

# 1

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‘Even in the information economy, geography matters!’

(Goddard 1990, p. xvii)

*The Internet on Earth: A Geography of Information*, the title of this book, sounds, hopefully, straightforward. Read it again now: *The Internet, on earth! A geography of information?* The meaning of the title now looks almost the opposite of the first reading. The following chapters attempt to convince those who tend to read the title in its second punctuation, to accept the first one. Thus, we shall go through various of their components in order to develop a geography of the Internet/information.

The geography of information is interrelated with other aspects and dimensions of information. This chapter will present some of these, beginning with differentiations among several types of information, and following with elaborations on information society, economy, politics, and law. These discussions will highlight, among other things, related spatial aspects.

### 1.1 Information and Knowledge

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*Information* is a term used in ambiguous ways, notably since the introduction of information technology, which has permitted the storage, processing and transmission of enormous quantities of information in electronic formats. On the one hand, it refers to a wide family of communicative, mostly codified, materials, which include data, information as a class, knowledge and innovations. As Roszak (1991, p. 13) noted: ‘in its new technical sense, *information* has come to denote whatever can be coded for transmission through a channel that connects a source with a receiver, regardless of semantic content’. On the other hand, the term information is also used for a

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specific class of communicative materials, to be defined in the next section. Information at large is obviously something intangible, although its containers or media have traditionally been material objects, mostly in the form of paper products, such as books, magazines, letters, documents, lists, etc. The emergence of electronic transmission and storage media, such as radio, TV, cassette recorders, followed later on by computers and the Internet, has once again accentuated the intangible and abstract character of information.

### *1.1.1 The information sequence*

The communicative materials, data, information, knowledge and innovation, have each received numerous independent definitions. However, it is also possible to refer to them as a sequence, in which data lead to the production of information, which, in its turn, may lead to the development of knowledge, and vice versa. Knowledge, for its part, may bring about the development of innovations (see Malecki 2000a, p. 104). We shall first review some of the definitions for each of the communicative materials.

*Data:* 'A series of observations, measurements, or facts in the form of numbers, words, sounds and/or images. Data have no meaning but provide the raw material from which information is produced' (Roberts 2000).

*Information:* Information per se, as a class of communicative materials, has received numerous definitions, estimated at over 100, proposed in about 40 disciplines (see e.g. Machlup 1983, Braman 1989). It was claimed *to be* an activity, a life form and a relationship (Barlow 1994). It was further seen *as* resource, commodity, perception of pattern, and a constitutive force in society (Braman 1989). From a sequential perspective, information is 'data that have been arranged into a meaningful pattern. Information must relate to a context for it to have meaning' (Roberts 2000, see also Borgmann 1999). Porat (1977, p. 2) similarly defined information as 'data that have been organized and communicated' (see also Castells 2000, p. 17).

*Knowledge:* Definitions of knowledge refer to its relation to information. It has, thus, been defined as 'the application and productive use of information. Knowledge is more than information, since it involves an awareness or understanding gained through experience, familiarity or learning' (Roberts 2000). For Roszak (1991, p. 105) 'ideas create information, not the other way around. Every fact grows from an idea'. Other commentators, however, such as Boisot (1998, p. 12), argue that 'knowledge builds on information that is extracted from data'. A kind of two-way relationship between knowledge

and information was illuminated by Neil Postman (1999, p. 93) as follows: ‘I define knowledge as organized information, information that has a purpose, that leads one to seek further information in order to understand something about the world. Without organized information, we may know something of the world, but very little *about* it. When one has knowledge, one knows how to make sense of information, knows how to relate information to one’s life, and, especially knows when information is irrelevant’.

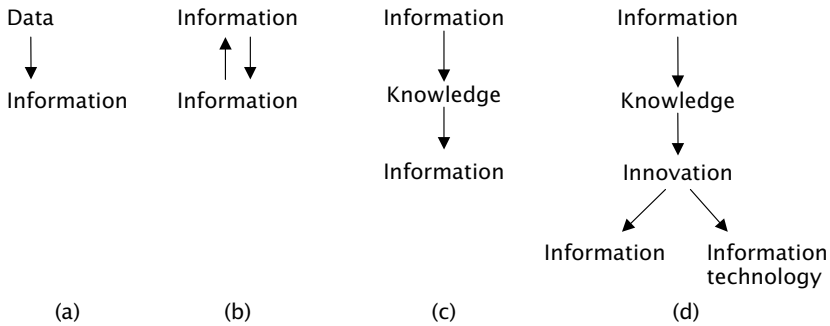
Bell (1976, p. 175; see also Castells 2000, p. 17) added to knowledge the communications element: ‘knowledge is a set of organized statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form’. On the other hand, knowledge may also be created without information and communications: ‘Information is acquired by being told, whereas knowledge can be acquired by thinking... Thus, *new knowledge can be acquired without new information being received*’ (Machlup 1983, p. 644). By the same token, ‘information transfer is always necessary to knowledge exchange, the reverse is not always true’ (Storper 2000b, p. 56).

There are communicative materials which are difficult to classify as either information or knowledge, such as the so-called *meme*. An example in this regard are work practices, norms and conventions transferred through behavior and imitation (Storper 2000b, pp. 56–57). Similarly, Thrift (1985) discussed knowledge availability to humans, through both individual and societal social action, defining knowledge simply as ‘information about the world’ (p. 367).

*Innovation*: It may be defined as the creation of new knowledge, through an intrinsically uncertain problem-solving process based on existing knowledge and/or information. Innovative knowledge may lead to the introduction of innovative products or the application of a novel production process, either through radical breakthroughs or through incremental improvements (Feldman 1994, p. 2, Feldman 2000, pp. 373–375). Knowledge may thus be viewed as an asset, which serves as an input (competence) leading to an output, in the form of innovation, which may thus be viewed as another kind of knowledge (OECD 2000a, p. 13). The role of innovation has become of major contemporary importance, since about 80% of productivity growth in advanced countries has been attributed to innovation (Sternberg and Arndt 2001).

Following the definitions for the four communicative materials, we may recognize four basic sequential processes for information at large, accentuating its transformative and communicative nature (Figure 1.1). In the first,

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**Figure 1.1** The information sequence

data are turned into information through meaningful patterns and context. In the second, information yields information, such as in a spoken or written exchange between two or more people. In the third, information turns into knowledge, through its application and use. However, knowledge may yield information, and knowledge is required for the additional development of information (Roberts 2000). Innovation, or the creation of new knowledge, notably of applied nature, is dependent on previously existing knowledge, tacit as well as codified, and information. On its part it may yield new information technology, as well as new information.

