2 Transition to the Knowledge-Based Economy and the Digital Economy – The Context of the Company Management, Stakeholder, and Social Responsibility Approach

Knowledge Revolution

The formulation “knowledge revolution”, although increasingly used in recent decades, is not sufficiently well known and utilized at international level. Certain people could see it as just a replacement for the “information revolution” or a “tautology”, while others could replace “knowledge revolution” with “digital revolution”. Although there is a close connection between the information revolution and the knowledge revolution, the latter is quite different from several points of view: genesis, scope, foundation, nature and economic, social, scientific, education, and ecologic performances (Burton-Jones, 1999). In the last few years, the “formula industrial revolution 4.0” has frequently been used. In this book, we continue to utilize the term “knowledge revolution”, because we believe that it suggestively reveals the new essential element involved in the present revolution – knowledge. The term “industrial revolution 4.0” hides the new content of the knowledge revolution and does not help to seize, understand, and take it into consideration.

Essentially, the **knowledge revolution** refers to a fundamental change from an economy based mainly on physical resources to an economy based predominantly on knowledge (Foray, 2009; Nicolescu & Nicolescu, 2011; Stewart, 1998b). This revolution is based on the determinant roles of knowledge within the modern economy. During the last few decades, we have noticed and taken into consideration the increasing economic impact of technology, information, economic processes, human capital, organizational capabilities, and competences, all very closely connected to knowledge. Each of these factors separately approached reveals the extremely valuable elements with huge pragmatic implications. Their common denominator is represented by knowledge, and these factors are actually being the ways to individualize and operationalize that knowledge.

From ancient times, wealth and power have been associated with the possession of physical resources. Traditional production assets – land, machinery, buildings, etc. – were predominantly of a physical nature.

For this reason, the need to have comprehensive and deep knowledge has been limited. Industrial revolutions in previous centuries were based to a large extent on steam power, the physical strength of human beings, and financial capital.

In recent decades, this situation started to change significantly, and the wealth and power of the twenty-first century – especially in the developed economies – are generated mainly by intangible intellectual resources, by knowledge capital. The knowledge revolution is a comprehensive and profound process generating essential mutations in all components of social activities, similar as intensity with those produced by industrial revolution.

Today, we are in the first stages of a knowledge revolution. The products and services are – from the knowledge point of view – more intensive than in the previous periods. Knowledge tends to become the main characteristic of many activities, more than the products and services produced (Cairncross, 1997). The impact of the knowledge revolution becomes visible through the market's volatility, the uncertainties regarding the direction of economic activities, the change in the knowledge structure of product costs and prices, the modification of jobs and careers, the perceived uncertainties of many people, and so on.

A knowledge-based economy is the result of the knowledge revolution, which is rapidly growing in the developed countries and – gradually – in other countries.

The knowledge revolution fulfils the change from a capitalist economy to a knowledge-based economy,¹ and it is, according to experts from the Denmark Ministry of Economy and Public Finance, a very complex process (Burton-Jones, 1999). In their opinion, informational technology and communication have an essential role in fulfilling the knowledge revolution. The new information and communication technologies determine radical changes in economic and social activities and, concomitantly, in the ways to acquire, create, disseminate, and use the knowledge. The new informatics and communication technologies determine the substantial modifications in organizations and in the methods used by producers of goods and services. The proliferation of these new technologies and the changes in the role and function of knowledge generate profound mutations in the modalities in which people work, learn, entertain, and communicate. In the economy, as a general result of the changes mentioned, knowledge becomes the essential factor in the attainment of high productivity and competitiveness by companies, industries, national economies, and the world economy.

According to the renowned specialist Hamel (2002), the economic revolution in the twenty-first century is characterized by complex and non-linear behaviour in technology, competition, and global markets, which are very closely interconnected and demand continued innovation

Figure 2.1 The typology of the causes.

Adapted from *Organizația și managementul bazate pe cunoștințe* (p. 156), by O. Nicolescu and C. Nicolescu, 2011, Prouniversitaria.

in order to create competitive wealth. In his opinion, the transition in the last few decades from an industrial-type economy to the new economy has involved three stages: innovations in products and services, innovation in business processes, and innovation in the entire economic thinking.

In the rich literature dedicated to the knowledge economy and knowledge society, the approach of causes generating a knowledge revolution is – in our opinion – only sporadic and not comprehensive, usually indicating mainly the new information and communication technologies. According to our analysis (Nicolescu & Nicolescu, 2005; Nicolescu & Nicolescu, 2011), the knowledge revolution is generated by **three categories of causes** (see Figure 2.1).

A Technical and technological causes refer to the essential changes made in the material factors of production, both in the hard equipment and in the soft technologies. In our opinion, the profound technical and technological changes contributing to the generation of the knowledge revolution deal with:

- a **Mutations in information processes**, based on informatic technologies, are often digital, which generate a huge increase and acceleration of the information and explicit knowledge collection, recording, transportation, dissemination, use, and deposit. In the economy, informatization determines the co-evolution of the demand and offer and radical changes in the business nature and dynamics (Mertens, 2004).
- b **Profound changes in communication processes**, which have as a consequence, greatly increased the capacity to transmit and to receive complex information and knowledge, despite distance, frequently in real time and often in ways similar to direct human communication, among a large number of individuals and organizations. Telecommunication has become more and more important, effective and efficient in the present economy.

- c **Atoms process mutations, mainly by using new technologies – nanotechnology** – generating new materials, intelligent raw materials, micro mechanisms, etc., having amazing properties and performances. Nanotechnologies influence the economy and social development in multiple ways.
- d **Living cells process mutations, through biotechnologies**, which are able to generate genetic changes in all components of the animal and vegetable kingdom. As a consequence, the yielding of plants and animals is substantially increased, and new superior plant varieties and animal breeds are created. All these biological products, which are very productive, incorporate quantities of big knowledge.
- e **Unconventional energy (ubiquitous energy) production and use** – solar, wind, geothermal, and green energy, which are unlimited, cheaper, and cleaner than the classical energy.

Recently, the study “An MIT SMR Executive Guide” by Segars (2018) was disseminated, which deals with the content and impact of new technologies. It announces “**the universal technological revolution**, one that is fundamentally altering four key realms of our world: commerce, health care, learning and environment”. In this study, seven classes of technology that are driving by a universal revolution are revealed:

- Pervasive computing: embedded proactive, networked digital processes;
- Wireless mesh networks: high bandwidth, dynamic, wireless, smart connectivity;
- Biotechnology: technologically created and enhanced life forms and system;
- 3D printing: digitally designed, chemically manufactured objects;
- Machine learning: augmented, automated data analysis;
- Nanotechnology: engineered atoms, super-materials;
- Robotics: precise, agile, intelligent mechanical systems.

