

## Chapter 2

# From IT to Digital Transformation: A Long Term Perspective

This chapter takes a long term perspective for the use of IT artifacts in companies and organizations. It analyses the semantical shift in the use of digital artifacts, from IT to IS to digitality. It also reviews how IT use has been integrated in the organizational design and the specific role of “organizational fit”. The chapter also reviews three major international programs which developed a historical perspective for the use of IT: the US program (Harvard), the Japanese program (supported by METI) and the French program, as supported by CIGREF. Finally, the chapter justifies how the concept of use, control and innovation are now shifting from companies towards the whole society, and the specific role of social media as new spaces for innovation and appropriation of IT artifacts.

## 2.1 Historical Perspective<sup>1</sup>

The historical perspective is useful here; as it puts the questions facing business leaders—and the ways information systems are used—into context.

It is instructive to look back at some of the studies and programs that have tried to outline a history of corporate computerization and, in the process, to reveal how information systems and technologies have been used strategically and operationally in given contexts. Such works are still fairly scarce. We will review some of them briefly here, first and foremost the Harvard program.

### 2.1.1 *The Harvard MIS History Project*

One of the first historical research papers on the management of information systems was published by Copeland and McKenney in 1988.<sup>2</sup> This paper, which

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<sup>1</sup>In this section I pick up on some of the ideas developed in the introduction to the special issue of *Entreprises et Histories*, no. 60, “De l’informatisation aux systèmes d’information dans les grandes entreprises”, 2010.

<sup>2</sup>Copeland and McKenney (1988).

studied air transport by means of historical analysis, revealed the importance of sector factors (deregulation), but also of factors specific to airlines in gaining competitive advantage via their reservations systems: as well as economies of scale, (cumulative) technological experience played a crucial role in establishing automated booking systems. In 1976, the authors tell us, the major US carriers (American, United, and to a lesser degree TWA) had stable distribution systems, and innovations could only be introduced incrementally. But these factors were insufficient; the managerial vision of the groups' leaders played a determining role. Several factors emerge as critical to the successful deployment of a reservation system by airlines: economies of scale, and what the authors call "intelligent persistence" (p. 368), in other words a practical vision—particularly by business leaders—of how to use technology.

This article opened the way for developing the conceptualization of the historical method in information systems research, around the Harvard project. The project was launched in 1988, to work on analyzing the impact of IT investments on business, industry and society. Coordinated by Harvard Business School professors James L. McKenney and John G. McLean, it involved a project team of nearly a dozen researchers and experts. The research focused mainly on analyzing the impact of information technology investments on four large companies, on which detailed case studies were conducted, including Bank of America and American Airlines. The research concluded that there was a need to develop a historical method to gauge the impacts of information technologies on enterprises. This was the subject of three papers published in *MIS Quarterly* in 1997 (no. 3) by the main project contributors.

The first, written by Mason et al. (1997b) raises the issue of the place and importance of historical research as a component of the information systems discipline and its general epistemological framework. It sees historical research as a factor in the legitimation of information systems research. After underlining the important difference between the history of information systems management and the history of information technologies, the authors formulate a general conceptual structure for what they call "IT-based business histories". Based on the four case studies analyzed—following the familiar Harvard method—the authors seek to understand how certain organizations manage to take advantage of information technologies to establish a dominant competitive position. Their answer is a modeling of companies' information technology uses by means of a "cascade" model, in which the ultimate phase is the imposition by the firm of a "dominant design" of information system uses. A dominant design is defined here as a radical design of a product or service liable to bring about a major change in the competitive landscape of an industry (the DC3 and the Ford T are cited as examples). The dominant design is the culmination of a cascading process that requires three roles to be performed: the roles of *leader*, *maestro* and *supertech*. The leader is an actor within the company, who deploys leadership resources to leverage the potential of technology; the example used is that of S. Clarke Beise, appointed President of Bank of America in 1954. The maestro is an IT manager with a thorough grasp of the company's business as well as technology (still a hot topic in

IS departments). Finally, supertechs are members of the project team itself, operating with a degree of harmony. The authors propose a five-phase cascading model, centered on these three roles. Starting out from a crisis situation, the company's actors look for a technical solution (Phase 1), then initiate the solution (Phase 2), adjust the organizational structure (Phase 3), and train assets who solve the problem, with the aim of gaining a competitive advantage (Phase 4), in order to assert a dominant design (Phase 5).

This conceptual model is used in the second article by McKenney et al. (1997) where it is applied to the case of Bank of America, demonstrating how the bank used information technologies as a crucial lever for attaining sector leadership in the USA—and the world in general—in the 1950s. The bank fundamentally changed the nature of the banking industry by deploying the ERMA and IBM 702 systems, which enabled it to develop a dominant IT design based notably on an articulation of three roles essential to the emergence of such a design: Clark Beise (leader), Al Zipf (maestro) and a group of supertechs. The cascading model proved its effectiveness here: starting from a crisis situation (IBM's inability to deliver a fully operational system for its 360/65), it became possible to produce a dominant design, enabling the bank to assert its leadership for a decade and a half.

