<tr>
<td>A graph or calculator can be used to solve the problem. Use of computer is optional.</td>
<td>Computers must be used to solve the problem.</td>
</tr>
<tr>
<td>The correlation coefficient is calculated.</td>
<td>The correlation matrix is calculated.</td>
</tr>
</tbody>
</table>

From a theoretical viewpoint, the sample size required to compute a regression model must be at least one greater than the number of independent variables; that is, for a model with four independent variables, the absolute minimum number of case samples required is five. Otherwise, the model will produce meaningless values. From a practical standpoint, the sample size should be at least four times the number of independent variables.

SIMPLE REGRESSION VERSUS MULTIPLE REGRESSION

- When there are two variables (one dependent and one independent), we call it a bivariate or simple regression.
- When there are more than two variables (one dependent and more than one independent), we call it a multivariate or multiple regression.
- The multivariate model offers a better fit than the bivariate model.
(D) Assumptions of the Multiple Regression Model
The next list provides assumptions about the multiple regression model.

- The errors are normally distributed.
- The mean of the error terms is zero.
- The error terms have a constant variance for all combined values of the independent variables.

In multiple regression analysis, additional independent variables are added to the regression model to explain some of the yet-unexplained variation in the dependent variable. Adding appropriate additional variables would reduce the standard error of the estimate where the value of the latter is too large for the regression model to be useful for prediction.

The correlation matrix is useful for determining which independent variables are likely to help explain variation in the dependent variable. A value of $\pm 1.0$ indicates that changes in the independent variable are linearly related to changes in the dependent variable.

Similar to simple regression, multiple regression uses $R^2$, the multiple coefficient determination, and is determined as shown in the following example:

**EXAMPLE**
If $R^2$ is 0.75, then 75% of the variation in the dependent variable can be explained by all independent variables in the multiple regression model.

When highly correlated independent variables are included in the regression model, a condition of overlapping called **multicollinearity** can exist. Specifically, when two independent variables are correlated with each other, adding redundant information to the model, multicollinearity does exist in practice. The best practical advice is to drop the independent variable(s) that is (are) the main cause of the multicollinearity problems from the model.

Multicollinearity influences the regression model negatively—the regression coefficient sign is the opposite of the expected sign. The independent variable causing multicollinearity is not necessary to the functioning of the model and hence can be removed without any loss. It is highly correlated with other independent variables and has low correlation with the dependent variable.

(E) Symptoms of Multicollinearity in Regression
Symptoms of multicollinearity in regression analysis are listed next.

- Incorrect signs on the coefficients
- Values of the previous coefficients change when a new variable is added to the model
- A previously significant variable changes to insignificant when a new variable is added to the model
- An increase in the standard error of the estimate when a variable is added to the model

Not all independent variables contribute to the explanation of the variation in a dependent variable. Some variables are significant but not all are. The significance of each independent variable...
can be tested using a “t” test. The test is calculated by dividing the regression coefficient by the standard deviation of the regression coefficients.

<table>
<thead>
<tr>
<th>“F” TEST VERSUS “t” TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>The “F” test is used to explain the significance of just one independent variable.</td>
</tr>
<tr>
<td>The “t” test is used to explain the significance of each independent variable. Multicollinearity affects the “t” test.</td>
</tr>
</tbody>
</table>

The regression model used for prediction should contain significant independent variables only. If insignificant variables exist, they should be removed and the regression model rerun before it is used for prediction purposes. Any coefficient with an unexpected sign indicates a problem condition. An unexpected sign implies unreasonable relationships between variables.

Developing a multiple regression model is an art. Judgment is required when selecting the best set of independent variables for the model that are less in conflict and contribute to the best predictor.

**(F) Dummy Variables in Regression Models**

When an independent variable in a regression model is a nominal or ordinal variable, it is called a qualitative variable. For example, in a model for predicting individual income, each manager may assign different values for a potential qualitative variable—for example, sex (male or female)—affecting the regression analysis.

In order to assign unique numerical values for these qualitative variables, dummy variables are added to the regression model. Rules for dummy variables include:

- If the qualitative variable has two possible categories (e.g., male or female), one dummy variable is added.
- For more than two possible categories, one less than the number of possible categories is added (i.e., for five categories, only four dummy variables).

Not following these rules can introduce unwanted multicollinearity and the fact that least squares regression estimates cannot be obtained if the number of dummy variables equals the number of possible categories. Dummy variables take on values of 0 and 1, and they represent the qualitative variables in the regression analysis.

**(G) Regression Methods**

Basically, there are two methods for developing a regression model: ordinary regression and stepwise regression (see Exhibit 1.73).
In the **ordinary regression method**, all independent variables are brought into the model at one step. The **stepwise regression method** develops the least squares regression equation in steps, through either backward elimination or forward selection.

**Backward Elimination.** The backward elimination stepwise method begins by developing an ordinary regression model using all independent variables. All insignificant independent variables are eliminated in a stepwise fashion. The only independent variables left are the ones that have coefficients that are significantly different from zero. The advantage of this method is that the manager has the opportunity to look at all the independent variables in the model before removing variables that are not significant.

**Forward Selection.** The forward selection procedure works in the opposite direction from the backward elimination procedure. It begins by selecting a single independent variable that is highly significant—the one highly correlated with the dependent variable. In the next step, a second independent variable is selected based on its ability to explain the remaining unexplained variation in the dependent variable.

*The forward selection procedure prevents multicollinearity from occurring.* It does this by dropping an insignificant variable that is causing the overlap from occurring. The forward selection procedure is widely used in decision-making applications and is generally recognized as a useful regression method. Because the selection process is automatic by the computer, managers need to use judgment to make sure the regression model is usable and meaningful.

**(H) Econometrics**

The application of statistical methods to economic data is called **econometrics**. Econometrics analyzes the relationships between two or more economic variables and uses multiple regression analysis.

**EXAMPLE**

Recent events caused the time-series forecasting model used by an electric utility company to become too unpredictable for practical use. An econometric model is developed to predict the demand for electricity (i.e., usage volume and sales revenue) based on factors such as class of service (residential or commercial), population growth (increasing or decreasing), and unemployment in the area of service (increasing or decreasing). Since there are three independent variables (i.e., service, growth, and unemployment), multiple regression analysis is used instead of the time-series model.

**(iv) Sensitivity Analysis**

**Sensitivity analysis** (“what-if” analysis) is an evaluation of how certain changes in inputs results in what changes in outputs of a model or system. It also deals with what changes in assumptions produce what changes in outcomes. (see Exhibit 1.74).

**EXHIBIT 1.74 Scope of Sensitivity Analysis**

Changes in inputs  Lead to  Changes in outputs

Changes in assumptions  Lead to  Changes in outcomes
The primary reason that sensitivity analysis is important to managers is that real-world problems exist in a dynamic environment. Change is inevitable. Prices of raw materials change as demand fluctuates, and changes in the labor market cause changes in production costs. Sensitivity analysis provides managers with the information needed to respond to such changes without rebuilding the model. Moreover, sensitivity analysis promotes the management-by-exception theory, meaning it focuses on abnormal things, not on normal things. For example, bank management can use the sensitivity analysis technique to determine the effects of policy changes on the optimal mix for its portfolio of earning assets.

Computer simulation techniques can be used to perform sensitivity analysis. The ability to ask what-if questions is one of the biggest advantages of computer simulation. In a way, what-if analysis deals with a Q&A session, meaning it asks a question and gets an answer. Sensitivity analysis, scenario analysis, and simulation techniques are used to measure a standalone risk. The next sections present sensitivity analysis for manufacturing applications, linear programming applications, financial applications, network applications, and inventory applications.

(A) Manufacturing Applications
The linking of production process improvement to financial results is critical to a successful computer-integrated manufacturing implementation. Management has established priorities to decrease process variability, shorten feedback time, and reduce support functions. A process model was developed with these parameters: facilities and equipment cost, theoretical materials consumption, actual materials consumption, and supplies cost. Sensitivity analysis was used to study the behavior of those parameters.

Sensitivity analysis was applied to the process model to compare the cash flows associated with various plan alternatives. Testing the model for changes in several parameters indicated that the model is sensitive to process inefficiency, product yields, volume variation, and price variations. Conversely, the model is relatively insensitive to change in labor costs.

The relationships between increased labor efficiency and gross profit can be studied using sensitivity analysis in a manufacturing plant environment.

Sensitivity analysis is the study of how changes in the coefficient of a linear program affect the optimal solution. The optimal solution is a feasible solution that maximizes or minimizes the value of the objective function. The objective function is used to measure the profit or cost of a particular solution.

(B) Linear Programming Applications
Sensitivity analysis associated with the optimal solution provides valuable supplementary information for decision makers. In the linear programming case, sensitivity analysis can be used to answer questions such as:

- How will a change in the coefficient of the objective function affect the optimal solution?
- How will a change in the right-hand side value for a constraint affect the optimal solution?

However, there is one prerequisite prior to making these changes: The optimal solution to the original linear programming problem needs to be in place. The changes are applied to the optimal solution. For this reason, sensitivity analysis is often called postoptimality analysis. For example, in a production environment, sensitivity analysis can help determine how much each additional labor hour is worth and how many hours can be added before diminishing returns set in.
(C) **Financial Applications**

Integer linear programming techniques have been used successfully to solve capital budgeting problems. Only the integer variables are permitted to ensure the values of 0 or 1. The variables could be either all integers or mixed integers. Fractional values of the decision variable are not allowed. The firm’s goal is to select the most profitable projects and budgets for the capital expenditures. The outcome is usually project acceptance (a value of 1) or rejection (a value of 0).

Another advantage of using an integer linear programming technique in capital budgeting is its ability to handle multiple-choice constraints, such as when multiple projects are under consideration and only one project can be selected in the end.

Sensitivity analysis is more critical for integer linear programming problems than that for linear programming problems because a small change in one of the coefficients in the constraints can cause a large change in the value of the optimal solution. An example would be that one additional dollar in the budget can lead to a $20 increase in the return.

(D) **Network Applications**

Sensitivity analysis can be performed on the network. It provides the ability to check the feasibility of current schedules and to permit management to experiment with or evaluate the effects of proposed changes.

(E) **Inventory Applications**

It is good to know how much the recommended order quantity would change if the estimated ordering and holding costs had been different. Depending on whether the total annual cost increased, decreased, or remained the same, we can tell whether the EOQ model is sensitive or insensitive to variations in the cost estimates.

(v) **Simulation Models**

The primary objective of simulation models is to describe the behavior of a real system. A model is designed and developed, and a study is conducted to understand the behavior of the simulation model. The characteristics that are learned from the model are then used to make inferences about the real system. Later the model is modified (asking what-if questions) to improve the system’s performance. The behavior of the model in response to the what-if questions is studied to determine how well the real system will respond to the proposed modifications. Thus, the simulation model will help the decision maker by predicting what can be expected in practice. A key requisite is that the logic of the model should be as close to the actual operations as possible. In most cases, a computer is used for simulation models.

Computer simulation should not be viewed as an optimization technique but as a way to improve the behavior or performance of the system. Model parameters are adjusted to improve system performance. When good parameter settings have been found for the model, these settings can be used to improve the performance of the real system.

The three steps involved in a computer simulation model are listed next.

1. A computer simulation model that behaves like or simulates the real-world system is developed.

2. A series of computer runs or experiments is performed to learn about the behavior of the simulation model.
3. The model design is changed to determine if the modifications improve system performance. What-if questions are asked of the model in this step. Thus, the simulation model helps managers predict the future.

Usually, a simulation exercise is conducted on a computer using a computer simulator. The simulator run by the computer program performs mathematical calculations and keeps track of the simulation results. Examples of calculations in a retail store environment include:

- Number of customers serviced at a retail store during the 20 hours of simulated operations.
- The average profit per hour per store
- Number of lost customers at a store per hour
- Average dollar loss per hour per store due to lost customers

**Simulation Applications in Forecasting**

Some simulation applications in forecasting are listed next.

- To perform a role-play to reflect reality in a person being trained
- To study the performance of a waiting line system
- To simulate traffic flow through a busy street intersection to determine the number of traffic signals required to improve traffic flow
- To simulate airplane flight conditions for training pilots
- To simulate the behavior of an inventory system to determine the best order quantity and reorder point
- To model a dry-run evacuation in an office due to fire in a high-risk building
- To create mock disasters to provide experience in dealing with crisis situations, such as product tampering, power outages, and floods
- To train auditors by providing financial statements and operating data to conduct a financial audit or an operational audit, respectively

**Simulation Procedures and Approaches**

Computer simulation is performed using the two basic procedures—heuristic and probabilistic—as shown in Exhibit 1.75.

**EXHIBIT 1.75 Simulation Procedures**

| Simulation procedures | Heuristic (Uses trial-and-error methods) | Probabilistic (Uses probability distributions) |

**Heuristic procedures** do not require probabilistic components. A variety of deterministic values are generated for the decision variables, and the best of the feasible solutions is selected.

When **probabilistic distributions** are involved, it is called the Monte Carlo simulation. Model inputs, such as the number of customer arrivals in a service center, are generated from probability
distributions. These models are based on probabilities and time intervals of outcomes. When probabilities are involved, it is called a stochastic model.

Two approaches exist to the logic and record keeping of a simulation model: fixed time period and next event. In the fixed-time-period approach, each time period is of equal length, and the state of the system is updated at either the beginning or the end of each time period. The time between system updates is fixed.

In the next-event approach, the time between arrivals and the time to complete service is randomly generated for a customer. The state of the system is updated each time a customer either arrives or completes service. The time between system updates is variable. Exhibit 1.76 presents advantages and disadvantages of simulation models.

**EXHIBIT 1.76 Advantages and Disadvantages of Simulation Models**

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The models solve complex problems where analytical procedures cannot be used.</td>
<td>There is a high cost of model development for design and programming.</td>
</tr>
<tr>
<td>The models provide convenient experimental laboratories. What-if questions can be asked of the models.</td>
<td>The models do not guarantee an optimal solution to a problem. Decision variables are selected that have a good chance of being near the optimal solution. Also, the models do not try all values of the decision variables because doing so would be costly.</td>
</tr>
<tr>
<td>The danger of obtaining bad solutions to a problem is slight, and the consequences have no effect on the organization.</td>
<td>Simulation may not be able to replicate all situations or complexities that may arise in a real-world case.</td>
</tr>
<tr>
<td>The models can be run long enough to reach a steady state that will enable managers to identify the apparent best decisions.</td>
<td>Participants may tend to generalize from the models. Doing so can create a false sense of confidence concerning their ability to cope with reality.</td>
</tr>
<tr>
<td>Learning is active for participants.</td>
<td></td>
</tr>
<tr>
<td>Mistakes are made in a risk-free environment.</td>
<td></td>
</tr>
<tr>
<td>Time spans can be compressed for key problems.</td>
<td></td>
</tr>
<tr>
<td>The models provide immediate feedback concerning proper and improper actions or decisions. Corrective action is timely.</td>
<td></td>
</tr>
</tbody>
</table>

**ANALYTICAL PROCEDURES VERSUS COMPUTER SIMULATION**

- Analytical procedures are best used to solve simple problems.
- Computer simulation is best used to solve complex problems.

The sequence of model activities is

Model validation $\rightarrow$ Model implementation

Model validation is a step in the simulation procedure.
(C) Simulation Model Validation
Validation involves verifying that the simulation model accurately describes the real-world system it is designed to simulate. The purpose of model validation is to make sure that it is a reasonable reflection of the real world. These methods will help to validate the model:

- The simulation results can be compared with the current and past behavior of the real system. The model is run with an actual set of past observations, and the output is compared directly with the behavior of the actual system.
- The model is reviewed by experts who evaluate the reasonableness of the simulation model and the simulation results.
- The assumptions made during model construction need to be revisited, clarified, expanded, and adjusted as needed.
- The model is peer reviewed or desk-checked by programming staff to detect errors. *Improper programming of the model can lead to inaccurate results.*
- The simulated distributions for the probabilistic components can be compared with the corresponding probability distributions in the real system.
- It is good to collect the data on the system after it has reached a stable or steady-state condition. Management is interested in what happens during “normal” business hours of operation. The steady-state condition of the model is synonymous with the normal hours of operation.

(D) Simulation Model Implementation
Model implementation includes various steps, such as searching for errors, exceptions, gaps between actual and expected, overlaps or duplications between procedures, and root causes of poor implementation.

1.14 Business Skills
This section presents business skills needed for supervisors, managers, executives, leaders, and entrepreneurs. Possessing the right skills can help solve the right business problems, make the right decisions at the right time, properly deal with people, and implement the required controls fully to reduce risks, decrease costs, and increase profits. Lack of business skills in supervisors, managers, executives, leaders, and entrepreneurs can make them inefficient, ineffective, incompetent, inadequate, and incomplete for the job. This section focuses on nine specific skills:

1. Team-building skills
2. Problem-solving and decision-making skills
3. Communication skills
4. Negotiating skills
5. Conflict management skills
6. Team-managing skills
7. Diversity management skills
8. Public-servicing skills
9. Organizational skills
(a) Team-Building Skills

(i) Role of Worker as Individual or Team Member

Every worker has a dual role: as an individual and as a member of a group. A group is defined by functional qualities, not physical properties. A group consists of a minimum of two or more people who interact with, communicate with, and influence each other for a period of time. To comprise a group, a collection of people must share more than circumstances. They must share perceptions and goals. Group members must be aware of, interact with, and exert influence on each other. To communicate with each other, they must both send and receive messages. And they must be engaged in these processes for more than a few moments.

Why do people join groups? Formal or otherwise, there are two common reasons why people join groups: goal attainment and needs gratification. By working together, people can accomplish goals that might be difficult or impossible for solitary individuals to achieve. Additionally, group participation addresses many social needs, such as access to approval, a sense of belonging, friendship, and love.

(A) Individuals in the Group Context

People do not inevitably lose their individuality in groups, although groups may help lessen self-awareness and produce a state of deindividuation. In fact, group membership can heighten certain aspects of the individual experience. Three important effects of the group on the individual are identity, deviance, and social impact (see Exhibit 1.77).

EXHIBIT 1.77 Effects of the Group on the Individual

1. **Identity.** Belonging to a group is a form of social categorization: The group becomes one aspect of social identity (e.g., a member of IIA). Reference groups are particularly important in defining not only identity but also aspirations. A reference group is a social network people consult for social comparison. When groups come into contact with each other, individuals may compare their own group favorably to the alternatives available.

2. **Deviance.** Group goals sometimes can override or conflict with the personal goals of individual members. When a member breaks with the group’s norms to satisfy personal needs, he or she becomes a deviant. Members of a group are important in validating each other’s beliefs. A deviant threatens that validation by defecting and reducing consensus. Ultimately the deviant will most likely be pushed out of the group, thus restoring group consensus with one fewer member.

3. **Social impact.** Social impact theory explains social influence. According to this theory, the degree to which a targeted individual is influenced depends on three factors: the strength of the source of influence, the immediacy of the influence, and the number of sources. Group membership can be seen as having social impact on an individual. Taken factor by factor, a group will have greater influence on each member if it is strong, if the group’s influence is immediate, and if the group is large in number.

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(B) Group Structures
Groups have tasks, such as solving problems and making decisions (task agenda) and meeting the emotional needs and social roles of the group’s members (social agenda). Groups meet these two agendas through several key processes and structures: norms, roles, and cohesiveness (see Exhibit 1.78).

EXHIBIT 1.78 Group Processes and Structures

<table>
<thead>
<tr>
<th>Group processes and structures</th>
<th>Norms (rules)</th>
<th>Roles (sets of norms)</th>
<th>Cohesiveness (feelings of attraction and loyalty)</th>
</tr>
</thead>
</table>

**Norms** are rules or guidelines for accepted and expected behavior. Some norms are explicit; members know what they are and can explain them to newcomers. Others are implicit or subtle, occasionally taken for granted until a deviation occurs. Most groups have a norm for how decisions are made. For example, a group of coworkers in a small business may agree that important contracts are to be voted on by all members, with a simple majority of more than half ruling. The coworker who tries to play dictator will be violating norms and may be treated as a deviant until the group restores consensus or pushes the deviant out.

**Roles** are sets of norms defining appropriate behaviors. Groups usually involve roles; some are broad (leaders and followers), while others are more specific. Roles differentiate members’ functions and contributions within the group. Roles may be organized according to individual talents. Roles can be a source of reward as well as a source of problems within a group. Group membership offers personal benefits, and group participation achieves goals that solitary individuals may not.