According to the author, each of these technologies exhibits three distinctive and rapidly evolving capabilities:

intelligence – the ability to sense or predict an environment or situation and act on that knowledge; natural interface – the ability to align with the actions, traits and intuitive schemes of humans, as well as the physics of nature; ubiquity – the ability to be omnipresent in previously discrete transactions, objects, machines and people. (Segars, 2018)

All presented elements regarding the new technical and technological mutations indicate an increase in their influence on the society and the

economy, based on the high incorporation of new productive and sophisticated knowledge.

- B Human nature causes**, which reflect major changes in human resources, in work processes, in the capacity, and modalities to innovate and to generate value added in organizations. We synthesize these mutations in the following manner:
- a **Quantitative and qualitative changes in the human resources level of education and knowledge.** From a quantitative point of view, we can see – especially in the developed countries – that the entire population is involved in the education system and in the lifelong learning process. From a qualitative point of view, we can see the radical changes in the teaching and learning processes at every level of the educational system. The theoretical dimension of education is decreasing, concomitantly with the amplification of the methodological pragmatic dimension, with active training methods becoming, gradually, predominant in all educational system components.
 - b All the aforementioned changes in the educational processes have, as a direct effect, the acquisition by all people – albeit to different degrees – of a **higher capacity to create, assimilate, use, and valorize knowledge**. As a consequence, the productive capacity of human resources is much higher than in the last century, concomitantly with the transformation of knowledge into the main economic “fuel”, and it determines decisively the productivity and the performance of individuals and organizations.
 - c **In this context, the innovation availability and capacity of human resources are increasing.** Innovative people represent one of the three determinant factors that contribute to innovation (Manso, 2017). New types of education, new technologies, and actual market demands generate simultaneously extremely high possibilities and necessities for innovation. In all fields – technical, commercial, production, finance, education, ecologic, legislative, social, etc. – innovation is quasi permanent.
 - d **Intellectual work becomes, in almost all economic activities, predominant and/or makes a decisive contribution to achieving performance.** As a result, major challenges are taking place regarding jobs, social composition, the structures, and institutional mechanisms in the economy, science, education, administration, politics, etc.

Because of all these causes, the nature of work is radically different to the work done in the previous millennium. To an increasing degree, work

means collection, combination, generation, and use of knowledge, while the percentage of physical processes is decreasing. Work tends to be based predominantly, both quantitatively and qualitatively, on knowledge and information becoming intellectualized.

- C **Managerial causes** that reflect the major changes produced in the managerial processes and relationships in the ways used in order to combine and to utilize the material production factors and the human resources. The professional management practised in the last few decades contributes to the knowledge revolution and to building a knowledge-based economy and knowledge-based society through its new dimensions and operational modalities (Nicolescu, 2001):
- a **Previsional management**, consisting in the anticipation of changes and in the designing of managerial solutions, allowing organizations to deal with these changes and to valorize their potential for enhancing performance.
 - b **Methodological-applicative management**, practising decisions and actions using to a large extent management systems, methods, techniques, etc. that increase the organization's rigour and efficacy.
 - c **Innovational management**, which consists in the permanent renewing of the managerial processes and relationship content and the modalities to implement them, having many and substantially direct and indirect positive effects on the functionality and performances of the entities involved (companies, clusters, networks, regions, countries, etc.) (Mitra, 2017). A 2017 PwC poll of 1,379 CEOs in 79 countries indicated that innovation was the aspect of their business that they most wanted to strengthen (PricewaterhouseCoopers, 2017).
 - d **Flexible management**, acting through quasi continued and intensive modification of the constructive and functional parameters of organizations' management, generating dynamism and efficacy in the organizations.
 - e **Motivational management**, managers' decisions, actions and behaviours taking into consideration permanently and at a high level, using special concepts, methods, and techniques, the interests of the organization's components and the other stakeholders, with a direct and significant positive impact on the organization's functionality and performance.
 - f **Informatized and digitalized management**, reflected in the use to a large extent, and intensively, of modern informatics, hard and soft, in designing and operating managerial solutions in organizations, having direct and substantial effects on the speed, rationality, and efficacy of the business and social processes in these organizations.

22 *Transition to the Knowledge-Based Economy*

- g **Formative management**, consisting in managers taking into consideration, in practising their managerial processes and relationships, the specific formative requirements, through adoption and implementation of decisions capable of increasing the level of knowledge and the potential of employees, seen as major vectors of the organization's development.
- h **Participative management**, through the implication of the organization's employees and other stakeholders, directly and indirectly, using certain managerial bodies, methods and approaches, in the analysis and in the solution of many complex and important problems of the organization, generating more efficiency. Certain specialists already believe that today there is a collaborative revolution (Adler, Heckscher, & Prusak, 2011).
- i **Systemic management**, consisting in the approach to, and solution of, problems faced by organizations taking into consideration their interdependences, placing in a central position the organization's strategic objectives, and considering the principal endogenous and exogenous variables involved, generating high multidimensional efficiency.
- j **Internationalized management**, by using in the design, adoption and implementation of managerial solutions, knowledge and information regarding managerial, commercial, financial, educational, fiscal, scientific, ecologic, etc. evolutions of the world economy and its important components, and managerial concepts, methods or approaches from other countries.

All these types of causes presented determine the knowledge revolution, which is generating profound and rapid changes in society and the economy.

Knowledge: Main Characteristics and Roles

The knowledge revolution and the new knowledge economy are based on knowledge, information, and data. American specialist Burton-Jones (1999) believes that these three concepts are related as illustrated in Figure 2.2.

Data is defined as a signal that can be sent from a transmitter to a receiver – human beings, computers, etc. **Information** represents intelligent data for a receiver, which brings something new to them. According to Stewart (1998b), **information is different from knowledge** in four respects:

- **Size**, information is usually smaller than knowledge, representing its components;

Figure 2.2 Interrelationships among knowledge, information, and data.

Adapted from *Knowledge capitalism: Business, work, and learning in the new economy* (p. 6), by A. Burton-Jones, 1999, Oxford University Press.

