1 Organising Construction Processes in Construction Companies

1.1 Educational outcomes

This chapter briefly analyses the construction industry, highlighting construction companies as the key productive element of the whole process and describing the construction project as the final result of this process. By the end of this chapter readers will be able to:

- identify the life-cycle of the facility (building or civil engineering infrastructure)
- recognise the production by projects as the main driver in the facility life-cycle
- formulate the particularities of the construction industry, from a European perspective
- summarise the characteristic of the construction companies that work in this market.

1.2 The facility life-cycle

The construction industry is complex, based as it is within the three major sectors (raw materials, manufacturing and services). It is generally seen as being in an intermediate situation, between industrial activities and services. Also, construction activity is very complex, as a result of a series of characteristics that define its activity, procurement and organisation. Its ultimate purpose is to design and complete a series of products (or facilities) and their subsequent commissioning for use, either free or with the corresponding
payment to a third party (Groàk, 1994). In the former case, the owner (client, promoter or developer) is public, and in the latter, the owner may be private (generally) or public (in some cases). In the context of this book, 'facility' is any building or civil engineering infrastructure (Wideman, 2003); the term 'infrastructure' will be also used synonymously through the text.

The construction industry can be viewed as a process that takes into consideration not only the execution (construction) of the facility, but also its feasibility analysis, design and operation (Groàk, 1994). This notion of process is equivalent to that of life-cycle (Levitt, 1965); it entails a set of phases starting with the initial concept and ending with the demolition of the facility, if necessary. Within the life-cycle approach, five main phases can be seen (Cleland, 1999): 1. feasibility, 2. design, 3. execution, 4. commissioning and operation – including maintenance – and, if required, 5. dismantlement. Different contracts can be present in each phase, either in series or in parallel (Figure 1.1). These contracts imply that the owners, as well as the companies involved, have to manage complex interfaces (Winch, 2010); an example of this would be the interpretation of the design by the contractor. The competitiveness of the companies working in this sector depends on the efficient operation of all the phases and interfaces. For example, an engineering consulting company may produce a good design but then it is not implemented for reasons beyond the control of the firm, or a construction site is permanently subject to stoppages because of poor management by the owner (licences, permits, etc.).

Feedback can happen over the whole life-cycle or in a part of it. To a large degree it will depend on the issues arising in the operation phase. At this phase maintenance is a key task, regardless of the operational approach and facility type. Anyway, it is important to realise that the quality and quantity of maintenance work will determine the service life of the facility. Once the regular life of the facility is over, three options are feasible (Figure 1.2): change of use, renovation or dismantlement.

The change of use of the facility is an option that focuses on a new approach to the operation phase. An example might be the owner of a building who decides to change its current rent option for selling the apartments to
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Customers (homebuyers). This involves a number of administrative and technical steps and actions in order to adapt the building to the new form of operation, but this change will not necessitate any construction works.

Renovation, with or without a change of use, can lead to many different situations. Three options are typical, depending on the nature of the renovation (Pellicer et al., 2012):

- **Structural renovation**: when the structure (mechanical framework that holds the facility) is affected, a major intervention is required starting with feasibility analysis to ensure that the facility can evolve from its current state to the required one. This is the typical case of a bridge with a damaged foundation that needs to be repaired (or, alternatively, the bridge dismantled) or a building that needs the addition of an upper storey for a new use.

- **Functional renovation**: in this case a new design is needed. An example might be the addition of another carriageway on a highway without increasing the platform (it needs the adaptation of the lighting, signalling, marking, guardrails, etc.) or the transformation of an old health centre into an office building.

- **Simple renovation**: refurbishments and repairs that do not modify the structure or design of the facility, such as changing guardrails and signalling in motorways, or changing small elements in buildings (doors, windows, bathroom remodelling, etc.).

Finally, dismantlement involves the demolition of the facility; this option can happen when the service life ends. The complexity of this phase requires a feasibility study in most of the cases, a demolition project and, finally, the
implementation of the ‘deconstruction’. Therefore, this alternative involves three sub-phases in the above scheme matching the three initial phases of the life-cycle of the facility (Pellicer et al., 2012).