The third article by the same three authors<sup>3</sup> proposes a seven-steps methodological framework for the conduct of historical research on information systems management.

### 2.1.2 *The Work of Chandler and Cortada*

In parallel to the Harvard managerial project, other American studies focused on the question of the history of information system and technology uses and their impact on business and industrial performance, most notably the work codirected by Alfred Chandler and James Cortada, followed by the three volumes published by James Cortada, dealing with the transformation of the American economy, and of American industries and administrations, by information technologies.

The collection directed by Chandler and Cortada (2000) offers a long-term perspective on the transformation of the American economy by information—and the establishment of informational infrastructure and interactions in the USA—since the 1700s. The work of James Cortada, who was also one of the contributors, gave rise to three important volumes, in which the impact of the “digital hand” (by analogy with Adam Smith's invisible hand) on industry and on the administration is analyzed in detail.

The first volume<sup>4</sup> looks at the role of information in the transformation of manufacturing, transportation and retail distribution, from the 1950s onward. Uses

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<sup>3</sup>Mason et al. (1997a).

<sup>4</sup>Cortada (2004).

are analyzed sector by sector, but also transversally, highlighting the importance of imitation in digital uses (as with the PC, of which the spread was induced by its adoption by IBM in 1981). It also underlines the facility with which information system applications were adopted by most industries, and how these radically changed the way industries operated, by transferring whole swathes of manual tasks to computers. This rapid spread was facilitated by early adopters: large companies to begin with, followed by smaller firms, and by initiatives taken within particular industries. Standardization, and the availability of commercial software, also played a determining role.

What managerial lessons can be drawn from this analysis? There was a clear interest in IT in the 1950s, but managers were very attentive to the economic aspects of the related investment, in a context characterized by senior management's poor understanding of the technology's potential until the 1970s. A fundamental change was brought about in the mid-1980s with the democratization of the PC. Suddenly, information systems were a strategic question.

The same structure is used in Volume 2,<sup>5</sup> which centers on the transformation of financial services, telecommunications, leisure and the media. The analysis of these branches throws up a number of specific problems, in particular those relating to intellectual property rights, as well as specificities in the structuring of information artifacts (such as databases in banking).

The third and final volume<sup>6</sup> deals with the public sector (defense, education, fiscal services, etc.). It particularly insists on the role of the defense sector (through government contracts) in creating a competitive IT industry.

In her book *structuring the Information Age*,<sup>7</sup> JoAnne Yates examines the adoption and use of information technologies by American insurance firms during the 20th century. She reveals the influence of uses on the evolution of information technologies, and vice versa, notably demonstrating how the use of tabulators in insurance influenced the adoption and use of the first computers, and how these computers had a similar relationship with the technology and the firms that produced them.

This American perspective underscores the importance of information system uses in the transformation of organizations and economies. In the works of the Harvard project and in those of Chandler and Cortada, the central question is that of usage, and how it transforms organizational and individual practices. At the level of the enterprise, the question concerns the definition of a "dominant design" that will produce a rent for the enterprise, and thus a lasting competitive advantage. At the macroeconomic level, the central questions are job creation, economic modernity and the technological leadership of a country or collectivity (in this case the USA since the 1950s). At the social level, the question can be framed in terms of the transformation of interpersonal relations by information artifacts and information

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<sup>5</sup>Cortada (2006).

<sup>6</sup>Cortada (2008).

<sup>7</sup>Yates (2005).

systems. The links to the Giddensian perspective and the theory of structuration are easy to see, as is the influence of the boundary-object reasoning advocated by Star and Griesemer.

### ***2.1.3 The Japanese Initiatives***

A number of Japanese studies on the history of digital uses were carried out in the 1980s, albeit with limited results. These often little-known works are described in Kiyoshi Murata's paper (2010). One of the first pieces of research on this topic was published by the Information Processing Society of Japan's Special Committee for the History of Computing in 1985 and 1998. Several projects focused on the contribution of information systems to organizational change, business performance and distribution of tasks between actors. But the work of particular interest to us here is the joint project launched in April 2007 by the Japan Society for Management Information (JASMIN), the Ministry of Economy, Trade and Industry (METI), the Japan Information Processing Development Corporation (JIPDEC), the Japan Users Association of Information Systems (JUAS) and Nikkei Business Publications. The project's goal, which involved some ten researchers over 2 years, was to gather in-depth knowledge about the conditions of use of information systems, both at the level of the overall economy and by sector (manufacturing, retail and financial services).

Unlike the Harvard project, with its strong focus on business and on competitive positioning, the Japanese program has a more systemic orientation, due to the plurality of actors; actors with an interest in how companies—and large corporations in particular—are transformed by information technologies. Through a collective research effort, these actors are able to gain insights into their respective involvement in deploying information system and technology uses in their organizations, and the factors behind their deployment, for example in terms of the balance of power between the different stakeholders, and their modalities of cooperation.