- **Nature**, because knowledge always contains “expertise”, elements that could be used, generating solutions;
- **Temporal**, since knowledge “expertise” involves time-consuming implementation, giving it a processual character;
- **Intelligence**, because knowledge makes the objects in which it is incorporated smart and quite frequently smaller and sligher. The modern mobile phones are a very good example in this respect.

Despite all these differences, in an organization, separation between information and knowledge is not always easy to fulfil in practice, especially when there are more persons involved who interact. There are situations when what is information for one person represents knowledge for another, as they have higher intellectual capacity and/or operational capabilities.

Taking into account the elements presented above, we can assert that in order to be correct, the **delimitation between information and knowledge should be done contextually**, taking into consideration the framework, the factors involved, and the results generated. In this regard, the specialist Cairncross (1997) demonstrated that distance plays an important role in the generation and use of knowledge and it “did not die”, despite the statements made by numerous informaticians.

Burton-Jones (1999) defines knowledge as “cumulative stocks of information and abilities generated by the receiver’s use of information”. In our opinion, this definition should be completed with two aspects. When the receiver is a human being, knowledge reflects

his/her perception and judgment on information received as raw material. Knowledge is also different from information because it depends on the intellectual capacity of the receiver, on his/her competencies regarding the perception, understanding, and use of the information (Bouchez, 2012; Ichijo & Nonaka, 2007). Knowledge incorporates information as its main input. Knowledge and information are substantially complementary (Foray, 2009). The second specification refers to the fact that knowledge is always different from information due to its **capacity to generate value added** (Adler et al., 2011; Bouchez, 2014; El-Korany, 2007; Mertens, 2004; Russ, Fineman, & Jones, 2010; Seeley & Davenport, 2006). It is not easy to identify this capacity, but it is always present in knowledge. Without this capacity, we are dealing with information or data.

Based on the previous elements, we can say that knowledge has **two dimensions – human and economic**. In a company, there is knowledge in human resources (human capital), in clients' preferences and demands (clients' capital), and in its products, processes, organizational capabilities, and system (structural capital). As a result, the value of knowledge assets could significantly surpass the value of company tangible assets (Burton-Jones, 1999; El-Korany, 2007).

A few years ago, a group of researchers from several North American universities (Russ et al., 2010, p. 8) defined knowledge using a mathematical formula:

$$K = P \times (P + S + P \times S)$$

in which:

K = knowledge

P = people

S = systems

P × S = synergy generated by people and systems.

This formula indicates that the processes and systems multiply everyone's capacity to create knowledge.

Analyses carried out by many specialists have revealed that in the present economy, knowledge achieves four essential roles or functions (see Figure 2.3).

Knowledge as **raw material** contributes to a large extent to producing modern products. It is obvious that in manufacturing a computer or TV, besides metal and plastic, a lot of knowledge is involved. Moreover, knowledge represents a major part of the value of these products.

Knowledge also represents an **essential production factor**, because together with classical production factors – labour force and production means – knowledge, often structured as technology, plays a part in all production and commercial phases. Of course, the more modern a company is, the more contributions the knowledge used makes as a production factor.

Figure 2.3 Knowledge roles in economy.

Knowledge represents very frequently a **finished product itself**, such as software, a technical project, card, patent, quality standard, marketing analysis, business plan, ecological project, management project, etc. In recent years, we have witnessed in the fast diversification of knowledge products, concomitantly with an increase of their weight in companies' turnover and in countries' GNP.

It is worth mentioning that at the same time, the majority of physical products incorporate much more knowledge. High-tech products – computers, telephones, satellites, TV sets, drones, robots, etc. – are “richer” in knowledge, which determines “de facto” their high performance and value.

In the total value of modern companies, **knowledge capital** tends to represent a high weight. Although intangible, the knowledge of companies, human resources, technologies, commercial management, financial know-how, etc. has high value, which is more frequently evaluated and taken into consideration in the companies' value on the stock exchange.

All the elements presented in this section demonstrate the multiple and essential roles of knowledge in companies, national economies, and the world economy. In practice, without knowledge none of the socio-economic entities – micro, mezzo, macro, international – could survive and work successfully. Knowledge represents in the modern economy the main stock of accumulation and the major source of wealth (Bouchez, 2014). Moreover, “knowledge not only makes for a more productive and resilient economy but it can also lead to the kind of agility and problem-solving ability that is especially needed in the face of sudden unanticipated shocks” (Mokyr, 2020), like the COVID-19 pandemic.

Knowledge-Based Economy Concept

Before defining and characterizing the knowledge-based economy, we consider it useful to present the three elements that in the opinion of Stewart (1998a, pp. 14–18) represents the pillars of this type of economy:

- a **Knowledge becomes the main content of the purchase, sale and production processes.** In order to demonstrate this, Stewart presents numerous figures regarding the economy of the USA.
- b **The knowledge asset – a component of intellectual capital – becomes more important than financial and techno-material assets.** In the past, when we referred to a company we indicated the building, deposits, etc. – mainly physical assets. In the present we usually indicate its brand.
- c **In the process of valorizing the knowledge and the intellectual capital, and obtaining the intellectual property are needed new terminology, new managerial methods and techniques, new technologies, and – not the last – new strategies.** In other words, the knowledge-based economy is a new type of economy that needs new concepts and approaches in order to be able to describe, explain, understand, and – against this new background – valorize its huge potential.

Of course, we may have some doubts about these three pillars, especially regarding their capacity to synthesize the quintessence of the knowledge-based economy. We consider them very useful, as they are able to bring to the foreground the essential features of the knowledge-based economy, which is very necessary to understand its content.

Specialists' opinions regarding the **definition of the knowledge-based economy or the new economy are rather different.** For example, Soete (2002), in a very well-known book edited by Archibugi and Lundvall, defines the knowledge-based economy as an economy dominated to a large extent by global influence and information and communication speed, often in real time despite the distance. They believe that its main features are globalization and digitalization, which confer intangibility on international transactions, both commercial and direct investment. The knowledge-based economy involves the emergence of new companies and new industries.

Examination of this definition reveals that actually the specialists approach the new economy almost entirely from informatization and internationalization perspectives. They do not realize the essential difference between information and knowledge, and without this landmark, the “new economy” refers less to the economy (except its international dimension) and more to the development of communication

within the economy. Although their approach contains valuable elements, it is not satisfactory because it does not grasp and take into consideration the major changes in the business processes. We appreciate that their approach represents a very interesting and useful definition of the “new economy” in the transition phase towards a knowledge-based economy.