Figure 1.2 summarises the whole process with their options. In this scheme, the whole sweep from the first idea to the dismantlement of the facility can be appreciated. After dismantlement, in the case of a building, there is then a vacant lot on which a new building can be built with the focus and goal that the owner deems appropriate.

1.3 Production by projects

Companies are organisations created by man and adapted to the environmental circumstances to attain specified objectives (economic profit, business survival and welfare of its employees) through the production of goods or services. Production can take place traditionally or by projects. Traditional production follows the common logical process: design, production, marketing and sale of the product. In production by projects, the traditional order is modified: first an idea is sold to the client, then the contract is signed and, finally, a unique product is developed, adapted to the client’s changing requirements (Pellicer, 2007). A project can generally be seen as a temporary organisation established in order to create a unique product or service. Based on this idea, production by projects focuses on the business structure based on temporary teams, with members who collaborate to attain a common goal.

In traditional industry, projects are executed sporadically, modifying the common business organisational structures, which are not suitable for working with a project approach. Projects are composed of specific teams, independent of the normal production of the company. In this case, there is management of projects, but not management by projects. Companies that use a managerial approach by projects follow two types of processes: business and project-based (Gann and Salter, 2000). The first type of process is continuous and repetitive, developing routines as a result of the recurrence and frequency of business activities, increasing the formalisation, normalisation and economies of scale. Project-based processes entail operations that are not based on routine and are not very repetitive; this limits the improvement of processes, normalisation and economies of scale. However, this type of process facilitates the adaptation to the environment and innovation.

In the construction industry, projects are managed using business organisations that are prepared to work systematically with this approach (Gann and Salter, 2000). Projects involve the normal production of the company, matching orders or contracts executed for clients. Work teams are not stable. The management of projects (at the productive level) coexists with the management by projects (at the business level). Throughout the production process, there are different types of actors, depending on the phase, in addition to the companies that operate in diffuse coalitions with other organisations throughout the
process (mainly in relations of owner–contractor–subcontractor). The feasibility and design phases are the basic field of action for engineering and architecture consultancies; in accordance with the degree of definition, the 'project' (in general) may consist of a feasibility study, a basic design project or a complete design project, among other elements. The construction phase is the main field of action of construction companies. In this case, the 'project' is represented by the actual construction works. Engineering and architecture consultancies can also participate in this phase through the inspection of the construction works acting as project managers on behalf of the owner. Other types of companies can appear throughout the construction process, with an important impact on other phases or on the whole process, such as, for example, developers (in private initiatives), service companies or concessionaires.

A typical business model is outlined in Figure 1.3 (Pellicer et al., 2009), and is based on an open systems approach in which the company interacts with the external environment. Each project originates in a bid prepared by the company to fulfill a request from a client. A signed contract between a company and a client follows, although this contract may be a verbal one. The aim of the contract can be any work that a company can perform during the construction process: feasibility studies, design documents, building infrastructures, maintenance works and so on. The production of the company is run by projects.

Resources are needed to deliver the end product. They may be internal (human resources, equipment and infrastructure) or external (supplies and subcontracting of human resources and equipment). It is likely that some of the company's resources will have to be transported from the central office to the work site in order to carry out a construction project. In addition, the firm
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is hierarchically organised, with well-defined personnel categories and work posts. This requires not only manpower, technicians and experts, but also administrative personnel. Moreover, every employee has a supervisor who oversees his/her work.

As stated previously, the activities that take place in a construction firm can be productive or administrative. The former are project-based, whereas the latter are business-focused (Gann and Salter, 2000). Administrative activities are non-productive activities, carried out mainly by administrative personnel who cannot be exclusively associated to a specific contract; consequently, they are calculated as overhead.

The construction companies follow a complex planning process, since production is discontinuous as a result of new contracts being constantly added. Strategic planning (long-term) depends on the political–economic cycle, with an irregular and hard-to-predict demand. Operational planning (short-term) is complex, since projects are subject to delays and changes caused by clients or third parties. These companies need to constantly adapt their organisation, in order to reallocate resources between different projects (Pellicer et al., 2009). The ideal objective is to achieve a continuous production, attaining the objectives, prioritising projects that provide an added value to the company and smoothing out the work peaks.