### *1.1.2 Information classification*

There are various ways to classify information as a class of communicative materials. One simple classification is by contents: social, business, entertainment, news, educational. Traditionally, there have evolved close ties among several of these information types, through the technologies used for their production or transmission. Thus, books and articles share similar printing technologies, entertainment and news are transmitted through radio and television, movies also include voice and music, and the telephone is used for both business and social conversations.

Computer-based multimedia technology was noted by Castells (1996, pp. 371–372) as enabling an ‘integration of all messages in a common cognitive pattern’. While the messages of an educational movie may differ from that of a news broadcast, their operational contexts may be similar, using icons, video-games, audio-visual shows, etc. Thus, multimedia can be used to present a wide variety of cultural expressions. The most integrative

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information technology is the Internet. This computerized information system functions as a comprehensive information store, containing all types of information, regardless of contents or form.

Another most basic classification is by form: text, data, graphics, voice, and picture. From the perspective of information production and transmission, major developments in transistor and computer technologies as of the 1970s, have turned all these information types into similar digital bit formats, differentiated mainly by the channel bandwidth required for their transmission. From the perspective of information users this classification has lost much of its significance through the introduction of the Internet in the 1990s, permitting integrative transmissions of information in every form through a single channel, transforming all information forms into electronic signals (see Kellerman 1997).

A third simple classification of information has focused on information transmission, distinguishing between information producers or senders, transmission media or telecommunications channels, and information receivers or users. However, as far as the Web system of the Internet is concerned, information may be produced and installed on the system, but not necessarily consumed by anybody. In other words, if nobody calls for a certain site, it will neither be transmitted nor received or used. Thus, electronic information has to be classified into designated and undesignated. Designated information is information which is transmitted to specific individual receivers (such as telephone calls or fax transmissions) or to specific audiences (e.g. CATV), whereas undesignated information is put on a transmission device (i.e. a host), and potentially received by any number of users.

An alternative classification which would fit mostly electronically transmitted information may look at it as something that does not stand for itself, but is rather woven into the wider context of social or economic processes. Information constitutes a resource or product, which may thus either be free of charge or involve a price for its use or purchase (see also Zook 1998). Four types of information may be recognized by economic process (Kellerman 2000a):

*(1) Pure information:* Personal, academic, and some business information, in the form of e-mail, or website information, is provided at no charge (other than for its transmission), and with no intention to create or promote purchases. Thus, some of this information is designated (e-mail), and some is not (websites).

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(2) *Information as part of sale processes*: Information transmission over the Internet has often become *part* of the sale process of both products (e.g. books) or services (e.g. airline tickets). This type of information is undesignated in most cases. However, it may turn designated, once a purchase is made (e.g. order confirmation or progress reports). Such types of information are currently part of the marketing systems of almost all material products, as well as of many services.

(3) *Information as product*: Information itself may be sold over the Internet (e.g. astrological forecasts) to any undesignated customers. Here too, once a sale has been executed, the information transmission becomes designated.

(4) *Products transformed into information*: Probably the only real product transformed into electronic information is also the most powerful one – money. Capital as a resource or as a product is currently transmitted almost exclusively over telecommunications channels, not necessarily over the Internet. The transmission of capital is obviously highly and most clearly designated.

The transmission of pure information through voice telephony, as of 1876, and later on of text and graphical transmission through fax (type 1), paved the way for the transmission of capital in the form of data as of the 1970s (type 4). The construction of dense domestic and international telecommunications networks facilitated the evolution of the Internet as of the late 1980s–early 1990s, so that electronic information could be integrated into sale processes (type 2), and information itself could be sold (type 3). The emergence of the Internet has enhanced the transmission of pure information and capital, making possible their transmission in more sophisticated ways than before.

### 1.1.3 Knowledge classification

There are numerous classifications of knowledge (for a review, see Howells 2000). The classification of knowledge dates back to Aristotle, who distinguished between three types of knowledge: *èpistemé*, or theoretical and universal; *techné*, instrumental knowledge, practice related, and context specific; and *phronesis*, experience-based, normative, related to common sense and context specific (Johnson and Lundvall 2001, p. 6). A recently proposed classification of knowledge into four types may be partially related to this ancient classification: know-what (facts); know-why (principles, similar to *èpistemé*); know-how (skills, similar to *techné*); and know-who (socialization) (Johnson and Lundvall 2001).

Another dominant classification of knowledge is into codified, or explicit, and tacit, or implicit (Cowan *et al.* 2000, Roberts 2000). Codified knowledge is recorded or transmitted through symbols (letters and letters turned into words and sentences, as well as digits and drawings), whereas tacit knowledge develops through learning, and is, thus, similar to know-how (skills). These two forms of knowledge complement each other, and they are normally present in any specific piece of knowledge. Codified knowledge can be converted into information and is mostly viewed, therefore, as more easily transferable through information technology, whereas tacit knowledge is more readily transferred through the transfer of knowledge-bearers, namely people (see Cowan *et al.* 2000, Roberts 2000, Johnson and Lundvall 2001). It is arguable, though, whether tacit knowledge is becoming less important than codified knowledge in an era of proliferating information technology, notably because ‘tacit knowledge remains a prerequisite in *all* knowledge activities’ (Howells, 2000, p. 61). Common professional education of people from different countries makes them talk the same professional language, thus assisting in the transfer of tacit knowledge (Storper 2000a, p. 157). As we shall note in Chapter 3, tacit knowledge is a crucial key for the innovation process in the development of new technologies.

#### 1.1.4 *Information, knowledge, and geography*

From a spatial perspective, information at large might be viewed as a rather *active* action that occupies time but does not occupy space at all (Barlow 1994), or it may be defined as something that is only *passively* contained within one’s mind, when viewed as ‘anything that is known by somebody’ (Machlup 1980, p. 7). On the other hand, information might be seen as something that is constantly moving over space: ‘information that isn’t moving ceases to exist as anything but potential’ (Barlow 1994, p. 7). The spread or movement of information differs from the movement of material objects in that ‘it leaves a trail everywhere it’s been... information can be transferred without leaving the possession of the original owner’ (Barlow 1994, p. 7). Thus, its impact on places may potentially be much more significant, when compared with those of other entities which are fully moving or being fully moved from one place to another.