Roles may differ not only in function but also in value to the group. Values are abstract ideas that shape an individual’s thinking and behavior. Roles associated with greater prestige or respect are said to have higher-status position or rank. Status affects the way members of the group communicate and work with each other. For example, high-status members, such as bosses and managers, may initiate communication with lower-status members, but not vice versa. A manager can interrupt a subordinate worker to ask a question, but a subordinate worker is not free to enter a manager’s office and ask questions without permission. Status can be a reward for specific members, but it carries a cost, since differences in status can be a source of resentment or competition among members.

Two kinds of role conflict commonly occur: person–role conflict and interrole conflict. Person–role conflict is where a person finds his or her group role difficult to perform. For example, a committee member may be required to criticize other members’ work but might feel uncomfortable having to do this.

Interrole conflict is where members in different groups compete with each other. For example, a church member may feel conflicted when her company schedules a workshop on a date with church significance. To be a good church member, she should skip the workshop; to be a good employee, she must violate church standards. Interrole conflict can be a familiar—if not minor—problem.
When a person's responsibilities within a group are unclear or unstable, the individual suffers the difficulty of role ambiguity. Roles are likely to be ambiguous when a member first joins a group or when task performance changes. Role ambiguity will occur when office tasks and factory tasks are automated.

**Cohesiveness** is a feeling of attraction and loyalty that motivates members to stay in the group. Members of cohesive groups like each other more and support common goals more strongly than members of less cohesive groups. High cohesiveness can be a source of both benefits and liabilities. Members of highly cohesive groups enjoy their membership and interaction more but are also prone to make mistakes by giving group feeling a higher priority than other group goals.

Anything that makes a group more valuable to its members increases cohesiveness. Competition within the group can reduce cohesiveness, since members fear threats from each other. Another barrier to fellowship is disliking or special preferences among members. When members are drawn to and away from each other, subgroups form, which break down organizational unity. Preferential differences in members' feelings are more likely to develop in large groups, and thus group size is negatively related to cohesiveness; the larger the organization, the harder it is to maintain attraction, loyalty, and fairness evenly among all members.

(ii) **Methods Used in Team Building**

After a team has been created, there are distinct stages through which it develops. New teams are different from mature teams. Recall a time when you were a member of a new team, such as a fraternity or sorority pledge class, a committee, or a small team formed to do a class assignment. Over time, the team changed. In the beginning, team members had to get to know one another, establish roles and norms, divide the labor, and clarify the team's task. In this way, members became parts of a smoothly operating team. The challenge for leaders is to understand the stage of the team's development and take action that will help the group improve its functioning.

Research findings suggest that team development is not random but evolves over definitive stages. One useful model for describing these stages contains five phases:

1. Forming
2. Storming
3. Norming
4. Performing
5. Adjourning

The **forming** stage of development is a period of orientation and getting acquainted. Members break the ice and test one another for friendship possibilities and task orientation. Team members find which behaviors are acceptable to others. Uncertainty is high during this stage, and members usually accept whatever power or authority is offered by either formal or informal leaders. Members are dependent on the team until they find out what the ground rules are and what is expected of them. During this initial stage, members are concerned about such things as “What is expected of me?” “What is acceptable?” and “Will I fit in?” During the forming stage, the team leader should provide time for members to get acquainted with one another and encourage them to engage in informal social discussions.

During the **storming** stage, individual personalities emerge. People become more assertive in clarifying their roles and what is expected of them. Conflict and disagreement mark this stage.
People may disagree over their perceptions of the team’s mission. Members may jockey for positions, and coalitions or subgroups based on common interests may form. One subgroup may disagree with another over the total team’s goals or how to achieve them. The team is not yet cohesive and may be characterized by a general lack of unity. Unless teams can move beyond this stage, they may get bogged down and never achieve high performance. During the storming stage, the team leader should encourage participation by each team member. Members should propose ideas, disagree with one another, and work through the uncertainties and conflicting perceptions about team tasks and goals.

During the norming stage, conflict is resolved, and team harmony and unity emerge. Consensus develops on who has the power, who is the leader, and members’ roles. Members come to accept and understand one another. Differences are resolved, and members develop a sense of team cohesion. This stage typically is of short duration. During the norming stage, the team leader should emphasize oneness within the team and help clarify team norms and values.

During the performing stage, the major emphasis is on problem solving and accomplishing the assigned task. Members are committed to the team’s mission. They are coordinated with each other and handle disagreements in a mature way. They confront and resolve problems in the interest of task accomplishment. They interact frequently and direct discussion and influence toward achieving team goals. During this stage, the leader should concentrate on managing high task performance. Both socioemotional and task specialists should contribute to the group.

The adjourning stage occurs in committees, task forces, and teams that have a limited task to perform and are disbanded afterward. During this stage, the emphasis is on wrapping up and gearing down. Task performance is no longer a top priority. Members may feel heightened emotionality, strong cohesiveness, and depression or even regret over the team’s disbandment. They may feel happy about mission accomplishment and sad about the loss of friendship and associations. At this point, the leader may wish to signify the team’s disbanding with a ritual or ceremony, perhaps giving out plaques and awards to signify closure and completeness.

The five stages of team development typically occur in sequence. In teams that are under time pressure or that will exist for only a short period of time, the stages may occur quite rapidly. The stages may also be accelerated for virtual teams. For example, bringing people together for a couple of days of team building can help virtual teams move rapidly through the forming and storming stages.

(iii) Assessing Team Performance
Another important aspect of the team process is cohesiveness. Team cohesiveness is defined as the extent to which members are attracted to the team and motivated to remain in it. Members of highly cohesive teams are committed to team activities, attend meetings, and are happy when the team succeeds. Members of less cohesive teams are less concerned about the team’s welfare. High cohesiveness is normally considered an attractive feature of teams.

Characteristics of team structure and context influence cohesiveness. The first characteristic is team interaction. The greater the contact among team members and the more time spent together, the more cohesive the team. Through frequent interactions, members get to know one another and become more devoted to the team. The second is the concept of shared goals. If team members agree on goals, they will be more cohesive. Agreeing on purpose and direction binds the team together. The third characteristic is personal attraction to the team, meaning that members have similar attitudes and values and enjoy being together.
Two factors in the team’s context also influence group cohesiveness. The first is the presence of competition. When a team is in moderate competition with other teams, its cohesiveness increases as it strives to win. Finally, team success and the favorable evaluation of the team by outsiders add to cohesiveness. When a team succeeds in its task and others in the organization recognize the success, members feel good, and their commitment to the team will be high.

The outcome of team cohesiveness can fall into two categories: morale and productivity. As a general rule, morale is higher in cohesive teams because of increased communication among members, a friendly team climate, maintenance of membership because of commitment to the team, loyalty, and member participation in team decisions and activities. High cohesiveness has almost uniformly good effects on the satisfaction and morale of team members.

With respect to team productivity, research findings are mixed, but cohesiveness may have several effects. First, in a cohesive team, members’ productivity tends to be more uniform. Productivity differences among members are small because the team exerts pressure toward conformity. Noncohesive teams do not have this control over member behavior and therefore tend to have wider variation in member productivity.

With respect to the productivity of the team as a whole, research findings suggest that cohesive teams have the potential to be productive, but the degree of productivity depends on the relationship between management and the working team. Thus, team cohesiveness does not necessarily lead to higher team productivity. One study surveyed more than 200 work teams and correlated job performance with their cohesiveness. Highly cohesive teams were more productive when team members felt management support and less productive when they sensed management hostility and negativism. Management hostility led to team norms and goals of low performance, and the highly cohesive teams performed poorly, in accordance with their norms and goals.

HOw MANY TEAMS ARE THERE?

In most organizations, employees work in teams to achieve goals. Many types of teams can exist within organizations. The easiest way to classify teams is in terms of those created as part of the organization’s formal structure and those created to increase employee participation. Examples include formal teams, virtual teams, horizontal teams, vertical teams, multidisciplinary teams, special-purpose teams, problem-solving teams, self-managing teams, self-directed teams, multidisciplinary teams, dream teams, and X-teams.

**Formal teams** are created by the organization as part of the formal organization structure. Two common types of formal teams are vertical and horizontal, which typically represent vertical and horizontal structural relationships.

A **vertical team** is composed of a manager and his or her subordinates in the formal chain of command. Sometimes called a functional team or a command team, the vertical team may in some cases include three or four levels of hierarchy within a functional department. Typically, the vertical team includes a single department in an organization. The third-shift nursing team on the second floor of St. Luke’s Hospital is a vertical team that includes nurses and a supervisor. A financial analysis department, a quality control department, an accounting department, and a HR department are all vertical teams. Each is created by the organization to attain specific goals through members’ joint activities and interactions.

A **horizontal team** is composed of employees from about the same hierarchical level but from different areas of expertise. A horizontal team is drawn from several departments, is given a specific task, and includes different areas of expertise.
and may be disbanded after the task is completed. The two most common types of horizontal teams are task forces and committees.

As part of the horizontal structure of the organization, task forces and committees offer several advantages:

- They allow organization members to exchange information.
- They generate suggestions for coordinating the organizational units that are represented.
- They develop new ideas and solutions for existing organizational problems.
- They assist in the development of new organizational practices and policies.

A virtual team is made up of geographically or organizationally dispersed members who are linked primarily through advanced information and telecommunications technologies. Although some virtual teams may be made up of only organizational members, virtual teams often include contingent workers, members of partner organizations, customers, suppliers, consultants, or other outsiders. Team members use email, voice mail, videoconferencing, Internet and intranet technologies, and various types of collaboration software to perform their work, although they may also sometimes meet face to face.

Virtual teams are highly flexible and dynamic. Some are temporary cross-functional teams pulled together to work on specific projects or problems while others are long-term or permanent self-directed teams.

Team leadership typically is shared or altered, depending on the area of expertise needed at each stage of the project. In addition, team membership in virtual teams may change fairly quickly, depending on the tasks to be performed. One of the primary advantages of virtual teams is the ability to rapidly assemble the most appropriate group of people to complete a complex project, solve a particular problem, or exploit a specific strategic opportunity. The success of virtual teams depends on several factors, including selecting the right members, building trust, sharing information, and effectively using technology. For example, VeriFone Company uses virtual teams in every aspect of its business.

Global teams are cross-border work teams made up of members of different nationalities whose activities span multiple countries. Generally, global teams fall into two categories: intercultural teams, whose members come from different countries or cultures and meet face to face; and virtual global teams, whose members remain in separate locations around the world and conduct their work electronically.

Global teams can present enormous challenges for team leaders who have to bridge gaps of time, distance, and culture. In some cases, members speak different languages; use different technologies; and have different beliefs about authority, time orientation, decision making, and so forth. Culture differences can significantly affect teamwork and relationships. Organizations using global teams invest the time and resources to adequately educate employees. They have to make sure all team members appreciate and understand cultural differences, are focused on goals, and understand their responsibilities to the team. For a global team to be effective, all team members must be willing to deviate somewhat from their own values and norms and establish new norms for the team. As with virtual teams, carefully selecting team members, building trust, and sharing information are critical to success.

Special-purpose teams, sometimes called project teams, are created outside the formal organization structure to undertake a project of special importance or creativity. Special-purpose teams focus on a specific purpose and expect to disband once the specific project is completed.

Problem-solving teams typically consist of 5 to 12 hourly employees from the same department who voluntarily meet to discuss ways of improving quality, efficiency, and the work environment. Recommendations are proposed to management for approval. Problem-solving teams usually are the first step in a company’s move toward greater employee participation. The most widely known application is quality circles, initiated by Japanese companies, in which employees focus on ways to improve quality in the production process.
Self-directed teams. Employee involvement through teams is designed to increase the participation of low-level workers in decision making and the conduct of their jobs, with the goal of improving performance. Employee involvement started out simply with techniques such as information sharing with employees or asking employees for suggestions about improving the work. Gradually, companies moved toward greater autonomy for employees, which led first to problem-solving teams and then to self-directed teams.

As a company matures, problem-solving teams gradually can evolve into self-directed teams, which represents a fundamental change in how employee work is organized. Self-directed teams enable employees to feel challenged, find their work meaningful, and develop a strong sense of identity with the company. Self-directed teams typically consist of 5 to 20 multiskilled workers who rotate jobs to produce an entire product or service or at least one complete aspect or portion of a product or service (e.g., engine assembly, insurance claim processing). The central idea is that the teams themselves, rather than managers or supervisors, take responsibility for their work, make decisions, monitor their own performance, and alter their work behavior as needed to solve problems, meet goals, and adapt to changing conditions. Characteristics of these self-directed teams, which are permanent teams, are listed next.

- The team includes employees with several skills and functions, and the combined skills are sufficient to perform a major organizational task. A team may include members from the foundry, machining, grinding, fabrication, and sales departments, with members cross-trained to perform one another’s jobs. The team eliminates barriers among departments, enabling excellent coordination to produce a product or service.

- The team is given access to resources, such as information, equipment, machinery, and supplies, needed to perform the complete task.

- The team is empowered with decision-making authority, which means that members have the freedom to select new members, solve problems, spend money, monitor results, and plan for the future.

In a self-directed team, team members take over managerial duties, such as scheduling or ordering materials. They work with minimum supervision, perhaps electing one of their own as supervisor, who may change each year. The most effective self-directed teams are those that are fully empowered. In addition to having increased responsibility and discretion, empowered teams are those that: have a strong belief in their team’s capabilities; find value and meaning in their work; and recognize the impact the team’s work has on customers, other stakeholders, and organizational success. Managers create the conditions that determine whether self-directed teams are empowered by giving teams true power and freedom, complete information, knowledge and skills, and appropriate rewards.

The scope of self-managing teams includes not only the normal work routine but also some traditional managerial tasks. Employees are assigned to self-managed teams. Team members get rotated for cross-training purposes. The manager’s role becomes more of a facilitator than a traditional supervisor role.

Teamwork is the key strategy to improving productivity, because all improvements involve people implementing change in a system. A system is a combination of social and technical systems. Management researchers say that better social systems, even at the expense of the technical systems, yield better results. The optimal social system is the self-managing team concept. It consists of a series of work teams consisting of 5 to 10 members who rotate jobs and produce an entire product or service with minimal supervision. The team assumes all responsibilities and makes all decisions regarding their product or service.

Self-directing teams have been extremely effective, because they challenge all workers to actively and mentally participate rather than blindly execute policies. This results in continuous productivity.
and quality improvements and, ultimately, success. Meaningful participation by workers always will have a positive impact on productivity. Empowering workers to do those things that enable them to work smarter is a powerful tool in increasing productivity.

**Venture teams** (V-teams) are groups of employees working together focusing exclusively on the development of a new product or acquisition of a new business.

**Training teams** (T-teams) are groups of employees participating in the basic skills training and development sessions away from the workplace.

A **focus group** is a team representation of individuals, either inside or outside of a firm, who are solicited to share their opinions (likes and dislikes) about a specific product, service, or process for its improvement under the direction of a trained moderator. Focus groups are used for several purposes in functions such as marketing, operations, and finance.

Complex and mission-critical projects often require **multidisciplinary teams**, consisting of individuals from different functional areas and led by a project manager, to plan and manage projects. Typically, a core project team is established early in the life cycle of a project, and additional individuals with particular technical or operational expertise are added during appropriate phases of the project. The team must not only possess technical and operational expertise, but it must also be composed of the “right” people. The selection of the team members is critical—they must be knowledgeable, willing to trade off leadership roles, and able to plan work and set goals in a team setting. The successful team will have a high spirit, trust, and enthusiasm. Key factors in the successful completion of a project are a sense of ownership and the drive of the team. This integrated and comprehensive approach improves communication between upper management and project managers and among the various stakeholders in the project. It also increases the likelihood that potential problems will be identified and resolved quickly, thus increasing the chances that the project will remain on schedule and within budget.

A **dream team** is an ideal team consisting of unique members from inside and outside an organization where a member’s skills, experiences, attitudes, and work-related goals and ethics perfectly match with those of other members of a project, the project manager, and the project sponsor. The goal-congruence principle is at play here.

The scope and nature of **X-teams** is different from the traditional teams (e.g., vertical teams, horizontal teams, and self-directed teams); X-teams have both inward and outward focus while traditional teams have inward focus only. Outward focus means reaching out to the external stakeholders; inward focus is on the internal stakeholders to obtain relevant information for a project. X-teams focus on both inward and outward sides and work with external and internal stakeholders.

Another difference is that X-teams are composed of multiple groups of individuals, such as core and noncore members, whereas traditional teams have only one type of individuals, such as team members with a team leader. Another notable difference is that X-teams operate in a dynamic and unpredictable environment whereas traditional teams operate in a stable and predictable environment within an organization.

An excellent application of X-teams is in a new-product development project where team members need to work with several external parties, such as product consultants, materials, suppliers, and hardware/software vendors, and several internal parties, such as the staff of the manufacturing department, marketing department, R&D, design engineering, and quality department. The purpose is to solicit and receive pertinent information about the planning, designing, producing, and marketing of the new product. The goal is to involve all affected parties in the team for open discussion, idea generation, idea sharing, and knowledge sharing on a proactive basis so that problems and obstacles can be estimated or assessed earlier and prevented quicker from occurring with careful planning at the outset. Traditional teams do not have this kind of broad focus. In other words, X-teams exist for multiple purposes whereas most traditional teams exist for a single purpose.
(b) Problem-Solving and Decision-Making Skills

This section describes problem-solving and decision-making topics to show how the right problems can be solved with the right kind of decisions.

(i) Problem-Solving Skills

(A) What Is a Problem?

In this section, we first discuss the theory behind problem solving followed by its application to internal auditing. A problem exists when there is a gap between “what is” and “what should be.” Individuals recognize a problem when they feel frustrated, frightened, angry, or anxious about a situation. Organizations recognize problems when: outputs and productivity are low; quality of products and services is poor; people are not cooperating, sharing information, or communicating; or there is a dysfunctional degree of conflict among people in various departments. When the gap between “what is” and “what should be” causes anxiety and inefficiency, something needs to be done to solve the problem (see Exhibit 1.79).

EXHIBIT 1.79 General Definition of a Problem

<table>
<thead>
<tr>
<th>Point A</th>
<th>Gap</th>
<th>Point B</th>
</tr>
</thead>
<tbody>
<tr>
<td>“What is”</td>
<td>“What should be”</td>
<td></td>
</tr>
<tr>
<td>(actual condition)</td>
<td>(desired condition)</td>
<td></td>
</tr>
</tbody>
</table>

A problem is the gap between where one is and where one wants to be. Problem solving is the process of closing the gap between the actual situation and the desired situation. Problems do not solve themselves—people solve problems. In a way, audit reports are problem-solving tools. The deficiency findings contained in audit reports describe and compare the actual condition (what is) with the desired condition (what should be), thus creating a gap. The auditor’s recommendations are aimed at closing this gap. Audit work is then a type of problem solving. Audit findings are the result of comparing “what should be” with “what is” and analyzing the impact (see Exhibit 1.80).

EXHIBIT 1.80 Audit Definition of a Problem

<table>
<thead>
<tr>
<th>Finding</th>
<th>Gap</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>“What is”</td>
<td>“What should be”</td>
<td></td>
</tr>
<tr>
<td>(actual condition)</td>
<td>(desired condition)</td>
<td></td>
</tr>
</tbody>
</table>

If internal auditing reports are problem-solving tools, then internal auditors are problem solvers since the audit work is done by auditors, who then prepare the audit report. The management principle behind the problem solving is Theory Y in that both managers and auditors will take responsibility for and are interested in solving organizational problems. Effective written and oral communication skills are prerequisites to effective problem-solving skills.

(B) Problem-Solving Process

Problem solving is a systematic process of bringing the actual situation or condition closer to the desired condition. Although there are many ways to handle problems, problem-solving is a
four-step sequence: (1) identifying the problem, (2) generating alternative solutions, (3) selecting a solution, and (4) implementing and evaluating the solution. These four steps are depicted in Exhibit 1.81 with a possible recycling from Steps 3 and 4 to Steps 1 and 2.

**EXHIBIT 1.81 Steps in the Problem-Solving Process**

<table>
<thead>
<tr>
<th>“What is”</th>
<th>“What should be”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying the problem</td>
<td>Implementing and evaluating the solution</td>
</tr>
<tr>
<td>Generating alternative solutions</td>
<td></td>
</tr>
<tr>
<td>Selecting a solution</td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td>Step 4</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
</tr>
</tbody>
</table>

**Step 1: Identifying the Problem.** The scope of this step includes awareness of a problem, problem diagnosis and identification, and criteria for solution. Identifying the problem is a major, crucial work. It can consist of initial awareness that something is not right. The problem-solving cycle begins with some identified need. If there is no need, the cycle is unnecessary. Problems could be defined with framing errors or effects. Consequently, incorrect problems could be solved leading to decision traps. Moreover, ill-defined and unstructured problems can waste resources (e.g., time, money, and effort). Symptoms should be separated from problems because symptoms will be repeated.

