Teaching Digital Entrepeneurship

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Doing business digitally Textbook

DOING BUSINESS DIGITALLY

TEXTBOOK

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TABLE OF CONTENT

PREFACE

'Coming together is a beginning.
Keeping together is progress.
Working together is success'
(Henry Ford)

The Internet changed the world business landscape. Nowadays, the consumer can express his opinion and, in this way, influences the decisions of firms, SMEs can compete with large companies, consumers can buy internationally, and small and local businesses can sell all around the world. All of the above has generated countless opportunities and, consequently, a profound change.

From the company's perspective, one of the most critical and attractive objectives is digitization: the latter understood as any change in the organization and its business model deriving from the increasing use of digital technologies. Digitization, which consists of the implementation of digital tools and technologies that can make business processes and flows more efficient, is supported by new information and communication technologies (ICT) and revolutionizes the way business is conducted through the use of the Internet of Things (IoT) technologies, intensive data exchange, and analytical forecasting. The use of digital technologies offers new business opportunities, supporting chances for value production, revenue growth, and operational efficiency. These opportunities push many companies to experiment with innovative business models based on digital technology, even if, despite the substantial investments of companies in digital initiatives, few have been able to experience the expected growth.

Therefore, the purpose of this handbook is to cover all critical issues needed to understand and to explain how to do business digitally effectively. This book is intended for both teachers and master's degree students, which are its main target. To the former with the intention of offering innovative teaching tools, to the latter to test the effectiveness of the tool on the learners' side.

The text is divided into two parts – Theoretical framework and digital entrepreneurship planning –, and the topics, with the relative examples taken from the various partners of the project, are the following:

Part 1 – Theoretical framework.

- Chapter 1 – *Introduction to Industry 4.0* – introduces the starting point of the fourth industrial revolution and its consequences from the economic and social point of view and the advantages and disadvantages of Industry 4.0.
- Chapter 2 – *Introduction to Industry 4.0 with a contribution on Society 5.0* – points out the concept of "Society 5.0", identifies the role of the digital technology in the development of the next Society, and recognizes the opportunity of "Society 5.0" for Digital Entrepreneur.
- Chapter 3 – *Disruptive technology* – explains the foundations behind Clayton's Christensen "Disruptive Innovation Theory" with its advantages and drawback and distinguishes between "disruptive" and "sustaining" technologies.
- Chapter 4 – *Digital business and digital transformation in business* –defines what digital business is and the pillars and critical factors of digital business development and identifies the digital business models and the enablers, barriers, and challenges of digital transformation.
- Chapter 5 – *Opportunities and threats for digital business and digital entrepreneurship* – points out fundamental modes of measuring digital business / digital entrepreneurship, identifies the current stage of digital business and digital entrepreneurship development and key

benefits as well as threats originating from an increasingly digitized world and explains the complexity of digital business and digital transformation.

- Chapter 6 – *Digital infrastructure* – distinguishes between "hard" and "soft" digital infrastructure, identifies the impact of the Internet of Things on the quality of digital infrastructure and its socio-economic benefits and threats, and analyzes the latest Blockchain technology.
- Chapter 7 – *Digital strategies* – clarifies the reasons why both firms and entrepreneurs need a digital strategy and how they align and/or integrate with and support firms' business goals and objectives, develops a framework for Digital Strategy formulation and implementation, and detects firms' strengths and weaknesses in answering to the digital change.
- Chapter 8 – *Digital firm's activities* – addresses to manage the supply chain and be aware how to turn it into digital supply chain, to learn and understand the digital evolutions, to manage digital marketing strategies and instruments, and successfully to implement digital firm's activities.
- Chapter 9 – *Digital Business Ecosystems* – develops the infrastructure of digital business ecosystem, finds out the competitiveness and benefits of digital business ecosystem, investigates the experience of some institutions of digital business ecosystems.

Part 2 – Digital entrepreneurship planning.

- Chapter 10 – *Developing success digital venture: resource and competence analysis* – identifies the elements that characterize the digital entrepreneurial mindset, how technological trends that contribute to the digital entrepreneurial mindset generate entrepreneurial opportunities in digital entrepreneurship and identifies and defines the set of resources and skills to support the development of entrepreneurial opportunities in the digital context.
- Chapter 11 – *The six building blocks for creating high-performing digital enterprises* – recognizes the different building blocks for creating a high-performing digital enterprise and the how they may be developed within firms to get success, identifies the firms' capabilities and their linkage with each block of the model and employs the model in practice.
- Chapter 12 – *Business model innovation* – analyses the construct of Business Model Innovation (BMI) in the new digital landscape, clarifies the critical role of boundary management capabilities to implement new BMI, and adopts a future-looking perspective in implementing successful BMI, considering the fundamental challenges to face on digital transformation.
- Chapter 13 – *Digital business plan and start-up* – explains the basics of business plans and of digital business plans, how to write a business plan, basics on start-ups, and financing possibilities for start-ups.
- Chapter 14 – *Digital Entrepreneurship: best practices for success* – explores some salient traits of Digital Entrepreneurship, clarifies the infusion of Digital Technologies in Entrepreneurship research fields, describes Digital Entrepreneurship along the firm's life cycle, and implements a successful business idea in a digitized world.
- Chapter 15 – *Socio-materiality and digitalization* – explains how technology can impact business practices on organizational practices, points out how digital artifacts can be perceived by entrepreneurs, identifies how digital technology interacts with the human factor.
- Chapter 16 – *Skills for disruptive digital business* – identifies how the different Talent Management models can be used in knowledge-intensive companies (KIF) with disruptive digital business models.