Stewart approaches the knowledge-based economy in greater depth, always using this denomination without referring to the “new economy”. He specifies that the knowledge-based economy has money in view – because it is an economy – in the context of purchasing, producing, and selling knowledge. The knowledge-based economy has its background intellectual capital (Stewart, 1998a). Knowledge – the foundation of the knowledge-based economy – is important not only for high-tech companies but also for companies with a low technical level, non-profit organizations, governmental agencies, etc. Stewart’s definition outlines the fact that in the knowledge-based economy, the elements of an economic nature, reflected in the priority given to business performance, remain essential. This is changed only for obtaining business performance. Stewart’s second major contribution is “knowledge debunking”, outlining that knowledge is not limited only to high technologies, sophisticated software or hardware etc. Knowledge is an approach with an emphasis on economic finality, on its capacity to generate value added, despite its nature, modernity or incorporated information.

The knowledge-based economy also means the development of a new culture in the society, which determines profound changes in our way of thinking, working, and living (Caspar, 2014). The very well-known international organization the OECD has formulated the following definition of a knowledge-based economy: “an economy based directly on the production, distribution and use of knowledge and information”. This definition has been adopted in many countries and also by the European Commission. It was included in a study edited by the European Union (European Commission – Directorate-General for Enterprise and Industry, 2004, p. 5). In such an economy, there is a high degree of connectivity among the involved agents, and knowledge is used and exploited in all ways possible in business activities (Arkeson & Kehoe, 2007).

World Bank specialists have elaborated another definition: “[A] knowledge economy is one where organizations and people acquire, create, disseminate and use knowledge more effectively for greater economic and social development” (World Bank, 2017). It calculates the knowledge index, which evaluates countries’ ability to generate, adapt, and diffuse knowledge.

We have started from these definitions; we have analyzed other approaches to the knowledge-based economy (Castells, 2010; Dumova &

Fiordo, 2010; Foray, 2009; Jouyet & Lévy, 2007; Mallovan, Liquète, & Verlaet, 2015; Powell & Snellman, 2004); we have taken into consideration certain definitions of previous economic types (capitalism, feudalism, etc.); and, based on these, we have formulated **another definition for the knowledge-based economy**. Essentially a knowledge-based economy is characterized by the transformation of knowledge into essential raw material, capital, product, and production factors of an economy, and by economic processes within the knowledge generation, purchase, sale, learning, use, development, sharing, storage, and the protection become predominantly, and decisively determine the productivity, the profit, and the long-term sustainability.²

We believe that this definition of a knowledge-based economy brings **some important supplementary elements compared with the previous variants of definitions**:

- a It indicates the role and economic functions of knowledge within economic processes, outlining its multidimensionality and comprehensive character never found so far for other elements involved in economic processes;
- b It specifies that knowledge transformation represents the main content of economic processes, the types of knowledge operations, and their major contribution to the generation of value added;
- c It asserts the conditioning relationship between the obtaining of economic performance and sustainability on the one hand, and the carrying out of the set of knowledge processes and the using of intellectual capital on the other, integrating, of course, classical resources (technical-material, labour force, financial, etc.).

The highlighting of the superior qualitative nature and the specificity of the knowledge-based economy does not mean a unilateral approach to the economic system. Naturally, a knowledge-based economic system could not be reduced only to knowledge. All inputs necessary for economic activities are maintained. They changed their weights in the economic circuits and partially their nature and manifestation ways because of the major impact of the knowledge.

Without any doubt, although the economic processes will change, they will always need human, technical-material, and financial resources, but in superior configurations and mechanisms, determined by the progress in previous periods by new elements. It is very important that political factors from numerous countries have picked up on the need to construct a knowledge-based economy. At the Lisbon Summit in 2000, EU countries decided through the Lisbon Strategy to build a knowledge-based economy (The Lisbon European Council, 2000). Ten years later, in the EU Strategy 2020 for 2010–2020, it is planned to develop a knowledge-based economy or smart economy

(European Council, 2010). Today's engine of economic growth, represented by the knowledge-based economy, "may lessen the long-term economic impact of the COVID-19 pandemic" (Mokyr, 2020).

Knowledge-Based Economy Features

The identification and presentation of the main characteristics of the knowledge-based economy contribute to the better understanding of its specificity and of the many and major impacts on all economic and social elements in the society. In Figure 2.4, we have indicated what the **most relevant characteristics of the knowledge-based economy** are, according to our research (Nicolescu & Nicolescu, 2019), which are largely different from the characteristics established by other specialists (European Commission – Directorate-General for Enterprise and Industry, 2010; Garmise, 2006; Grant, 2007).

Of course, these features of the knowledge-based economy are not exhaustive and some of them are more difficult to fully understand due to their specific nature. But all together, they provide valuable elements in order to grasp the specificity of the knowledge-based economy and the essential differences compared with the economy that is still predominant at present.

Digital Revolution and Digital Economy

The digital revolution started a few decades ago, and there are many and very diversified approaches. Recently, the specialists Unruh and Kiron (2017) proposed a framework for understanding digitalization and its implications, which in our opinion is very helpful (Figure 2.5).

In fact, in this framework, **the three phases of the digital revolution** are presented:

- The first phase is **digitization, which refers mainly to the products and services changed** from analogue to digital format. Digitization has happened first in sectors where products and services rely just on information (publishing, music, finance), and it has been slower, for more tangible, physical products. **The main result of the first phase of digital revolution has been digitized products and services.**
- The second phase – **digitalization** – has focused on **organizational level**, involving industries in which have been developed new business models and business processes capable of valorizing the benefits to the newly digitized products. In this phase, new types of companies, like Apple, Amazon, etc., have started and developed rapidly. Digitalization has not been limited only to the business sector but spreading to the public sector too. **The main result of this phase is new organization models and processes.**

Figure 2.4 Knowledge-based economy features.

Figure 2.5 A framework for understanding digitalization.

Adapted from “Digital transformation on purpose” by G. Unruh and D. Kiron, 2017, *MIT Sloan Management*, p. 3. Retrieved from <https://sloanreview.mit.edu/article/digital-transformation-on-purpose/>

- **The third phase – digital transformation – has occurred at the level of the entire economy and society**, because of the large-scale diffusion to the new technologies. Digital technologies alter individual and group values, decisions, actions, and behaviours. Digital technologies transform everything (Nicolescu & Nicolescu, 2005) at the individual, organizational, and societal level. They even transform the human genome (Unruh & Kiron, 2017). The main results of this phase – which is continuing rapidly – are the **major changes in the economy and in the society, structures, mechanisms, behaviours, and performances**. These transformations are both positive and negative.