Some examples of problem indications are listed next.

- A production manager finds a gap between actual weekly production and the desired level of production.
- A plant department manager finds a gap between actual attendance levels and desired attendance levels.
- A marketing manager finds a gap between the actual market share for a product and the desired market share.
- A financial manager finds a gap between the actual earnings for a quarter and the desired earnings.
- An audit manager finds a gap between the actual report issuance time and the desired report issuance time.

The adage “A fully developed problem is half solved” is truly applicable here. Problem identification is a two-dimensional process. The first dimension deals with the degree or condition of the problem, and the second one addresses the structure of the problem. Each dimension is discussed briefly.

It is necessary to understand the degree or intensity of a problem in order to plan the appropriate timing and strategies for its solutions. There are three issues involved here: stable, dynamic, and critical.

---

A **stable issue** is one in which there is a little or no controversy. The decision maker requires little input and can usually solve the problem in a task-oriented fashion. A **dynamic issue** is one around which there is a good deal of controversy and the decision maker turns to a group for input. Leadership is process-oriented. A **critical issue** is immersed in controversy and requires resolution by senior management. Leadership is most effective in resolving critical issues when it is task as well as process oriented.

The Structure of the problem has to do with the routineness of the decision required. Questions to ask include: How much is known or understood about the problem? Is this a new problem? Do mechanisms exist within the organization to deal with this problem?

Two types of problems exist: structured and unstructured problems. Structured problems have only one unknown and have routine programs available to respond; unstructured problems have at least two unknowns and no routine programs available to respond. As an organization faces the same unstructured problem repeatedly, it gradually develops mechanisms to respond to the problem, which then becomes structured.

After being aware of the problem, it is good to obtain valid information about the problem in order to identify what it is. Problem identification is a description of present conditions, symptoms, and underlying causes. The outcome should be a written statement identifying the root problem.

Defining the criteria for a solution addresses what the desired condition should be. This condition should be measurable and specific. True agreement on the criteria that a solution must meet is important to help avoid conflict at a later time in the problem-solving cycle.

### STUMBLING BLOCKS FOR PROBLEM FINDERS

- **Defining the problem according to a possible solution**: means ruling out alternative solutions in the way one states a problem
- **Focusing on narrow, low-priority areas**: means ignoring organization goals and objectives
- **Diagnosing problems in terms of their symptoms**: means inability to differentiate between short-run and long-run handling of symptoms. Treating symptoms rather than underlying causes is acceptable in the short run but is not acceptable in the long run since symptoms tend to reappear. The real cause(s) of the problem should be discovered. Causes are variables, whether they are controllable or uncontrollable. The problem can be solved or the gap can disappear by focusing on adding or removing these variables.

### Step 2: Generating Alternative Solutions

During this step, the problem solver needs to identify the possible methods and means to get from what is to what should be. The information collection effort includes researching new ideas and methods and resources for achieving the goals. Generating alternative solutions is time consuming and demanding mental work.

People have a tendency to settle for the first answer or alternative without really developing several answers or alternatives from which to choose. Developing several alternatives requires a combination of careful and thorough analysis, intuition, creativity, and a sense of humor. Several
techniques using individual and group creativity are available to develop alternatives. These include brainstorming, synectics, and others, which are discussed later in the section.

**Step 3: Selecting a Solution.** In this step, the various alternatives are evaluated against the established criteria for the solutions. In this way, the solution that best fits the criteria can be selected. Each alternative must be compared to others. Since “best” is a relative term, the alternative solutions must be evaluated to provide a reasonable balance of effectiveness and efficiency, considering the constraints and intangibles, if any.

If during this step the problem solver cannot establish a satisfactory solution, it may be necessary to return to Step 1 in order to redefine the problem or to repeat Step 2 in order to generate more realistic alternatives and solution criteria.

As part of the decision-making process, alternative solutions should be screened for the most appealing balance of effectiveness and efficiency in view of relevant constraints and intangibles. Russell Ackoff, a specialist in managerial problem solving, contends that three things can be done about problems: They can be resolved, solved, or dissolved (see Exhibit 1.82).

**EXHIBIT 1.82 How Are Problems Handled?**

<table>
<thead>
<tr>
<th>How problems are handled</th>
<th>Resolved</th>
<th>Solved</th>
<th>Dissolved</th>
</tr>
</thead>
</table>

**Resolving the problem** includes selecting a course of action that is good enough to meet the minimum constraints. Here the problem solver satisfices rather than optimizes. Optimizing or maximizing is selecting the best possible solution. When a problem is resolved by selecting a course of action that meets the minimum constraints, a manager is said to be satisficing. The manager uses a minimal amount of information to make a quick, good-enough, and not the best, decision. Satisficing has been criticized as a shortsighted and passive technique emphasizing survival instead of growth. Idealizing involves dreaming that no problem exists or changing the current situation so that the problem no longer exists.

**SATISFICING VERSUS OPTIMIZING VERSUS IDEALIZING**
- **Satisficing** is settling for a solution that is good enough.
- **Optimizing** is systematically searching for a solution with the best combination of resources and benefits.
- **Idealizing** is changing the nature of a problem’s situation

**Solving the problem** is when one selects the best possible solution with the best combination of benefits. A **problem is dissolved** when the situation in which it occurs is changed so that the problem no longer exists. Problem dissolvers are said to idealize because they actually change the nature of the system in which a problem resides.
Step 4: Implementing and Evaluating the Solution. Once a solution has been chosen, implementation must be planned in detail. This step includes deciding who will do what and when. It requires implementation plans, checkpoints, schedules, and resources. Implementation of the action plan should move the situation from what is to what should be.

At this point, both product and process evaluation are important. The outcomes must be measured against the desired criteria to determine if the goal has been reached and the problem solved. If people are still uncomfortable with the way things are, it may be necessary to start again at Step 1.

(C) Impediments to Problem Solving
Business problems are solved either by individuals or by groups. The most neglected area of problem solving is human resources, the people who participate in the problem-solving group. The group leader can encourage new ideas and creativity in group members by following these guidelines.

- Practice effective listening because people think much more rapidly than they speak. Effective listening is the best way to gather information. Try not to be distracted.
- Practice “stroking,” a concept borrowed from transactional analysis. A stroke is a unit of recognition. Provide recognition to people and ideas. Positive stroking makes people more important and secure and invites more ideas and creativity.
- Discourage “discounting” (i.e., not paying attention), another concept borrowed from transactional analysis. When discounting is high, group members will feel reluctant to respond to questions and will be constantly ready to attack or retreat. This is not a healthy climate
for successful problem solving, and it encourages dysfunctional behavior and uncooperative attitudes among the members of the group.

- Keep the group members informed about progress and what is expected of them.

Psychology researchers frequently cite these reasons for people making mistakes in solving problems: lack of understanding of concepts, reasoning errors, failure to note details, and insufficient computation skills. Researchers have identified these common traits that good problem solvers possess:

- Good estimation and analysis skills
- Ability to perceive similarities and differences
- Reflective and creative thinking
- Ability to visualize relationships
- Strong understanding of concepts and terms
- Ability to disregard irrelevant data
- Capability to switch methods easily, but not impulsively
- Ability to generalize on the basis of a few examples
- Ability to interpret quantitative data
- Strong self-esteem

A problem-solving attitude, an inquiring and questioning mind, can be developed. It does not occur by accepting from others truths and conclusions that the learner ought to establish by him- or herself. The attitude is produced by continued experience in solving real problems, one consequence of which is that the learner comes to expect new problems and to look for them. Auditors have the same agenda in mind. The ability to discriminate among possible alternatives is a valuable life skill. Problem-solving skills are not a single, uniform capability. Problems of different kinds may require substantially different problem-solving skills.

Problem-solving expertise consists of skill in identifying obstacles that can be easily circumvented and of ingenuity in dealing with particular obstacles. The identification of problem obstacles is generally given too little priority because people are solution oriented. We spend too little time in exploring the problem situation.

### IDEA GETTING VERSUS IDEA EVALUATION

- Reaching a final solution depends on both idea getting (generating alternatives) and idea evaluation (choosing the best alternative). Sometimes we do not achieve a satisfactory solution because we put too little effort into considering alternatives or we make a poor selection from those alternatives evaluated. Often the obstacle to successful problem solving is the tendency to evaluate and select an alternative before better ideas have been generated.

- Unless idea getting is stressed and idea evaluation is temporarily suppressed, the presence of available alternatives can impede the possible consideration of other, more viable alternatives.

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(D) Problem Solving and Creativity
The reorganization of experience into new configurations is called creativity. The best argument in favor of creativity is that environmental changes make creativity essential for long-term survival. Stagnation can lead to organizational failure or demise. Creativity is not easy to get or to manage, as it requires hiring intelligent people and motivating them to deliver to the fullest extent of their skills.

A creative act is one that is original, valuable, and suggests that the person performing the act has unusual mental abilities. A creative act is a problem-solving act; in particular, it is the solution of an ill-defined problem. Four cognitive processes especially important for creativity include problem finding, idea generation, planning, and preparation.

The discovery of a new problem not suggested by anyone else is important in any field. Three procedures that can help people to find problems are bug listing, searching for counterexamples, and searching for alternative interpretations.

Sometimes, when we are trying to solve an ill-defined problem, we are blocked by difficulty in generating ideas for solution. Brainstorming and discovering analogies may help us out of this difficulty. Planning is important in creative activities, as it is in any form of problem solving. Good writing and good art depend on good planning.

Internal auditors need to use creative skills during audit planning, the preliminary survey, and development of the audit program. Identification of audit objectives is important in the audit planning phase. Development of a good approach to conduct the preliminary survey requires creativity. Deciding what audit procedures need to be performed requires creativity during audit program development. Both new audits and repeat audits benefit from applying creative skills.

(E) Reasons Why Individuals Solve Problems Differently
Different people have different problem-solving skills. Five factors (see Exhibit 1.83) are key to a person’s problem-solving capabilities:

1. Value system
2. Information filtration
3. Interpretation
4. Internal representation
5. External representation

EXHIBIT 1.83 Factors Contributing to Different Problem-Solving Skills

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Value system
Information filtration
Interpretation
Internal representation
External representation

---

**Value System.** Individuals make decisions and solve problems differently because people have different value systems. If two people make different choices in the same situation, it does not mean that one of them is wrong; it may just be that they have different values. This means that we cannot tell how good people’s decision-making processes are by the choices they make. However, training in formal decision-making methods and problem-solving skills would help. No matter what people’s values are, if they use good decision-making methods, they should tend to agree with themselves when they make the same decision again.

**Information Filtration.** Some people can filter relevant information from the irrelevant. It is a skill that can be acquired through reasoning and practice. Problem solving is simpler for people who can think simply and clearly in their minds. Also, a multiple-level organization structure is most likely to produce information filtration. Information is subject to distortion or filtration as it moves through many channels of communication. The greater the level of communication, the greater the information filtration.

Even when two people present the same problem, they may not represent it in the same way. A person who is very good at filtering out irrelevant details may produce a very sparse representation. Another person who is not good at filtering out irrelevant details may produce a complex and ornate representation.

**Interpretation.** Forming an interpretation is a very active process in which a person adds and subtracts information and interprets information in the original situation. Pictures can be used during the process of interpretation.

**Internal Representation.** Internal representation deals with analogies and schemas in our minds. When we encounter a problem, we recognize that we have seen a similar problem before. This is called analogy.

Our skill in problem solving depends in a very important way on our store of problem schemas. Each problem schema we know gives us a very valuable advantage in solving a whole class of problems—an advantage that may consist in knowing what to pay attention to, or how to represent the problem, or how to search for a solution, or all three. *Clearly, the more schemas we know, the better prepared we are as problem solvers.*

Different people may create different internal representations of the same problem. There are more differences between representations, though, than just the amount of detail they contain. One person may represent a problem in visual imagery, another in sentences, and a third in auditory images. If two people represent a problem in visual images, they may not use the same images. For example, people frequently use both auditory and visual imagery in solving arithmetic problems. While doing problems in their heads, people use visual images of the digits of the answer and of marks indicating borrowing or cancellation.
**External Representation.** In many cases, an external representation is very helpful for solving problems. Drawing a sketch, jotting down lists, writing out equations, and making diagrams can help us to remember information and to notice new relationships in the problem. Some relationships in problems are easier to discover when diagrams are used. For example, a matrix representation is useful in solving control identification problems (e.g., matching controls to control objectives).

External representations are very helpful in solving complex problems, but they are not useful without an internal representation of the problem. An internal representation is essential for intelligent problem solving since it is the medium in which people think—the same way the words are the medium for speech. Sometimes an internal representation is sufficient for solving simple problems. However, external representation alone is not useful. Both representations are needed for most cases.

**(F) Prospective and Retrospective Methods**

Often management asks auditors to deal with forward-looking, future-oriented problems or questions. Collectively they are referred to as **prospective methods** to distinguish them from approaches designed to answer questions about what is happening now or what has happened in the past—that is, **retrospective methods**. An auditor’s problem-solving skill set should contain both of these methods. Conducting a repeat audit of accounts payable is an example of a retrospective method. Performing a due diligence review is an example of a prospective method of problem solving.

**TYPES OF PROSPECTIVE METHODS**

Four types of methods exist: actual, empirical, logical, and judgmental.
1. Actual types include experimental test and demonstration programs.
2. Empirical types include simulation and forecasting.
3. Logical types include front-end analysis, risk assessment, systems analysis, scenario building, and anticipatory analysis.
4. Judgmental types include Delphi techniques and expert opinion.

Basically, two types of forward-looking situations exist: anticipate the future or improve the future. In both situations, auditors would critique others’ analyses or would do their own analyses. Future needs, costs, and consequences are analyzed when anticipating the future issues. Courses of action that have the best potential for success are analyzed to improve the future. These types of questions are most appropriate in acquisition and divestiture audits.

The type of questions being addressed dictates the need for a systematic method of analysis. Where the questions are controversial, far-reaching, and sensitive, more systematic methods of analysis may be called for. Simple questions need simple methods. Some advantages of using systematic methods include the full range of existing information can be brought to bear on the question and high-quality standards of evidence and analysis can be used in documenting the basis for answers about the future. Exhibit 1.84 compares retrospective methods with prospective methods.
EXHIBIT 1.84 Comparison of Retrospective Methods with Prospective Methods of Problem Solving

<table>
<thead>
<tr>
<th>Retrospective Methods</th>
<th>Prospective Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Require less judgment due to the lower level of uncertainty involved</td>
<td>Require more judgment due to the higher degree of uncertainty involved</td>
</tr>
<tr>
<td>Decreased need for alternatives and options</td>
<td>Increased need for alternatives and options</td>
</tr>
<tr>
<td>Source of questions: existing criteria, issues, and policies</td>
<td>Sources of questions: ideas and assumptions about problems, probable causes, possible solutions</td>
</tr>
<tr>
<td>Primary sources of information: documents, administrative data, interviews, observations, surveys</td>
<td>Primary sources of information: prior research, theory, pilot tests, experimental tests of proposed approaches, expert opinions</td>
</tr>
<tr>
<td>Primary types of analysis: qualitative and quantitative approaches to empirical data, information syntheses in relation to criteria and issues</td>
<td>Primary types of analysis: simulations, forecasting, and information syntheses in relation to conceptual and operational assumptions of proposed solutions; Delphi techniques; analyses of likely effects</td>
</tr>
</tbody>
</table>

(G) Tools and Techniques for Problem Solving

Many tools and techniques are available for the problem solver to solve problems. They include brainstorming, synectics, nominal group technique, force-field approach, systems analysis, and others (see Exhibit 1.85). Differences exist among the problem-solving methods, and all of them do not work equally well in all situations. In any given situation, one or two methods might have a greater probability of leading to the desired outcomes.

EXHIBIT 1.85 Tools and Techniques for Problem Solving

- Brainstorming (the more ideas, the better; encourages uninhibited flow of ideas)
- Synectics (a highly structured approach; uses excursions, fantasies, and analogies)
- Nominal group technique (no real group exists, uses a very structured approach)
- Force-field analysis (identifies inhibiting and facilitating forces)
- Systems analysis (breaks down a large problem into many smaller problems)

(H) Brainstorming

The purpose of the brainstorming technique is to generate a great number of ideas; that is, its purpose is idea generation. The key is to let group members feel free to express whatever ideas come to mind without fear of judgment or criticism. Uninhibited flow of ideas is permitted; negative thinking is not permitted. Recording all ideas and deferring judgment until the later phases of the analysis is the hallmark of brainstorming. See Exhibit 1.86 for advantages and disadvantages of the brainstorming technique.

EXHIBIT 1.86  Advantages and Disadvantages of the Brainstorming Technique

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid generation of ideas</td>
<td>Focuses on idea generation, not on specific solutions</td>
</tr>
<tr>
<td>Identification of many factors of a particular topic</td>
<td>Does not work well where problems are not open-ended</td>
</tr>
<tr>
<td>Expression of a cross section of views from various disciplines</td>
<td></td>
</tr>
</tbody>
</table>

The brainstorming technique is most effective when the presence of an expert is not necessary, the high level of creativity is seen as a bonus rather than an irritant, and a large quantity of ideas is needed.

MISCONCEPTIONS ABOUT BRAINSTORMING

There are two misconceptions about brainstorming: (1) there is a total lack of control and direction in a brainstorming session, and (2) brainstorming does not involve judgment or evaluation of ideas; all ideas are seen as equally effective and productive.

There are four rules for effective brainstorming sessions.

1. **Postpone evaluation of ideas of others as well as one's own.** This rule is the most critical, because the best way to reduce effective idea generation is to make premature evaluations and/or judgments.

2. **“Freewheeling” is welcome and invited.** “Freewheeling” means that any idea is permitted, no matter how outlandish or fanciful. One person’s flight of fantasy may be the trigger for another’s generation of a very workable idea.

3. **Many ideas are wanted.** The greater the number of ideas, the greater the possibility that quality ideas will emerge.

4. **Encourage hitchhiking.** Hitchhiking is the art of combining and improving on ideas; in other words, building on another’s suggestion. Frequently, a group will develop a cue for members to use when they want to hitchhike—for example, snapping a finger. Hitchhiking is a by-product of brainstorming.

*I Synectics*

Synectics is a technique for creating an environment that encourages creative approaches to problem solving. It is a highly structured approach for an individual who needs a group to help solve a problem. It involves the use of nontraditional activities, such as excursions and fantasies and analogies. Synectics is good for idea generation and team building. See Exhibit 1.87 for advantages and disadvantages of the synectics technique.

EXHIBIT 1.87  Advantages and Disadvantages of the Synectics Technique

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The method works exceptionally well when people feel in a rut or blocked with a problem.</td>
<td>Participants may have difficulty with excursions; some may be reluctant to fantasize.</td>
</tr>
<tr>
<td>The process is fun—there is a lot of energy flowing.</td>
<td>The process works best with small groups of six to eight members.</td>
</tr>
<tr>
<td>It generates a great number of new perspectives on a problem.</td>
<td>The process works better for individual problems than for group problems.</td>
</tr>
<tr>
<td>In addition to structure, there is plenty of room for flexibility.</td>
<td>Although the process sounds easy, it requires much preparation.</td>
</tr>
<tr>
<td>Participants feel very involved in the process.</td>
<td></td>
</tr>
</tbody>
</table>
Excursions and fantasies are deliberate moves to get participants away from consciously thinking about the problem. In synectics, the excursion is used to involve the subconscious mind to work on the problem and find clues to possible solutions. Excursions are productive with regard to developing possible solutions, and they also serve to energize the group members.

Analogies are an important source of ideas when searching for problem solutions. A checklist is prepared for each type of analogy, including personal, direct, symbolic, fantasy, and attribute. The user works through the checklist and tries to find analogies of each type. Personal analogy is where the problem solver puts him- or herself directly into the problem situation. Direct analogy involves searching for a setting where the same function is accomplished.

Symbolic analogy is associated with symbols, notations, figures, and pictures. Fantasy analogy includes magic and science fiction. In an attribute analogy system, the checklist would list attributes of an object—its name, form, function, color, and material. After listing the attributes, analogies are attached to each one by screening for useful insights. Analogies and symbols are also called free association, where unconventional thinking is encouraged.

(J) Nominal Group Technique
The nominal group technique (NGT) is an idea-generating, consensus-building tool. No real group exists—it is a group in name only. A strength of this process is that it permits a problem to become focused in a short period of time. It uses a very structured approach and is an excellent technique to use when the group members are drawn from various levels of the organizational hierarchy or when they are in conflict with one another. The technique gives everyone an opportunity to express ideas without being interrupted by others in the group. See Exhibit 1.88 for advantages and disadvantages of NGT.