### ***2.1.4 Research in France and the ISD Research Program***

Historical research in the field of managerial information system uses is a recent phenomenon. It can, for the most part, be tied in with work by management scientists and historians. But overall, it is still an emerging area of research.

CIGREF initiated one of the first studies on the changing position of the information systems function in large companies.<sup>8</sup> This research, by Ravidat,

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<sup>8</sup>Ravidat et al. (2005), Ravidat and Akoka (2006).

Schmitt and Akoka, presented a longitudinal analysis of the evolution of the position of the IS function from 1992 to 2004, collating 12 years of publications, including 146 reports. The resulting analytical model brings five components into play:

- The 5 main actors of the information systems function (the business units, the users, the suppliers, the integrators, and branch IT);
- The technical and economic environment;
- The points of balance or compromise between the 5 actors;
- The core business of the IS function;
- The main distinguishing features identified.

This longitudinal study of the key features and interactions of these five elements made it possible to characterize the evolution of the IS function's position within organizations. A notable observation was that the explosion in the supply of technological products was accompanied by an increase in the responsibility of the IS department and its consequent reorientation towards less technical issues, as from 2000. More generally, the study identified key periods that characterize the position of the IS function in the enterprise, and a characteristic line of development of its "core business" (Table 2.1).

The historical research in France also looked at the agenda of information systems researchers over more than 25 years. Like their Anglo-Saxon colleagues before them,<sup>9</sup> Desq et al. (2002, 2007) analyzed the topics studied by information systems researchers, bringing out the specificity of Francophone research, notably in terms of methodology and the central themes developed. Similarly, the work of Nathalie Greenan and her colleagues<sup>10</sup> on the evolving relationship between ICT investments and new organizational practices in French companies, which draws on the COI survey, has an obvious historical dimension, revealing as it does a strong positive correlation between ICT uses and the quantity of new organizational practices during the 1990s, with moments of acceleration in company reorganizations running parallel to growth in their ICT investments.

### 2.1.5 The ISD Program

The ISD program is built around a central concept: organizational design, bearing in mind that deconstruction is all around us, in business, society and international power struggles. This concept of design is not new. Looking no further than the sphere of information systems, one of the recurrent questions in the literature is that of the development of an *organizing vision* of innovation.<sup>11</sup> But it has been put

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<sup>9</sup>See notably Culnan and Swanson (1986).

<sup>10</sup>Greenan and Mairesse (2006), Greenan et al. (2010).

<sup>11</sup>Swanson and Ramiller (1997), Ramiller and Swanson (2003).

**Table 2.1** Evolution of the IS function in large French companies (1992–2004)

	Core competence	Positioning
1992–1994	Coherence and control	Technical positioning
1995–1996	Architecture, service continuity	Technical and services positioning
1997–1999	Security, cost, service	Loss of technical control, positioning as internal software house
2000–2002	Knowledge management, governance	Positioning towards the strategy
2002–2004	Urbanization, certification, business intelligence, legal	Search for new legitimacy

Source Ravidat, Schmitt, Akoka (2005: 7), translated by the author

back center stage by the fundamental changes under way in technology and in the structure of businesses and business activities, and the emergence of new organizational models in which immateriality plays a key role.

In the case of ISD, organizational design is a conceptual tool that should enable us to determine the core characteristics of *organizing 2020*, starting from the five dimensions developed earlier, and paying close attention to emerging factors (along the lines of the MIT program on the future of the automotive industry in the 1980s). The program posited that growth in the use of artifacts and information spaces (via digital), and their increasing ubiquity, associated with a massive transformation of modes of production and social interaction, including in the workplace, and the arrival of emerging actors, will generate new organizational configurations in the enterprise—configurations that need to be characterized. If digitality is a structural given of modes of production and interaction, it is also clear that the future modalities of interaction will in part be determined by managerial practices and modes of contractualization at the societal level. Will the liquid society defined by Bauman (2000) find its counterpart in the “liquid enterprise”? As we will see, liquidity is one of the key dimensions in the design of the 2020 enterprise.

The special issue of *Entreprises et Histoire*, which marks CIGREF’s 40th anniversary, considers the question of the IS-driven transformation of businesses from a historical perspective. Some of the research published here refers to work conducted and defended during the prototyping phase of the ISD program, or aligned with the program. In keeping with the general stance of *Entreprises et Histoire*, this issue presents research conducted by management experts and business historians in France and in two countries where thinking on the information-system-driven transformation of businesses, from a historical perspective, has been particularly developed namely the USA and Japan. It also reports on an interesting and stimulating debate between CIOs, CEOs and researchers.

The paper by M. Lynne Markus (2010) that opens the issue raises the question of how the use of information technologies articulates with the design of organizations. It reviews the long term evolutions of US large corporation since the M form

deeply analysed by the work by Chandler. The paper analyzed the success of organizational design during the last period: from the IBM (mainframe) era to Microsoft (client-server), to probably the now google era. The paper insists on the co-evolutionary character of IT technology and organization design. It also underlines the need to develop a specific research agenda on the topic of organizational design.