In terms of location, information has been defined as a ‘compromise between presence and absence’, since it represents a ‘form of something without the thing itself’ (Latour 1987, p. 243). Communicating information is, thus, ‘being; persons literally occupy the media they use; their existence cannot be separated from these symbolic systems’ (Adams 1995).

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Information, though being abstract and most flexible for electronic processing and transmission, has a simultaneous presence in places of origin and destination. Towards its transmission over space, it may be packaged and transformed. Furthermore, its interpretation and uses may change from one receiver to another, so that the same piece of information may embed differently in various places, thus bringing about different aggregate geographical patterns.

These various statements or definitions point to three major geographical aspects of information at large, similar to other human products: production, flow, and consumption or dissemination. None of these aspects is new or related in principle solely to the contemporary introduction of information technology. This technology rather has changed the scale and form of information production and consumption, as well as the speed of its transmission. If the major traditional container of information was paper, followed later on by films and electro-mechanical signals (through the telephone), more recent information technology has made it possible to transform all information forms into standard electronic bits, and has offered a singular channel for its transmission, the Internet. In principle, these innovations should have made the production, transmission, and consumption of information at large, ubiquitous.

The production of information, in the narrower sense of the term, differs, however, from place to place. It is not only dependent on the size of a place but also on the types of economic activities taking place and concentrated in it. Thus, the finance industry is a major producer of information, so that cities which specialize in finance tend to produce more information than others (see Chapter 4). Since the development of this industry had its roots long before the introduction of information technology, the initial and cumulative advantages in this industry have created a rather early differentiation in information production. As far as knowledge production is concerned, notably technology production, the differentiation may be even more significant, with fewer places dominating the map of technology production, with an initial and cumulative advantage obtained by cities with universities specializing in technological studies and research (see Chapter 3).

The transmission of information is dependent, foremost, on the availability of a transmission system. The more bandwidth it provides, the more and faster transmission of information it may handle. Transmission systems refer, thus, to information in terms of its size, rather than its content, pricing transmission by volume or time rather than value by content. The price of information at large may differ sharply by content, notably through the

difference between information and knowledge. The transmission of information is often considered a global phenomenon, constrained no longer by political boundaries, though this is not always the case. However, legal procedures, notably those relating to copyrights may regulate the flows of various types of information, such as movies, and much of the flows of knowledge. It is also much easier to move codified rather than tacit knowledge, though conferences and e-mail permit an accelerated transmission of this form of knowledge as well (Roberts 2000).

The consumption and dissemination of information and knowledge also may differ from one place to another, and again, not necessarily because of differences in population size. There is a need for some socio-cultural similarity or *contextuality* between the sender and receiver of information in order for a significant dissemination of information to take place (Johnson and Lundvall 2001). Such contextuality relates to major aspects such as language, education, and economic development. This is notably striking as far as the transmission of knowledge is concerned. The transmission of rather codified knowledge depends on the level of tacit knowledge at the receiving station for its dissemination (Johnson and Lundvall 2001).

The spatial dimension of knowledge, mostly as an economic resource for the recently evolving knowledge-based economy, has been highlighted by numerous authors in both economics and geography, and several readers have been recently published in this subject (Dunning 2000a, Bryson *et al.* 2000, and partially Clark *et al.* 2000). Economic knowledge has become of rather general importance, not just for high-tech industries (Bryson *et al.* 2000, pp. 1–2; see also Hodgson 1999, pp. 181–182). The elaboration of the locational and flow aspects of knowledge and innovation will be treated in Chapter 3, devoted to technology. As a conclusion, it would suffice here to note that information and knowledge are neither concentrated in one place, nor universally distributed. They present rather complex geographies of production, flows and consumption, dependent on and regulated by various factors, notably technology, social and cultural aspects, economic development, and legal procedures.

## 1.2 The Information Society

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The term *information society* has been increasingly in use since the early 1980s, though earlier terms such as the *age of information* date back to the early 1970s (Kellerman 2000b). These and other terms have emerged within

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the context of numerous attempts to coin societal transformations since the early 1950s. Beniger (1986, pp. 4–5) counted 75 such terms proposed between 1950 and 1984, almost all of which have not been adopted for the naming of our current age.

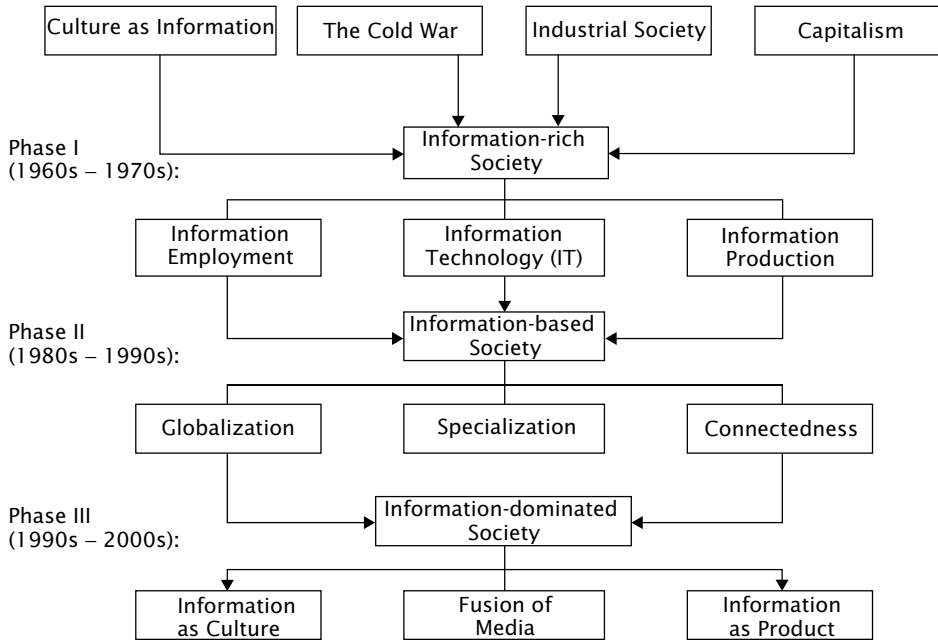
Definitions for information society highlight two of its major facets, namely the economic and the cultural. At the economic end 'in an information society, information is the most important commodity' (European Commission 1996, p. 7), whereas culturally it is 'a society that brings about a general flourishing state of human intellectual creativity, instead of affluent material consumption' (Masuda 1980, p. 3). Castells (1998, p. 67) related these two facets by claiming that information society 'is based on the historical tension between the material power of abstract information processing and society's search for meaningful cultural identity'. Castells (2000, p. 21, n. 31) also differentiated between *information society* and *informational society*. Whereas the first relates to the role of information in society, which has always been of some importance, the second relates to 'a specific form of social organization in which information generation, processing, and transmission become the fundamental sources of productivity and power because of new technological conditions'.