EXHIBIT 1.88 Advantages and Disadvantages of the Nominal Group Technique

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGT can be used with groups of varying backgrounds, cultures, education, or work roles who share a common problem or goal.</td>
<td>The technique calls for a trained leader or group facilitator.</td>
</tr>
<tr>
<td>The technique can be used in groups where participants do not have previous training in group process or communication skills.</td>
<td>It can deal with only one question at a time.</td>
</tr>
<tr>
<td>The highly structured process is a quick way of bringing people together to approach a common task.</td>
<td>NGT is inappropriate to use in a group that does not already have interactive problem-solving and team-building skills.</td>
</tr>
<tr>
<td>NGT promotes the generation of many ideas about an issue.</td>
<td></td>
</tr>
<tr>
<td>NGT allows for maximum and equal participation of all group members, encouraging input from many areas of expertise.</td>
<td></td>
</tr>
<tr>
<td>The NGT process is easy to run.</td>
<td></td>
</tr>
</tbody>
</table>

Social psychology researchers have found that individuals working in groups generate more ideas than when they work alone. Furthermore, nominal groups—groups in name only, where people are brought together but not allowed to communicate—have been found to be more effective for idea generation than interacting groups, where people meet to discuss, brainstorm, and exchange information. Such interacting groups tend to inhibit creative thinking. However, for purposes of attitude change, team building, and consensus generation, interacting groups have been found superior.
BRAINSTORMING VERSUS SYNETICS VERSUS NOMINAL GROUP TECHNIQUE

- If the goal is idea generation, use brainstorming or synectics, since each facilitates more diverse or creative thinking.
- If the goal is for a group of relative strangers to meet in order to reach group consensus concerning common issues, use the NGT since it is a structured process of consensus building.

The unique NGT process combines a silent time for idea generation with the social reinforcement of an interactive group setting. This structured process forces equality of participation among members in generating and sharing information about the issue. NGT groups may consist of five to eight participants.

(K) Force-Field Analysis

Force-field analysis involves the identification of a problem and the factors or forces contributing to making it a problem, and steps for generating solutions. Two main sets of forces are identified: inhibiting forces—those that resist the resolution of the problem; and facilitating forces—those that push the problem toward resolution. Once the forces acting on a problem are identified, actions can be taken to decrease the major resisting forces, increase the major facilitating forces, or both. This process, then, is basically an analysis of the forces acting to keep the problem a problem. See Exhibit 1.89 for advantages and disadvantages of force-field analysis.

EXHIBIT 1.89 Advantages and Disadvantages of Force-Field Analysis

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The outcome of the force-field analysis process is a detailed action plan with evaluation criteria built in.</td>
<td>The group may get lost in arguments about what the problem really is, what forces are the most important, which action steps to begin with, and the like.</td>
</tr>
<tr>
<td>It is an excellent process for a group to use in dealing with group problems.</td>
<td>Problems that are not easily and clearly defined may be difficult for this process.</td>
</tr>
<tr>
<td>It is an effective tool to define problems, analyze problems, and develop solutions into workable action plans.</td>
<td>The team leader needs to be a good listener and should be able to help the team weigh and rank alternatives.</td>
</tr>
<tr>
<td>Group size is not a critical factor, and force-field analysis can be used as a team-building process.</td>
<td></td>
</tr>
</tbody>
</table>

Force-field analysis calls for the definition of current conditions and desired conditions. Once a clear image of these conditions is established, effective intervention strategies can be devised to move from the present to the desired condition. As a problem-solving process, force-field analysis involves identifying and analyzing problems, developing strategies for change, and clarifying specific steps to be taken to confront the problem. It is an excellent analytical tool. The outcome will be a detailed action plan outlining when, to whom, and how the problem will be addressed. The force-field approach is useful for viewing a problem that involves the entire group, and it may be combined with other problem-solving methods in order to establish a long-term plan of action.

(L) Systems Analysis

Systems analysis breaks down a large problem into many smaller problems. It is an excellent technique if the desired outcome of the problem-solving session is a detailed understanding of a problem. The technique offers a structure for analyzing a problem and various alternative solutions. However, it does not structure the roles of participants. The major strength of this process is that it
offers a method of reviewing the total context of a problem. The phrase “systems analysis” does not mean analysis of computer-based information systems. The scope is broader than that—manual, automated, or both. See Exhibit 1.90 for advantages and disadvantages of systems analysis.

**EXHIBIT 1.90** Advantages and Disadvantages of Systems Analysis

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The problem is fully analyzed, touching on important questions and areas of concern. Several alternatives are developed, leaving abundant options for choice. It can be combined with other problem-solving methods.</td>
<td>There may be a tendency for the group to get bogged down in the process.</td>
</tr>
</tbody>
</table>

This method requires the problem solver to look beyond the unit of the problem to the environment for various possible solutions. It focuses on three attributes: open systems, multiple reasons and causes, and the entire picture.

The first attribute of systems theory assumes that a system is open; it interacts with its environment and can be represented by three models: hierarchical, input-output, and entities model. In the hierarchical model, systems are seen within a structure of subsystems. This framework may be useful in identifying the context in which the group finds itself. An input-output model may be useful in identifying the inputs that are needed and how they are to be transformed toward the desired outputs. The entities model may be used to form tentative hypotheses about how group members may interact.

The second attribute of systems theory looks at multiple reasons or causes for things; it keeps the problem solver from having tunnel vision concerning the nature of the problem. The systems approach moves away from linear causation, which assumes that the effects of a situation are based on single causes. Realizing that problems often have more than one cause helps the problem solver to attack the problem from several fronts.

The third attribute of the system model examines the entire picture rather than only one part or element. Remember the classic elephant story—different views of the elephant by six blind people.

**Tools and Techniques for Problem Solving**

Many tools and techniques are available for the problem solver to handle problems. They include brainstorming, synectics, nominal group technique, force-field approach, systems analysis, and others. Differences exist among the problem-solving methods, and all of them do not work equally well in all situations. In any given situation, one or two methods might have a greater probability of leading to the desired outcomes. Specific tools and techniques for problem solving include the following.

**Imagineering.** Imagineering involves the visualization of a complex process, procedure, or operation with all waste eliminated. The imagineer assumes the role of dreamer, realist, and critic. The steps in imagineering consist of taking an action, comparing the results with the person’s imagined “perfect” situation, and making mental correction for the next time. This approach will eventually improve the situation and bring it to the desired level. Imagineering is similar to value analysis.
Value analysis. Value analysis is a systematic study of a business process or product with a view to improving the process or product and reducing cost. Creative skills are required while doing value analysis. Its goal is to ensure that the right activities are performed in the right way the first time. Industrial engineering techniques, such as work measurement and simplification methods, can be used to achieve the goals.

Leapfrogging. Leapfrogging is taking a big step forward in thinking up idealistic solutions to a problem. For example, leapfrogging can be applied to value analyzing comparable products to identify their best features and design. These ideas are then combined into a hybrid product that, in turn, can bring new superior products to enter a new market.

Blasting, creating, and refining. Blasting, creating, and refining are used when a completely new way of thinking or speculation is required or when answering a question, such as “What else will do the job?” Blasting is good when the group members are free to speculate and come up with totally new ideas that were never heard of or thought about before. Creativity comes into full play.

Attribute listing. Attribute listing emphasizes the detailed observation of each particular characteristic or quality of an item or situation. Attempts are then made to profitably change the characteristic or to relate it to a different item.

Edisonian. Edisonian, named after Thomas Edison, involves trial-and-error experimentation. This method requires a tedious and persistent search for the solution.

Investigative questions. The scope includes asking six investigative (journalism) questions: who, what, when, where, why, and how—to better understand the root causes of issues and problems.

Cause and effect diagrams. Cause and effect (C&E) diagrams (also called Ishikawa or fishbone diagrams) can be used to identify possible causes for a problem. The problem solver looks for the root causes by asking the “why” five or six times to move from broad (possible) causes to specific (root) causes. The idea is that by repeating the same question “why,” the true source of a problem is discovered. This process will help identify the real problem. Then the problem solver chooses the most likely cause for further review. Brainstorming can be used in developing the C&E diagrams.

Pareto charts. Pareto charts can be drawn to separate the vital few from the trivial many. They are based on the 80/20 rule; that is, 20% of items contribute to 80% of problems.

Psychodramatic approaches. These approaches involve role-playing and role-reversal behavior. In psychodrama, the attempt is made to bring into focus all elements of an individual’s problem; in sociodrama, the emphasis is on shared problems of group members.

Checklists. Checklists focus one’s attention on a logical list of diverse categories to which the problem could conceivably relate.

General semantics. These include approaches that help the individual to discover multiple meanings or relationships in words and expressions.

Morphological analysis. This is a system involving the methodical interrelating of all elements of a problem in order to discover new approaches to a solution.

Panel consensus technique. This technique is a way to process a large number of ideas, circumventing organizational restraints to idea creation, using extensive participation and emphasizing methods for selecting good ideas.
Delphi technique. This technique is a method used to avoid groupthink. Group members do not meet face-to-face to make decisions. Rather, each group member independently and anonymously writes down suggestions and submits comments, which are then centrally compiled. The compiled results are then distributed to the group members who, independently and anonymously, write additional comments. These comments are again centrally compiled and the process is repeated until consensus is obtained. The Delphi technique is a group decision-making method.

Work measurement. This industrial engineering program applies some of the general principles of creative problem solving to the simplification of operations or procedures.

Storyboard. Storyboarding is a group problem-solving technique to create a picture of relevant information. A storyboard can be created for each group that is making decisions. A positive outcome of storyboarding is that it takes less time than interviewing, and many employees can get involved in problem solving, not just the managers.

Humor. In addition to being a powerful tool to relieve tension and hostility, humor is a problem-solving tool. When correctly executed, it opens the mind to seeking creative solutions to a problem. Humor can be in the form of detached jokes, quips, games, puns, and anecdotes. Humor gives perspective and solves problems. Stepping back and viewing a problem with a certain level of detachment restores perspective. A sense of humor sends messages of self-confidence, security, and control of the situation. However, humor should not be sarcastic or scornful.

Operations research. Operations research is a management science discipline attempting to find optimal solutions to business problems using mathematical techniques, such as simulation, linear programming, statistics, and computers.

Intuitive approach. The intuitive approach is based on hunches (gut feelings). It does not use a scientific approach and uses subjective estimates or probabilities, which are difficult to replicate.

T-analysis. T-analysis is a tabular presentation of strengths on one side and weaknesses on the other side of the letter “T.” The goal is to address the weaknesses (problems).

Closure. Closure is a perceptual process that allows a person to solve a complex problem with incomplete information. It is the last step in problem solving.

TRIZ. TRIZ (a Russian acronym) is a theory of solving inventive problems. It supports the idea that unsolved problems are the result of contradicting goals (constraints) and nonproductive thinking. It suggests breaking out of a nonproductive thinking mold by reframing the contradicting and competing goals in such a way that the contradictions disappear.

Stratification. Stratification is a procedure used to describe the systematic subdivision of population or process data to obtain a detailed understanding of the structure of the population or process. It is not to be confused with a stratified sampling method. Stratification can be used to break down a problem to discover its root causes and can establish appropriate corrective actions, called counter-measures. Failure to perform meaningful stratification can result in the establishment of inappropriate countermeasures, which can then result in process or product deterioration in quality.

(M) Considerations of Problem Solving: Traits and Behaviors

All auditors should be familiar with certain traits and behaviors during problem solving. While certain problem-solving behaviors, such as conjecturing, predicting, and drawing conclusions, can be learned and taught, other behaviors and problem-solving traits, such as self-reliance, risk
taking, creative thinking, and interacting, are examples of affective-related behaviors that are fostered through individual encouragement.\(^{33}\)

An auditor needs to focus on the traits and behaviors listed next.

**Traits**

- **Curious.** Eager to investigate, to learn new approaches and techniques, to understand how a problem is solved.
- **Keen.** Interested in problems, quick to respond to individual challenges.
- **Interactive.** Participates freely with others, seeking and sharing ideas.
- **Creative.** Responds to problem situations in new or unusual ways; not confined in problem approaches or ways of thinking.
- **Receptive.** Willing to listen to and consider ideas of others.
- **Intuitive.** Able to act on hunches or educated guesses.
- **Retentive.** Draws on and applies previously acquired information in new situations.
- **Self-confident.** Believes that skills and abilities are adequate to meet the challenge of new problems.
- **Relishes challenges.** Desires and enjoys pitting abilities against problems.
- **Critical.** Evaluates ideas and explanations carefully; looks for exceptions to generalizations.
- **Organized.** Approaches problems systematically, investigates problem ideas in an orderly, sequential manner; keeps a record of successful and unsuccessful attempts.
- **Tolerant.** Listens to ideas and problem approaches that are not personal choices; willing to bide time in making and seeing suggestions acted on; respects problem-solving efforts and achievement of others.
- **Resourceful.** Able to overcome obstacles in more than one way.
- **Flexible.** Capable of changing or expanding thinking to incorporate new or different ideas from others.
- **Self-directed.** Motivated from within to pursue and continue with challenges.
- **Introspective.** Considers own thinking processes in problem solving; reflects on how new knowledge or discoveries integrate with previous information or thinking.
- **Risk taker.** Unafraid to be wrong in ideas or to be unsuccessful in efforts to solve a problem; willing to present ideas about a problem to others for evaluation.

**Behaviors**

- **Questions.** Expands on problem-solving discussion by asking about other cases; how the situation varies by changing givens; pursues matters that need clarification in own or others’ thinking.
- **Notes details.** Considers all information that may affect the outcome of a problem; alert to recognizing relationships among variable quantities.

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Discriminates. Perceives similarities and differences among objects or relationships that are important to the problem; distinguishes relevant information from irrelevant problem material.

Recognizes patterns. Detects similarities that characterize a set of information; able to predict missing elements.

Anticipates. Examines alternatives using cause and effect reasoning without carrying action to conclusion; capable of meeting problems before they arise.

Predicts. Foresees or foretells the outcomes of or results to a problem based on previous background, experience, or reasoning.

Generalizes. Extends the results of a particular problem or set of data to a larger and more general situation.

Visualizes. Forms mental images of problem variables to perceive interrelationships among them.

Infers. Examines problem information carefully to derive hypotheses and draw conclusions.

Speculates. Reflects on and reasons about problem components, interrelationships, and implications; forms educated conjugates from available evidence.

Concentrates. Summons all of his or her skills and resources to attack a problem; overcomes extraneous influences and distractions.

Synthesizes. Integrates individually acquired skills and information into a larger understanding of the processes and components of problem solving.

Draws conclusions. Able to bring thinking to a decision to direct problem-solving actions; able to summarize the results of problems or implications.

Deliberates. Recognizes the appropriate times to consider carefully the information of a problem before acting, the implications of a result before generalizing, the alternatives before choosing.

Perseveres. Persists with a problem despite lack of success, discouragement, or opposition to his or her ideas; reluctant to give up on a problem.

Makes refined judgments. Able to adjust thinking or statements based on additional information; able to improve the work of others by noting subtleties, distinctions, exceptions, or special cases.

Uses divergent thinking. Able to perceive more than one implication or consequence to a problem action; able to consider unique or unusual approaches or outcomes to a problem; able to expand thinking throughout a problem rather than narrowing it.

(N) Problem Solving and the Internal Auditor

Internal auditors solve problems for their company when they engage in an audit work, but do not make decisions for the company management because it is the management who makes decisions. An example of a problem-solving skill required of internal auditors is that of determining which audit procedures are most appropriate for a given situation. Because internal auditing involves examining evidence and reaching conclusions based on that evidence, auditors must understand and be adept in the use of inductive reasoning. In addition, internal auditors must be able to evaluate a specific audit situation and deduce, for example, what evidence should be gathered to reach a valid audit conclusion.

It is true that auditors should not challenge or second-guess the management’s decisions in problem-solving, strategic planning, capital expenditures, advertising budgets, marketing initiatives, manufacturing plant capacity expansions, mergers and acquisitions, and other...
strategic matters. Instead, auditors can ask and evaluate management about their rationale, justification, constraints, and assumptions went into the decision-making process. From a company’s business viewpoint, internal auditors are problem solvers, not decision makers. On the other hand, an audit director is the sole and final decision maker when managing the internal audit department.

(ii) Decision-Making Skills
In this section, we first discuss the theory behind decision making, followed by its application to internal auditing. Decision making is a process of choosing among alternative courses of action. The correct sequence of the decision-making process is shown in Exhibit 1.91.

**EXHIBIT 1.91 Steps in the Decision-Making Process**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identify the right information</td>
</tr>
<tr>
<td>2</td>
<td>Identify an acceptable level of risk</td>
</tr>
<tr>
<td>3</td>
<td>Identify alternative courses of action</td>
</tr>
<tr>
<td>4</td>
<td>Make a timely decision</td>
</tr>
</tbody>
</table>

Note the difference between the problem-solving and decision-making steps. Identify an acceptable level of risk (Step 2) does not enter into the problem-solving process. Risk is unique to decision making and is an integral part of it. Decision making reduces or increases the risk, depending on the quality of the decision making and the level of uncertainty.

The process of management is fundamentally a process of decision making. The functions of management (planning, organizing, directing, and controlling) all involve the process of initiating, selecting, and evaluating courses of action. Therefore, decision making is at the center of management functions. The manager makes decisions in establishing objectives: planning, organizing, motivating, and control decisions.

Professor Igor Ansoff classifies the organizational decisions into three categories: strategic, administrative, and operating (see Exhibit 1.92).

**EXHIBIT 1.92 Decision Categories**

<table>
<thead>
<tr>
<th>Decision categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic decisions</td>
</tr>
<tr>
<td>Administrative decisions</td>
</tr>
<tr>
<td>Operating decisions</td>
</tr>
</tbody>
</table>

**Strategic decisions** are primarily concerned with a firm’s external problems rather than its internal problems. Examples include product mix and markets to sell.

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Administrative decisions are concerned with structuring the firm's resources to create maximum performance potential.

Administrative decisions are further divided into organizational structure and resource acquisition and development. Organizational structure involves structuring of authority and responsibility relationships, workflows, information flows, distribution channels, and location of facilities. Resource acquisition and development involves the development of raw material sources, personnel training, personnel development, financing, acquisition of facilities, and equipment.

Operating decisions are primarily concerned with maximizing the profitability of current operations. They include pricing, establishing market strategy, setting production schedules and inventory levels, and deciding on the relative expenditures in support of R&D, marketing, and operations.

Basically, a decision must be made when the organization faces a problem, when it is dissatisfied with existing conditions, or when it is given a choice. There is no unified agreed-on structure for decision theory because each decision maker has a different value system. Staff and line people perform a significant amount of work in discovering problems, defining the problems, and preparing the alternatives for decisions. The actual decision is only the conclusion of a decision-making process. The intelligence phase in the decision-making process includes finding the problem.

The three-step sequence of setting objectives is listed next.

1. Broad objectives are established at the senior managerial levels.
2. Strategies and department goals are developed from the broad objectives. The department goals provide a framework for decision making at lower managerial levels.
3. The manager needs to balance multiple objectives, conflicting objectives, and the hierarchy of objectives.

As the term indicates, “multiple objectives” means that the manager is focusing on two or more objectives at the same time. Examples include market growth, diversification, profit/sales maximization, employee attitudes, social responsibility, and employee development. The latter three objectives are difficult to quantify.

Conflicting objectives arise when two objectives are at odds with each other. For example, social responsibility, such as pollution control projects, may adversely affect profit margins.

Hierarchy of objectives means that objectives of organizational units must be consistent with the objectives of higher organizational units. This means there are objectives within objectives. If the cascade of organizational objectives is not consistent, suboptimization results. Suboptimization occurs, for example, where a departmental level maximizes its own objectives but, in doing so, subverts the overall objectives of the organization. Examples include dichotomies where the sales manager prefers large inventories; the production manager prefers large production runs; the warehouse manager prefers minimum inventory; the purchasing agent prefers large lot purchases; and the financing manager prefers low inventories, low production runs, and so on.

(A) Many Facets of Decision Making

Managers and leaders make a variety of decisions. The type of decision made depends on the level of that manager in the organization hierarchy. To accommodate this variety of decisions, many facets of decision making exist, as depicted in Exhibit 1.93.
**Sequential/Nonsequential Decision Making.** Sequential decision making is the process of successively solving interrelated subproblems that make up a large complex problem. It uses the principle of divide and conquer. Decision C cannot be made until decisions A and B are made. Most senior management decisions are nonsequential in nature for strategic issues; lower-level management mostly makes sequential decisions.