I have already stressed the importance of James Cortada's contributions to the analysis of the impact of information technologies on businesses and industries in the USA. His article discusses the importance of industries in analyzing the impact of information technologies, but also for the professional positioning of information system managers. According to him, industries constitute an important scope for analyzing the transformation of firms by IT (Cortada, 2010).

Kiyoshi Murata's paper (2010) reports on the lessons learned from the analysis of the development of information systems in Japanese companies. This research points to a disruption in the triangular balance between large companies, large administrations (METI) and large service providers to the benefit of the latter, due to the spread of outsourcing practices. These practices have weakened companies' capacity to absorb and to transform, because they have lost the necessary skills. A managerial lesson that European businesses would do well to reflect upon.

Alexandre Giandou's text (2010) has an institutional scope. It describes the conditions for the creation of CIGREF in 1970, the end purposes defined by the founders, and the institutional credibility that CIGREF has since acquired in the field of information systems.

Rodhain et al. (2010), meanwhile, have compiled a history of information systems research based on the analysis of 1945 articles published between 1977 and 2008. Their analysis breaks the development of management information system research down into key periods, notably with regard to the dominant research topics and methodologies. Management information system (MIS) research is still a young discipline, but it has already demonstrated a capacity for theorizing and for developing a specific agenda, in phase with the concerns of businesses and society.

Griset's article (2010) analyzes the first period in the adoption of information technologies by enterprises in France. In it, we discover that the introduction of the computer raised more problems than it solved, and called for a fundamental rethink of organizational and informational mechanisms and processes. The logic of flows came into its own in the early 1970s. The concepts of "network" and of "real time" are major vectors of computerization.

In a complementary paper, Alain Beltran<sup>12</sup> studies the arrival of IT and the organization of French companies from the end of the 1960s to the beginning of the 1980s. His research sheds light on the organizational dimension of business computerization, the structuring of tasks, the articulation between centralization and decentralization, and the democratization of IT knowledge beyond the circle of specialist technicians.

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<sup>12</sup>Beltran (2010).



François Hochereau<sup>13</sup> offers an in-depth analysis of the transition to computerization of a large telecommunications company, by reconstituting “successive organizing visions of a strategic business process”. The different stages in computerization are highlighted, notably with a customer orientation observable in other enterprises. The article confirms the validity of thinking in terms of an “organizing vision” of technological innovation driven by the information systems, but it also describes its limitations, in particular its inability to integrate spiral developments, which reflect contradictions that can be resolved through recourse to other technical innovations.

The article by Pierre-Eric Mounier-Kuhn<sup>14</sup> describes the role of user clubs in the evolution of products and practices, around particular vendors and more generally in the dissemination of knowledge between users, and in defending IT investments to stakeholders (investors, government agencies).

In this special issue, the discussion between CIOs and researchers is interesting (p. 70–84). It provides an overall vision of a history of information systems and technology uses in business, and highlights a number of discussion points, particularly as relates to the role of government in real-life transformation processes.

## 2.2 The Long-Term Perspective

To understand the role of the digital transformation, it is important to consider it from a long-term perspective. As Malecki and Moriset (2008) underline, the digital revolution can be considered from the perspective of the Kondratiev cycle (Malecki and Moriset 2008: 26). This approach has been analyzed by several scholars (Atkinson 2004; Freeman and Louça 2001; Louça 2003). For example, Freeman and Louça (2001) analyzed successive industrial revolutions, notably: (1) the British industrial revolution (the age of cotton, iron and water power); (2) the second Kondratiev wave (the age of railways, steam power, and mechanization); (3) the third Kondratiev wave (the age of steel, heavy engineering, and electrification); (4) The Fourth Kondratiev wave (the great depression and the age of oil, automobiles, motorization, and mass production); and (5) what authors have named a new techno-economic paradigm, the age of information and communication technologies. This paradigm is characterized by the widespread use of computers and telecommunications, and is accompanied by an organizational change, namely the “network firm” (Freeman and Louça 2001: 324–327). It represents an institutional change, new modes of regulation and a culture of virtuality.

The current information revolution is based on digital, entrepreneurial and knowledge-based discovery, together with a change in managerial practices and organizational design (Malecki and Moriset 2008). These three ingredients are the

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<sup>13</sup>Hochereau (2010).

<sup>14</sup>Mounier-Kuhn (2010).

key to understanding the ongoing digital transformation and raise the question: How do managerial practices and entrepreneurial discovery interact with digital artifacts to build a new production system?

There is a common thread that emerges from this brief overview: the articulation between information systems and organizational design. Digitality, as a system, changes the game. It amplifies the impacts that researchers have identified, due to its ubiquitous and transformational nature that goes beyond the traditional boundaries of the enterprise. Therefore, one of the expected outputs of the ISD research program is to answer the question: How does digitality articulate with the design of enterprises, and how does it affect their transformation?