The information society constitutes two major processes, production and consumption. These do not necessarily have to develop to high levels in all aspects of production and consumption of information in a given national information society. At the production end, several things may be produced. One major production process may be the innovation and wide-scale production of the hardware of information society, such as computers and telecommunications devices and equipment. Another major production process may be computer software, and a third one may be information itself, notably electronic, such as Internet sites, television programs and movies.

High levels of consumption of information may too be expressed in both hardware, software and information per se. The wide adoption of telecommunications and information devices such as PCs, telephones, TVs, etc., is one indicator. Sales of software are another, as are the number and duration of domestic and international phone calls, or the proportion of homes connected to cable TV, or to the Internet.

The rise of information society during the last three decades has sometimes been viewed, explicitly or implicitly, as a single phase process (see e.g. Schement 1989, Webster 1994). Some still consider the term *information society* to be a concept rather than a mature phenomenon, claiming that Western society is still in a process of *informatization*, thus lacking clear

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**Figure 1.2** Phases in the emergence of the information society

quantitative measures to demonstrate the existence of information society (Halal 1993, Martin 1995). The following discussion outlines three stages in the development of information society: information-rich; information-based; and information-dominated (Figure 1.2). The incubation of the information society took place chiefly in the U.S., within four major societal elements: industrial society; capitalism; the Cold War; and culture as information.

## 1.2.1 Processes leading to the information society

Some commentators recently have argued that information as a major power has continuously transformed American society, since the very beginnings of European settlement in North America (Chandler and Cortada 2000). The emergence of information society, and as we shall see in Chapter 4, the largest concentration of information production, has been in the U.S. Whether industrial society has given way to information society by continuity or change, has been extensively debated in the literature (see e.g. Gottmann

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1961, Bell 1976, Kellerman 1985; 1993a; Schement 1989, Masuda 1980, Lyon 1995, Castells 1996, p. 228). On the one hand, the development of information technology (IT) with the consequent need for skilled workers who consume and produce more information, is viewed as nesting within industrial society and the subsequent service economy. On the other hand, information technologies allow 'a direct, on-line linkage between different types of activity in the same process of production, management, and distribution, establish a close, structural connection between spheres of work and employment artificially separated by obsolete statistical categories' (Castells 1996, p. 228). Thus, at a certain stage, information and knowledge may replace labor and possibly also capital as leading production factors.

Capitalism has been recognized as a major force in the emergence of an information society by facilitating the transfer of information from the public to the private sector, or 'the privatization of information' (Schiller 1981, Schement 1989). This process involved the rise of a class of technocrats in the so-called *programmed society*, in conflict with more disparate groups being governed or managed by them (Touraine 1974, Lyon 1995).

A third major force in the rise of information technology and society in the U.S. was the Cold War (Nye and Owens 1996, Lyon 1988, Masuda 1980). Computers were widely required for missiles and defense from missiles, as well as for space exploration. Furthermore, the contemporary Internet network had its roots in the earlier Pentagon ARPANET e-mail system.

A fourth major dimension facilitating the emergence of information society is the nature of cultural activity in developed societies, requiring a constant and rich transmission of written and oral information which used to be constrained by volume, form, time and distance. Thus, the very accent on information and information transmission in contemporary information society was not novel.

### *1.2.2 Information-rich society (1960s–1970s)*

With these four dimensions in place, the first phase in the evolution of information society took place between the 1960s and 1970s, and may be termed as the *information-rich society*. The characteristics of this phase included growing emphases on information production and employment in information work, mainly vis-a-vis the introduction of information technologies.

Growing employment in information-related activities has been recognized as an early and central aspect of information societies: 'The term "information society" has been used to describe socioeconomic systems that exhibit

high employment of information-related occupations and wide diffusion of information technologies' (Katz 1988, p. 1). Porat (1977) and Machlup (1962) showed that a large proportion of U.S. workers were *information workers*, employed in information-related occupations, or in the so-called *knowledge sector*, already back in the 1960s, followed in the 1970s to 1980s by other leading economies (Hepworth 1990), and growing significantly since then (Leinbach 2001). However, it was not until later phases in the emergence of information society that information became a common thread in production as well as consumption, through the introduction of personal computing and a common channel of information flow, the Internet.

The introduction of information technology via computers and telecommunications and its rapid and wide diffusion and adoption have become the driving force of information society, interrelated with the growth in information employment. The impact of information technology over the years has been on two levels. On the one hand, it has been a major enabling force for society, allowing inexpensive recording and storage, and fast processing and transmission of information (Martin 1988, p. 40, Steinfeld and Salvaggio 1989, pp. 2–3, European Commission 1996). It has also become an extensive industry in itself, namely the high-tech industry, characterized by intensive R&D and entrepreneurship.

A third major aspect of the information-rich society of the 1960s–1970s was the growth in information production. It seems obvious that the introduction of information technology and the growth in employment in information would lead to the production of larger volumes of information. However, this growth also had to do with the expansion of research and study in universities and research institutes during these decades, yielding ever increasing numbers of books and journals (Bell 1976, Steinfeld and Salvaggio 1989).

### *1.2.3 Information-based society (1980s–1990s)*

The growth in information volume, technology and employment led to a second phase in the emergence of information society, the *information-based society* of the 1980s–1990s. This phase has been characterized by three trends, all based in their part on developments in the first phase: globalization, specialization and connectedness.

The ability to move information instantaneously worldwide has become possible with the rapid development of international telephony, the Internet, and cable/satellite television. These technological breakthroughs have reduced the significance of international boundaries to the movement of

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information, so possibly weakening statism. This has been evident in various economic, social and cultural areas, including news coverage, banking, commerce, and social contacts. The pace of information production and interaction has quickened, with the shrinking of space (friction) in time.