1.4 The construction industry

The purpose of this book is to describe the construction phase of the facility life-cycle, so the text will only focus on this phase from next section on. The productive activity of the construction phase is defined by the works execution, which presents specific peculiarities that condition the existence, structure and operation of companies working within this phase. The production starts after an order is placed. On the one hand, the product is unique: there are no two identical products, and the difference lies in the interaction with the terrain. In addition, production is temporary and intermittent: it has a start and an end. Finally, the construction procedures employed are not usually identical and, in many cases, can be subject to mechanisation. Other specific peculiarities of construction as a productive activity are (developed from Nam and Tatum, 1988):

- the final product involves a facility built on a specific site; the construction activity is carried out within the same place where the product will be set and not moved, which implies the spatial dispersion of the production process
- production is divided into many different parts. It can take place on any site of human activity, regardless of its importance, or even at any point of the world geography where a facility needs to be built. Construction sites constitute a relatively autonomous centre of work
- the finished product is extremely heterogeneous, given the large diversity of applications of construction products
- the size and complexity of the final facility is variable
- there are physical determining factors of the production process: topography, geology, use of natural resources, weather, urban planning, etc.
- the personality of the technicians taking part during first the design and then the construction has an impact on the final result.

The typical characteristics of the sector not only derive from the peculiarities of the final product and the production activity, but are also imposed through the market by demand factors (Pellicer, 2007). Demand from the private sector is materialised randomly in time and location. One of the immediate consequences is the low transparency of the market. In addition, as a consequence of its dispersion and division, there are large geographical fluctuations. The opacity of public demand is significantly lower, as a result of the legal requirements of publishing the tender prior to the awarding of the contract. In any case, the different bidders must compete in order to be awarded the contract. In most cases, the contract is awarded to the lowest bidder. As a consequence, the price of the product is formalised before the production takes place. This circumstance forces the entrepreneur to adjust the profit margins with a great precision. In some cases, particularly during slumps in the economy, bids can be so low that the entrepreneurial surplus can be zero or almost zero, where the only benefit would be ensuring their presence in the market for a period of time.

Therefore, it can be inferred that the sector is characterised by the production of heterogeneous and highly differentiated goods, which takes place in many different places and under different circumstances, with processes that are not usually subject to mechanisation, and working in many cases by order (Nam and Tatum, 1988). There is a strong correlation between economic cycles and production in the construction industry. During economic boom periods, the sector is one of the main driving agents of the economy, with indicators that are clearly above the mean, producing a pulling effect on the economy as a whole. But during depressions, the sector clearly drops below the average, especially regarding private investment. Therefore, public investments in infrastructure is a priority for public expenditure and a basic tool for the state’s policy of boosting the economy during slumps; they also promote regional equilibrium, aiming at major social and economic objectives, including the stimulation of the creation of employment, favouring economic and social development. This is usually a key factor in the cohesion funds provided by the European Union. For example, Spain has directed the greatest part of the European Union’s cohesion funds during the past few years to public infrastructure, mainly roads, railways and wastewater treatment plants. When the funds decreased (along with the increasing financial and property crisis), the Spanish construction industry lost energy; a similar situation happened to the UK, even though in this country the bubble was not so large. Nonetheless,
as can be seen in Figure 1.4, there are still five countries (Germany, France, Italy, the UK and Spain) that hold approximately 70% of the production in construction in 2011 for the EU-27 (data obtained from FIEC, 2012b).

In accordance with data provided by the European Construction Industry Federation (FIEC, 2012a, b) regarding data from 2011 for the European construction industry (EU-27), the investment was €1200 billion, the average weight compared to the GDP was 9.6%, and employment comprised 7.0% of the total. The average investment in civil works was 22%, while the rest (78%) was concentrated on buildings, being 33% of the total for maintenance and refurbishment of these, as shown in Figure 1.5 (data obtained from FIEC, 2012b).
The current state of the European construction industry is generally stagnant, because of the economic crisis that is mainly affecting the southern European countries (FIEC, 2012a). In addition to the general characteristics of the construction industry, residential building (also referred to as the housing market) has some specific properties:

- the market includes not only the acquisition of homes, but also rental
- prices cannot be easily compared
- demand and supply operate with small delays in time
- the acquisition of a home generally depends on a mortgage loan to finance it.