## 2.3 Digital Transformation

Digital transformation is a new development in the use of digital artifacts, systems and symbols within and around organizations. Although the term does not have a clear definition, it encompasses several dimensions. Recent McKinsey reports have examined the issue of digital transformation via the impact of the Internet. Several reports have been issued that target both businesses and policymakers.

Bughin and Manyika (2012) provide an analysis of the impact of the Internet on economic growth at a national scale, given the respective positioning and potential of countries. They found that the Internet contributed 3.4 % to GDP in the 13 countries they looked at. The United States leads the supply ecosystem. In Europe, the United Kingdom and Sweden are game-changers, while France and Germany are very influential in terms of usage. The position of India and China is becoming stronger, while two of the Brics (Brazil and Russia), together with Italy are still in the early stages. More recently, Woetzel et al. (2014) report on the importance of Internet use by Chinese citizens. Some key figures include: 632 million Chinese Internet users; 700 million active users of smart devices, and US\$ 300 billion earned in e-tailing sales in 2013. Internet use in China tends to be consumer-oriented and the market share of the Internet-oriented economy is 4.4 % GDP, which is higher than in the United States or Germany. In France, the 2014 McKinsey report (McKinsey and Company 2014) underlines the disequilibrium between widespread consumer user and business use. The latter appears to be lagging behind due to a lack of skills, financial constraints and commitment from senior management. This suggests that the digital transformation is a process that involves the diffusion of the Internet in both demand and supply sectors. It therefore differentiates performance between countries in terms of the level and extent of the use of Internet applications. This use reflects the level of maturity of countries and disequilibrium between demand and supply.

In the same vein, but from a microeconomic perspective, Cap Gemini and MIT Sloan Management (2011) examined the issue of digital transformation in terms of maturity level. Digital transformation is defined as “the use of technology to

radically improve performance or reach of enterprises” (p. 5). Based on interviews with 157 executives in 50 companies, the study defined four level of maturity based on two criteria: digital intensity and transformation management intensity (pp. 60–62):

- *Digital beginners*: firms with low scores on both criteria
- *Digital fashionistas*: firms with high levels of implementation in terms of digital intensity, but low levels of transformation
- *Digital conservatives*: these firms “represent the wise old men and women of the digital world” (p. 61). They are aware of the importance of digital transformation, but work is still clearly divided into silos.
- *Digitari*: firms that really understand the value of digital transformation and how to take advantage of it.

The authors propose two dimensions as the key building blocks for defining digital transformation: digital intensity and transformation management. This taxonomy is helpful in defining the digital transformation at the firm level, and provides an overall picture of executives in terms of maturity. However, these criteria need to be defined in more detail, and the approach must be extended beyond the traditional boundaries of the (large) firm.

We now look in more detail at how practitioners approach the issue of digital transformation in general. In two recent books (one about the digital enterprise and the other about digital culture), CIGREF defined specific aspects of what they called the “key dimensions of digital transformation”.

In the book about the digital enterprise (Ménard 2010), the author justifies the use of the term ‘digital enterprise’ on the basis of the dissemination of digitality into every process and section of the enterprise (p. 40). The digital enterprise is defined in terms its dimensions: innovation, customers, resources, change management, marketing, and distribution.

These topics were expanded upon in the book about digital culture (CIGREF 2013), which defined a clear agenda phrased in terms of organizational design, new incentive systems, and new forms of leadership.

From this, we can see that digital transformation is an issue that needs further conceptual refinement, especially with regard to its nature, scope, and implications for decision making in organizations.

### 2.3.1 *The Transformational Nature of Digitality*

How can we analyze the transformational nature of digital technology? Lucas et al. (2013) based their analysis of transformation on three sectors of activity (financial markets, health care, and consumer experience), while Dehning et al. (2003) analyzed the conditions for technology to be transformational, based on a literature

review. They identified the following key criteria: a profound change in the traditional way of doing business, the need to acquire new capabilities, and fundamental changes in tasks. The authors develop several different dimensions of transformation, including: processes; new organizations; relationships; user experience; markets; customers; and the disruptive impact. These dimensions can be analyzed at different levels: that of the individual, the firm and the overall society or economy. For example, in the financial services sector various transformations have been proposed, notably in the stock market. One example is the user experience, where the change from the use of telephones to a purely digital platform has created new, e-trading organizations.

This analysis helps to identify various issues that are relevant to managers. In particular, it highlights the importance of widening the perspective used for the analysis of the use of digital artifacts in and around organizations and ecosystems. The issue of digitization goes beyond entrepreneurship in the traditional sense; it has become ecosystemic. This leads to new perspectives and insights that need to be better integrated through research and action; this focus of the ISD program is consistent with the literature.

### 2.3.2 *Digital Transformation: Its Scope, Scale and Sources*

Several dimensions of digitization—and therefore of digital transformation—have been proposed. This section expands on the special issue of MIS Quarterly dedicated to “Digital Business Strategy: Toward a Next Generation of Insights” (June 2013).