The second phase in the rise of information society has been typified also by the rapid diffusion and adoption of *information devices*, such as telephones, cellular telephones, fax machines, personal computers, television sets and the like (Kellerman 1999a). Special appliances have evolved for specific uses of information, together with specialized suppliers of equipment, software and information.

A third characteristic of information-based society has been increased connectivity. Internet technologies have permitted the recording and transmission of all forms of information, namely text, data, graphics, voice and pictures in electronic digital bit format. Coupled with fast and low-priced telecommunications and PCs they have allowed an increased connectedness of individual customers with service providers, as well as complex connections among goods producers and service providers among themselves (Kellerman 1997). Furthermore, the interrelationship between electronic information and printed information has changed with the introduction of low-priced high-quality laser printers and optical scanners, permitting non-professional users to produce high-quality paper information products. These developments have rendered society in developed countries increasingly information-dependent (Feather 1994, p. 2, Kitchin 1998, p. 131).

### *1.2.4 Information-dominated society (1990s–2000s)*

Unfolding in the late 1990s towards the 2000s, has been a third phase in the rise of information society which might be termed *information-dominated society*. Information production, transmission and use has become a leading if not *the* leading economic and social activity, both as a product in itself and as a service leading to the production or consumption of material products. As such, three additional characteristics have been added to information society: information becoming a major product, information media beginning to fuse into each other, and information becoming a culture.

Information has increasingly become a commodity in its own right. By the late 1990s, revenues from the sale of information were matching those from the sale of material products and services. Major examples are the sale of data sets relating to Internet users, or the tremendous growth in the sales of software and TV programs. The U.S. has become the world leader in the sale and distribution of electronic information (Kellerman 1997) (see Chapter 6).

Liberalization trends in the provision of information services to households, as well as technological advances, have brought about early signs of possible fusions among different forms of information, their transmission and use. Thus it has become possible, for example, to use the computer also as a telephone, fax and TV, and receive several of these services from a single service provider. This fusion may possibly mature into a single appliance for information consumption and production, as well as so-called *public networks* of data and software (Halal 1993, Kellerman 1997).

The information society becomes, at this third phase of its development, a society with a culture of information. Some commentators have seen this as 'recognition of the cultural value of information through the promotion of information values in the interest of national and individual development' (Martin 1988, p. 40). Others believe that beyond promoting the proper and aesthetic production, transmission and consumption, the culture of information may turn into one of power:

*Cultural battles are the power battles of the Information Age. They are primarily fought in and by the media, but the media are not the power-holders. Power, as the capacity to impose behavior, lies in the networks of information exchange and symbol manipulation, which relate social actors, institutions, and cultural movements, through icons, spokespersons, and intellectual amplifiers. . . Culture as the source of power, and power as the source of capital, underlie the new social hierarchy of the Information Age. (Castells 1998, p. 348).*

Another important cultural dimension of information is the changing significance of time and space. Instantaneous written and oral communications in global space intensify the pace of work and alter working times. In terms of cultural symbolism and reality, our source and anchor have gradually been in a change from traditional national territory to a global virtual one, bringing Castells (1998) to declare that 'the space of flows of the Information Age dominates the space of places of people's cultures' (p. 349). But others see no cultural imperialism in the blurring of national boundaries and no threat to domestic democratic institutions (Kitchin 1998, pp. 101–102, see also Graham 1997).

### **1.3 The Information Economy**

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It was geographer Jean Gottmann who first identified the emergence of an urban information economy in the U.S., in his 1961 seminal *Megalopolis*, in

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which he defined the *quaternary occupations* as ‘those supplying services that require research, analysis, judgment, in brief, brainwork and responsibility’ (p. 580). Abler *et al.* (1977, p. 200) broadened the scope of the quaternary sector into *information activities*. The quaternary sector was more widely defined by Bell (1976), to include trade, finance, insurance and real estate (see also Kellerman 1985). The roots of the contemporary information economy lie, therefore, in the post-industrial economy and the service economy identified in the 1970s–1980s. The concept *information economy* was first coined by Porat (1977, see also Hepworth 1990, p. 6), when he commented on the growing shares of information in U.S. GNP and labor force.

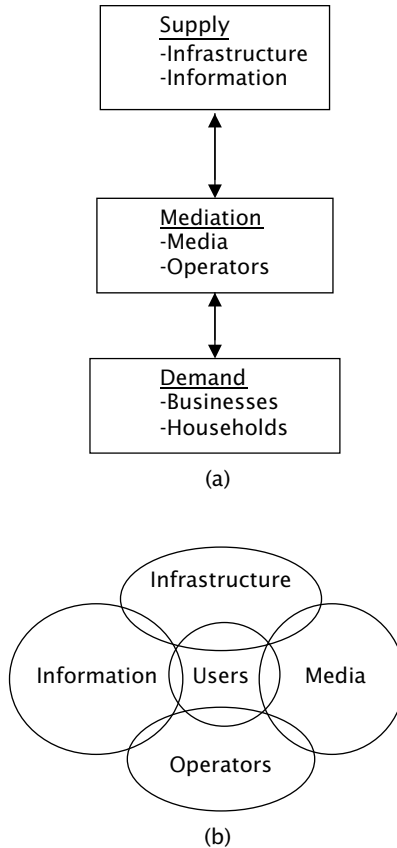
### 1.3.1 Major elements of the information economy

Information may be considered as both a product and a resource or input for various uses by both individuals and businesses. It constitutes a product in the most simple way when it is sold, and it serves as a resource or input in many ways, such as information on market trends being used as an input for the production of material products. Goddard (1990, 1992) identified four characteristics of the evolving information economy: the increasing centrality of information in the production of goods and services; the development of information technology; information becoming a commodity in itself; and economic globalization. The very incorporation of information into the production of goods and services is not novel (Miles and Robins 1992, p. 2), bringing some to comment that ‘every business is an information business...information is the glue that holds together the structure of all businesses’ (Evans and Wurster 1997, p. 72). The increasing centrality of information in the production of goods and services, is thus related to the development of information technology. This technology, once wide-scale connectivity has been achieved, permitted the development of an information economy dealing with information itself, notably as an electronically packaged and transmitted product. The four characteristics proposed by Goddard (1990, 1992), are thus, interrelated.

The information economy consists of five major elements (Figure 1.3b):

- *Infrastructure*: consists of information and communications technologies, including computers, communications appliances, telecommunications networks.