Pierpaolo Magliocca
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PART I:

THEORETICAL FRAMEWORK

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1. INTRODUCTION TO INDUSTRY 4.0

Learning objectives

After reading this chapter, you will able to:

- Know the evolution of the industry during all its stages.
- Recognize which is the starting point of the fourth industrial revolution and the consequences it generated in the economic and social spheres.
- Analyze the concept of Industry 4.0 and know the integration methods that exist in a connected industry.
- Identify the fundamental aspects of the enabling technologies that make up Industry 4.0.
- Identify the digital transformation process of the industry and know how a smart factory can be structured from the conceptual point of view.
- Know the advantages and disadvantages of Industry 4.0.

1.1. Historical overview of the industry evolution

The most stunning revolution in the history of mankind is the industrial one. The term "industrial revolution" is considered to have been coined in 1837 by the French economist Auguste Blanqui to define the socio-economic changes brought about by the transition from domestic craft work to factories with motorized machinery.

These revolutions arise mainly from the evolution of technology and innovation in the way of raising the means and existing resources in the industry. For this reason, the process of change between each of the industrial revolutions has been long and slow, which is ongoing at this time.

As Schwab (2016) indicates "17% of the world has not yet fully experienced the second industrial revolution, since almost 1.3 billion people still lack access to electricity. This is also true for the third industrial revolution, with more than half of the world's population, 4 billion people, most of whom live in the developing world, without access to the Internet. The spindle (hallmark of the first industrial revolution) took almost 120 years to spread outside Europe".

Currently, there is the idea that the success of an industrialized nation will depend on its active participation in the fourth industrial revolution, where it will have to adapt to changing consumer demands and adaptations in the manufacturing process. Figure 1.1 shows a diagram of the evolution of the industrial revolution.

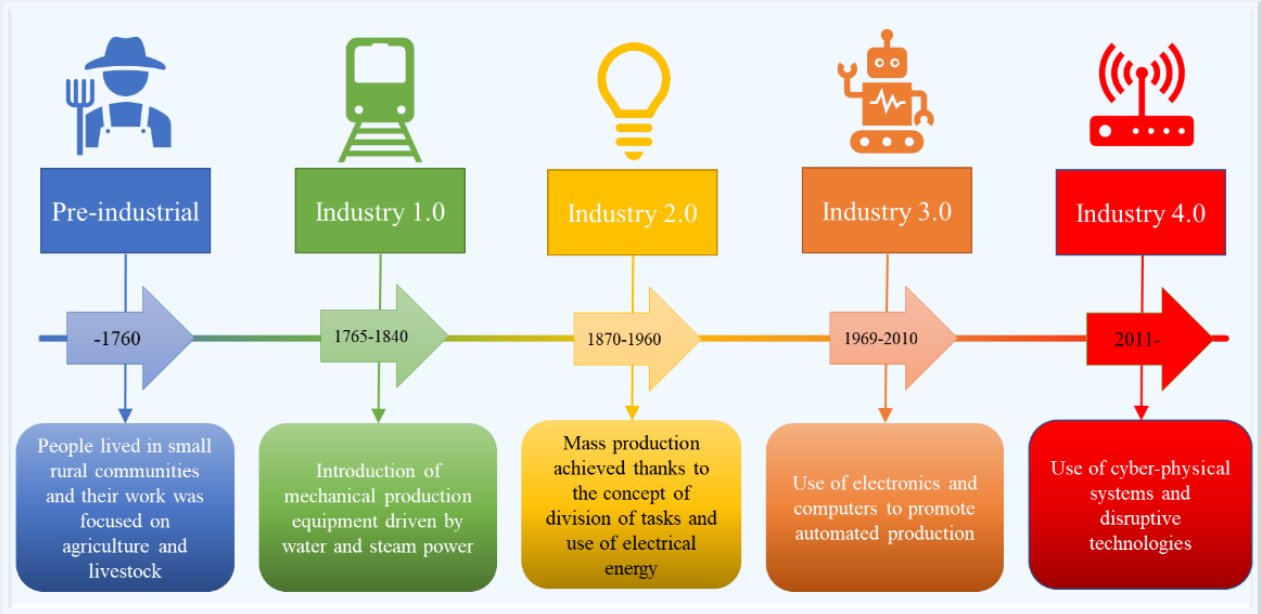

Figure 1.1. From the first to the fourth industrial revolution

The First Industrial Revolution – Industry 1.0 (1760–1780)

In the pre-industrial era, people lived in small rural communities and their work was focused on agriculture and livestock. Working conditions were very precarious, as were sanitary conditions and daily life. To carry out work tasks, they used simple devices and tools that they made by hand in their own homes (Lele, 2019).