Digital transformation relates to four aspects of the firm’s business strategy (Bharadwaj et al. 2013):

- Its *scope*, which needs to extend beyond the traditional boundaries of the firm (supply chains, industries, etc.);
- Its *scale*: the emergence of platforms that create important network effects in a context of data abundance;
- Its *speed*: the launch of products/services, decision making, building networks, etc.;
- The *source* of value creation and capture (data, networks, digital architecture).

With respect to *scope*, there is a need to develop new approaches to ecosystems. The concept of a business community that goes beyond an orchestrated platform has been proposed and is defined as “a set of possibly overlapping ecosystems in a defined area of business activity” (Markus and Loebbecke 2013: 650). There is also the need to integrate a community dimension into the digital strategy (Lucas et al. 2013). Such an extension is essential, especially when we consider the key characteristics of what Keen and Williams (2013) call ‘ultrasuccessful’ firms. Their study provides interesting insights into how value is created in the digital world through an examination of extremely successful firms such as Amazon, Expedia,

**Table 2.2** Digital transformation: dimensions, issues and implications for managers

Dimension of digital transformation	Questions for managers (strategic, organizing, business models)	Key topics
The scope of digital strategies	<ul style="list-style-type: none"><li>• What analytical approaches go beyond the extended firm view?</li><li>• What are the emerging spaces for value creation?</li></ul>	Defining and analyzing spaces for value creation
The scale of digital strategies	<ul style="list-style-type: none"><li>• What is the relative importance of platforms? What typology? Which governance structures foster innovation?</li></ul>	Defining and analyzing the new scope of value creation
The speed of digital strategies	<ul style="list-style-type: none"><li>• How to define and deploy innovative offers?</li></ul>	Analyzing acceleration as a systemic phenomenon
The sources of value creation based on digital strategies	<ul style="list-style-type: none"><li>• What are sources of value creation in digital spaces?</li></ul>	Defining how value is proposed in digital spaces

Google, and Facebook, which they contrast with ‘ultrafades’, i.e. firms that were dominant but have lost ground (e.g. Dell, RIM, Nokia). They take as a starting point four aspects of value: (1) the buyer determine value; (2) its relative and shifting nature; (3) companies’ leverage of ecocomplexes; and (4) entrepreneurs who continuously offer new dimensions of value. A transitory and ecosystem view of value that integrates social media is important in this respect (Oestreicher-Singer and Zalmanson 2013).

In terms of *scale*, the power of digital markets lies in platforms that compete to leverage the key resource of the intangible economy: data. In this context, *speed* (acceleration) plays a critical role in success. Acceleration calls for the development of a new form of capital: the capital of digital systems is defined as the cumulative knowledge of the design of IT artifacts, which should be distinguished from, for example, discrete strategies used to enlarge the cumulative stock of knowledge (Woodard et al. 2013). Finally, new digital strategies call for the definition of new governance structures (Drnevich and Croson 2013), together with new forms of leadership (Bennis 2013) (Table 2.2).

## 2.4 Some Insights from Recent Foresight Programs

This book and the ISD program focus on the future design of enterprises (the 2020 enterprise) and their digitality. While the design is based on ad hoc research, it is also worthwhile integrating insights from recent or similar international programs. Here we consider two types of programs: those that develop a macroscopic perspective, and those that (like ISD) focus on the enterprise perspective.

In the following, we examine programs with a societal and organizational focus.

## 2.4.1 *Macro and Innovation Foresights*

### 2.4.1.1 Global Trends 2030, Alternative Worlds

The report published by the National Intelligence Council (2012) in the United States analyzes the drivers for change at the global scale and provides scenarios for evolution. Four ‘megatrends’ are proposed: (1) individual empowerment, (2) the diffusion of power at the global level, (3) demographic patterns that impact growth in aging countries, and (4) the food, water, and energy nexus, as demand for these resources will grow as the world’s population grows.

The report develops six game changers. These include: the impact of new technologies, the governance gap, and the role of the United States. With respect to the impact of new technologies (number 5) the report underlines the importance of the big data era. The processing and storage of data, together with cloud solutions will expand massively, while fears of an Orwellian state may lead citizens to pressure governments in the North to limit the power of big data analytics. Megacities will emerge from nowhere. New manufacturing and automation technologies (e.g. 3D printing) will improve productivity and reduce the need for outsourcing. There will be breakthroughs in technologies related to security and resources that are vital for populations (water, food, energy). Health technologies will continue to expand.

Based on this, four scenarios are developed: (1) *Stalled engine*, “a scenario in which the risk of interstate conflict rises owing to a new ‘great game’ in Asia” (p. XII). In this scenario, the United States and Europe will turn inward thereby losing power at the global level; (2) *Fusion*, in this scenario the United States, China and Europe agree on an agenda for global collaboration leading to a worldwide effort to deal with global challenges; (3) *Genie out of the bottle*, this is a worse-case scenario where inequalities increase between regions and nations. In this scenario, “the EU single market barely functions [...] Cities in China’s coastal zone continue to thrive, but inequalities increase and split the party” (p. xiii); (4) *Non Stated world*, this scenario is dominated by the emerging power of nonstate actors such as nongovernmental organizations, multinational corporations, academic institutions, megacities, and wealthy individuals. These stakeholders are global leaders in addressing issues such as the environment, inequality, poverty, anti-corruption, and peace.