Production in the construction industry does not have a high industrialisation capacity (and it cannot be easily replicated), despite the massive use of prefabricated materials. Final assembly is carried out within a specific location, with different topographical, weather, geological, hydrological, social and cultural characteristics. As already mentioned, demand determines prices, in accordance with local circumstances and the degree of entrepreneurial concurrence, which causes the variability in prices in the different local markets (Winch, 2010). Nevertheless, there is a correlation between the construction prices and income per capita, since costs – and especially manpower costs – are higher in developed countries. The construction sector in each country is also influenced by issues that offer a different analysis per nation: cultural habits, unreliable data, the predominance of small and medium companies, the informal economy, the legal and illegal migration and the high degree of subcontracting.

1.5 Construction companies

Construction companies transform the design into a facility ready for users. The production of these companies is the construction of a facility using a series of specific processes and procedures. The construction project starts with an order or contract with the client; it can be public (common in civil engineering) or private (more frequent in building). The execution of the construction works is based on a design project. The setup of the construction project is in the same site where the facility will be located. Therefore, a construction company is disseminated throughout the different construction sites where the company has construction projects under way. Construction companies coordinate the set of specialised suppliers and subcontractors with the purpose of executing the works. The supplies or inputs required are: labour force (own and subcontracted), equipment and machinery (own and subcontracted), materials, vehicles, offices and so on.

Currently, there is a strong trend towards diversification. Construction companies are frequently involved in the maintenance and operation of existing infrastructures; they also act as concessionaires and public-private
consortiums that have made a big impact on the market, through PFI/PPP contracts (Winch, 2010). Apart from the concession business, during recent decades, European construction companies have expanded their traditional business in order to include the management of utility services in general and infrastructures, in particular. These include waste management, urban furniture, sewage maintenance, public gardening, parking facilities and technical inspection of vehicles. This way, these companies have diversified their risks (out of the construction field) and invested their profits into businesses that allow increased synergies.

The next step (or a parallel step depending on the company and country) was the implementation of the main business (construction) in foreign countries – both developing and developed – with a minimum judicial security (Ofori, 2003). Consequently, foreign income represents an important percentage of their final turnover. Two factors have driven these companies to begin a process of international expansion. In the first place, construction has unfavourable characteristics from the point of view of risk: it is a very cyclical business with projects that take a long time to mature and the risk of cost increases, placing their financial viability in danger. The second factor is the strength that companies in the sector have acquired through decades of fierce competition, which shows a great capacity for managing their businesses. This international expansion is possible because of their in-depth knowledge of managing very complex projects (Bon and Crosthwaite, 2000). It meets several targets (Box 1.1), the main ones being: to reduce the risk of a cyclical business such as construction; to obtain additional contracts and turnover.

Box 1.1 What are the main reasons for a contractor to internationalise its business?

1. Related to need:
   a. The internal market is stagnant.
   b. The competition among companies is very high.
   c. There are unused resources in the company.

2. Related to opportunity:
   a. International relationships offer timely actions to the company, either alone or in joint ventures with other partners.
   b. Key clients go abroad and require support.
   c. Foreign markets need specialised companies.

3. Related to strategic vision:
   a. Entrepreneurial spirit and business vision.
   b. Acquiring prestige and improving the image of the company.
   c. Growing in size (manpower, contracts and turnover).
   d. Reducing the risk by diversifying markets.
   e. Increasing the profitability.
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Furthermore, each contractor can adopt several strategies for starting to work in a foreign country (Box 1.2), depending on the reasons for its internationalisation (internal analysis), the opportunities detected in the foreign country (external analysis) and the resources to hand. The case study presented in Box 1.3 can be also analysed as a real example of implementation.

The typology of these companies is very varied. The most common classification takes into account the size, in accordance with their production, but classification according to the number of employees can be misleading, due to the high level of subcontracting existing in the sector. The area of operation of the company can be decisive; there are companies that operate in local, regional, national or international markets. They can also be classified according to their specialisation. A common major division is between civil engineering and building; another is the type of client (public or private). Usually, large companies operate in national and international markets and offer wide-ranging services. Table 1.1 shows the top 15 contractors in the world (data from 2011). The first company (Hochtief AG) has belonged, since June 2011, to Grupo ACS (ranked second); thus this group has more than three times the revenues of the third company (Vinci).