The first industrial revolution began in the United Kingdom around 1760-1780 (second half of the 18th century) and lasted until around 1840, and arose through mechanization powered by steam engines, making a transition from manual production to machines in industries. Later, this first industrial revolution appeared in Germany, the United States, France, Belgium and Switzerland.

The first industrial works were based on mechanical production powered by water and steam turbines that used coal as fuel. The first industries were based on the textile and metallurgical field (iron and steel). At the same time, the development of the railway as a means of transporting material, mainly, and the invention of the steam locomotive made commercial transactions possible. Somehow, a major change in production was taking place, also leading to an economic and social transformation.

The fundamental consequence of this stage was to achieve a faster and cheaper production, with more quality, quantity and efficiency, generating an industrial culture and a growing acceptance by society (improvement in terms of quality of life). At this stage, the world population grew by 57% to 700 million and then, in 1800, it reached the 1 billion mark.

The Second Industrial Revolution – Industry 2.0 (1870)

The second industrial revolution (technological revolution) appeared in the second half of the 19th century and ended with the start of the First World War. A process of industrialization was developed in the United Kingdom, Germany and the United States, and also in Japan, France and Italy.

One of the highlights of the second industrial revolution was the use of new energy sources, such as electricity, gas and oil. Fundamentally, the use of electrical energy led to an increase in the efficiency of production processes, since electrical machines represented a considerable technological advance and solved operating and maintenance problems.

The most important inventions of this era are the light bulb, the telephone, the telegram, automobiles, and airplanes. Also, the steel industry and the chemical industry (manufacture of synthetic fabrics, fertilizers, etc.) appeared.

As discussed above, the electrification of production systems, in the case of assembly lines, was a considerable innovation at this time and improved mass production through the division of labour. In this sense, production flows were automated, allowing more quantity to be produced in less time and at lower cost.

Unfortunately, this stage also generated poverty, since unemployment increased; the great depression that occurred between 1873 and 1896 caused completely terrible consequences in the labour and economic sphere. In addition, working conditions were dangerous and the working day was made up of too many hours, leading to an increase in workplace accidents (Popkova, et al., 2019). However, skilled workers achieved high wages and economic stability.

The Third Industrial Revolution – Industry 3.0 (1969)

The third industrial revolution is determined by the development of electronics (transistors, integrated circuits) and computing (microprocessor). These technological advances achieved the goal of automating mass production, making it more flexible. Among the outstanding devices of this time we must mention the programmable logic controller (PLC), which allowed to have independent advanced automated systems which reduced human intervention.

At the energy level, nuclear energy arises, which is why it was possible to increase the production of electrical energy and, in addition, also increase the efficiency of electrical and electronic systems. This increase in efficiency leads to computerized automation, further reducing the human presence in the production process (although not eliminating it completely), increasing precision and reducing process time.

This revolution also spawned a shift from analog and electronic technology to digital technology, which appeared in 1980 and continues to develop today. The invention and production of miniaturized material generated an increase in research in space technologies and biotechnology.

The development of hardware and software in the field of telecommunications allowed the development of many management processes, such as enterprise resource planning (ERP), supply chain management (SCM), stocks and operations management, etc. This evolution also led to the emergence of the Internet and information and communication technologies.

In the 1980s and early 1990s, personal computers favoured further modernization of organizations. Programming languages, databases, and LANs integrated tasks, organized information, and optimized decision-making.

Since the early 1990s, the Internet has had a significant impact on the economic, commercial and socio-political aspects of our lives. At a business level, it has offered organizations better opportunities, has developed electronic commerce and has made it possible to increase the presence of organizations worldwide.

Finally, information and communication technologies allow constant connectivity and interactivity. This has generated substantial changes in consumer behaviour and new business models have been developed, favouring economic growth.

The Fourth Industrial Revolution – Industry 4.0 (2011–)

The fourth industrial revolution emerged at the beginning of this century and is fundamentally based on the digitization of all processes. At the Hannover Fair (Germany) in 2011, the multinational company Bosch spoke about technological changes and the applications of information and communication technologies in the field of production. The German government, aware of the coming technological revolution, proposed the “Industrie 4.0” project with the idea of preparing German industry for changes in production.

At the same time, similar concepts were introduced in other countries, such as:

- North America: in late 2012, General Electric generated the concept of "Industrial Internet" to describe the interrelationship between the physical and virtual worlds.
- France: the "Industrie du futur" concept is based on the following items: disruptive technologies, advanced training of workers, support for SMEs enterprises, promotion of the industry, international cooperation.
- China: in 2015, the "Made in China 2025" initiative of the Ministry of Industry and Information Technology was launched in collaboration with the Academy of Engineering. The goal is to move from low-cost to high-quality products.