### 2.4.1.2 OECD (2015): Securing Livelihoods for All

This OECD report (2015) discusses the issue of livelihoods and presents five future scenarios. The report underlines the significant progress that has been made in improving global livelihoods, noting that more than two billion people have emerged from extreme poverty. However, despite this progress there are still major

challenges for the future, especially with regard to disparities in revenue and financial fragility. The report argues that the world is experiencing massive demographic shifts, notably with regard to the provision of pensions for ageing populations. Environmental degradation is another major problem. From this perspective, technology is seen a source of innovation that can help to address some of the major issues. The report makes key recommendations at multinational, national and local levels (Aubert and Wermelinger 2015).

The following five scenarios are formulated (pp. 118–130):

*Scenario 1: Automated North*

The main drivers are automation and growing inequalities. The impacts on livelihoods are growth in unemployment and the automation of low- and high-skilled jobs. Migration is an important issue. Important policy and societal issues emerge, particularly related to wealth redistribution, taxation and skills development.

*Scenario 2: Global financial crash*

The financial crisis in emerging economies is the main driver in this scenario. The impacts on livelihoods are protectionism related to increases in poverty, inequality and insecurity.

*Scenario 3: Drought and joblessness in the South*

Here, the main driver is climate change leading to drought. The impact is related to the inability of farmers to make a living and an increase in the number of jobless young people. Policy issues concern migration, social protection and increased R&D related to drought-resistant agriculture.

*Scenario 4: Regenerative economies*

Here, the main drivers are innovation and policies that promote sustainability. Innovation creates demand for jobs in new products and services, and problems relate to the deployment of unskilled and older workers. Challenges relate to equality via access to education.

*Scenario 5: Creative societies*

The IT revolution and new societal attitudes are among the main drivers. Impacts relate to joblessness created by technology, reduced reliance on institutions, and a workforce this is increasingly oriented towards developing their own skills portfolio. In this context, new ways to measure progress are needed that are less dependent on GDP.

### **2.4.1.3 The European Patent Office Foresight of the Future Patenting System by 2025**

The report concerns the future of the patent system (European Patent Office 2007) and an assessment of the impact of various factors. The report presents several scenarios, based on an evaluation of five principal factors:

1. *Power*: sources of global power; governments, multinationals, civil society organizations, special interest movements, international bodies and the possible emergence of new sources of power.
2. *Global jungle*: as globalization leads to major changes in investments, capital flow, economies of scale, etc., the major question is “Who will survive, and for how long?”
3. *Rate of change*: this reflects the tension between rapid changes in technology, the short-term nature of the political system and the long-term cycle of institutions such as the intellectual property (IP) system.
4. *Systemic risk*: increasing global interdependence in terms of finance, technology and ideas is a source of systemic risk. Here, the question is, “Where are the tipping points that threaten global interdependence?”
5. *Knowledge paradox*: given the dissemination of knowledge, societies are challenging the relevance of the IP system. Here the question is “Are there cheaper, quicker methods for protecting and exploiting knowledge than the patent system?” (p. 4).

Based on these factors the report develops four scenarios for the evolution of the IP system by 2025, as a function of the dominant source of power:

*Market rules.* Business is the dominant driver, and it says “Yes” to IP.

*Whose game?* Geopolitics are the dominant driver, the IP system does not have global legitimacy and there are conflicting rules between national and regional IP systems.

*Trees of knowledge.* Society is the dominant driver. In this scenario classical monopoly rights have no legitimacy.

*Blue Skies.* Technology is the dominant driver. In this scenario IP reform restores global legitimacy to the IP system.

#### **2.4.1.4 ESPAS–Global Trends to 2030: Can the EU Meet the Challenges Ahead?**

The ESPAS report (2013) analyses global challenges and trends for the years to come. Five global trends are identified: (1) the fact that the human race is becoming older and richer, with an emerging middle class; (2) the shift of power to Asia; (3) the technological revolution, especially digitization that is infiltrating every aspect of life; (4) a scarcity of resources (energy); and (5) the interdependence of countries that is not matched by global governance. The report identifies three revolutions, which will make the world less secure: (1) an economic and technological revolution, which, while it offers huge potential for productivity, at the same time presents challenges in terms of job creation, inequalities, and increasing poverty for the middle classes, including in Europe; (2) a social and democratic revolution, due to a more connected and therefore more demanding and critical population; and (3) a geopolitical revolution, with a shift of power to Asia. The result of this is a less secure world and higher systemic risk. These trends create



major challenges for Europe, in terms of restricting the economy, promoting a society focused on change and innovation (including via the digital revolution), and reinforcing the international role of Europe.

#### **2.4.1.5 Innovation Futures in Europe**

The focus here is on innovation in Europe in 2025 (Innovation Futures 2011).

Five scenarios are proposed, based on an in-depth analysis of the driving factors and their interactions.