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**Figure 1.3** Major elements of the information economy

- *Information*: as contents of all types, whether personal, business, educational or entertainment, to be delivered through the infrastructure to customers (users).
- *Media*: through which various types of information are consumed, basically the telephone, TV (and radio), and the Internet, devoted to different information types, at least from the user perspective, and requiring different production, transmission and receiving systems and appliances.
- *Operators*: Consist of a very wide variety of companies that deal with the operation of businesses for production and servicing of the infrastructure

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(e.g. computer and telephone companies), information (such as news agencies and film-making companies) and the media (such as web design companies and TV stations).

- *Users*: are all customers of the infrastructure, media and information, whether households or businesses.

Traditionally these five major elements amount to three economic functions, namely supply (infrastructure and information), mediation (media and operators), and demand (businesses and households). The supply side of the contemporary information economy is typified by fusion processes among these elements (Figure 1.3b), mainly because all information types have been turned into electronic bits, and also because of the later development of a single channel for all information types, the Internet. The infrastructure, as well as the production and consumption of information will be highlighted in later chapters, so some attention will be given here to the media and operators (Kellerman 1997).

### 1.3.2 *Media*

Until the 1970s there existed three separate major information media: TV (and radio) broadcasts which were mostly unwired; the telephone which provided mostly local and inland long-distance conversation services; and computers which functioned as independent data-processing machines (see Kellerman 1993a). The information revolution has brought these three media closer to each other, through improvements in digital technology and transmission channels. Each of these media has been enhanced and expanded as a separate medium as well. The telephone was coupled with fax and mobile telephony, the television was coupled with cable and satellite transmissions, and computers have turned into major appliances for Internet communications. Fibre optics and satellites provided powerful transmission capacities, whereas the integration of the three media permitted visual presentations of computer inputs and outputs on PCs, as well as their transmission from one computer to another. In addition, a wide variety of communications means was developed, mainly digital phone service, fax, the Internet, video conferencing and videophones (see also Castells 2000, Kellerman 1993a).

The integration of transmission media and technologies has several impacts. First, it may become technically possible to transmit all types of information through one transmission system (Batty and Barr 1994). For example, technology permitting the use of standard telephones for Internet-transmitted phone calls already exists. Second, developments in one

technology, such as computers, telecommunications or TV, may have direct impacts on other technologies. The pace and significance of technological development are enormous. The exponential decrease in the cost of telecommunications and computers is coupled with an exponential increase in their speed (Makridakis 1995). Third, the international telephone system which, until recently, enjoyed overcapacity, may become overloaded because of the increased use of the Internet system for the transmission of wideband visual information, such as movies (*The Economist*, 1996). Internet providers are considering the introduction of separate lines for web communication, so that other services will be charged differently (Schrag 1996).

Technologically, then, it may become possible to have future information outlets and machines installed in homes and offices, facilities which will serve as terminal points for the transmission of all types of information through a single system, or, from a user's perspective, through a 'one-stop shop'. Such a multi-purpose, unified transmission system is not what Noam (1997) termed an 'integrated single superpipe', related to traditional state monopolistic common carriers, but it is rather what he called system integration, or a 'system of systems', which is to emerge following the present 'network of networks' (i.e. the Internet). System integrators, or the new generation of operators, would provide a variety of telecommunications services to end-users, as well as to competitive suppliers. A similar change is already underway with the introduction of Internet and fax services through mobile telephones.

A similar development was described by David (1990) for the evolution of the electricity industry, moving from the provision of electric power through independent dynamos to central and interconnected power stations. The difference between the central supply of electricity and that of information is that electricity amounts to one product, energy, with endless applications and uses, whereas centralized information supply amounts to an endless number of products served through a single infrastructure and technology.

### *1.3.3 Operators*

Until the 1990s the organizational structure of information production and transmission reflected the technologies of the 1960s, as well as governmental regulative philosophies which called for the existence of separate operators for each type of information. Thus, the provision of telephone, TV, computer and data services was kept separately. Even the breakdown of the giant Bell system in the U.S. in 1993, permitting AT&T to produce computers,

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did not change this separation. However, several developments in the late 1980s changed this situation. In the U.S., regional Bell companies looked for additional revenues, given the rather restrained local telephone market. The permission granted them to transmit their own cable TV programming over the telephone system was coupled with the development of an opposite technology, enabling the transmission of phone calls over cable-TV systems. These possibilities have yielded several mergers between telephone and cable-TV companies.

Another recent technological development of a potentially much wider application has been the transmission of telephone and videophone calls over the Internet system. This has brought into the operators' game another group of players, namely hardware companies, notably Intel and IBM, which now provide telephone services over the Internet. Thus, there has evolved a blurring of interest and operation areas among previously specialized communications and computer companies (Castells 1996, p. 63, Makridakis 1995). Although the Internet telephone technology is still young, it has gained some popularity, since users pay only for a local call or nothing for accessing their Internet Service Provider (ISP). In the U.S. alone the number of users was estimated at half a million in 1997, and major telephone companies, as well as the Federal Communication Commission (FCC), were exploring the market.

Current trends point, therefore, to a move from a parallel and competitive operation of information companies, each in its traditional speciality, coupled with competition among companies within the same field. Rather, growing competition among companies in areas other than their historical specialization has developed. This competition may bring about changes in the rules of the game. For instance, the sale of information service-packages to end-users, providing telephone service, cable TV and Internet service, or a move from charging per time-use in the account settlement system among telephone companies to charging per width of access, as is the norm for the Internet system (*The Economist* 1996).

In the mid-1990s several major mergers, acquisitions and alliances occurred, topped by the acquisition of Time-Warner by AOL, creating information operators which provide all or almost all information services, namely telephone, TV, computer and the Internet. The converging of hardware and software enables companies to gain control over the entire spectrum of information business from production, through distribution to display (Mosco 1996, pp. 185, 194–195). This has become possible technologically, and in the U.S. also administratively, by changing governmental policies as a

result of the 1996 Telecommunications Act, a law which amounts to a major overhaul of the 1934 law which created FCC (Federal Communication Commission) as the federal regulating agency (FCC 1997, Chan-Olmsted 1998, Tseng and Litman 1998). Whereas these mergers and acquisitions may hamper domestic competition and hence reduce service improvements and efficiency, they may simultaneously be balanced through market intrusion by foreign operators. Still the universality of service, traditionally required from telephone operating companies, may be replaced by the so-called *cherry-picking* of service areas (Graham and Marvin 1996, see also Warf 2001).