**Decision Rules**

Decision rules are behind the programmed decisions procedures. Decision rules require that there is a standard approach to resolve recurring problems and that the problems need to be solved only once.

There are no decision rules behind nonprogrammed decision making. Every situation is different, unique, and complex, requiring innovative and creative problem-solving approaches.

**Static/Dynamic Decision Making.** Static decisions are one-time events leading to one-shot decisions. Dynamic decision making emphasizes that management’s decisions are not usually one-time events but are successive over a time frame. Future management decisions are influenced to some degree by past decisions.

**Structured/Unstructured Decision Making.** Structured decisions have formal rules while unstructured decisions have no rules. Examples of structured decisions include production scheduling, inventory reordering, and MRP. These models have a rigid structure to the decision processes and are programmed to perform routinely without much human involvement. Examples of unstructured decision models include decision support and executive support systems. All decision models are rational within their own limits and boundaries. Structured decisions can mean programmed decision making; unstructured decisions can mean nonprogrammed decision making.

**Programmed/Nonprogrammed Decision Making.** Programmed decisions are those that are repetitive and routine, requiring definite procedures. Examples of programmed decisions are employee hiring, billing, supply order, consumer loan, and pricing decisions. In contrast, nonprogrammed decisions are unstructured and novel; there are no set patterns for handling them. Higher levels of management are associated with the unstructured, nonprogrammed decisions.

Nonprogrammed decisions are complex, important situations, often under new and unfamiliar circumstances. These decisions are made much less frequently than are programmed deci-
Examples of nonprogrammed decisions include building a new manufacturing plant or warehouse and merger and acquisition decisions. There is no cut-and-dried method for handling nonprogrammed decisions because the problem has not arisen before, or because its precise nature and structure are not clear, or because it is so important that it deserves a custom-tailored approach. See Exhibit 1.94 for a hierarchy of management decision making.

**Exhibit 1.94 Hierarchy of Management Decision Making**

<table>
<thead>
<tr>
<th>Higher-level managers</th>
<th>Strategic management</th>
<th>Nonprogrammed decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle-level managers</td>
<td>Administrative management</td>
<td>Semiprogrammed decisions</td>
</tr>
<tr>
<td>Lower-level managers</td>
<td>Operating management</td>
<td>Programmed decisions</td>
</tr>
</tbody>
</table>

Senior-level managers make nonprogrammed (nonroutine) decisions for strategic management purposes. Programmed (routine) decisions address lower-level and highly repetitive tasks, as they are fully programmed. Clerks and computers are involved in routine programmed decisions, such as production scheduling and machine loading. Programmed decisions serve the needs of operating management. However, there is an overlap with semiprogrammed decisions in the sense that such decisions are made by both higher-level managers and middle-level managers.

The Institute of Management Accountant’s research study identified nine models to describe nonroutine decision-making environments and labeled them semiprogrammed decisions. The nine decision models are listed next.

1. New product decision
2. Distribution channels decision
3. Acquisition decision
4. Divestment (product abandonment) decision
5. Capital expenditure decision
6. Make-or-buy decision
7. Lease-or-buy decision
8. Pricing decision
9. Manpower planning decision

**Routine/Nonroutine Decision Making.** Routine decisions involve structured and programmed tasks. Nonroutine decisions involve unstructured and nonprogrammed tasks. Higher levels of management deal with nonroutine decision making while lower-level management handles routine decisions. Exhibit 1.95 depicts who makes what decisions.

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EXHIBIT 1.95  Who Makes What Decisions?

<table>
<thead>
<tr>
<th>Type of Decision</th>
<th>Lower-Level Management</th>
<th>Higher-Level Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential decisions</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Nonsequential decisions</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Structured decisions</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Unstructured decisions</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Programmed decisions</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Nonprogrammed decisions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine decisions</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Nonroutine decisions</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

**(B) Decision-Making Models**

Models are predetermined procedures that specify the step-by-step actions to be taken in a particular situation. Two types of decision models exist: normative and empirical models. Normative models prescribe the decision-making process—what should be. These models do not describe actual management practice in decision making. Instead, they describe how a decision procedure should be followed.

Empirical decision models do not describe how a decision maker should go about making a decision. Instead, they describe the actual decision processes followed by a decision maker—what is. A decision process is any interrelated set of activities leading to a “decision”—a commitment of resources. Reconciliation is needed between the normative and descriptive results in order to develop theories and hypotheses about how managers make use of information. When there is no set of procedures for a decision process, then by definition there is no model for it. Examples include crisis handling and leadership.

Normative models are programmed decisions. They help lower-level operating management implement programs, such as production scheduling or inventory control. Empirical models are nonprogrammed decisions. They help middle to senior management in making strategic decisions, such as pricing and new product introduction.

**NORMATIVE MODEL VERSUS EMPIRICAL MODELS**

- Normative models are prescriptive in nature, address what and how it should be, and are programmed.
- Empirical models are descriptive in nature, address what is, and are nonprogrammed.

**(C) Types of Data Used in Decision Making**

Decision making is a process that incorporates the estimating and predicting of the outcome of future events. When specific events are known with certainty, the decision maker does not use probabilities in the evaluation of alternatives. When specific events are uncertain, the decision maker uses probabilities in the evaluation of alternatives. The decision maker often uses the most likely outcome stated in deterministic format rather than incorporating all outcomes in a probabilistic (stochastic) format.
A decision maker uses two types of data: deterministic data and probabilistic data. Deterministic data are known and not subject to any error or distribution of error. They are based on historical data; their environment is stable and predictable. Decision results will be certain with a single unique payoff. There is only a single outcome for each possible action.

The decision maker uses probabilistic data to evaluate decisions under situations of risk and uncertainty. An estimation of distribution of possible outcomes can be made, not an assured or a predictable outcome. The environment is characterized as unstable and unpredictable since each event is assigned a probability of occurrence. Probabilistic data allows for better risk evaluation since sensitivity analysis can be performed on each action to measure the material impact of the various events.

An estimated payoff table or decision tree can be developed for analysis. A drawback of using probabilistic data is the availability and integrity of data to determine multiple courses of action because probabilistic data are not known.

### Deterministic Data Versus Probabilistic Data
- Deterministic data are known, and the environment is stable and predictable.
- Probabilistic data are not known, and the environment is unstable and unpredictable.

Decision making is a frequent and important human activity and is especially a managerial activity. Decisions are not all of one kind. The procedure for making one decision, such as buying a home, is entirely different from making another decision, such as taking a CIA examination.

Decision making is related to risk levels. With respect to risk, individuals act differently and can be grouped into three categories: risk takers, risk neutral, and risk averters. When contrasted with a risk-taking entrepreneur, a professional manager (or an auditor) is likely to be more cautious as a risk taker (i.e., either risk neutral or risk averter). Another factor is that risks are related to returns. The higher the risk, the greater the return, and vice versa. Also, controls are related to risks. The higher the risk, the greater the need for controls, and vice versa. Controls reduce or eliminate risks and exposures.

Four general types of decisions exist that require different decision procedures: decisions under certainty, decisions under risk, decisions under uncertainty, and decisions under conflict or competition (see Exhibit 1.96).

#### Exhibit 1.96 Types of Decisions

<table>
<thead>
<tr>
<th>Types of decisions</th>
<th>Decisions under certainty</th>
<th>Decisions under risk</th>
<th>Decisions under uncertainty</th>
<th>Decisions under conflict</th>
</tr>
</thead>
</table>

Decision Making under Certainty. In decision making under certainty, a decision maker is operating in an environment where all of the facts surrounding a decision are known exactly, and each alternative is associated with only one possible outcome. The environment is known as certainty.

Five different methods exist that are useful for making decisions under certainty. The first four methods are optimization methods—that is, they attempt to identify the very best alternative available. The fifth method, satisficing, simply looks for the first satisfactory alternative (see Exhibit 1.97).

**EXHIBIT 1.97 Optimization Methods**

<table>
<thead>
<tr>
<th>Optimization methods</th>
<th>Dominance method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lexicographic method</td>
</tr>
<tr>
<td></td>
<td>Additive weighing method</td>
</tr>
<tr>
<td></td>
<td>Effectiveness index method</td>
</tr>
<tr>
<td>Nonoptimization method</td>
<td>Satisficing</td>
</tr>
</tbody>
</table>

The dominance method is the simplest of the decision procedures. To use it in making decisions, it is necessary to find the dominance relations among the alternatives. One alternative dominates another if both of the following are satisfied:

1. It is at least as good as the other on all properties, and
2. It is better on at least one property.

Any alternative that is dominated by another is dropped from consideration since it will never be judged the best alternative by any reasonable decision procedure. Any alternative that dominates all the others is chosen as best.

**VALUE SYSTEM IN DECISION-MAKING CHOICES**

- If two people make different choices in the same situation, it does not mean that one of them is wrong; it may just be that they have different values. Therefore, the correct choice in any decision-making situation depends on the decision maker’s individual value system.
- Generating alternatives, examining their properties, and choosing among the alternatives are all activities that may add considerable cost to the decision-making process.

The advantage of the dominance method is that people can agree about which alternatives are dominant. This method is easy to apply, and its results are reliable. Its disadvantages are that it is not a powerful decision-making method because it usually does not eliminate very many of the alternatives. Examples of applications of decision making under certainty are linear programming, transportation problems, inventory models, and break-even analysis.
The **lexicographic method** is so named because of its resemblance to the procedure for ordering the definitions of words in the dictionary. In this method, first look at the most important definitions of interest. If two alternatives have the same value on this property, then decide on the basis of the second most important property, and so on. It is necessary to specify the order of importance of the properties of the alternatives.

To make a decision by this method, consider the most important property first. If one alternative is better than the other alternatives on the most important property, then that alternative is the one chosen. If two or more alternatives are tied on the most important property, then drop the other alternatives from consideration and consider the next most important property in order to break ties. If any ties remain unbroken, then consider the third property, and so on. Changing the order of importance of the properties in the lexicographic method does not always change the alternative chosen as best.

The lexicographic method is most appropriate when one of the properties outweighs all of the others in importance. The method's major strengths under these circumstances are that it is quick and easy to apply. This method is least appropriate when the properties are roughly equal in importance. Under these circumstances, the method may lead us to choose an alternative that has a slight advantage in the most important property, even though that advantage is outweighed by big disadvantages in other properties. This situation occurs because the lexicographic method typically ignores all but the most important property.

The **additive weighing method** takes all of the properties into account but does not give them equal weight. The more important properties receive heavy weights and the less important ones receive lighter weights. To use this method, numbers for both weights and values of the properties must be available.

To make a decision by the additive weighing method, multiply numerical values of the properties by the weights of the properties for each alternative. Then choose the alternative with the largest sum as "best." This method takes all of the properties into account in making the decision but does not take the interactions of the properties into account. Therefore, this method can lead to inappropriate decisions by ignoring these interactions, just as the lexicographic method can lead to inappropriate decisions by ignoring the less important properties. The major drawback of this method is that it is time consuming and obtaining the numbers for the weights and values of the properties is difficult.

The **effectiveness index method** takes into account the interactions that the additive weighing method ignores. This method is used when the interactions are especially strong or because errors in decisions are very costly, or both. The method requires an extensive analysis of the situation under consideration, and designing and implementing such a method is very expensive and time consuming.
Satisficing is a nonoptimizing approach to decision making under certainty. The satisficing method requires the decision maker to identify the worst value he or she is willing to accept for each of the attributes. The decision maker then considers all of the alternatives in order, rejecting any alternatives that fall below the minimal values of the attributes and accepting the first alternative that meets all of the minimal values.

The satisficing method is particularly useful when we have to choose among a very large number of alternatives and it is not necessary to find the best. This method is less costly since it does not examine all of the alternatives and may not yield a decision at all if the decision-making standards are very high.

Decision Making under Risk. When a decision maker is faced with a decision and the probabilities of various outcomes are known, the situation is said to be decision making under risk (see Exhibit 1.98). Gambling decisions are typical of decisions under risk. An essential feature of decisions under risk is that we can calculate a probability for the effect of the chance event. Tossing a fair coin, rotating a roulette wheel, and rolling a die are examples of decisions under risk. Examples of decision making under risk can be found in queuing theory, statistical quality control, acceptance sampling, and PERT. Decision trees are used to assist the decision maker under conditions of risk.

Risk is a condition faced by managers when they have to make a decision based on incomplete but reliable information. Uncertain conditions exist when little or no reliable information is available. Certainty conditions exist when complete, reliable information is available.

One widely recommended technique for making risky decisions is to choose the action that has the greatest expected value. The expected value of an action is the average payoff value we can expect if we repeat the action many times.
**EXAMPLE OF EXPECTED VALUE**

Game 1. Win $2.00 whether the coin comes up heads or tails when a fair coin is tossed.

Game 2. Win $10.00 if the coin comes up heads and lose $5.00 if it comes up tails.

\[
\text{Expected value} = \text{Average payoff} = \text{Probability of a head } (PH) \times \text{Payoff for heads } (VH) \\
+ \text{Probability of a tail } (PT) \times \text{Payoff for tails } (VT) \\
EV = PH \times VH + PT \times VT
\]

Here \( PH \) and \( PT \) have equal chances, that is, \( \frac{1}{2} \).

\[
EV \text{ (for game 2)} = \frac{1}{2} (10.00) + \frac{1}{2} (−5.00) = 5.00 − 2.50 = 2.50 \\
EV \text{ (for game 1)} = \frac{1}{2} (2.00) + \frac{1}{2} (2.00) = 1.00 + 1.00 = 2.00
\]

Since the expected value of game 2 is greater than the expected value of game 1, we should choose game 2 in order to maximize our expected value. Whether we choose to play game 1 or 2 depends on whether we are risk averse or not. Game 1 is a no-lose game while game 2 is not.

**Decision Making under Uncertainty.** Like decisions under risk, decisions under uncertainty involve a chance factor. The unique feature of decisions under uncertainty is that we cannot calculate a probability for the effect of the chance event. This is a situation in which a decision must be made on the basis of little or no reliable factual information. When considering pricing of competitors, actions of regulatory agencies, and strikes of suppliers, the decision maker is addressing the problem of uncertainty.

Multiple outcomes are possible. The first task is to establish subjective probabilities of occurrence for the multiple outcomes. Under conditions of uncertainty, the rational, economic decision maker will use expected monetary value as the decision criteria. The expected monetary value of an act is the sum of the conditional profit (loss) of each event times the probability of each event occurring.

There are four strategies for making decisions under uncertainty: the mini-max strategy, the maxi-max strategy, the Hurwicz strategy, and the mini-max regret strategy (see Exhibit 1.99).

**EXHIBIT 1.99 Strategies for Making Decisions under Uncertainty**

<table>
<thead>
<tr>
<th>Strategies for making decisions under uncertainty</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-max strategy</td>
<td>Maxi-max strategy</td>
</tr>
<tr>
<td>Hurwicz strategy</td>
<td>Mini-max regret strategy</td>
</tr>
</tbody>
</table>

The **mini-max strategy** is a very conservative, pessimistic strategy that assumes that whatever action we choose, nature is against us and will cause the worst possible outcome. The values of the worst outcomes are the row minima. This strategy calls for choosing the action that gives us the best (largest) of these minima. That is, it chooses the action whose worst possible outcomes are not as bad as the worst possible outcomes of the other actions.
The best examples of applications for uncertainty are in problems of the military, war, and various
types of athletic competition, product development, product pricing, collective bargaining, arbitration,
foreign policy decisions, contract bidding, and oligopolistic and monopolistic market conditions.

A nice property of the mini-max strategy is that it guarantees an outcome that is no worse than
the minimum value for the action. The outcome may be better than the minimum, but it will
certainly be no worse. However, this strategy, which focuses on preventing disaster, has the
unfortunate property of possibly eliminating the best outcomes from consideration.

The maxi-max strategy is an optimistic strategy that assumes that nature will cooperate with us
to provide the best possible outcome for the action we choose—the row maxima. This strategy
chooses the action that yields the best of the possible outcomes. However, it does not defend
the decision maker against the possibility of occurring the worst possible outcome, as does the
mini-max strategy. Decision makers who are attracted to large gains would most likely use the
maxi-max decision rule.

**APPROACHES TO DECISION PROBLEMS**

Whatever strategy we decide to use in approaching decision problems, it is wise to make a habit of de-
termining if any of the alternatives is dominant and could therefore be eliminated.

The Hurwicz strategy is a compromise between the very pessimistic mini-max strategy and
the very optimistic maxi-max strategy. A value between 0 and 1 is chosen for the coefficient of
optimism, A, keeping in mind that low values of A are an indication of pessimism and high values
of A are an indication of optimism. The goal is to find both the row minima and the row maxima
and choose the activity that yields the maximum of the computed quantities. When A is zero,
the Hurwicz strategy is the same as the mini-max strategy; when A is 1, the Hurwicz strategy is
the same as the maxi-max strategy.

**MINI-MAX STRATEGY VERSUS MAXI-MAX STRATEGY**

- The mini-max strategy is a pessimistic strategy and finds the row minima. It gives a conservative feel
  when playing a game against nature but not when playing against a human opponent. This is because
  we know our opponents.
- The maxi-max strategy is an optimistic strategy and finds the row maxima.

The mini-max regret strategy is good for situations where the expected values concept fails.
Why does the expected value technique fail? Expected values are averages of values. They are
appropriate when we are trying to balance values that are close together, for example the chance
of losing $2.00 versus the chance of winning $4.00. Averages are much less appropriate when we
balance values that are very different, such as the cost of a modest insurance premium versus
the risk of being impoverished by a serious car accident.

The mini-max regret decision criteria choose the strategy that minimizes the maximum oppor-
tunity cost. To measure regret, take the difference between the value of the outcome actually
obtained and the maximum value that could have been obtained if a different alternative had been chosen.

**Decision Making under Conflict.** Decision making under conflict is referred to as game theory. The mini-max strategy is used for analyzing decisions under conflict or competition. There are two types of games under conflict: zero-sum games and non-zero-sum games.

**Game theory** is used when the states of nature of the decision maker are the strategies of the opponent (i.e., the other player or the other decision maker). When one opponent gains at the loss of the other, it is called a zero-sum game involving a complete conflict of interest. Games with less than complete conflict of interest are called non-zero-sum games. In non-zero-sum games, the gains of one competitor are not completely at the expense of the other competitors.

The majority of business competitive actions involve non-zero-sum games. Non-zero-sum games require that the payoffs be given for each player since the payoff of one player can no longer be deducted from the payoff of the other, as in zero-sum games. The prisoner’s dilemma is a type of business game situation where one firm is concerned about the actions of its rivals. The outcome of the prisoner’s dilemma game cannot be predicted conclusively. An example of payoff table is shown in Exhibit 1.100.

**EXHIBIT 1.100 Payoff Table**

<table>
<thead>
<tr>
<th>States of Nature</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Expected Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

States of nature are uncontrollable future events that can affect the outcomes of a decision. The best examples of applications of zero-sum games are in problems of the military, war, and various types of athletic competition. The best examples of applications of non-zero-sum games are in product development, product pricing, collective bargaining, arbitration, foreign policy decisions, contract bidding, and oligopolistic and monopolistic market conditions.

The simplest type of gain is the two-person zero-sum game. The players, X and Y, are equal in intelligence and ability. The term “zero sum” is used because the sum of gains exactly equals the sum of losses. The sum of player X’s gains (or losses) and player Y’s losses (or gains) is zero. Such a game, in which the sum of gains and losses added up over all players is zero, is called a zero-sum game.
EXAMPLE OF UTILITY FOR ALTERNATIVES

Assume a linear utility for money and a risk-neutral decision maker. From the next payoff table, we can conclude that the utility for alternative A is

<table>
<thead>
<tr>
<th>State of Nature</th>
<th>S1</th>
<th>S2</th>
<th>Expected Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative A</td>
<td>100</td>
<td>200</td>
<td>$160</td>
</tr>
<tr>
<td>Alternative B</td>
<td>140</td>
<td>40</td>
<td>$ 80</td>
</tr>
</tbody>
</table>

a. $300.
b. High.
c. Exactly twice that of B.
d. Approximately twice that of B.

The correct answer is c. The utility function for money would be linear, and the decision maker’s behavior would be consistent with the maximization of expected profit. A risk-neutral decision maker will select the alternative with the highest profit, that is, alternative A, which is exactly twice that of B (160 / 80 = 2). Choice a is incorrect. Utility is measured in utils, not in dollars. It does not compare the two alternatives. Choice b is incorrect. This requires a judgment about the utility function of the decision maker, which is unknown. Choice d is incorrect. The linearity assumption leads to exact statements, not approximations.

(D) Pure Strategy and Mixed Strategy

A pure strategy exists if there is one strategy for player X and one strategy for player Y that will be played each time. The payoff, which is obtained when each player pays the pure strategy, is called a saddle point. The saddle point represents an equilibrium condition that is optimum for both competitors.