- Scenario 0: “Nothing changes”. In this scenario there are no major changes in the European innovation landscape by 2025, while the major players experience a shortage of innovative skills (engineers and scientists). By 2020, Europe will lose its pioneering role in environmental technologies and by 2025 there will be stagnation in all fields, including social life.
- Scenario 1: “Unleashing the creative spirit: Europe’s Innovative Societies”. In this scenario Europe becomes a major player in innovation by 2025, with societies becoming the source of the development of new products and services, while sustainable business and consumption become the norm. Societal welfare is no longer defined in monetary terms. By 2025, social and environmental aspects are fully integrated.
- Scenario 2: “The Exhausted Giant. Europe Innovation Fatigue”. In this scenario Europe experiences “innovation fatigue”. Policymakers and entrepreneurs stick to obsolete growth models. Innovation still exists, but only in the business domain and is not embedded into the overall innovation system. By 2020 European competitiveness declines and by 2025 there is a dramatic shortage of innovation.
- Scenario 3: “Locally-Driven Innovation in a Nutshell”. In this scenario, innovation moves to cities and regions. Local entrepreneurship drives innovation, but mainly for local urban purposes. By 2025, Europe is “back on track” (p. 38), but at the citizen/city level.
- Scenario 4: “Prometheus Unbound: Innovation for Innovation’s Sake”. In this scenario innovation is open and ubiquitous throughout the European system, but mainly for economic purposes. Environmental issues are not comprehensively targeted. By 2025, Europe is a leader in innovation, but protests emerge related to the failure to take into account environmental issues.

### **2.4.2 Digital Foresights**

#### **2.4.2.1 The Digital World by 2030**

According to work by the European Internet Foundation (2014), by 2030 we will move to a knowledge society where real time is the dominant factor.

The position of Europe with respect to the knowledge society will depend upon its transformational capacity—a move from mass collaboration to a “knowing society”. A fully-powered digital economy is expected to be in place by 2030, through a set of specific changes such as ‘smart cities’.

#### **2.4.2.2 Internet Foresight by 2030**

According to a report edited by Gille and Marchandise (2013), the future of the Internet has more to do with machine-to-machine interaction. This is expected to have a massive impact on all sectors of activity, individuals, and societies. Because of this, public policies must be fundamentally reworked in order to cope with the challenges.

#### **2.4.2.3 The Future of the Internet in 2025?**

Based on inputs from an online Delphi survey of experts and analysis, this study by the Oxford Internet Institute (2010) proposes four scenarios:

1. *Smooth Trip*: the rise of the overall Internet economy.
2. *Going Green*: Internet technologies target environmental needs.
3. *Commercial Big Brother*: the Internet becomes a mainly commercial platform.
4. *Power to the People*: the Internet becomes mainly a forum for democracy and the exchange of knowledge.

### **2.4.3 Digital Enterprises Foresights**

Little work has been carried out into organizing for digital firms. The following three studies are related to the ISD program’s objectives and content.

#### **2.4.3.1 Inventing the Organizations of the 21st Century**

In their report, Malone et al. (2003) refer to the MIT’s “initiative on inventing the organizations of the 21st century”, which was sponsored by large companies such as BT, EDS/AT Kearny, the National Westminster Bank, the Norwegian Business Consortium, the Union Bank of Switzerland, and Siemens Nixdorf among others. This five year research initiative (1994–1999) analyzed the transformation in eco-systems, especially between large companies and startups, trends in outsourcing and the decentralization of activities. The report is a collection of contributions that address different facets of organizing: the boundaries of the firm and the role of IT in business performance, and scenarios for 2015.

### **2.4.3.2 The Future Internet Enterprise Systems (FInES)**

The FinES Research Roadmap 2025 (FinES 2012) developed a research agenda within the FinES cluster. Four conceptual dimensions were considered to be critical: the socioeconomic space; the enterprise space; the enterprise system, platforms and application space; and the enabling technology space (ICT solutions, in particular those related to the future of the Internet). For each of these dimensions, the document suggests topics of interest for researchers.

### **2.4.4 A Synthesis**

From these foresight programs we can identify areas of uncertainty, and therefore where there are questions about the future. Of these areas, the issue of global equilibrium and the impact of global change on growth is an open question, as is the impact of digital technology on job creation. With respect to Europe in particular, there is also the issue of the dynamics of its innovation systems and its capacity to take advantage of potentialities offered by sustainability technologies, including digital technologies.

At the microeconomic/sectoral level, digital transformation, due to the Internet, is already underway in many sectors, and significant changes are expected, especially with regard to machine-to-machine interaction, while business models are undergoing continuous change in many sectors.

The ubiquity of digital technology is paving the way for new forms of business organization. Therefore, we need to refine their content, structure and building blocks. This will be addressed in the next chapter.



<http://www.springer.com/978-3-319-23278-2>

Digital Futures, Digital Transformation  
From Lean Production to Acceluction

Bounfour, A.

2016, XIII, 154 p., Hardcover

ISBN: 978-3-319-23278-2