Regarding the structure of business costs, 30% of the cost relates to human resources (regardless of the percentage of subcontracting), although technicians represent less than 5% of the company’s costs. Of the production, more than 80% comes from the supply of materials and equipment, and the subcontracting of machinery and manpower. Billing must be done every month (generally through unit prices or lump sum contracts). The rotation of capital could even finance a company (Pellicer, 2007): 1. work is carried out; 2. the company’s human resources are paid; 3. invoices are issued; 4. payment is collected; and 5. subcontractors are remunerated. The relative profit varies between 1 and 5%; even though the relative value seems low, the absolute value is high.

Box 1.2 What are the strategies for a contractor to start working in a foreign country?

1. From the point of view of partnering, the company could:
   a. perform as a subcontractor hired by a main contractor from the same country of origin
   b. act alone as a main contractor
   c. form joint ventures with other companies.
2. From the point of view of the in-depth integration in the country, the company could:
   a. bid for construction projects from its country of origin
   b. create a branch or subsidiary firm in the foreign country
   c. buy a local company in the foreign country.
Box 1.3  Skanska, a case study of continuous adaptation to the market

Skanska is currently the ninth contractor in the world according to 2011 revenues (ENR, 2012). The company's mission is to develop, build and maintain the physical environment for living, traveling and working, whereas its vision is to be a leader in its home markets – the customer's first choice – in construction and project development (Skanska, 2012). The history of the company's earlier years is linked to Rudolf Berg, a chemical engineer who was appointed president of the cement producer *Skånska Cement*, founded in 1873 in Limhamn (Sweden). At that time, cement was mostly used for bricklaying. However, Berg perceived the huge potential for this material and developed a new casting technique. In 1887, he founded *Aktiebolaget Skånska Cementgjuteriet* (Skansa Precast Cement) in Malmö. The original purpose of the firm was the manufacture of cement-based decorative building elements, used for decorating Sweden's public buildings. Under the engineering vision of Berg, the company moved into the production of construction materials using concrete, mainly concrete pipes and floor plates. During that time, the French engineer François Hennebique (1892) patented the modern reinforced-concrete method of construction, and Berg took advantage of the system specialising the company in concrete structures. In 1897, Skanska had its first international contract: the supply of 100 km of hollow concrete blocks used for supporting telephone cables; the client was the UK's National Telephone Company. Yet in the 19th century, Berg's vision was to conduct a globalised business...

The change of century brought Skanska a huge contract, replacing the sewer system of St Petersburg, using concrete pipes. Throughout the following decades the firm contributed greatly to the development of infrastructure in Norway, Denmark, Finland and Sweden: roads, power plants, commercial and residential buildings. The company finished the Sandö Bridge in 1943: a 264 m span that was the world's longest concrete-based arch-bridge until the 1960s. The company also developed the Allbetong method, prefabricating elements for large-scale building projects; these elements were manufactured in Skansa's factories and put into place using construction cranes.

During the 1950s Skanska expanded internationally, moving to South America, Africa and Asia. At the beginning of the 1970s the company started to work in Poland, the Soviet Union and the USA. During the 1990s, Skanska had become one of the top US contractors, being involved in a large share of the Boston's Central Tunnel. Skanska was also a major shareholder in the Sundlink Consortium which won the contract to construct the Öresund Bridge and tunnel, linking Sweden with Denmark.

(Continued)
1.6 Organisational structure of a construction company

A company has to be managed effectively and efficiently in order to reach objectives planned by the upper management. This process is developed according to the procedures and policies previously set by the company. However, the main function of the company is production; and for a contractor, production means the construction of facilities or infrastructure (building or civil engineering). This process takes place within an organisational structure (Griffith and Watson, 2004). The organisation is the framework within which the company’s tasks are divided, grouped and coordinated. The design of this structure for a construction company involves a decision-making process focused on the specialisation of tasks, chain of command, amplitude of control, decentralisation, formalisation and departmentalisation (Robbins 2004).

Table 1.1 Top 15 international contractors considering only projects outside their home countries (based on primary data from ENR, 2012).