The technologies that make a major contribution to digital transformation, and will have a tendency to increase their impact in the next decade, are the following: the Internet of Things (IOT) and connected devices, artificial intelligence (AI), big data analysis and cloud, custom manufacturing and 3D printing, robots and drones, pervasive computing, biotechnology, machine learning, nanotechnology, social media and platforms and autonomous vehicles (Ben-Ner & Siemsen, 2017; Fisher, 2017; Pigni, Piccoli, & Watson, 2016). According to a recent study (Segars, 2018), combining the capabilities of these technologies will give rise to even more powerful super-technologies that will open a new digital frontier.

The digital revolution has multidimensional effects, not only technological but also economic, ecologic, human, etc. Certain specialists, like Becerra (2017) from the Boston Consulting Group, in his speech at the Davos Forum in 2017, believe that the digital revolution is not about technology, but it is about people.

We present a selection of the **major effects** of the digital revolution based on the works of representative specialists and organizations in the field (Bukht & Heeks, 2017; Dahlman, Mealy, & Wermelinger, 2016; Meyer, 2017; Rifkin, 2016; Schwab, 2016; World Economic Forum & Accenture, 2018):

- change of consumer expectations;
- cheap and better technologies;
- falling cost of advanced technologies;
- product enhancement;
- development of collaborative innovation;
- cheap connection and a more connected world;
- rapid proliferation/extension of networks;
- three big impacts on the labour markets: substitution, augmentation, and creation;
- disruption of existing economic processes, systems, and sectors;

32 Transition to the Knowledge-Based Economy

- reshaping of existing consumer behaviour, business interaction, and business models;
- restructuring of the economy and society;
- deepening inequality in society;
- decreased trust in all technology sectors;
- positive contribution to the decoupling of economic growth from an increase in emissions and resources;
- increased productivity in many sectors;
- new opportunities for leisure, artistic expression and a healthier future;
- generation of new risks, challenges, and opportunities for individuals, organizations, economies, and societies.

The generic results of the digital revolution are – according to its three phases – a **digital sector**, **digital economy**, and **digitalized economy**, as we can see in Figure 2.6.

The figure reveals explicitly the content of each of them and the relationships among their content. **The digital economy** is defined as “that part of economic output derived solely or primarily from digital technologies, with a business model based on digital goals and services” (Bukht & Heeks, 2017, p. 1). The digital economy “encompasses both the core digital sector and also the broader range of extensive digital activity, without claiming that all digitized activity is part of the digital

Figure 2.6 Scoping the digital economy.

Adapted from Defining, conceptualising and measuring the digital economy (p. 13), by R. Bukht and R. Heeks, 2017, <https://diodeweb.files.wordpress.com/2017/08/diowkpr68-diode.pdf>.

economy” (Bukht & Heeks, 2017, p. 13).³ The dimension of the digital economy is huge: its total value reaches USD 2.9 trillion (Gada, 2016). **The digitalized economy** is the result of the digital transformation, and it is more comprehensive quantitatively and higher from a qualitative point of view than the digital economy.

Digital business is different from traditional business in many respects. According to a recent investigation (Kane, Phillips, Copulsky, & Andrus, 2019), the biggest six differences are the following: pace of business (speed, rate of change), culture and mindset (creativity, learning risk taking), flexible, distributed workplace (collaboration, decision-making transparency), productivity (streamlined processes, continuous improvement), improved access to use of tools (greater data availability, technology performance), and connectivity (remote working, always on). During the recent period, within COVID-19 context, digital business development has accelerated, proving again its unique features and advantages.

Relationships Between Digital/Digitalized Economy and Knowledge-Based Economy

In the previous paragraphs, we presented the main elements that characterize the knowledge-based economy: digital economy, digitalized economy, knowledge revolution, digitization, digitalization, and digital transformation. In order to better understand the complex relationships between them and their influence on management, economic, and societal processes, we analyze comparatively a digital–digitalized economy and a knowledge-based economy. We identified **five main differences** (Nicolescu & Nicolescu, 2019) as indicated in Table 2.1.

Based on these elements, we can state that the **relationships between the knowledge-based economy and digital/digitalized economy are relationships between the whole and the part**. A knowledge-based economy is more comprehensive, complex, and multidimensional than a digital/digitalized economy. The knowledge-based economy incorporates entirely the digital and digitalized economy. At the same time, it is important to emphasize that the digitalized economy is an essential component of the knowledge-based economy, and it plays a major role in its development.

In the near future, the digitalization of the knowledge-based economy will increase, with many positive effects on it, but also with increasing challenges and risks. The present knowledge-based economy, according to reputed professor Jeremy Rifkin, is characterized by

digital interconnectivity. Social capital is as vital as market capital, access is as important as ownership, sustainability supersedes consumerism, collaboration is as crucial as competition, virtual

34 *Transition to the Knowledge-Based Economy*

Table 2.1 The main differences between a digital and digitalized economy on the one hand and a knowledge-based economy on the other

No.	Criteria	Digital and Digitalized Economy	Knowledge-Based Economy
1.	Genesis	A digital and digitalized economy are the results of the digital revolution having digital technologies as its main content.	A knowledge-based economy is generated by the knowledge revolution, ⁴ which involves five technical causes, four human causes, and ten managerial causes (see Section 2.1).
2.	Scope	A digital and digitalized economy contain a core digital sector (IT/ICT) and the other components of the economy where digital technologies are used (see Figure 2.6). The potential for development is very large. For example, a study by strategy consultant Roland Berger, cited by Schweer and Sahl (2017), concludes that the digital transformation could add around 1.25 trillion euros to Europe's industrial value creation by 2025. Another evaluation presented at the Davos Forum in 2017 estimated that digitalization could generate a value of around 100 trillion over the next decade globally (World Economic Forum & Accenture, 2017).	A knowledge-based economy unfolds at the level of the entire economy, where the economic processes are focused increasingly on knowledge. It is much larger than a digitalized economy, because of the large amount of knowledge – primarily tacit knowledge – that is not digital and could never be digital.
3.	Foundation	Digital and digitalized economies are focused on the use of digital technologies: Internet	A knowledge-based economy is focused on knowledge (creation, purchase, store,

(Continued)

Table 2.1 (Continued)