A central power in this regard is the Internet system which represents a major source of demand and versatility of use: 'The wonderful thing about the Internet is that it still reflects what its users want, not what some large telecommunications company believes they ought to have' (*The Economist* 1996, p. 24). The Internet is also one of a few technologies, jointly with writing, printing, and electricity, which were termed *general purpose technologies* (GPT) (Helpman 1998). It is similar to other GPTs in that it is an enabling key technology, being used simultaneously by many users (Malecki 2000b). However, as far as media and operators are concerned, its major power is the unification of all information forms (text, data, voice, graphics, motion picture) into one information channel.

### 1.3.4 *Information economic geography*

Information economic geography focused first mainly on infrastructure, be it computers (Hepworth 1990) or telecommunications (Kellerman 1993a). The implicit assumption was that the infrastructure and its uses are to be priced, among other things, vis-a-vis their location and spatial networking, resulting in spatial patterns of industries and services, at the urban, regional, and national levels. The geographies of infrastructure have proven to be neither decentralized nor concentrated, but rather complex (see Hepworth 1990, p. 97).

Contemporary, mainly Internet based, information economy, assumes foremost that information per se has production, processing, transmission and consumption prices which may vary from one place to another. Thus, some commentators stated that 'information systems redefine and do not eliminate geography' (Li *et al.* 2001, p. 701). Such a redefinition may comprise new networks of centrality and peripherality (see Moss and Townsend 2000, Graham and Marvin 2001). The fusion processes between the major elements of the information economy may imply urban specialization within the

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information economy which may potentially evolve along one of two lines: phases in the handling of information (production, processing and packaging, transmission, and consumption); and types of information production at large (information, knowledge, innovation). Such local specializations are embedded within the local economy and social structure. If a city specializes in more than one phase, within any of the two classifications, it may become a leader within the information economy. We shall discuss this further in Chapters 3 and 4.

### **1.4 Information Politics**

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We have just noted, regarding information economics, that geographers tended to focus on the study of its infrastructure rather than on information per se. A similar trend was noted for information politics. 'The notion that information is a constitutive force in society (e.g. power, control)... has to date not been introduced into geographical studies to any significant extent' (Li 1995, p. 30). Instead, light has been shed on geographical-political issues concerning information infrastructure (or technology), media and operators (see e.g. Warf 2001, Graham 1998).

Information politics relates mainly to the role of the state and the markets in the control and regulation of production and consumption. However, as we shall see, it may have to do with individuals as well. The production and distribution of information is not only dependent on technological infrastructures, but on constant inputs of numerous professionals, who may be located in separate cities, and who produce, edit, transmit and manage the flow of information (Graham 1998). Electronic-virtual information is thus space and place dependent for its production and distribution. The information production industry in its various branches (TV programs and websites as major electronic forms of information) may tend to nest and locate within cities with initial and cumulative expertise in infrastructure production. Such cities may accumulate power in information production, as well as a central, though not necessarily decisive, role in information distribution.

Users may benefit from the growing production of information if they meet several preconditions: they must have technical access to information, mainly to the Internet; they must have socioeconomic access vis-a-vis knowledge to interpret and use the received information; and they must have enough buying power to buy it or get involved in all kinds of e-commerce. Since all these elements depend on previous educational and economic development, information consumption and its uses are not equally distributed in space,

and hence the so-called *digital divide*, which we shall discuss further in Chapter 7.

Socially and spatially unequal information production and consumption are developed and sustained by the tendencies of advanced national economies to permit market forces to shape the social geography of information. National governments have gradually retained more minor regulation and control tasks, following four major shifts undertaken since the 1980s (Mosco 1996, pp. 202–203): 1) *commercialization*, changing government policies from public interest (such as universality of service provision) to market standards; 2) *liberalization*, opening telecommunications and information services to competition; 3) *privatization*, selling previously government owned or managed services to commercial companies; and 4) *internationalization*, permitting foreign companies to provide services in domestic markets, either directly or through some alliances with domestic companies.

Interestingly, the role of the state in the production and regulation of knowledge, notably innovative knowledge, has not followed the path of information production. Moreover, the direct and indirect involvement of national governments in this area has increased (see Mitchelson 1999, Kellerman 2002a). Thus, governments provide assistance to universities to develop technological studies, as well as providing budgets for innovative research, the applied results of which may be maintained by the universities or research institutions. Moreover, governments provide seed monies for start-up companies, and they assist or invest in the construction of high-tech industrial parks and industries. Sub-national regional and local governments too are engaged in the formulation and execution of development policies for the attraction of high-tech industries (see e.g. Gibbs and Tanner 1997).

The difference between governmental policies for the production of information and the production and dissemination/application of innovative knowledge is based on the assumption that information currently may be produced best and conveyed most efficiently by the private sector and market forces. On the other hand, however, knowledge production cannot be left to market forces only, because they may keep it too geographically concentrated. We shall elaborate on this in Chapter 3. Another reason for governmental efforts to assist the development of innovative knowledge relates to this knowledge being tacit knowledge, which does not lend itself to instant transmission as information and codified knowledge do. Tacit knowledge, if not available through permanent or temporary migrations of research and development (R&D) workers has to be 'home-grown'. High-tech R&D requires major long-term investments in education and training, as well

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as incentives for global venture capital to flow and anchor in specific places. Success in the development of high-tech industry in a certain place implies too an accumulation of power there, though in rather different ways than in places specializing in the production of information. As we shall see in Chapter 3, success in high-tech R&D activities may stimulate a mostly local development chain in both research, industrial production, and producer services, with an indirect influence on people's lives outside the region through innovation. On the other hand, the development of a local speciality in information production may have a wider, and even global, impact on people's daily lives through popular television programs or Internet sites.

The development of the Internet and notably the Web, have brought about a shift in the distribution of power not only from governments to the private sector, but also from institutions to individuals (see related discussion in Thu Nguyen and Alexander 1996). The production, and even more so the distribution of information to the public, have traditionally been of the form of *one-to-many*, completely dependent on large-scale and powerful institutions, such as newspapers, radio and TV stations, and book and magazine publishers (see Morris and Ogan 1994, Adams 1998, Dodge and Kitchin 2001, pp. 201, 56–57). However, the production of a website with either permanent or changing content can be done by any individual, not to mention the varied e-mail systems, ranging from a one-to-one (correspondence) form to *one-to-many*, and *many-to-many* (listservers, etc.). Though the construction of a website still requires a modest investment of capital, it allows extensive populations to produce and distribute information on a global scale. Whereas information production, publication and distribution powers have shifted partially to individuals, they often have relatively little means to market their sites, so that sites may be accessed by just a few surfers, or even none, so that the shift in power of information production may remain more potential than real.