<table>
<thead>
<tr>
<th>Rank</th>
<th>Firm</th>
<th>Revenue $ mil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hochtief AG, Essen, Germany</td>
<td>31 871</td>
</tr>
<tr>
<td>2</td>
<td>Grupo ACS, Madrid, Spain</td>
<td>31 148</td>
</tr>
<tr>
<td>3</td>
<td>Vinci, Rueil-Malmaison, France</td>
<td>18 674</td>
</tr>
<tr>
<td>4</td>
<td>Strabag SE, Vienna, Austria</td>
<td>17 289</td>
</tr>
<tr>
<td>5</td>
<td>Bechtel, San Francisco, Calif., USA</td>
<td>16 700</td>
</tr>
<tr>
<td>6</td>
<td>Saipem, San Donato Milanese (Milan), Italy</td>
<td>14 110</td>
</tr>
<tr>
<td>7</td>
<td>Fluor Corp., Irving, Texas, USA</td>
<td>13 527</td>
</tr>
<tr>
<td>8</td>
<td>Bouygues, Paris, France</td>
<td>12 608</td>
</tr>
<tr>
<td>9</td>
<td>Skanska AB, Solna, Sweden</td>
<td>12 339</td>
</tr>
<tr>
<td>10</td>
<td>China Communications Construction Group Ltd., Beijing, China</td>
<td>9 547</td>
</tr>
<tr>
<td>11</td>
<td>Technip, Paris, France</td>
<td>9 313</td>
</tr>
<tr>
<td>12</td>
<td>FCC Fomento de Construcciones y Contratas SA, Madrid, Spain</td>
<td>8 570</td>
</tr>
<tr>
<td>13</td>
<td>Construtora Norberto Odebrecht, Sao Paulo, SP, Brazil</td>
<td>7 351</td>
</tr>
<tr>
<td>14</td>
<td>Bilfinger Berger SE, Mannheim, Germany</td>
<td>7 146</td>
</tr>
<tr>
<td>15</td>
<td>Samsung Engineering Co. Ltd., Seoul, S. Korea</td>
<td>5 907</td>
</tr>
</tbody>
</table>
The chain of command is the uninterrupted line of authority flowing from the highest levels to the lowest levels of the organisation. The organisation’s hierarchy is specific, involving three fundamental concepts: authority, responsibility and unitary command. The hierarchical definition of each position is fundamental for the company’s staff to inform and issue orders, and for employees to receive information and orders. The amplitude, control and consequently the number of levels of authority, must be sufficient to ensure a straightforward organisational structure, which can be flexible enough to adjust to the changing conditions of the market. The growth of the company involves a higher delegation of authority and responsibility.

Departmentalisation is the base on which tasks are grouped, in order to attain the organisation’s objectives. Each organisation has its own way of classifying and grouping activities. Departmentalisation can be achieved by functions, products, geographical location or clients (Robbins and Coulter, 2010). Construction companies with a national or international scope usually have a geographical departmentalisation originating from business strategy and proximity to production issues. Within each geographic department (or branch) there can be a division by functions or products. Often, these branches are almost fully autonomous, depending on the central office for making critical decisions or for the generation of corporate policies. Smaller companies, with a local or regional character, have structures that are almost flat, whereby all employees report to the management. The degree of decentralisation, delegation and formalisation increases when companies grow in size.

The departmental structure is shown in the organisational chart of a construction company, in Figure 1.6. The organisational chart must not be simply seen as a graphical representation, but must also define the positions with their hierarchical relationships, establishing the objectives, functions, responsibilities and tasks. Usually, an organisational chart simply defines the management areas, line of support or ‘staff’ services and operational or ‘engineering’ line. The staff services have assistance functions: administration, ICT, clerical and so on. Line services have command functions covering personnel and technical functions over the company’s productive activities.
Safety and health, environmental management, quality assurance and, recently, innovation (sometimes also including research and development) usually have their own areas, separated from the remaining departments of the company but directly linked to the board of directors (Harris et al., 2006).

In a construction company, the staff line is often divided in two independent departments: administration and commercial (Figure 1.7). The commercial department is very important in a construction company. They are in charge of tendering, bidding and public relations. The tendering process is basic in order to obtain new contracts to guarantee the permanence of the company in business. Usually, there is a period of one to two months to prepare a bid; the final economic proposal is established by the management area, depending on the business strategy (Harris et al., 2006). In general, although this might depend in the region, type of works and circumstances of the market, it could be considered 10% as the optimum awarding percentage.