No.	Criteria	Digital and Digitalized Economy	Knowledge-Based Economy
		of Things (IOT), artificial intelligence (AI), data analytics and cloud, 3D printing, drones, robots, technological platforms, etc., and their impact on the level of product, organization, and – to a less extend – the economy and the society. In these types of economy, it is not done the difference between information and knowledge, and it is not emphasizing the essential capacity of knowledge to create value added.	dissemination, use, share, learning, protecting, valorizing, etc.), taking into consideration both explicit and tacit knowledge, the latter not being organically associated with digital technologies.
4.	Nature of processes involved	A digital and digitalized economy deal mainly with information processes, where digital technologies and to a smaller extent their impact on business processes are largely used.	A knowledge-based economy deals with all economic processes based on knowledge; economic and social processes are approached taking into consideration their multidimensional nature – economic, social, ecologic, etc.
5.	Performance	Digital and digitalized economy performances are evaluated to a large extent by specific indicators, which reflect the particularities of the digital technologies used: for example, digital traction metrics, presented at the Davos Forum in 2017 (see Table 2.2). Of course, they are usually filled with some financial indicators.	Performance of the knowledge-based economy is evaluated multidimensional – economic, social, ecologic, and educational. For example, the Knowledge Economy Index (KEI) is based on the average of four subindexes, which represent the four pillars of the knowledge-based economy: economic, innovative, and institutional regime

(Continued)

Table 2.1 (Continued)

No.	Criteria	Digital and Digitalized Economy	Knowledge-Based Economy
			(EIR); innovation and technological adoption; education and training; information and communication technologies (ICT) infrastructure. Each of them is calculated using many and diversified indicators.

Table 2.2 Company digital indicators

Company Digital Indicators			
Size	Number of Active Users	Rate of Users	Implication
Examples	Examples	Examples	Examples
<ul style="list-style-type: none">• Total conversions• Overall traffic• Number of users• Chanel specific traffic	<ul style="list-style-type: none">• Total site visits• Number of monthly active users• Number of weekly active users	<ul style="list-style-type: none">• Ratio of new users to repeat users• Click through rates• Lead to close ratio• Abandon rate	<ul style="list-style-type: none">• Return of digital investing• Top technical talent attracted, promoted and retained• Interactions per visit• Client satisfaction index

Adapted from Digital transformation initiative (p. 23), 2018, World Economic Forum. Retrieved from <http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/dti-executive-summary-20180510.pdf>

integration of value chains gives way to lateral economies of scale, intellectual property makes room for open sourcing and creative common licensing, GNP becomes less relevant and social indicators become more valuable in measuring the quality of life of society, and an economy based on scarcity and profit vies for a Zero Marginal Society Cost, where an increasing array of goods and services are produced and shared for free in an economy of abundance. (Rifkin, 2016)

In the last few decades, the knowledge-based economy has developed fast, especially in the developed countries. The European Union, in order to accelerate the construction of the knowledge-based economy,

has adopted two strategies – the Lisbon Strategy in 2000 and the 2020 EU Strategy in 2010. Unfortunately, these were not very successfully implemented.

For the next period, it is necessary, using systemic and realistic approaches, not reactive but proactive, at the world and organization level, to harness the huge potential of all types of knowledge, of a digital transformation. The Davos Forum 2017 (World Economic Forum & Accenture, 2017) and many specialists (Bukht & Heeks, 2017; Dahlman et al., 2016; Kiron & Unruh, 2018; Meyer, 2017; Mosco, 2017; Schweer & Sahl, 2017; Unruh & Kiron, 2017) have provided many essential elements capable of unlocking knowledge value to society.

Knowledge-Based Company – The Essential Component of the Knowledge-Based Economy

The knowledge-based economy has as its principal component a knowledge-based organization. The majority of knowledge-based organizations are **knowledge-based companies** that could be defined as companies that rely on an equilibrated approach from an economic, ecologic, social, and educational point of view and are able to highly valorize knowledge and other available resources, generating long-term efficiency and multidimensional performances, validated by the market and recognized by the society. The knowledge-based company is a sustainable enterprise, which establishes long-term economic, social, ecologic, and educational objectives and has the capacity to fulfil them through intensive use of knowledge, producing multiple positive effects for an organization, its stakeholders, and environment.

A **digital company** is a very important type of knowledge-based company that is characterized by the widespread use of digital technologies and by intensive use of digitization, digitalization, and digital transformation. Digital companies are very innovative and flexible, focusing on up-to-date knowledge, closely associated with digital technologies. Usually, a digital company is a networking-driven company. There is a large variety of digital companies, such as hubs, technological platforms, living labs, etc.

Analysis conducted by specialists, as well as the activities and performances of companies, reveals that a **knowledge-based company presents** specific features that are quite different from classical enterprises, which still predominate. In Table 2.3, we display these features, synthesized from the many studies (Burton-Jones, 1999; Cairncross, 2003; Fabbri, Glaser, Gaujard, & Toutain, 2016; Iansiti & Lakhani, 2017; Nicolescu & Nicolescu, 2011; PricewaterhouseCoopers, 2017; Schneider, Wickert, & Marti, 2017; Weill & Woerner, 2017; Weill & Woerner, 2018; Williamson & De Meyer, 2012).

Table 2.3 The features of the knowledge-based company

No. *Features*

1. Decrease of physical assets, activities, and employees, concomitantly with the development of the internal knowledge base and the amplification of the relationships with clients, suppliers, and external human resources.
2. Externalization of activities that are not essentially for the company, concomitantly with internalization of other activities, essential for organization
3. Change of the relationships with external human resources necessary for the company, by asking them to fulfil less important activities, like office works and maintenance operations.
4. Amplification and diversification of the knowledge treatment processes – creation, purchase, dissemination, use, share, storing, learning, sale, protection, etc. – that have a decisive impact on the company's competitiveness.
5. Large scale of the innovation processes in the company's activities, being technical, commercial, human resources, managerial, etc.; innovation becomes a precondition of the company's survival and performance.
6. Strategic development of the company relies on increasing the organization's knowledge (vertically and horizontally), which supposes that the company has the capacity to develop its own knowledge and to seize the opportunities for synergetic cooperation with other enterprises in the knowledge domain.
7. Intensive preoccupation of the company with implementation of digital technologies and other up-to-date technologies, methods and techniques.
8. Internal organization model of the knowledge-based company is to a large extent similar to the human cognitive model, involving structural networks, semi-autonomous team, flexibility, organizational and individual abilities for learning, etc.
9. Proliferation of participative and collaborative approaches, with the company acting to develop collaborative communities.
10. Reduction of the number and roles of middle and low-level managers and, gradually, externalization of peripheral works, concomitantly with the integration in the company of "knowledge managers", who frequently start their work with the company as change consultants and agents.
11. Amplification of the learning processes of human resources, with the company becoming a learning organization.
12. Remodelling of the company's managerial and economic capacities, in order to exploit better the knowledge and digital technologies.
13. Training investment directed to a certain extent at external labour force used, in order to replace their own company employees, who are not developing skills sufficiently.
14. Restructuring of the company's motivation system according to the following requirements:
 - increase of the stimulants given to all employees, according to their proven performance and merits;
 - increase of the stimulants based on individual performance for peripheral employees;