The Wald criterion, which is a variant of decision making under uncertainty, is a useful technique to determine if a pure strategy exists. A saddle point can be recognized because it is both the smallest numerical value in its row and largest numerical value in its column. Not all two-person zero-sum games have a saddle point. When a saddle point is present, complex calculations to determine optimum strategies and game values are unnecessary.

When a pure strategy does not exist, a fundamental theorem of game theory states that the optimum can be found by using a mixed strategy. In a mixed strategy, each competitor randomly selects the strategy to employ according to a previously determined probability of usage for each strategy. Using a mixed strategy involves making a selection each time period by tossing a coin, selecting a number from a table of random numbers, or using some probabilistic process.

There is a simple test to determine whether a pure or mixed strategy is best. If the maximum of the row minima (the maxi-min) equals the minimum of the column maxima (the mini-max), then a pure strategy is best. Otherwise, use the mixed strategy.
(E) Decision Making versus Problem Solving

Decision making and problem solving are not the same; they have two different time dimensions. The basic difference is that decision making is future oriented and problem solving is past oriented. Decision making deals with risk while problem solving does not.

Decision Making → Future Oriented
Problem Solving → Past Oriented

Decision making is the probability of success. Examples of decision-making situations include investing in a new product line, buying new equipment, and selecting an employee for a key position. Examples of problem-solving situations include handling a tardy employee, correcting a poor-quality production, and working with a slow-paying customer.

Exhibit 1.101 presents an overview of differences between decision making and problem solving.

EXHIBIT 1.101 Differences between Decision Making and Problem Solving

<table>
<thead>
<tr>
<th>Decision Making</th>
<th>Problem Solving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision making is concerned with future consequences; it changes the environment and the situation. A decision is made to create a change and therefore generates a new set of circumstances. Decision making focuses on making things happen in the future. A decision has a risk and an uncertainty, but it also creates an opportunity.</td>
<td>Problem solving is concerned with looking back; this is the way it should be and it no longer is. A problem is solved now so that decision making is not needed later. This is because the problem-solving approach has restored the process where it should be. Problem solving can be excessive because it creates a fear of change. A change should be seen as an opportunity to go forward, not to go back to the past.</td>
</tr>
</tbody>
</table>


Although the element of risk is different between decisions and problems, they are intertwined in that a decision is needed to fix a problem. Although decisions are made to solve problems, some bad decisions create more problems, causing a circular effect. Problems come first and decisions come next. Note that current decisions are made to fix past problems, to detect and
solve current problems, and to prevent future problems from occurring. Also note that future management decisions are influenced to some degree by past decisions.

(F) Decision Making and the Internal Auditor: Applications
In order for auditors to reach decisions, they must understand how the various pieces of information are combined. For example, the issues of materiality, conflicting evidence, and determining whether sufficient evidence has been gathered all influence the auditor’s decision-making process.

The internal auditor will be making decisions under various circumstances. When the auditor must make an important decision in a hurry and that decision is based on incomplete information, the decision-making process would be called satisficing, not maximizing, minimizing, or rationalizing. Satisficing is a non-optimization decision-making method. The auditor presents several audit situations that require a decision.

(G) Tools and Techniques for Decision Making

- **Differential analysis.** Differential analysis is a technique to compare differences in revenues or costs of two or more alternatives.

- **Decision table.** A decision table is a tool that documents rules used to select one or more actions based on one or more conditions. These conditions and their corresponding actions can be presented either in a matrix or tabular form.

- **Flowcharts.** Flowcharts help a decision maker in analyzing a large, complex problem. Flowcharts and decision trees both show flow or sequencing. Unlike the flowchart, a decision tree shows outcome probabilities.

- **Discriminant analysis.** Discriminant analysis is a qualitative, subjective tool to differentiate between effective and ineffective procedures or actions.

- **Management science.** Operations research, or management science, provides management an approach that focuses on decision making and reliance on formal mathematical models.

- **Decision trees.** A decision tree is a graphical representation of possible decisions, events, or states of nature resulting from each decision with its associated probabilities, and the outcomes of the events or states of nature. The decision problem displays the sequential nature of the decision-making situation. The decision tree has nodes, branches, and circles to represent junction boxes, connectors between the nodes, and states-of-nature nodes, respectively.

- **Payoff table.** A payoff table is a tabular representation of the payoffs for a decision problem. It shows losses and gains for each outcome of the decision alternatives.

- **Cost-benefit analysis.** Cost-benefit analysis is a decision procedure in which we compare the expected costs and benefits of alternative actions. We choose the action for which the expected value of the benefits minus the expected value of the costs is greatest. The expected value is the desirability of alternative multiplied by the probability of success. The likelihood of an occurrence that is derived mathematically from reliable historical data is called objective probabilities. However, subjective probabilities do not have mathematical reliability since they are derived from intuition and “gut feel” of the decision maker.

- **Success-failure analysis.** Success-failure analysis is a qualitative approach to brainstorm conditions for both success and failure. A T-column can be used with headings such as “What will guarantee success” and “What will guarantee failure.”
- **Devil’s advocate techniques.** In the devil’s advocate technique, the decision maker focuses on failures and identifies ways an action or an alternative can be less than successful.

- **Reality check.** The reality check decision is tested in the pseudo-real-world conditions. A T-column is used with possible headings “Our expectations” and “Our concerns” to facilitate the analysis.

- **Risk analysis.** Risk analysis is the analysis of possible risks to be encountered and the means to handle them that can be performed. A T-column can be used with possible headings “Anticipated risks” and “Actions to overcome risks.”

- **Activity analysis.** All current activities can be labeled as either value-added or non-value-added using a T-account diagram. The goal is to eliminate or reduce non-value-added activities since they are adding little or no value to the process at hand. Decisions affecting costs incurred for non-value-added activities can then be challenged or revisited by performing a detailed analysis of all tasks and activities with the purpose of eliminating or reducing them. A T-column can be used with possible headings “Value-added activities” and “Non-value-added activities” to facilitate the activity analysis.

(c) **Communication Skills**

Topics such as communication chain, factors in the communication process, formal and informal communications, elements of effective communication, presentation of information, barriers to communication, and organizational dynamics are discussed in this section.

(i) **Communication Chain**

One thing that is common to all four functions of management—planning, organizing, directing, and controlling—is communication. Surveys have shown that 80% of a manager’s time is spent on communication and 20% is spent on other activities. Communication can be either formal or informal. It involves two or more people and includes written and oral where people are transferring information and understanding that information from one person to another. The effectiveness of organizational communication can be increased with clear verbal and written messages with little or no noise. Nonverbal communications (body language and messages sent through actions, not words) and listening skills (the art of receiving messages) are also important. Research describes communication as a chain made up of identifiable links—sender, encoding, medium, decoding, receiver, and feedback. The communication chain is only as strong as its weakest link.

(A) **Sender**

The sender is an individual or a group of people whose goal is to convey or transmit the message to a receiver in the best possible media and in the fastest way.

(B) **Encoding**

The objective of encoding is to translate internal thought patterns into a language or code that the intended receiver of the message will be able to understand. Words (written or oral), numbers, gestures, or other symbols are used in encoding. The purpose of the message affects the medium of encoding. For example, if a manager were proposing a new employee benefit plan, which is a sensitive program, a meeting with emotional appeal and gestures would have a bigger impact than a normal written (cold) report. A meeting conveys personal interest and empathy, unlike a report.
Many types of media exist to send and receive a message, including face-to-face communications, telephone calls, regular meetings and electronic meetings (video-conferencing), emails, text messages, memos, letters, reports, efaxes, bulletin boards, newsletters, and others. Each media type varies in richness from high rich to low rich. **Media richness** is described as the capacity of a given medium to convey information properly and promote learning. The goal is to match media richness with the situation. Otherwise, mismatching occurs, which can lead to confusion and embarrassment.

Examples of high-rich media include face-to-face conversation, telephone, or video-conferencing, since they provide multiple information cues (e.g., message content, tone of voice, facial expressions), facilitate immediate feedback, and are personal in focus. High-rich media is good for discussing nonroutine issues and problems.

Examples of low-rich or lean media include bulletin boards, reports, memos, email, text messages, and letters. These media provide a single cue, do not facilitate immediate feedback, and are impersonal. Low-rich media is good for discussing routine problems.

**Decoding**

Decoding is the translation of the transmitted message from the sender’s language and terminology to the receiver’s language and terminology. Effective decoding requires that these messages be the same between the sender and the receiver. The receiver’s willingness to receive the message is a primary criterion for successful decoding.

**Receiver**

The receiver is an individual or a group of people whose goal is to acknowledge and receive the intended message sent by a sender. The receiver will take an action based on the message received.

**Feedback**

The communication process is not complete until the receiver acknowledges the message (via verbal or nonverbal feedback) to the sender. Without feedback, the sender is not sure whether the receiver has received the message. Feedback affects follow-up: If the receiver does not understand the message, follow-up meetings should be scheduled.

**Factors in the Communication Process**

Two factors in the communication process include noise and perception.

**Noise**

Noise is not part of the chainlike communication process. It is any interference with the normal flow of understanding of a message from one person to another. Examples of noise include misperception, illegible print, speech impairment, and garbled computer data transmission. Understanding has an inverse relationship with noise—the higher the noise, the less the understanding. For effective communication to take place between and among people, we all need to identify the sources of noise and reduce it. Greater amounts of noise in communication not only waste resources (time and money) but also create frustration between the sender and the receiver.

**Perception**

Perception is a process of giving meaning to one’s environment and is a vital link in the communication process. It consists of three subprocesses: selectivity, organization, and interpretation. Selectivity is sensory screening and a sorting-out process. Organization is mentally creating
meaningful patterns from disorganized thoughts. Interpretation is how people understand a message, which is often different for different people.

(iii) Formal and informal Communications

Formal communication channels are those that flow within and outside the chain of command. They include downward, upward, horizontal, and diagonal communication.

Downward communication refers to the messages and information sent from a higher level to a lower level in the management hierarchy (e.g., goals, strategies, mission, vision, directives, policies, procedures, and performance feedback).

Upward communication refers to the messages and information transmitted from a lower level to a higher level in the management hierarchy (e.g., grievances and disputes, routine progress and performance reports, suggestions for improvement, and problems reporting and exceptions reporting).

Horizontal communication refers to the lateral or diagonal exchange of messages and information among peers or coworkers, occurring within or across departments (e.g., intradepartmental problem-solving requests, interdepartmental coordination on joint projects, and use of task forces and committees). Horizontal communication is important in learning organizations with teams solving problems.

Diagonal communication refers to the exchange of messages and reports from a lower-level employee in one department to a higher-level employee in another department. This communication occurs only when the manager of the lower-level employee is fully informed and gives the employee permission to initiate such communication. Diagonal communication also occurs when a higher-level employee requests special studies and projects from a lower-level because the latter has the necessary skills and knowledge to conduct such activities. Diagonal communication can take place in both directions between lower-level employees and higher-level employees and vice versa. Note that this type of communication violates the chain-of-command management principle because the subordinate is receiving orders from two superiors and reporting to two supervisors.

Informal communication channels exist that do not consider the organization’s formal or official hierarchy of authority and chain of command. Examples include MBWA and the grapevine. In MBWA, higher-level employees (e.g., executives and senior managers) talk directly with lower-level employees (e.g., hourly workers at factory, office, or warehouse) to learn about problems and issues confronting them as well as to share their key ideas and values. These meetings are informal and unannounced.

The grapevine is the unofficial and informal communication system. It sometimes conflicts with the formal system; at other times, it complements and reinforces the formal system. The grapevine will remain in organizations as long as people are working in a group environment. It has both positive and negative sides. On the positive side, grapevine communication can help management learn how employees truly feel about policies, procedures, and programs—a type of feedback mechanism. A negative consequence of grapevines is rumors. Other places for spreading rumors are around the water cooler and in hallways, break rooms, and cafeterias.

(iv) Elements of Effective Communication

Research has shown that the three essential elements of effective communication are genuineness, respect, and empathy. The person who has mastered the skills of communication but
lacks genuineness, respect, and empathy will find her professional expertise irrelevant or even harmful. **Genuineness** means being what one really is without a front or facade. Genuineness is essential to all vital relationships, especially auditor–auditee relationships. It is being honest and open with others and open about one’s feelings, needs, and ideas. **Respect** and acceptance mean having a positive regard for others. Respect recognizes the sanctity of the other’s privacy, supports the other person’s self-direction, and respects his or her individuality. **Acceptance** is an attitude of neutrality toward another person. Every person is in the need of acceptance. Acceptance and respect may or may not be accompanied by warmth, and they do not mean blindly agreeing and cold submission. Once you accept and respect a person, that person tends to be more at ease around you. **Empathy** is simply putting oneself in someone else’s shoes. It is the ability to understand another person in the same way as that person understands him or herself. It refers to the ability to really see and hear another person and understand the person from her perspective. One needs to be careful with empathy because it can be perceived as excessive if a person identifies very closely with another. There must be a balance between detached and attached involvement.

When an internal auditor practices the three elements of communication skills (i.e., genuineness, respect, and empathy), it is easier to agree to disagree with the audit client about audit findings, values, and other issues. The goal is to solve real problems on a win-win basis (i.e., both parties win).

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### APATHY VERSUS EMPATHY VERSUS SYMPATHY

- **Apathy** is a lack of feeling or a lack of interest or concern (e.g., “I don’t care”).
- **Empathy** involves experiencing the feelings of another person without losing one’s own identity (e.g., “Looks like you are feeling down”).
- **Sympathy** is defined as feelings for another person (e.g., “I feel just dreadful for you”).

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**Presentation of Information**

Information can be improperly analyzed and incorrectly interpreted. The causes of poor business decisions can be attributed not only to a lack of information but also to the failure to properly interpret information. Proper interpretation of information depends largely on the reliability of the source (i.e., internal versus external source or single versus multiple sources), the manner in which the information is presented, and the personal perception of the person receiving or giving the information. For example, surveys and census data are firsthand information (mostly reliable), and hearsay is secondhand information (mostly unreliable).

The manner in which information is presented can significantly affect its use. Most information that has been assembled from statistics, data, and facts has been “massaged” (assembled in a manner applicable to a particular problem at hand). This is because if 10 people created charts from the same set of statistics, we would have 10 different charts. Each person would massage the information in a different way—yet all the different charts could be correct.

Proper and accurate interpretation also depends on our own abilities of perception. One should always keep the original question or problem in mind and pay close attention to details. It is good to view all information with a bit of healthy skepticism because information is not an exact science. **The return on an investment in information is knowledge.**
(vi) Barriers to Communication

It is false to assume that if people can talk, they can communicate. Talking is different from communicating. Many barriers exist between all people, which make communications much more difficult than most people seem to realize. The auditor needs to know all the barriers that exist that can block effective communication. The negative effects of roadblocks to communication include diminishing of self-respect in others, triggering defensiveness, resistance, and resentment. Negative effects can also lead to dependency, withdrawal, and feelings of defeat or of inadequacy.

(vii) Organizational Dynamics

Organizational dynamics is a combination of individual dynamics, group dynamics, and work-related dynamics.

(A) Individual Dynamics

Individual dynamics deal with how an individual’s needs and wants are satisfied at the workplace. Managers should understand Maslow’s hierarchy of needs, which help to explain the actions of employees at the workplace.

(B) Group Dynamics

Group dynamics deal with how group members interact with each other at the workplace and how managers resolve group problems. Each member of the group plays an expected role, and the group has its own biases, values, and beliefs. Another dimension affecting group dynamics is conflicts among departments or functions within an organization, including organizational politics.

(C) Work-Related Dynamics

The environment—physical, social, and cultural—is part of the situational context of human behavior at the workplace. We are affected not only by our relationships with others but by the places and spaces in which we interact. Environmental psychology is the science of transactions between human behavior and the environment.

(d) Negotiating Skills

Negotiation is a decision-making process among different parties with different preferences. Negotiation is gaining the favor of people from whom we want things such as money, justice, status, and recognition.

Two common types of negotiation include two parties (buyer and seller) and three parties (buyer, seller, and agent). Traditionally, negotiation takes a win-lose attitude, which is based on power, position, and competition. Here, one person’s success is achieved at the expense of the success (loss) of others. It takes something away from the other party. A win-win attitude is based on high principles and cooperativeness among parties. Here, one person’s success is not achieved at the expense of the success of others. With a win-win attitude, every party gets something, meaning each party wins something.

Four outcomes are possible in a negotiation process involving two parties, as follows:

<table>
<thead>
<tr>
<th>First Party</th>
<th>Second Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Win</td>
<td>Win</td>
</tr>
<tr>
<td>Win</td>
<td>Lose</td>
</tr>
<tr>
<td>Lose</td>
<td>Win</td>
</tr>
<tr>
<td>Lose</td>
<td>Lose</td>
</tr>
</tbody>
</table>
Of course, each party’s goal is to win the negotiation. Successful collaborative negotiations depend on finding out what the other side really wants and showing them a way to get it, while still getting what you want. It is the definition of a win-win situation. Managers should practice successful collaborative negotiations to reach win-win situations.

**Dos of Negotiations**

- Do use phrases such as “I don’t know,” or “I don’t understand it,” which can result in negotiating leverage.
- Do approach others and ask for help. Doing so tends to set the climate for a mutually beneficial relationship. At the very least, you will cause the other side to make an investment that ultimately accrues to your advantage.

**Don’ts of Negotiations**

- Don’t be too quick to “understand” or prove your intellect at the outset of an encounter. Learn to ask questions, even when you think you might know the answers.
- Never give an ultimatum at the beginning of a negotiation. An ultimatum must come at the end of a negotiation, if at all.
- Do not use “hard” ultimatums, such as “Take it or leave it” or “It is this way or else!” These attitudes are self-defeating. Use “soft” ultimatums, such as “Your position is valid, but this is all I can do at the moment. Help me.”
- Never leave the other side without alternatives. Always allow others to make some kind of choice.
- Don’t reduce the other side’s stress unless you receive what you are shooting for.
- Don’t be abrasive, because how you say something will often determine the response you get.
- Avoid using absolutes when responding to people. Learn to preface your replies with phrases such as “What I think I may have heard you say . . . ” This “lubricant demeanor” will soften your words, consecrate your actions, and minimize the friction.
- Avoid publicly embarrassing the people with whom you deal. Never ridicule anyone in front of others. Even when you are right, shun all opportunities to humiliate people, especially in public.
- Never forget the power of your attitude.
- Never judge the actions and motives of others.

(i) **Added-Value Negotiating and Best Alternative to a Negotiated Agreement**

Two related topics in negotiation are added-value negotiating and best alternative to a negotiated agreement. Each is discussed next.

(A) **Added-Value Negotiating**

Added-value negotiating (AVN) is a value-added process (win-win) involving development of multiple deals with multiple outcomes as opposed to traditional (win-lose) negotiating, which is based on a single outcome with a single winner.

AVN is based on openness, flexibility, and a mutual search for the successful exchange of value. AVN allows one to build strong relationships with people over time. It bridges the gap between win-win theory and practice.
AVN is comprised of five steps:

1. **Clarify interests.** Both parties jointly identify subjective and objective interests so that a common goal is found.

2. **Identify options.** A variety of choices are developed to create value for both parties.

3. **Design alternative deals.** Multiple win-win offers are designed to promote creative agreement.

4. **Select a deal.** Each party selects a mutually acceptable deal after testing the various deals for value, balance, and fit.

5. **Perfect the deal.** Unresolved details are openly discussed and agreements are put in writing, which strengthens the relationship for future negotiations.

**(B) BATNA**

The members of the Harvard Negotiation project discovered a new concept in negotiations known as the best alternative to a negotiated agreement (BATNA) to establish a standard (i.e., bottom line) against which any proposed agreement should be measured. BATNA describes the anchor point for both sellers and buyers when negotiations do not produce the desired outcome(s) for each negotiating party in terms of a settlement amount.

Each negotiating party’s BATNA is a decision point in terms of accepting or rejecting the offer by the other party. The difference between the seller’s BATNA and the buyer’s BATNA is known as the bargaining zone, which becomes the only basis for further negotiation due to overlapping range of acceptable outcomes. Negotiation is either useless or unnecessary outside the bargaining zone because it is not a common ground for both parties. Agreement is possible within the bargaining zone and not possible outside the zone. Therefore, estimating one party’s BATNA is essential in protecting the negotiating parties from accepting offers that are unfavorable and from rejecting offers that are favorable.