The administration department includes: general services (reception, courier, photocopying ...), ICT (information and communications technologies), finance, accounting, human resources and legal matters, among other areas. Currently, as a result of the operational decentralisation of medium and large companies, the adequate use of ICT is critical (smart-phones, laptops, tablets, iPads, email, internet, intranet, extranet, etc.); they can facilitate the transmission of information between the headquarters, branches and each of the
current construction sites. Therefore, a specific service is required within the company to manage the purchase and use of these basic tools; the ICT department is usually responsible for such tasks (Harris et al., 2006).

The engineering or operational macro-department is usually divided in three departments: construction, technical support and purchasing (including subcontracting). The construction department is fundamental in these companies, since it groups the works teams in accordance with their geographical area, type of works, client and so on. (Figure 1.8). After the awarding of the contract, the team responsible for its execution is emancipated from the company, establishing its own independent organisation which is used to execute the construction project. The real value of the company is mainly generated by the personnel working at the construction site.

The technical support services are usually located at the headquarters. They are used to offer their help in areas related to the design and detailed calculation of some elements, and to draft (totally or partially) ‘as built’ projects.

The purchasing department has an importance that depends on the degree of subcontracting of the company, as well as the extent and management of the company’s own equipment. In some companies, it works as an independent business unit, renting the equipment internally and to third parties. In others, it operates as an internal service department, supplying the equipment required for each contract. In other cases, the company subcontracts the machinery supply to third parties for each project, thus avoiding maintenance and the internal management of the plant (Harris et al., 2006).

In large construction corporations, the general organisational chart presented in Figures 1.6, 1.7 and 1.8 can be replicated for each regional branch.
Another frequent option is the creation of intermediate organisational structures that maintain the centralisation of some staff departments (finance, personnel, legal, etc.) or the areas assisting the board of directors (quality control, health and safety, innovation, etc.).

### 1.7 The construction site within the construction company

As explained, during the construction phase, the design project has to be executed with the purpose of transforming it into an infrastructure that can be finally used. Therefore, the owner (client, promoter or developer) issues its orders to the construction company (or contractor) during this phase, generally through contracts. There is generally a representative of the owner for each contract (or construction project) that has administrative functions as well as inspection functions, depending a great deal on the type of contract and context (Fisk and Reynolds, 2006); this agent is called the resident project representative (USA), project manager (UK), facultative director (Spain), supervisor (Chile) or inspector (Colombia), depending on the country. The construction company manages different construction projects, on different sites and with a temporary limitation, all within the same business structure. The business organisation must take into account this plurality of production centres.

Each construction site manages its own human resources and materials. This organisation is simpler and more flexible than that of the company. Again, geographical dispersion and the immobility of the infrastructure is essential, and leads to different logistical problems at the construction site, regardless of the type of infrastructure or contractual conditions. The construction project requires a maximum degree of centralisation, as opposed to the decentralisation that is so common within companies. To sum up, the organisational structure at the construction site must be simple, with clear lines of dependence, while being flexible in order to adapt properly to the environmental circumstances (Pellicer et al., 2012).

A key element of the construction project is the construction site manager who performs as representative of the contractor (Dulaimi et al., 2005). This position is filled by a qualified technician in charge of the administration of the construction project, assuming full responsibility for planning, organisation, leading and control. This work post is generally filled by a university graduate. In addition, the construction site manager acts as the link between the company's macro-organisation and the works micro-organisation. The construction site manager is the last management step of the corporate ladder, but they are the top managing authority at the construction site (Figure 1.9). Under this position, there is a reduced team of technicians whose responsibilities include the execution, quality, risks prevention and surveying, among others.
In most cases, clients, collaborators, subcontractors, final users and even competitors look at the company in terms of the individuals who are managing the construction project (Winch, 2010). Thus, it is important to know how to transmit a good image of the company from the basic production centre represented by the construction site. The construction site manager is the driving agent of corporate culture, since they operate as the essential contact with the client, subcontractors and the social environment in general. If they are successful in their mission, they can be promoted up the corporate ladder. In most cases, the executives of construction companies are technicians who were promoted after spending much time and gaining experience through many construction projects.

References


Figure 1.9  The construction site manager as the link between elements in the organisation.


**Further reading**