(Continued)

Table 2.3 (Continued)

No.	Features
	<ul style="list-style-type: none"> • enhancement of the concomitant use of organizational, group and individual stimulants for the company's core employees; • widespread use of promotion as a stimulant for internal and external company human resources.
15.	Development of an open culture, with the company communicating and inviting clients, suppliers, and other external stakeholders in the organization in order to follow how it implements the decisions regarding their entities.
16.	Use of transparent and correct approaches in the company relationships with internal and external company stakeholders, paying close attention to building and maintaining "trust capital".
17.	Implementation of multiple collaborative ways with other organizations participating in networks, ensuring company has better resource access, time, and cost conditions.
18.	Diminution of barriers between the different types of company, between human enterprise resources and persons, and between home work and work organization.
19.	Gradual decrease of the boundaries among companies.
20.	Maximization of the company's efficiency and effectiveness is based concomitantly on highly cohesive teams and on the moderate interaction among them.
21.	Company focus on intellectual capital obtaining, use, protection, and valorization.
22.	Organization focus on the achievement of multidimensional performances – business, social, ecologic, and educational – which are conditioning decisively the company's sustainability.

There are two ways to create a new type of enterprise – a knowledge-based company:

- a **Business transformation of "classical" enterprises**, sometimes by digital transformation, fulfilling, according to specialists, a complex process, structured in six steps:
 - knowledge identification and evaluation
 - knowledge re-engineering
 - knowledge networking
 - knowledge-based motivation
 - knowledge enhancement
 - knowledge-based company maturization

The number of "classical companies" that transform themselves into knowledge-based companies is increasing rapidly, because – as outlined recently by the renowned specialists Weill and Woerner (2017) – today "companies must reinvent to survive".

- b **Creation of knowledge-based companies, usually digital companies.**
A major characteristic of this type of company is the strong emphasis on internal and external stakeholders, using a wide range of approaches. These start-ups are built from the beginning as ecosystems, taking different forms: hubs, living labs, fab labs, technological platforms, etc. Frequently these are very competitive, with some of them becoming famous – Apple, Microsoft, Uber, etc.

Knowledge-based companies should be sustainable organizations, and their activity and management should **rely on the quadrangle of knowledge sustainability** (see Figure 1.1 in the chapter “Instead of introduction” elaborated by Nicolescu and Nicolescu, 2017). The quadrangle highlights the four dimensions of the efficiency and effectiveness of a knowledge-based company. In our opinion, this quadrangle synthesizes in a systemic way the essential elements regarding economic and social utility and the impact of a knowledge-based organization. The four dimensions on which the model is structured represent axes that must be considered by company managers and other stakeholders, in order to harness the huge knowledge potential and to generate accelerated and sustainable development.

The eight key lessons formulated recently by a group of specialists (Kiron et al., 2017) could be very useful for achieving company sustainability. Also, super-technologies will offer rich opportunities for companies (Segars, 2018).

Business Ecosystems – The New Performant Structures of the Knowledge-Based Economy

A business ecosystem represents a new form of knowledge-based company developed in the last few decades that is radically different from classical companies. A **business ecosystem** is a flexible and adaptable network of organizations – suppliers, producers, distributors, customers, competitors, and other stakeholders – interacting on the delivery of specific products or services, both through cooperation and competition. The ecosystem is generated by transforming companies from being product-driven to networking-driven. The **main characteristics** of the ecosystem (Puranam, Alexy, & Reitzig, 2014; Uden, Wangsa, & Damiani, 2007; Williamson & De Meyer, 2012) are the following:

- ecosystem products and/or services are complex, not standard, involving a large amount of, and specific, tacit and explicit knowledge;
- each organization component affects and is affected by others;
- each organization is proactive in developing mutual relationships with other ecosystem components;

- one organization is the lead company and uses “smart power” to play an active role in directing, stimulating and shaping the business ecosystem around it;
- the ecosystem structure, activities, and interactions are flexible and can be rapidly reconfigured;
- the ecosystem’s organizations are embedded in a specific flexible business environment and they need to co-evolve together;
- the business ecosystem is an informal system, flexible, innovative, adaptive, and dynamic, focused on satisfying the changing demands in certain market niches and on engineering effective ways to capture profit for its components.

In the context of digital transformation, special attention has been paid to the **digital ecosystem** (Briscoe & De Wilde, 2006; Dini et al., 2005; Puranam et al., 2014; Uden et al, 2007; Weill & Woerner, 2018; Zhu, 2015), which represents a new type of ecosystem. The **digital ecosystem** is an open socio-technical system, based on the collaborative community model, focused on the production and distribution of knowledge-intensive products and services, using largely digital technologies. The properties of the digital ecosystem are self-organization, scalability, and sustainability. In the last few years, artificial intelligence ecosystems have proliferated quickly (Bughin & Hazan, 2017; Halper & Stodder, 2016;). In the world economy, a large variety of digital ecosystems has developed (Almirall et al., 2016; Coyle, 2017; Dini et al., 2005; Dushnitsky, Guerini, Piva, & Rossi-Lamastra, 2016; Fabbri et al., 2016; Iansiti & Lakhani, 2017; Puranam et al., 2014; Van Alstyne, 2016; Van Alstyne, Parker, & Choudary, 2016; Visnjic, Neely, Cennamo, & Visnjic, 2016; Williamson & De Meyer, 2012):

- hubs
- digital platforms
- industrial mash-ups
- global digital centres
- “smart” cities
- fab labs
- living labs

In digital ecosystems, a digital culture is developed that is characterized by impact, speed, openness, and autonomy (Westerman, Soule, & Eswaran, 2019). The fast extension of the digital ecosystem is caused by the **multiple advantages** generated for its components and for economic development. Williamson and De Meyer (2012) have identified six very consistent key advantages (see Figure 2.7).

Elements presented in this section provide convincing arguments for understanding that the ecosystem represents a new form of knowledge-

Figure 2.7 Key ecosystem advantages.