The main objective of this stage is to interconnect production and allow its interaction in real time, using enabling technologies and cyber-physical systems (physical systems that are controlled by automation systems equipped with artificial intelligence that minimize or eliminate human presence). As a result of the fulfilment of this objective, the concept of "smart factory" appears, where machines and processes can share and analyse information globally and in real time, establish control actions independently, or manage themselves virtually.

Also, another important characteristic of the fourth industrial revolution is the concern to achieve manufacturing processes that are sustainable. In this sense, Industry 4.0 uses the advantages offered by emerging technologies to obtain a competitive advantage in the field of logistics, production scheduling, quality control and increased efficiency. Emerging technologies and innovation were spreading much faster and more widely than in previous industrial revolutions, which continue to develop in some parts of the world.

Finally, Schwab (2016) indicates that "*even today the lesson of the first industrial revolution is valid: that the extent to which society adopts technological innovation is a determining factor of progress. The government and public institutions, as well as the private sector, must do their part, but it is also essential that citizens see the long-term benefits*".

1.2. Industry 4.0 concept

Industry 4.0, carrying out an extensive review of the literature, can be defined in general terms as the process of digital transformation of production systems using different enabling technologies in order to increase the competitive value of companies, providing greater flexibility to processes and customizing products and/or services in a sustainable way and with respect for the environment. In parallel, considering the literature review indicated above, there are other Industry 4.0 definitions:

- Industry 4.0 is a revolution enabled by the widespread application of advanced technologies at the production level to bring new values and services to customers and to the organization itself (Khan & Turowski, 2016).
- Industry 4.0 approach represents a paradigm shift in production processes and business models, setting a new level of development and management for organizations (Paiva Santos et al., 2018).
- Industry 4.0 encompasses the development and integration of innovative information and communication technologies into the industry. The main goal is to foster the intelligent networking of products and processes along the value chain, thus allowing it to use more efficiently the organizational processes, into the creation of goods and services to enhance customer benefit offering them novel products and services. These related changes in the industrial sector are seen as a comprehensive paradigm, currently named as the fourth industrial revolution: Industry 4.0 (Barreto, 2017).
- A complex communication network between various companies, factories, suppliers, logistics, resources and customers (Qin, 2016).
- The new technological developments that the Internet and support technologies form the backbone of integrating physical objects, human players, intelligent machines, production lines and processes across organizational boundaries (Schumacher, 2016).
- Industry 4.0 is a collective term for technologies and concepts of value chain organization. Within the modular structured Smart Factories of Industry 4.0, Cyber-Physical Systems (CPS) monitor physical processes, create a virtual copy of the physical world and make

decentralized decisions. Over the Internet of Things (IoT), CPS communicate and cooperate with each other and humans in real time. Via the Internet of Services (IoS), both internal and cross organizational services are offered and utilized by participants of the value chain (Rossit, et al., 2018).

- A new industrial stage of the manufacturing systems by integrating a set of emerging and convergent technologies that add value to the whole product lifecycle. This new industrial stage demands a socio-technical evolution of the human role in production systems, in which all working activities of the value chain will be performed with smart approaches and grounded in information and communication technologies (Frank, 2019).
- Industry 4.0 refers to the integration of Internet of Things technologies into industrial value creation enabling manufacturers to harness entirely digitized, connected, smart, and decentralized value chains able to deliver greater flexibility and robustness to firm competitiveness and enable them to build flexible and adaptable business structures, acquiring the permanent ability for internal evolutionary developments in order to cope with a changing business environment as the result of a purposely formulated strategy implemented over time (Piccarozzi, et al., 2018).

Considering the previous definitions, in all of them there are the following terms or ideas in common: technology, efficient, flexibility, customer, communication network, Internet, value chain, and so on.

The main features of Industry 4.0 contain horizontal integration through value networks to facilitate collaboration between companies, vertical integration of hierarchical subsystems within a company to create a flexible and reconfigurable manufacturing system, and end-to-end integration to support product customization (Wang, 2016). The fundamental aspects of these characteristics of Industry 4.0 are the following:

- Horizontal integration: unification of the technological systems used in the stages of the manufacturing and planning processes within a company and between several different companies. According to the philosophy that is incorporated in the Industry 4.0 standards, an organization must compete and cooperate simultaneously with other related organizations, forming an efficient ecosystem. In this way, a close collaboration is established between several companies, using the same independent information systems and generating the same value creation network.
- Vertical integration: integration of technological systems at different hierarchical levels within the organization, establishing a standardized network manufacturing system to exchange information. A digitization of the manufacturing process occurs, and through this integration, smart systems form a flexible, self-organizing system that can be reconfigured in real time to accommodate different custom products.
- End-to-end integration: it is based on horizontal and vertical integrations and its objective is to connect the design and manufacturing processes of the product with the customer. In this way, the company is helped to supply personalized and more qualified products and services to the customer, thereby generating a value creation process focused on the product.