By the same token, access to the Web may potentially permit a limitless exposure to information by individuals and its digestion at low costs, information which is flowing in from all over the globe. Still, however, it was found that websites tend to be linked either to other sites in the same country, or to websites in the U.S., which is the largest information producer (Halavais 2000) (see Chapter 4). Yet another study of ten Asian countries found too that most hyperlinks are to domestic sites, and links to other countries among those studied are foremost to Japan (37%), Singapore (14%), and Hong Kong (11%), probably as the major financial and thus information centers in the region (Ciolek 2002). A shift in the geographical sources of

information implies a shift in power, because it brings about more political and cultural transparency than previously available through the local media, but a smart use of these wider sources is still limited by time availability, personal interests and knowledge, as well as culture and language. The Internet was argued to be 'shaped by, and reflect(s), the place-rooted cultures in which it is produced and consumed' (Holloway and Valentine 2001, p. 153). Thus, the Internet which seems to be a seamless global information system, is currently only potentially such, and the geographically restricting forces for limitless information flows are still diverse.

## 1.5 Information Law

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Information law consists of laws which protect some ownership rights of information, and even more so of knowledge and innovative knowledge, known as *intellectual property rights*. *Copyright* laws have been developed to protect information and knowledge; *licence* requirements have been developed to protect information tools and products; and *patent* laws protect the ownership and rights of innovative knowledge. These legal arrangements may seem to be limiting the free transmission of information and knowledge. However, information laws actually enhance the opposite. They facilitate the transmission of knowledge and information, because without such legal systems for the protection of intellectual rights, information and knowledge transmissions would have been rather more restricted (see Smith and Parr 2000, p. 8–9, Johnson and Lundvall 2001).

The long existing system of information laws has come under threat with the digitization of information and its easy and instant transfer through the Internet. The traditional approach to intellectual property protection has viewed information and knowledge as similar to material products, which can be saved by putting barriers around them for the prevention of leaking, which may cause 'their scarcity value (to be) eroded' (Boisot 1998, p. xiv, see also Barlow 1994). Protection was thus established for the containers (mainly paper products, such as books, documents, etc.), rather than for the ideas themselves.

The Internet challenges several basic elements of law and law enforcement. The Internet blurs the boundaries between the public and the private, as well as between professional publishers or printers and individuals (Elkin-Koren 1996, Geller 1996). The fluid and global nature of the Internet does not fit traditional legal approaches which 'tie the choice of law to points fixed in geographical space' (Geller 1996, p. 28). Still, however, the more

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knowledge becomes codified the easier it becomes to protect it (Roberts 2000, Boisot 1998). On the other hand, however, the fluid nature of the Internet has brought about intellectual piracy, so that codified knowledge becomes more difficult to hold on to and extract value from, causing some to declare the Internet as a lawless *electronic frontier* (see Warf 2001). At yet another level, the Internet blurs the clear differences between the permitted and forbidden from a spatial-legal perspective. An example in this regard are virtual casinos, operated from territories where gambling is permitted, but players are scattered indifferently in permitted and forbidden areas for gambling (Wilson 2002).

Another legal problem stemming from the geographical fluidity of the Internet is taxation, mainly of sales. This question may receive special attention in upcoming years, once the currently developing so-called *geolocation* projects, which permit the locational identification of computer-hosts participating in any Internet interaction, become mature and reasonably-priced for massive use, in this case by governments (see Chapter 8). The structure of the Internet itself, based on domain names for website identification, requires protection as well (see Wilson 2001a).

Regan (2001) noted the paradox which the Internet poses for the very functioning of legal systems. On the one hand the system seems to be seamless and disembodied, but on the other, it may provide an authentication of place and identity to a much larger degree than activities in the physical world and this authentication of place and identity is crucial for law enforcement. The Internet is also beginning to change the traditional practice of law. The State of Michigan announced the opening of a so-called *cyber court* as of January 2002, in which lawyers not licensed in Michigan will be permitted to practise. In addition, a number of websites operated from various countries, offer international private cyber courts, so that the problem of location-based rules and laws is becoming even more crucial (Wilson *et al.* 2001).

### **1.6 Conclusion**

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The preceding discussions pointed to a technological revolution which has rapidly introduced information and communications technologies into the traditional world of information. This rapid introduction and dissemination has required quite radical adjustments of economic, political, and legal systems, at both domestic and international scales, changing the organizational, regulative and legal status of information products, operators of businesses of information production and services, as well as those of consumers. The

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major question to be treated in the next chapters is, whether geographical adjustments also followed through with these changes. There are those who would argue for the *death of distance* (Cairncross 1997), whereas others would point to the growing importance of a handful of global centers (e.g. Sassen 1991).

The information revolution has yielded contradicting trends in the aspects presented so far. It has brought about huge conglomerates of information production and distribution, but, on the other hand, it has permitted individuals to engage in the production and global distribution of their own information items and products. The flexibility and fluidity of information production and use has not eliminated the need for information and knowledge protection, as intellectual property. Rather it has accentuated the growing dependence on information and knowledge, as its use and dissemination become more flexible.

The contemporary handling of information, looked upon from whichever perspective, implies foremost the application of information technology. Information has become completely integrated with information technology, whether it be for its production, storage, processing, retrieval, transmission, manipulation, or consumption. The immense and constantly growing power of information technology for the handling of information has led to an illusion that information is to be ubiquitously and freely produced and used. It turns out that information is a social and economic product and resource with its own rules of operation, even under the most fluid conditions, manipulated by capital. Thus, information constitutes an integral part of the locally unfolding mosaics of power and culture. On the other hand, the easiness of global flows of information and the virtual image of information turn it into something that may transcend local and domestic conditions. These rather complex relationships will be in the center of our discussion in the next chapter. The different types of communicative materials, especially information, on the one hand, and knowledge and innovative knowledge on the other, may yield varying geographies, which will be the focus of Chapters 3 and 4.