**EXAMPLE OF CALCULATING THE BARGAINING ZONE GIVEN THE SELLER’S AND BUYER’S BATNA**

An item’s original price was $400, current appraised value is estimated at $500, its owner is making a final offer to sell the item at $600, and a buyer’s final offer to buy the same item is $350. The seller’s BATNA is $400, and the buyer’s BATNA is $500. What is the bargaining zone in amount and range?

The bargaining zone amount is Buyer’s BATNA minus Seller’s BATNA = $500 − $400 = $100.

The bargaining zone range is $400 to $500.

A realistic BATNA can protect against four decision-making traps: framing error, escalation of commitment, overconfidence, and negotiating without a standard.

- Framing error deals with how information is presented (i.e., positively or negatively), which can lead to bias in behavior and decision making.
- Escalation of commitment is like the throwing good money after bad dilemma in that managers continue to fund losing projects to save face.
- A positive relationship exists between overconfidence and task difficulty. Managers exhibit extra courage needed to handle difficult situations, which leads to unreasonable risks.
Careful analysis of situations and critical thinking about decision alternatives can help managers avoid the overconfidence trap.

- Negotiating parties usually move aimlessly in the dark due to a lack of negotiating standards, which results in accepting unfavorable terms and rejecting favorable terms. A negotiating standard such as BATNA helps in making better decisions because a seller’s BATNA becomes the standard for accepting or rejecting offers.

(e) Conflict Management Skills

(i) Conflict Defined
Social scientists say that conflict is inevitable between people, and without conflict there is no major personal change or social progress. Conflict is based on scarcity of power, availability of resources, social position, and difference in value structure between individuals or groups involved in the situation.

Conflict is the medium by which problems are recognized and solved. Conflict is closely related to change and interpersonal dealings. It refers to all kinds of opposition or antagonistic interaction.

Conflict management involves accepting or even encouraging constructive conflict as necessary. The key point is to minimize the destructive form of conflict. Despite its drawbacks of creating friction, conflict has some benefits. It can spur technological development, encourage personal and intellectual growth, and help renew business organizations.

Example: A manager creates a constructive conflict on purpose by introducing a work-related healthy competition among employees to get the best out of them. A reward is given to the employee who handled the competition best.

Because human behavior varies with people and is difficult to predict, there are a variety of types of conflict, such as disruptive and destructive conflict, realistic and unrealistic conflict, and functional and dysfunctional conflict.

(ii) Disruptive Conflict and Destructive Conflict
To be human is to experience conflict. This conflict arises due to differences in personal values, opinions, desires, habits, and needs of people. It is impossible for people to rise completely above selfishness, betrayals, misrepresentations, anger, and strain. The best way to depict conflict is on a scale of disruptive and destructive dimensions (see Exhibit 1.102).

EXHIBIT 1.102 Scale of Disruptive and Destructive Dimensions

<table>
<thead>
<tr>
<th>Best condition</th>
<th>Worst condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disruptive behavior</td>
<td>Destructive behavior</td>
</tr>
</tbody>
</table>

Conflict at best is disruptive; at worst it is destructive. Once conflict erupts, it is difficult to control. Disruptive conflict is temporary and not harmful, caused by few employees due to their personal grudges. Destructive conflict has a tendency to expand until it consumes all the things and all people it touches.
(iii) Realistic Conflict and Unrealistic Conflict

When two or more people are together for any length of time, some conflict will be generated. That is inevitable. Social scientists make an important distinction between two types of conflict: realistic conflict and unrealistic conflict.

Realistic conflict, which is based on rationality, arises from opposing needs, goals, means, values, or interests. Realistic conflict can be resolved by focusing on the emotions first followed by substantive issues and using collaborative problem-solving methods.

Unrealistic conflict, which is based on irrationality, arises from ignorance, error, tradition, prejudice, dysfunctional organizational structure, win-lose types of competition, hostility, or the need for tension release. Unrealistic conflict creates unwarranted tension between people and can cause unnecessary destruction. It should be handled very carefully; it can be prevented to some extent.

(iv) Functional Conflict and Dysfunctional Conflict

Conflict can be divided into two types, functional and dysfunctional conflict; the former is better than the latter.

The benefits of functional conflict are increased effort and improved performance, enhanced creativity, and personal development and growth. It is like expressing anger in a constructive manner, without actually showing the anger. Functional conflict is always encouraged.

The signs and symptoms of dysfunctional conflict include indecision, resistance to change, destructive emotional outbursts, apathy, and increased political maneuvering. The goal of management is to resolve or neutralize the dysfunctional conflict, which is always discouraged.

(v) Personal Conflict Prevention and Control Methods

Although it is impossible to totally eradicate conflict, personal conflict prevention and control methods can avert much needless strife (unrealistic conflict). Both individuals and organizations need to develop prevention and control methods. Robert Bolton recommends five methods to reduce the amount of conflict, as follows.

1. **Reduce roadblocks.** Use fewer roadblocks to diminish the amount of conflict. Ordering (dominating), threatening, judging, name-calling, and other roadblocks are conflict-promoting interactions, so do not use them.

2. **Improve listening skills.** Listen to others when they have a strong need or a problem. Doing so helps other people dissipate “negative” emotions.

3. **Improve assertion skills.** Enable people to get their needs met with minimal strife. One can prevent the buildup of emotions that so often cause conflict. Both listening skills and assertion skills help to clear up two major sources of conflict: errors and lack of information.

4. **Improve awareness skills.** Know what behaviors are likely to start a needless conflict between people. Possessing awareness skills can eliminate many types of confrontations. Certain words, looks, or actions tend to trigger specific people into conflict. These behaviors may be rooted in early childhood experiences. Some people can sense that a storm is brewing.

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5. **Achieve a win-win result with collaborative problem-solving methods.** In collaborative problem solving, once people discover they have conflicting needs, they join together to find a common solution acceptable to both. It entails redefining the problem, discovering alternatives, and focusing on overlapping interests. In this process, neither person capitulates to or dominates the other. Because no one loses, no one gives up or gives in. Because all parties benefit, this is often called a win-win way of dealing with conflicting needs.

**(f) Team-Managing Skills**

Selecting individuals (employees) to become team members is the most important and difficult task for supervisors, managers, and leaders alike. The selection is based on an individual’s job skills, experience, and attitudes. The selection is a difficult task because it is the team members that can make or break the team since the success of the team entirely depends on the success of each member. Selecting the wrong team members will make the entire team wrong. Managers and leaders need to establish and manage teams successfully because a team consists of individuals with different personalities, behaviors, and goals. Understanding team dynamics is very critical in terms of team members’ good and bad interactions. Team-managing skills include planning, organizing, directing, and controlling skills to guide team members and to evaluate their performance.

Team’s Overall Performance = Sum of Team Member’s Performance

**(g) Diversity Management Skills**

Treating all employees in the workplace fairly and equally without showing prejudice, bias, and discrimination is the hallmark of possessing diversity management skills.

Today, most organizations hire a mix of employees of different genders; different skill sets; different skin colors, nationalities, and ethnicities; different languages with varied communication tones and sounds; and different attitudes, behaviors, and cultures—today’s workplace is indeed very diverse and complex.

This complex workplace requires that all employees, supervisors, managers, and leaders are open-minded and have high levels of tolerance and acceptance to ambiguity and diversity. Obtaining sensitivity training (T-group training) and role-playing games are suggested to each and every employee in order to treat other employees fairly and equally. T-groups also consist of employees participating in organizational development training programs conducted away from the primary workplace.

**(h) Public Servicing Skills**

As a part of social responsibility, the scope of public servicing skills is large. It includes such things as (1) making monetary donations to charities and other legal and eligible religious organizations; (2) sponsoring and/or participating in various public and social events such as community services and fundraising programs; (3) helping disabled and chronic unhealthy citizens; and (4) providing educational assistance to underprivileged students. Society at large expects business corporations to provide these types of public services. Not all managers and leaders have the right amounts of public servicing skills.
(i) Organizational Skills

The scope of organizational skills applies to both supervisors and managers and includes knowing how to: perform job analysis; develop job or position descriptions; to coordinate a person’s work with others’ work and vice versa; make presentations to a group of people; conduct interviews; manage budget and time: set priorities among competing tasks. It also involves learning how to draw organizational charts, not playing organizational politics, and understanding how to conduct employee performance appraisals and evaluations.

Skills such as work planning, work organizing, and work completion ideas (e.g., preparing a to-do list with a timeline can help in this area), combined with time management skills (i.e., not exceeding time allocations for specific tasks) can improve the overall organizational skills of supervisors and managers.

1.15 Business Controls

Control strategies should be linked to business strategies in that an organization’s controls and control environment should facilitate the achievement of business goals and objectives. To this end, business controls are established to achieve business objectives of reducing risks, decreasing costs, and increasing profits.

(a) Hard Controls and Soft Controls

An organization’s control environment consists of developing and implementing business controls, which can be classified as hard controls and soft controls.

Hard controls are formal, tangible, objective, and much easier to measure and evaluate than the soft controls. Examples of hard controls include strategies, plans, policies, procedures, budgets, forecasts, dual controls, written approvals, reconciliations, authorization levels, verifications, and segregation of duties. Tools to evaluate hard controls include big data, data analytics, data mining, flowcharts, system narratives, testing, and counting. By definition, hard controls are strong controls in terms of their effectiveness and validation.

Soft controls are informal, intangible, subjective, and much harder to measure and evaluate than the hard controls. Examples of soft controls include an organization’s legal and ethical climate, integrity, honesty, values, culture, vision, people’s behaviors and attitudes, commitment to competence, tone at the top, voice of the top, management philosophy and operating style, level of understanding and commitment, and communication. Tools to evaluate soft controls include self-assessments, questionnaires, interviews, workshops, focus groups, and role playing. By definition, soft controls are weak controls in terms of their effectiveness and validation.

(b) Hard Skills and Soft Skills

Skills of an individual can be labeled as two types: hard skills and soft skills.

Hard skills are mostly quantitative in nature and include analytical, technical, functional, problem-solving, decision-making, managing, application, integration, and negotiation skills.
Soft skills are mostly qualitative in nature and include people (interpersonal), motivation, leadership, communications, presentation, coordination, comprehension, project management, implementation, time management, creative, and critical thinking skills.

(c) Controls and Skills
Managers and executives need to possess certain type of skills to exercise and implement specific controls over employees and nonemployees as well as over tasks and activities. This means skills should match with controls and vice versa. A link exists between controls and skills, as described next.

- Problem-solving and decision-making skills, which are hard skills, are needed to exercise and implement hard controls, such as strategies, plans, policies, and procedures.
- Leadership skills and people skills, which are soft skills, are needed to exercise and implement soft controls, such as integrity, honesty, legal and ethical values, and culture.
- Soft skills, such as leadership skills containing team-building skills, motivation skills, and conflict management skills, are needed to exercise and implement soft controls, such as management philosophy, management operating style, tone at the top, voice of the top, and management commitment.

In summary, higher-level managers and executives need more depth in soft skills and soft controls and less depth in hard skills and hard controls. Lower-level managers and executives need more depth in hard skills and hard controls and less depth in soft skills and soft controls.

(d) Controls and Risks
Countermeasures (controls) are established to reduce risks. The relationship between controls and risks is described next.

Business events, transactions, activities, and business owners create risks.
High-risk activities need strong controls to contain risks.
Medium-risk activities need medium controls to contain risks.
Low-risk activities need light controls to contain risks.
Strong controls discourage excessive risk-taking approaches.
Strong controls encourage risk-inhibiting approaches.
Business strategies, plans, policies, and procedures are designed into controls (i.e., built-in controls are better than built-on).
Business controls are built into daily procedures and practices.
Controls mitigate risks to an acceptable level of risk tolerance.

A risk and control map can help managers and auditors to document the relationship between risks and controls. Possible outcomes from the risk and control mapping are listed next.

Some high risks are undercontrolled (open to fraud, threats, and vulnerabilities).
Some low risks are overcontrolled (waste of resources, delays in operations).
Some risks are not controlled at all (open to fraud, threats, and exposures).
Some controls are not needed (waste of resources, delays in operations).
Some controls do not address any risks (waste of resources, open to threats).
Some weak controls are overdesigned (waste of resources, delays in operations).
Some strong controls are underdesigned (open to fraud, threats, and vulnerabilities).
Some simple controls are overcomplicated (waste of resources, delays in operations).
Some complex controls are oversimplified (open to fraud, threats, and vulnerabilities).
Some controls and risks have no relationship (mismatch of design and function).

(e) Types of Controls

Three types of controls are discussed: business control systems, management control systems, and corporate control systems.

(i) Business Control Systems

(A) Control Requirements
The auditor needs to understand the control requirements of an application system or a business operation before assessing control strengths and weaknesses. In other words, there should be a basis or baseline in place (i.e., standards, guidelines, and benchmarks) prior to control measurement and assessment. In the absence of a baseline of standards, the auditee will question and not accept the auditor’s findings, conclusions, and recommendations.

(B) Combination Controls
Rarely does a single control suffice to meet control objectives. Rather, a combination of controls or complementary controls is needed to make up a whole and to provide a synergistic effect. An example of a combination of controls is a situation where fire-resistant materials are used in the computer center (a preventive control) to prevent a fire while smoke and fire detectors are used to detect smoke and fire (a detective control) and fire extinguishers are used to put out the fire (a corrective control). Here a single preventive control would not be sufficient. All three controls are needed to be effective.

(C) Complementary Controls

Complementary controls (hand-in-hand controls) have an important place in both the manual and the automated control environment. Complementary controls are different from compensating controls in that, with compensating controls, weak controls in one area or function are balanced by strong controls in other areas or functions, and vice versa. A function or an area need not be weak to use complementary controls. Complementary controls can enhance the effectiveness of two or more controls when applied to a function, program, or operation. These individual, complementary controls are effective as stand-alone and are maximized when combined or integrated with each other. In other words, complementary controls have a synergistic effect.

Controls in these areas can complement each other: administrative, physical security, personnel security, technical security, electromagnetic emanations security from equipment, operations, applications, procedural, environmental (heat, humidity, air-conditioning), and telecommunications security controls.
(D) Compensating Controls

Normally the auditor will find more control-related problems in first-time audits of an area. Generally, the more frequently an area is audited, the lower the probability of many control weaknesses. Therefore, auditors need both audit instinct and business judgment to determine the nature of efficient and effective operations. During the control evaluation process, auditors should consider the availability of compensating controls as a way to mitigate or minimize the impact of inadequate or incomplete controls. In essence, the concept of compensating controls deals with balancing weak internal controls in one area with strong internal controls in other areas of the organization. Here the word “area” can include a section within an end user department or IT department.

An example of a weak control is a situation where data control employees in the IT department are not reconciling data-input control totals to data-output control totals in an application system. This control weakness in the IT department can be compensated for by strong controls in the user department where end users reconcile their own control totals with those produced by the application system. Sometimes automated compensating controls and procedures are needed to shorten lengthy manual controls and procedures (e.g., replacing a manual report balancing system with an automated report balancing system).

(E) Contradictory Controls

Sometimes two or more controls are in conflict with each other. Installation of one control does not fit well with the other controls due to incompatibility. This means that implementation of one control can affect another, related control(s) negatively. Some examples follow.

- Installation of a new software patch can undo or break another related existing software patch either in the same system or other related systems. This incompatibility can be due to errors in the current patch(s) or previous patch(s) or because the new patches and the previous patches were not fully tested by the software vendor or by the user organization.
- Telecommuting work and organization’s software piracy policies could be in conflict with each other if a noncompliant telecommuter implements such policies improperly and in an unauthorized manner when purchasing and loading unauthorized software on home/work personal computers.

(F) Control Assessment

During an assessment of control strengths and weaknesses, auditors might run into situations where a business function, system, or manual/automated procedure is overcontrolled or undercontrolled. This means that there may be too many controls in one area and not enough controls in other areas. Also, there may be duplication or overlapping of controls between two or more areas. Under these conditions, auditors should recommend the elimination of some user controls, some IT controls, some manual controls, some automated controls, or a combination of them. The same may be true of situations where a system or operation is oversecured or undersecured, and where an application system is overdesigned or underdesigned. This assessment requires differentiating between relevant and irrelevant information, considering compensating controls, considering interrelationships of controls, and judging materiality and significance of audit findings taken separately and as a whole.

(G) Cost-Benefit Analysis

A cost-benefit analysis is advised during the process of designing each type of control into an application system during its development and maintenance as well as during its operation.
(i.e., built-in controls). Ideally, costs should never exceed the benefits to be derived from installing controls. However, costs should not always be the sole determining factor because it may be difficult or impractical to quantify benefits such as timeliness, improved quality and relevance of data and information, and improved customer service and system response time. When controls are properly planned, designed, developed, tested, implemented, and followed, they should meet one or more of these 12 attributes:

1. Practical
2. Reliable
3. Simple
4. Complete
5. Operational
6. Usable
7. Appropriate
8. Cost-effective
9. Timely
10. Meaningful
11. Reasonable
12. Consistent

(H) Costs versus Controls versus Convenience

Costs of controls vary with their implementation time and the complexity of the system or operation. Control implementation time is important to realize benefits from installing appropriate controls. For example, it costs significantly more to correct a design problem in the implementation phase of an application system under development than it does to address it in the early planning and design phases.

There are trade-offs among costs, controls, and convenience factors. The same is true among usability, maintainability, auditability, controllability, and securability attributes of systems.

(I) Controls by Dimension

Control can be viewed through three different dimensions of timing: pre-control (proactive control), concurrent control (ongoing control), and post-control (reactive control).

Pre-control (e.g., policy) anticipates problems and is proactive in nature. Concurrent control is exercised through supervision and monitoring. Post-control identifies deviations from standards or budgets and calls for corrective action, and is similar to feedback control. Pre-control and feed-forward control are interrelated since they deal with future-directed actions. Forecasting, budgeting, and real-time computer systems are examples of feed-forward controls. Pre-control is the most preferred action; the least preferred action is post-control. The difference in these controls is when a corrective action is taken—the sooner the better.

A feedback control is used to evaluate past activity in order to improve future performance. It measures actual performance against a standard to ensure that a desired result is achieved. Feedback controls have been criticized because corrective action takes place after the fact (reactive).
Feedback controls can allow costs to build up due to their back-end position. An example is HR managers holding exit interviews with employees who have resigned to go to work for competitors. Management tabulates the interviewee’s responses and uses the information to identify problems with training, compensation, working conditions, or other factors that have caused increased turnover. Other examples include customer surveys, increased finished goods inspections, increased WIP inspections, variance analysis, postaction controls, monitoring product returns, and evaluating customer complaints.

Feed-forward controls attempt to anticipate problems and effect timely solutions (proactive); hence they are important to management. An example is when a key auditee employee will not be available for a few weeks for audit work due to illness, and the audit supervisor reschedules the audit work to be done in this auditable area. Other examples include: defect prevention by quality control inspection of raw materials and WIP, quality control training programs, budgeting, forecasting inventory needs, and advance notice of a purchase.

(J) Controls by Function

Controls prevent adverse effects of risks. Controls can be classified according to the function they are intended to perform. Among the different types of control functions are directive, preventive, detective, corrective, manual, and computer controls.

**Directive controls** ensure the occurrence of a desirable event. Specific examples of directive controls include requiring all members of the internal auditing department to be Certified Internal Auditors and providing management with assurance of the realization of specified minimum gross margins on sales. Other examples include policies, directives, guidance, and circulars.

**Preventive controls** are needed to avoid the occurrence of an unwanted event. Examples of such controls include segregation of duties, use of checklists, use of systems development methodology, competent staff, use of passwords, authorization procedures, and documentation. Segregation of duties means duties are divided among different people to reduce the risk of error or inappropriate actions. For example, it includes dividing the responsibilities for authorizing transactions, recording them, and handling the related asset. A manager authorizing credit sales would not be responsible for maintaining accounts receivable records or handling cash receipts. Similarly, salespersons would not have the ability to modify product price files or commission rates. Segregation of duties calls for a separation of the functional responsibilities of custodianship, record keeping, operations, and authorization. Other examples include separating threats from assets to minimize risks and separating resource allocation from resource use to prevent resource misuse.

**Detective controls** are needed to discover the occurrence of an unwanted event. The installation of detective controls is necessary to provide feedback on the effectiveness of preventive controls. Examples of detective controls include reviews and comparisons, bank reconciliations, account reconciliations, and physical counts.

**Corrective controls** are needed to correct after an unwanted event has occurred. They fix both detected and reported errors. Examples of corrective controls include correction procedures, documentation, and control and exception reports.