These integrations and the development and implementation of the industry's digital transformation process will be possible through the reasoned application of a certain number of enabling technologies, which will be briefly described in the following subsection (a more detailed and developed study will be carried out in the second chapter of this textbook).

1.3. Key Technologies Enablers for Industry 4.0

Industry 4.0 reaches a fairly broad set of enabling technologies, although from a professional point of view only some of them stand out, considered the basic pillars of digital transformation (shown in Fig. 1.2).

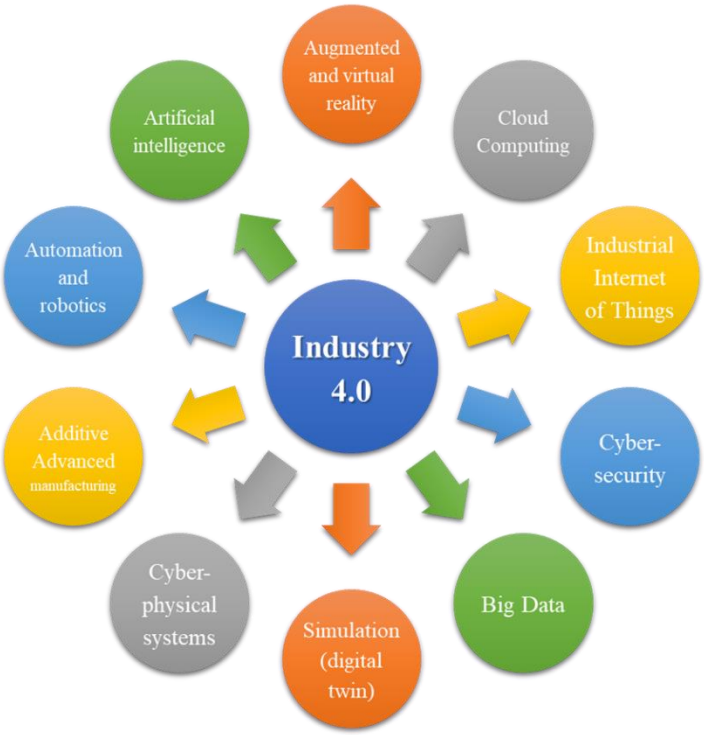

Figure 1.2. Fundamental enabling technologies of Industry 4.0

Such basic enabling technologies are as follows:

- Big Data and analytics: production systems and the environment that surrounds them generate an exorbitant amount of data that represents added value to organizations that care about using them. Aware of this competitive advantage, Industry 4.0 uses complex methodologies, technologies and tools to obtain, analyse, archive and use these large amounts of data. Big Data and analytics generate benefits for organizations, such as higher product quality, optimization of the supply chain or the possibility of estimating demand.
- Additive/Advanced manufacturing: it is usually also called 3D printing technology, which is based on the addition of materials (plastics, ceramics, metals, and others) layer by layer and shaping the object that you want to manufacture and that has previously been designed using a computer-aided design software tool. In this way, completely customized, stronger and lighter complex products can be manufactured, minimizing the amount of waste material and without the need to weld or assemble individual parts. Currently, its main application is based on prototyping and spare parts production, where it is a fundamental part of the business due to high-level after-sales services.
- Augmented and virtual reality: it is an interactive and virtual experience of objects and environments in the real world, using technologies and devices that augment or superimpose information in real time. This information can be images, audio, video or animations, improving the user experience and the perception of the real object. With this enabling technology, production processes and new product development can be improved.
- Industrial Internet of Things (IIoT): in Industry 4.0, it helps to connect different physical entities (devices) to the Internet and to each other to create a network, using new digital technologies and sensors, which facilitates communication between people, products and machines. Real-time communication provides information to improve the production process and business decisions, enabling factories to be smart.
- Simulation (digital twin): there are computer tools that allow representing the physical world in simulated models, allowing the stakeholders of an organization (managers, directors, middle managers, workers, etc.) to test and optimize the configuration of the production

system. This enabling technology offers the ability to analyse the production line and material usage, control operating times, and reduce installation errors and costs.