Adapted from “Ecosystem advantage: How to successfully harness the power of partners” by P. J. Williamson and A. De Meyer, 2012, *California Management Review*, 55(1), p. 33. Retrieved from https://ink.library.smu.edu.sg/cgi/viewcontent.cgi?article=4518&context=lkcsb_research

based organization, capable of solving sustainable, very complex challenges in the knowledge-based economy, by developing comprehensive relationships with certain important stakeholders. In the context of the COVID-19 pandemic, many ecosystems have proved superior resilience and performance compared with the “classical companies”.

Challenges of COVID-19 Pandemic Context

Under the impact of the COVID-19 pandemic, the world economy faces a deep societal crisis. In almost all countries, a so-called “real economy freezing” has occurred, which is reflected in decreased GNP, increased unemployment, state budget income reduction, increased budget deficit and public debt, etc. Analyses realized by numerous specialists in many countries regarding the crisis generated by COVID-19 have revealed **five essential elements**:

- a Medical and business situations are, and shall be, very different from one country to another, because of diversified characteristics and influences of medical, economical, managerial, social, cultural, and ecological determinants, both national and international.
- b Every country needs a specific approach, as a function of the particular/national context and of the business and social resilience at the national, sectoral, and territorial levels.

- c Countries should collaborate and coordinate certain essential medical and business elements, taking into consideration the fact that the world faces not only a medical pandemic but also an economic crisis, which is very complex and challenging.
- d Combating the pandemic and its many negative effects, getting out of the crisis, and relaunching the economy are conditioned by comprehensive and substantial state intervention in the socio-economic activities.
- e Getting out of the crisis and relaunching the economy also depend to a large extent on companies, which are the main providers of value added, GNP, jobs, and incomes to the state budgets in every country. In order to be able to do this, many companies should reinvent themselves and remodel their management.

Under the influence of the COVID-19 pandemic, there are many major changes in the economy, which have a powerful impact on companies and represent **challenges for their management**. Among these, we mention the following:

- Notable decrease in direct demand for certain products and services (tourism, transport, entertainment, etc.).
- Reduction and/or delay of the supply with certain raw materials, spare parts, and finished goods.
- Increased risk of being blocked or delayed with public or private economic and social ongoing projects.
- Decrease in the indirect demand (especially industry, service, and trade) for many products and services caused by the previous changes.
- Notable fluctuation in orders and prices for certain important product types, like drugs, medical equipment, oil, some raw materials, etc.
- Decrease or major modification of alternative financing (stock exchange, venture capital, equity funds, business angels, etc.).

Under these conditions at the national and international level **new societal priorities** are emerging:

- Health population protection at a high level.
- Maintaining the functioning of the economy at all its levels – national, regional, sectoral, local, and company – as close as possible to its normal standards and performances, in order to be able to satisfy major individual and organizational needs, both economic and social.
- Normalization of the entire society's functioning.

44 *Transition to the Knowledge-Based Economy*

- Preservation of the national economy sustainability in the long run, in the present and future medical, commercial, financial, social, etc. conditions.
- Rapid recovery of the economic growth in each country.

In order to cope with these challenges and priorities, it is **necessary to project and implement a new type of management** that is able to increase the resilience of all economic and social entities at national, sectorial, regional, local, microeconomic, and international level.

In the crisis and post crisis, management will be effective and efficient if it has at least the following six capabilities:

- The ability to have realistic perceptions of the processes developing in the economy and society and of their consequences on the people, companies, business, etc.
- Capacity to provide rapid, flexible, and effective feedback on new situations (Dykes, Hughes-Morgan, Kolev, & Ferrier, 2020; Romeo, Moukanas, & Rung, 2020).
- Resilience capacity in the face of multiple stresses (medical, social, economic, political, etc.).
- Capacity to be innovatively performant in the short, medium, and long run.
- Capacity to cooperate with other entities, in order to take into consideration the present and future societal priorities, threats, and opportunities.
- Capacity to conceive an innovative strategy that is able to cope with the new contextual threats and to valorize the new opportunities, contributing decisively to the rapid and performant recovery of the company.

A new type of management should be able to valorize the potential of all the organization's main stakeholders – external and internal – as was stressed at Davos by the World Economic Forum (WEF, 2020) and numerous specialists (see, e.g., Chaturvedi, Dey, & Singh, 2020; Chima & Gutman, 2020; Radjou, 2020; Romeo, Moukanas, & Rung, 2020), who believe that this is the key for a performant management in the present and post-COVID context. In their implementation, managers should bear in mind that the return to normality, which will be a “new normality”, will be a long process (Levenson, 2020), and the contribution of each important stakeholder is very much needed.

Notes

- 1 We mention that not all specialists who approach the future changes of the economy and society, agree with the knowledge revolution and the knowledge-

based economy. For example, in a book largely debated at the international level a few years ago – G. Balakrishnan (Ed.). (2003). *Debating empire*. London, UK: Verso – is proposed a transition through revolution to the empire, at the world level, without taking into consideration “de facto”, the impact of the last economic, scientific, etc. developments, although they mention some of them.

- 2 Of course, there are some authors who denied the existence of the knowledge-based economy (Azam, G. 2006. L'utopie de L'économie des Connaissance. *Problèmes Economiques*, 2901, 33–39; Foray, D. 2004. *The economics of knowledge*. Cambridge, MA: MIT Press).
- 3 Definition formulated by Bukht, R. and Heeks, R. is not only correlated with the three phases of digital revolution, but also based on the analysis of 21 definitions of digital economy (Bukht, R., & Heeks, R. 2017. *Defining, conceptualising and measuring the digital economy*. Working Paper Series, Paper No. 68. Retrieved from <https://diodeweb.files.wordpress.com/2017/08/diwp68-diode.pdf>).
- 4 The knowledge-based economy is the result of the knowledge revolution, which is more comprehensive than digital revolution (see comparatively 2.2 and 2.5 content). In our study, we choose to use the term of knowledge revolution and not fourth industrial revolution (see, e.g., Schwab, K. approach) or third revolution (see, e.g., Rifkin, J. approach). We prefer the concept of knowledge revolution, for several reasons: the knowledge represents the essential element of the radical transformation in economy and society; industrial represents just one dimension of the economy and it is not able to express the essence of the last decades deep mutations which include all economy branches and sectors. Industrial is something “déjà vu”, which not reflects the novelty of what happens in the last decades, the radical new content of the economic and society processes is represented by the knowledge.

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