**Manual controls** include budgets, forecasts, policies, and procedures; reporting; physical controls over equipment, inventories, securities, cash, and other assets that are periodically counted and compared with amounts shown on control records (i.e., official book records).
**Computer controls** include general controls and application controls. General controls include controls over data center operations, system software, access security, and application system development and maintenance. Application controls are designed to control application processing, helping to ensure the completeness and accuracy of transaction processing, authorization, and validity. Many application controls depend on computerized edit checks. These edit checks consist of format, existence, reasonableness, and other checks on the data, and they are built into each application during its development. When these checks are designed properly, they can help provide control over the data being entered into the computer system. Computer controls are performed to check accuracy, completeness, and authorization of transactions.

**(K) Controls by Objectives**

Data objectives such as data completeness, data accuracy, data authorization, data consistency, and data timeliness are examples of controls by objectives.

**Data completeness** refers to the presence or absence of information. All required data elements must be present for a transaction or record to be complete. Examples include all numeric places should be filled and a check cannot be issued unless all fields have a valid value. Examples of data completeness controls include use of prenumbered forms, obtaining transaction authorization, and system logging of transactions.

**Data accuracy** asks whether data values have been entered into the system correctly and whether they have been distorted during processing. The sources of the data in terms of where they came from and incorruptibility of data are also important here. This means that the received data are unchanged (no additions, changes, and deletions from the original order, without repetition and omission) with positive assurance and an acceptable degree of confidence. Examples include checking for numeric ranges, spelling errors, data duplication, and data omission. Examples of data accuracy controls include use of batch and hash totals, check digits, balance controls, and system-assigned numbers to documents.

**Data authorization** looks at whether transactions are authorized by appropriate personnel for proper accountability. The person who is approving the transactions is also important here. Moreover, the authorization function should be tailored or responsive to the requirements of the application system. Examples of data authorization controls include management approvals, two-person controls, and management overrides.

**Data consistency** asks whether policies, procedures, and standards have been uniformly applied. This refers to the relation between intra-data elements and intra- and inter-records and files. Examples include a requestor’s name cannot equal an approver’s name, and an approver’s name cannot equal a signatory’s name in a check-approval scenario. The causes of data inconsistencies can be due to invalid, untimely, incomplete, and inaccurate data.

**Data timeliness** means that data are not stale for intended use and that they are current. Management needs to understand the need for establishing controls to ensure data integrity. This understanding makes the system more effective and useful. Examples of data timeliness controls include use of electronic mail and text messages to send urgent messages instead of phone and use of efaxes to send urgent letters instead of regular mail.

**(ii) Management Control Systems**

Topics such as control systems, closed control systems, open control systems, broader management controls, and specific management controls are discussed in this section.
(A) Control Systems Defined
All control systems contain two variables: an input variable (reference value) and an output variable (controlled value). Control systems are of two types: closed and open. The main difference is that closed systems have a feedback mechanism while open systems do not have a feedback mechanism. Hence, closed systems are much stronger, more effective, and more complete than open systems. In a feedback mechanism, actual output of a system is fed back to the input end (reference value) for comparison with the desired output (controlled value).

Most business control systems (e.g., paying vendor bills by check; the feedback mechanism is when the check clears a bank) and engineering control systems (e.g., a thermostat to control a room’s temperature where the thermostat is the feedback mechanism) are examples of closed control systems due to their feedback mechanisms. Here, closed control systems provide a feedback to indicate whether: a control has worked or not worked operationally; a control is effective or ineffective in achieving objectives; an error or a deviation has occurred or not occurred; and errors and deviations were corrected or not corrected. There is no improvement in management’s plans and actions without timely feedback.

(B) Closed Control Systems
Closed control systems contain six elements to operate: a process element, a measurement element, a comparison element, an error element, a control element, and a correction element. Note that the measurement element, comparison element, and error element are the basic functions of a feedback mechanism. Each element with its purpose is described next.

1. The process element transforms inputs to outputs.
2. The measurement element observes output and sends error signals to the comparison element to decide if there are errors or deviations (feedback).
3. The comparison element is a person or device comparing inputs to measured output and sends error signals.
4. The error element sends error or deviation signals from input to the control element.
5. The control element decides what actions to take when it receives error or deviation signals.
6. The correction element makes changes in the process to remove errors and deviations.

(C) Open Control Systems
Open control systems contain three elements to operate: a process element, a control element, and a correction element. What is missing in an open control system is the measurement element, comparison element, and error element, which are the basic functions of a feedback mechanism. An example of an open control system is an electric fireplace to heat a room where the room temperature cannot be regulated due to lack of a thermostat, which acts as a feedback mechanism.

(D) Broader Management Controls
Management controls, in the broadest sense, include the plan of organization, methods, and procedures adopted by management to ensure that its goals and objectives are met. Management controls, also known as internal controls, include accounting and administrative controls.

Management control systems must be integrated with ongoing management practices and, where appropriate and effective, with other management initiatives, such as productivity improvement,
quality improvement, BPI, reengineering, and performance measures and standards. Examples of management practices include periodic staff meetings, quarterly management reviews, budget planning and execution, and variance analysis.

Management control systems must be effective and efficient—balancing the costs of control mechanisms and processes with the benefits the systems are intended to provide or control. They should identify who is accountable and provide accountability for all activities.

**Traditional Management Controls.** Management controls include the process for planning, organizing, directing, and controlling the entity’s operations. They include the management control systems for measuring, reporting, and monitoring operations. Specifically, they include automated and manual systems, policies and procedures, and other ongoing management activities that help ensure risks are managed and controlled. Internal auditing is an important part of management control.

Managerial control can be divided into feed-forward and feedback controls. A feed-forward control is a proactive control, such as defect prevention, inspection, training, and budgeting. A feedback control is used to evaluate past activity to improve future performance. It measures actual performance against a standard to ensure that a defined result is achieved. Examples of feedback controls include surveys and variance analysis.

**Contemporary Management Controls.** Many new management controls have evolved over the years, including economic value added (EVA), market value added (MVA), activity-based costing (ABC), open-book management, and the balanced scorecard system.

**EVA** is a financial control technique that is defined as a company’s net (after-tax) operating profit minus the cost of capital invested in the company’s tangible assets. It captures all the things a company can do to add value from its activities, such as running the business more efficiently, satisfying customers, and rewarding shareholders. Each job, department, or process in the organization is measured by the value added.

**MVA** measures the stock market’s estimate of the value of a company’s past and projected capital investment projects. For example, when a company’s market value (the value of all outstanding stock plus the company’s debt) is greater than all the capital invested in it from shareholders, bondholders, and retained earnings, the company has a positive MVA, an indication that it has created wealth. A positive MVA usually goes hand in hand with a high EVA measurement.

**ABC** attempts to identify all the various activities needed to provide a product or service and allocate costs accordingly. Because ABC allocates costs across business processes, it provides a more accurate picture of the cost of various products and services. In addition, it enables managers to evaluate whether more costs go to activities that add value or to activities that do not add value. Managers can then focus on reducing costs associated with non-value-added activities.

**Open-book management** allows employees to see for themselves—through charts, computer printouts, meetings, and reports—the financial condition of the company. It also shows individual employees how their job fits into the big picture and affects the financial future of the organization. Finally, it ties employee rewards to the company’s overall success. The goal of open-book management is to get every employee thinking like a business owner rather than like a hired hand—what money is coming in and where it is going. Open-book management helps employees appreciate why efficiency is important to the organization’s success. It turns the traditional control on its head.
The balanced scorecard system is a comprehensive management control system that balances traditional financial measures with measures of customer service, internal business processes, and the organization’s capacity for learning and growth. The financial perspective reflects a concern that the organization’s activities contribute to improving short- and long-term financial performance (e.g., net income and ROI). Customer service indicators measure such things as how customers view the organization as well as customer retention and satisfaction. Internal business process indicators focus on production and operating statistics, such as order fulfillment or cost per order. The learning and growth indicator focuses on how well resources and human capital are being managed for the company’s future. Metrics may include employee retention and the introduction of new products.

(E) Specific Management Controls
Management controls are a part of closed control systems because management always wants feedback on its plans and actions. Management controls can be divided in several ways, such as positive controls, negative controls, feed-forward controls, concurrent controls, feedback controls, proactive controls, ongoing controls, reactive controls, pre-controls, current controls, and post-controls.

Positive controls will increase the motivation levels of employees in making them sincere, honest, efficient (productive), and effective (achieving goals) in their work (e.g., bonuses, promotions, and wage increases).

Negative controls will decrease the motivation levels of employees in making them sincere, honest, efficient (productive), and effective (achieving goals) in their work (e.g., punishments, demotions, and wage decreases).

Feed-forward and feedback controls are based on actions. A feed-forward control is a proactive control, such as error prevention, inspection of incoming materials and products, employee training and development, and operating and capital budgeting. A feedback control is a reactive control used to detect errors and to evaluate past activity to improve future performance. It measures actual performance against a standard to ensure that a defined result is achieved. Examples of feedback controls include surveys from customers, employees, and suppliers and variance analysis from budgets.

Management controls can also be viewed through three different dimensions of timing: pre-control (proactive control), concurrent control (ongoing control), and post-control (reactive control).

Feed-Forward Controls → Proactive Controls → Pre-Controls → Preventive Controls
Concurrent Controls → Ongoing Controls → Current Controls → Detective Controls
Feedback Controls → Reactive Controls → Post-Controls → Corrective Controls

(iii) Corporate Control Systems
(A) Definition of Controls
Control strategies should be linked to business strategies in that controls and the control environment in an organization should facilitate the achievement of business goals and objectives. Control is any positive and negative action taken by management that would result in accomplishment of the organization’s goals, objectives, and mission. Controls should not lead
to compulsion or become a constraint on employees. Controls should be natural and should be embedded in the organizational functions and operations. More so, controls should be accepted by the employees using or affected by them. Use and implementation of controls should be inviting, not inhibiting.

Controls should be seen as beneficial from the employee’s personal and professional viewpoints. Ideally, controls should facilitate the achievement of employee and organizational goals and objectives. In other words, any control that does not help or promote in achieving the goals and objectives should not be implemented.

Controls should be effective and efficient. Controls should not cost more than the benefits derived. Controls reduce risks, but they cannot completely eliminate all risks due to their high-cost nature. Note that current controls address current risks only; as new risks always emerge, new controls are needed in a timely manner to address new risks; otherwise, new control-related problems can occur.

**(B) Classification of Controls**

Controls can be classified into five major categories: management (previously discussed), accounting, administrative, operational, and internal controls. The reason for classifying controls in different ways is that different controls work best in different departments or functions.

**Accounting controls** are defined in professional standards published by accounting authorities. They help ensure there is full accountability for physical and financial assets and that all financial transactions are recorded and reported in a timely and accurate fashion (i.e., bookkeeping and record keeping). Accounting controls provide checks and balances over people, tasks, and activities to prevent errors, fraud, and collusion.

**Administrative controls** help ensure resources are safeguarded against waste, loss, fraud, abuse, and misappropriation and support the accomplishment of organization’s goals and objectives. Administrative controls provide an oversight role.

**Operational controls** are the day-to-day procedures and mechanisms used to control operational activities. The goal is to ensure that they are carried out effectively and efficiently. They also address computer security methods focusing on mechanisms primarily implemented and executed by people and computer systems. These controls are put in place to improve the security of a particular computer system or group of systems. They often require technical or specialized expertise and often rely on management controls and technical controls.

**Internal controls** are processes within an organization designed to provide reasonable assurance regarding the achievement of five primary objectives:

1. The reliability and integrity of information
2. Compliance with policies, plans, procedures, laws, regulations, and contracts
3. The safeguarding of assets
4. The economical and efficient use of resources
5. The accomplishment of established objectives and goals for operations and programs
1.16 Sample Practice Questions

In the actual CIA Exam for Part 3, 100 multiple-choice (M/C) test questions appear. This book contains 100 M/C sample practice questions divided into syllabus-based domains using the approximate domain weight given in the exam. These questions are added at the end of each applicable domain of this book with the sole purpose of showing the flavor and structure of the exam questions and of creating a self-quiz experience. The answers and explanations for these questions are shown in a separate section at the end of this book just before the Glossary section. This separate section is titled “Sample Practice Questions, Answers, and Explanations.” If CIA Exam candidates need to practice more sample questions to obtain a higher level of confidence, Wiley offers a separate online test bank software product with hundreds of similar, sample practice questions.

1. Which of the following is very useful in developing succession plans for executives and senior management of a corporation?
   a. Depth charts
   b. Organization charts
   c. Responsibility charts
   d. Accountability charts

2. In addition to the four basic requirements of a contract, which of the following must also occur in order to have a valid contract?
   a. The agreement always must be in writing.
   b. There must be evidence of undue influence.
   c. There must be an absence of an invalidating contract.
   d. A legal remedy need not be available for there to be a breach.

3. Some economic indicators lead the economy into a recovery or recession, and some lag it. An example of a lag variable would be:
   a. Chronic unemployment.
   b. Orders for consumer and producer goods.
   c. Housing starts.
   d. Consumer expectations.

4. The relationship between organizational structure and technology suggests that in an organization using mass production technology (e.g., automobile manufacturing), the best structure would be:
   a. Organic, emphasizing loose controls and flexibility.
   b. Matrix, in which individuals report to both product and functional area managers.
   c. Mechanistic, that is, highly formalized, with tight controls.
   d. Integrated, emphasizing cooperation among departments.

5. Routine tasks, which have few exceptions and problems that are easy to analyze, are conducive to:
   a. Formalized structure, where procedure manuals and job descriptions are common.
   b. Decentralized decision making, where decisions are pushed downward in the organization.
   c. Organic structures that emphasize adaptability and flexibility to changing circumstances.
   d. High degrees of job satisfaction on the part of employees performing them.

6. Which of the following theories predicts that employee behavior depends on the belief that good performance will be rewarded by continued employment?
   a. Equity theory: Employees compare their job inputs and outcomes with those of others and then react to eliminate inequities.
   b. Expectation theory: The strength of a tendency to act in a certain way depends on the strength of an expectation that an act will be followed by a given outcome.
   c. Goal-setting theory: Specific and difficult goals lead to higher performance.
   d. Reinforcement theory: Behavior is a function of its consequences.

7. Which of the following has a flat organizational structure compared to others?
   a. Organization A with 11 hierarchical levels
   b. Organization B with three hierarchical levels
   c. Organization C with eight hierarchical levels
   d. Organization D with six hierarchical levels
8. The **most** fundamental flaw of cost-plus pricing is that it:
   a. Fails to account for competition.
   b. Ignores demand.
   c. Ignores industry-wide standard markup policies.
   d. Places too much emphasis on competition.

9. “Selling price = Unit cost + Desired profit” represents which of the following pricing approaches?
   a. Profit maximization
   b. Demand-based pricing
   c. Target return pricing
   d. Standard markup

10. Choosing vendors based solely on which of the following factors is detrimental to the long-term success of a buying firm?
    a. Quality
    b. Service
    c. Price
    d. Delivery

11. Supplier audits are an important first step in:
    a. Supplier certification.
    b. Supplier relationships.
    c. Supplier partnerships.
    d. Strategic partnerships.

12. Customers in which of the following phases of the product life cycle are called laggards?
    a. Introduction
    b. Growth
    c. Maturity
    d. Decline

13. Few competitors exist in which phase of the product life cycle?
    a. Introduction
    b. Growth
    c. Maturity
    d. Decline

14. Regarding the theory of constraints in operations, which of the following does **not** describe a bottleneck situation appropriately?
    a. A machine exists where jobs are processed at a slower rate than they are demanded.
    b. A work center exists where jobs are processed at a slower rate than they are demanded.
    c. An employee’s skill levels are more than needed for a specific job but less than needed for any general job.
    d. The demand for a company’s product exceeds its ability to produce that product.

15. Regarding production process flows, which of the following is **not** a part of the levers for managing throughput of a process?
    a. Decrease resource idleness.
    b. Increase effective capacity.
    c. Reduce setup resources.
    d. Decrease theoretical capacity.

16. Which of the following inventory items would be the **most** frequently reviewed in an ABC inventory control system?
    a. Expensive, frequently used, high stock-out cost items with short lead times
    b. Expensive, frequently used, low stock-out cost items with long lead times
    c. Inexpensive, frequently used, high stock-out cost items with long lead times
    d. Expensive, frequently used, high stock-out cost items with long lead times

17. What are the three factors a manager should consider in controlling stock-outs?
    a. Holding costs, quality costs, and physical inventories Incorrect. These are inventory-related terms, but none will controls stock-outs.
    b. Economic order quantity, annual demand, and quality costs
    c. Time needed for delivery, rate of inventory usage, and safety stock
    d. Economic order quantity, production bottlenecks, and safety stock
18. Reordering of specific items from vendors should be based on:
   a. Computations on the basis of economic order quantities.
   b. Demand forecasting based on early orders for the items.
   c. Market demographics.
   d. Vendor quantity discounts and warehouse space.

19. A risk associated with just-in-time (JIT) production is the:
   a. Increased potential for early obsolescence of inventories of finished goods.
   b. High cost of material handling equipment.
   c. Potential for significant costs associated with reworking defective components.
   d. Critical dependency on a few vendors.

20. With regard to inventory management, an increase in the frequency of ordering will normally:
   a. Reduce the total ordering costs.
   b. Have no impact on total ordering costs.
   c. Reduce total carrying costs.
   d. Have no impact of total carrying costs.

21. In which of the following phases of business development life cycle will both outputs and employment be declining?
   a. Peak
   b. Recession
   c. Trough
   d. Recovery

22. Which of the following scope items for an outsourced vendor takes on a significant dimension in a supply chain environment?
   a. Liabilities and guarantees
   b. Well-defined service levels
   c. Licensing of services and products
   d. Changes to terms and conditions of services

23. When managing a third-party organization such as an outsourcing vendor, which of the following is not applicable?
   a. Due diligence review
   b. Rules of engagement
   c. Rules of behavior
   d. Contractual agreement

24. Where does the information about opportunities and threats come from for a company?
   a. An analysis of the organization’s internal environment
   b. A department-by-department study of the organization
   c. A scan of the external environments
   d. An analysis of employee grievances

25. The auditor has recognized that a problem exists because the organizational unit has been too narrow in its definition of goals. The goals of the unit focus on profits, but the overall organizational goals are much broader. The auditor also recognizes that the auditee will resist any recommendations about adopting broader goals. The best course of action would be to:
   a. Avoid conflict and present only those goals that are consistent with the auditee’s views since all others will be ignored.
   b. Identify the broader organizational goals and present a set of recommendations that attempts to meet both organizational and auditee goals.
   c. Subtly mix the suggested solution with the problem definition so that the auditee will identify the solution apparently independently of the auditor.
   d. Only report the conditions found and leave the rest of the analysis to the auditees.

26. Which of the following problem-solving tools is an idea-generating and consensus-building technique?
   a. Brainstorming
   b. Synectics
   c. Systems analysis
   d. Nominal group technique
27. Job performance is **best** defined as follows:
   a. Job performance = Motivation × Ability
   b. Job performance = Needs × Skills
   c. Job performance = Satisfaction × Job experience
   d. Job performance = Goals × Training

28. Which of the following is a critical challenge in implementing the employee empowerment principle?
   a. Pushing authority downward closer to front-line employees
   b. Expecting accountability from all employees
   c. Delegating employees with restrictive rules to achieve objectives
   d. Developing clear and complete job descriptions for employees

29. In light of rapidly changing technologies and increasing competition and to provide the ability to affect quality initiatives, which of the following human resources policies and practices is **not** enough?
   a. Hiring competent employees
   b. Providing one-time training for employees
   c. Encouraging continuing education for employees
   d. Conducting periodic performance evaluations for employees

30. From a human resources policies and practices viewpoint, which of the following sends a strong message to all interested parties?
   a. Expected levels of integrity
   b. Expected levels of disciplinary actions
   c. Expected levels of ethical behavior
   d. Expected levels of competence and trust

31. Commitment falls under which of the following types of a leader’s power?
   a. Reward power
   b. Coercive power
   c. Expert power
   d. Referent power

32. Which of the following defines the process of evaluating an individual’s contribution as a basis for making objective personnel decisions?
   a. Performance appraisal
   b. Environmental factors
   c. Facilitation skills
   d. Training and development

33. Negotiation, manipulation, coercion, employee education, and increased communication are all ways in which managers can:
   a. Improve employee morale.
   b. Overcome resistance to change.
   c. Maintain control of information.
   d. Demonstrate their power to both their supervisors and subordinates.

34. The adoption of a new idea or behavior by an organization is known as organizational
   a. Development.
   b. Change.
   c. Structure.
   d. Intervention.

35. In project management, which of the following outcomes of the schedule performance index (SPI) analysis should be worked on first?
   a. A negative SPI of 1.0.
   b. A positive SPI of 1.0.
   c. A negative SPI of 2.0.
   d. A positive SPI of 2.0.