- Cloud computing: it is an infrastructure support for services (hardware, platform and software) through the Internet and technologies that provide the storage and processing of large amounts of data. It allows information to be shared in real time through servers, networks, databases, software and storage systems, ensuring data for the production system and improving the quality of operations.
- Cyber-physical systems: information technology (networking and computing) is turning mechanical devices into automatic ones by integrating into these systems. In this way, computers and networks coordinate, control and monitor mechanical systems, giving instructions to carry out the determined task and establishing measures of key variables to optimize processes and increase their efficiency. The algorithms and software used are integrated into the devices to establish a mechanism of action and machine learning.
- Artificial intelligence: automated solution to collect and analyse large amounts of data, transforming it into information and knowledge, so that the devices of the production system (for example, robots) work independently and make their own decisions to solve problems without the human intervention. In production processes, this enabling technology can help in decision-making and increase quality and productivity through machine learning.
- Automation and robotics: these enabling technologies have been configured in the form of interconnected and modular systems that are increasingly cooperative, communicative and flexible, ensuring the automation of the industry. Within these systems are considered automatic machines, autonomous robotics, collaborative robots (cobots) and automated guided vehicles or unmanned aerial vehicles. These technologies do not dispense with labour, but rather improve collaboration with them, with new tasks focused on the planning and control phases, eliminating the technological limitations of automatic systems.
- Cybersecurity: within Industry 4.0 contexts, it plays a leading role in avoiding the loss of companies' competitiveness. Actually, industrial equipment is susceptible to a number of cyber-attacks, which are able to change the business model. It is expected that this enabling technology will convert an essential part of the strategy and operations of organizations that choose to develop Industry 4.0.

If a review of the literature is carried out, we find other enabling technologies, some of them as an update or advance of those that have been described above as basic pillars of Industry 4.0. Among them, we can cite the following:

- Cognitive computing: this offloads cloud storage saturation and drifts to IoT devices. This technology employs routers, switches, Wi-Fi access points, set-top boxes, base stations, etc., close to sensors or computing devices.
- Ubiquitous computing: system that makes each computational and non-computational device intelligent and interactive through sensors, which collect data that is published for processing through the ubiquitous network. The goal of ubiquitous computing is to make the real-life object interactive with each other and the users.
- Edge/Fog computing: this is a technological platform that uses artificial intelligence in computing, simulating human knowledge to solve complex problems. The computer system used learns from experiences and develops its decision-making capabilities.
- Highspeed wireless networks: this allows you to easily connect computing devices to each other wirelessly, anywhere without the overhead of establishing and maintaining a wired network. However, a standard wireless network is slower than a wired network, so data communication problems can occur when any device in the system produces large amounts of data at high speed. Therefore, this problem would be solved with a high-speed wireless network
- Machine/Deep Learning: this is an application of artificial intelligence that, through algorithms, helps machines to learn and discover the knowledge of data sets.

- Blockchain: it is a technology that offers us the possibility of creating an accounting book that is distributed through a computer network without having the need for a central server or database. This technology is to become the cornerstone of automated production.

Regarding the application of the enabling technologies described in the previous paragraphs, it must be taken into account that not all the processes or tasks to be carried out within a given production system need the same technologies or the way in which they are applied and developed. For example, additive manufacturing can add competitive advantage to a product's value chain as long as manufacturing by molding does not do so more efficiently and economically.

A more detailed description and more extensive discussion of the enabling technologies that make up Industry 4.0 will be provided in the next chapter of this textbook.

1.4. Applications of Industry 4.0

Industry 4.0 is capable of improving the adaptability, resource efficiency and integration of supply and demand processes, so that factories and manufacturing, cities and equipment and products become smart. This requires a great deal of knowledge and experience in related technologies and processes, as well as new skills.

As Parsei (2021) and Ghobakhloo et al. (2021) comment, Industry 4.0 applications are based on the following principles:

- Interoperability: interaction between members to connect them flexibly.
- Virtualization: virtual models can introduce and/or replace an event throughout the process without touching the real world.
- Decentralization: it is more advisable to divide companies into smaller elements so that they can be easily managed and controlled.
- Real-time capability: send feedback from actuators to sensors about manufacturing processes and systems.
- Service orientation: IIoT is oriented to build intelligent systems.
- Modularity: increases the scope of flexibility and the level of agility.

Smart factory and manufacturing

Parsaei (2021) considers that a smart factory is a cyber-physical system that "enables all information about the manufacturing process to be available when it is needed, where it is needed and, in the form, that it is needed across entire manufacturing supply chains, complete product life cycles, multiple industries and small, medium and large enterprises". In order to achieve this connected and intelligent system, a factory can be organized into smaller connected and intelligent subsystems (Figure 1.3) through a process of fragmentation, so that the selection and planning process can also be simplified.

For a factory to be ready to operate in smart mode, several challenges must be faced in the design and implementation of its processes beforehand:

- The connectivity of the machines is important to create an information network from one machine to another.
- It is necessary to have the skills to create the intelligence necessary for machines and the behaviour of the machine must be adjusted according to human behaviour.
- Information network security is essential for machines to function properly.
- It is very important to compose the set of different knowledge that exists in an organization to turn a factory into a smart system.

The smart manufacturing communicates all manufacturing cells to coordinate and control processes within the production planning system. A cyber-physical manufacturing system is established with intelligent control and planning of production, with machine-to-machine (M2M) communication and cloud computing to better organize the manufacturing activity.

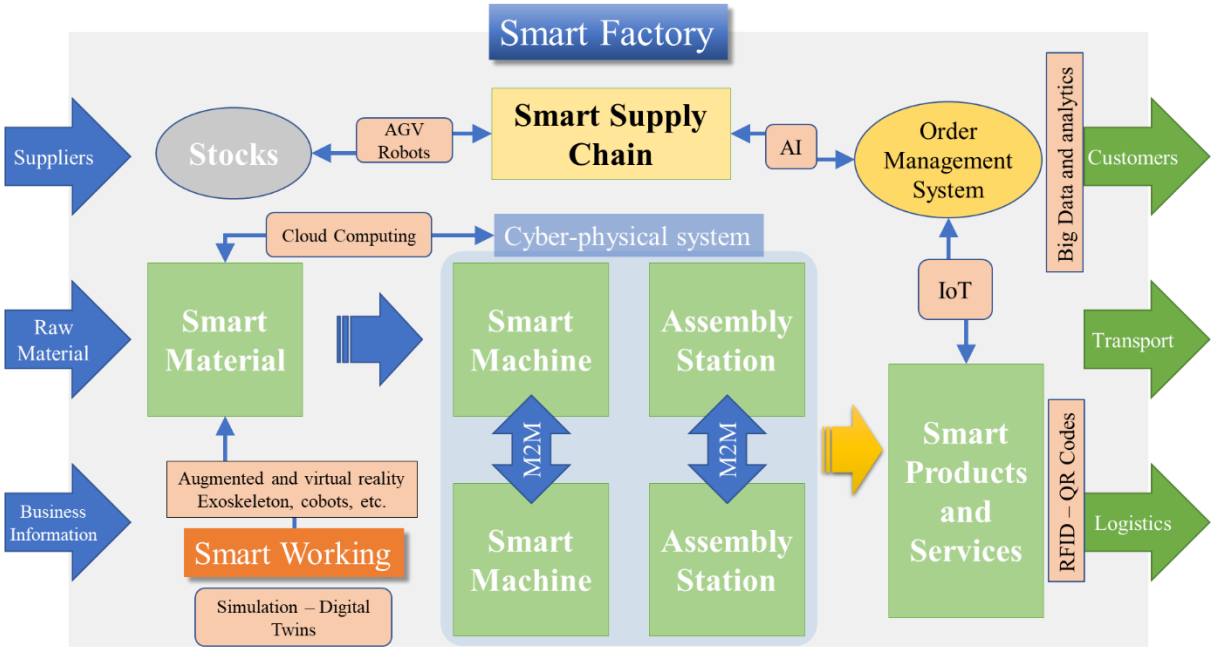

Figure 1.3. Conceptual model of Smart Factory

Smart product

Products become smart when, for example, sensors and microchips are incorporated. In this way, communication is established between these new products and human beings through intelligent control, visualized monitoring, integration of data formed in the cloud, etc.

Smart products must be created with advanced technologies in linked physical and digital processes. In this way, it is possible to exchange information with intelligent manufacturing systems. On the other hand, you can also generate cyber-physical structures that provide intelligent user interfaces and are used to facilitate your operations in a fully connected environment.

Smart City

Smart City is a city that develops six smart factors in its approach: economy, mobility, environment, people, life and governance. In a smart city, citizens go from being users to key stakeholders. The application of enabling technologies in a city aims to ensure sustainability, improve the quality of life and safety of citizens, and provide energy efficiency.

1.5. Advantages and disadvantages of implementing Industry 4.0

The study of the main characteristics and the consequences that are obtained from the development of Industry 4.0 results in a considerable number of advantages but, also, several disadvantages can be generated. After reviewing the reference literature that exists in the field of industry digital transformation, we can summarize the advantages and disadvantages of Industry 4.0 in Table 1.1. The advantages and disadvantages of Industry 4.0 are developed in the following subsections.

Table 1.1. Summary of the advantages and disadvantages of Industry 4.0

Advantages	Disadvantages
• More efficient and effective organizations • Production system optimization • Innovation in manufacturing processes • Sustainable production and environmental and social benefits • Good customer experience and product satisfaction • Quick response of the organization to the changing environment • Flexibility of production systems	• An additional investment is necessary • Need for highly skilled workforce and insufficient knowledge within companies • Acceptance of employees and trade unions suspicion • Insufficient infrastructure and technology • Cybersecurity, data sharing, and legal uncertainties

1.5.1. Advantages of implementing Industry 4.0

As it has been possible to develop in various parts of this chapter, Industry 4.0 has transformed and is transforming the industry, turning traditional production and service systems into intelligent and optimized systems developed in factories of the future.

In a competitive sense, products generated in smart factories will create product differentiation, customer segmentation, dynamic pricing, and closer relationships with customers.

The main advantages of Industry 4.0 that have been listed in Table 1.1 are summarized below.

More efficient and effective organizations

Before describing the way in which production systems based on Industry 4.0 become more efficient and effective, it is necessary to define the concepts of efficiency and effectiveness in the field of production. Thus, we can consider that efficiency is determined by the amount of output that can be obtained with respect to an input amount, while effectiveness is the power that an organization has to generate resources.

With regard to the efficiency of an organization, the establishment of flexible and reconfigurable manufacturing systems through intelligent machines will reduce the losses of resources. Also, the physical and information systems of products and services will increase the efficiency of supply chains and production. For this, it will be necessary to develop a management policy based on resources, establishing a dynamic structure based on the adaptation, integration and reconfiguration of processes (Sony, 2020).

Concerning the effectiveness of an organization, Industry 4.0 will increase profitability, innovation and achievement of objectives compared to its competitors. For example, a high level of automation will generate higher quality and better priced products, creating a competitive advantage for the organization.

The efficiency and effectiveness of the organization can also be increased by improving the productivity of human resources. In this sense, the improvement of working conditions, the improvement of professional skills, a greater organizational and collaborative capacity in different areas of the company and the ability to learn from each other will allow greater productivity.

Production system optimization

Industry 4.0 supposes an optimization of the processes even before the creation of value. The simulation of the different activities could be one of the reasons for this optimization and the availability of product data will provide the opportunity to improve its quality.

In parallel, the analysis of the data collected from the product allows Industry 4.0 to develop predictive maintenance models, which offer a way to compare values to reduce

machine downtime and be able to communicate them to operators through wearable devices. These models will also be used to reduce maintenance costs, errors, quantity of raw material, etc. leading to fewer quality failures, lower scrap rates, and reliable production systems (Cugno, 2021).

On the other hand, vertical and horizontal integration will result in shorter time to market and reduced lead times and stock across all elements of the supply chain.

Innovation in manufacturing processes

The introduction of the enabling technologies that make up Industry 4.0 will encourage the implementation of new manufacturing processes ideal for generating new products and experimenting with optimized designs.

In this sense, we know that new manufacturing systems will be connected through IoT and artificial intelligence and will use Big Data from production to demand to obtain a competitive advantage compared to traditional manufacturers. Advances in automation and digitization will make it possible to increase the degree of innovation in manufacturing.

Also, Industry 4.0 allows the evaluation of the functionality and performance of products and processes through the creation of virtual models (digital twin). In this way, it is possible to examine the behaviour of the factory in different contexts in order to make strategic decisions with the aim of optimizing all the processes linked to the production system.

Sustainable production and environmental and social benefits

Industry 4.0 establishes higher quality production system, improving resource efficiency and therefore reducing waste, while also achieving significant improvements in energy efficiency. A clear example of this competitive advantage of Industry 4.0 can be found in one of its enabling technologies, such as additive manufacturing, where the amount of raw material used in the manufacturing process can be optimized in high percentages in relation to traditional manufacturing systems.

In parallel, the literature indicates that Industry 4.0 can achieve environmentally sustainable manufacturing, reducing the emission of greenhouse gases; due to vertical integration, the emissions data (carbon footprint) will be monitored using control techniques that meet the ideal parameters.

In terms of social benefits, physically demanding jobs or ergonomically uncomfortable positions will be performed by robots. Also, monotonous tasks within the production process will be carried out in an automated way, without human presence or reducing it as much as possible, giving rise to an intelligent, autonomous and self-regulated production process. In this way, the quality of the work activity of workers can be improved.

Good customer experience and product satisfaction

Industry 4.0 technologies allow companies to increase their competitive advantage over their competitors as the adaptation of products to customer expectations and needs increases. These expectations include the quality of customer service, advertising, product and service features, ease of use, and reliability. Gentile et al. (2007) established that one of the important definitions of the customer experience is "*the customer experience originates from a set of interactions between a customer and a product, a company or part of its organization, which provoke a reaction. This experience is strictly personal and implies the customer's involvement at different levels (rational, emotional, sensorial, physical and spiritual)*".

Industry 4.0 also increases the degree of customer participation in the products, having direct or indirect contact with the company and obtaining more power and control over the products. The fact of generating personalized products will make them more expensive, but recent studies have shown that customers do not mind paying more for this customization, for the establishment of this unique customer service experience, where they can check the status of their products even on the production line.

Implementing Industry 4.0 will also result in better product quality and safety. The use of product safety data, such as improved quality management systems, common incident problems, automatic monitoring of quality characteristics, solutions, etc. will reduce safety problems and increase their quality.

Quick response of the organization to the changing environment

Industry 4.0 will help the organization to detect and respond to customer needs, competitor actions, and government regulations. An intelligent network of manufacturing cells and production lines will help to respond quickly to customer demand. Also, the creation of subsystems within the organization will allow to manufacture small quantities of product in an economically viable way and satisfying the needs of the client.

The process of digital transformation of production systems will allow organizations to face market variations through the use of a rapid response.

Flexibility of production systems

Industry 4.0 enables improved production flexibility through virtualization, decentralization, and networking. In addition, flexible production can be achieved through mass customization combinations, manufacturing products in limited volumes that meet customer needs and improving production volumes by 45-55%.

1.5.2. Disadvantages of implementing Industry 4.0

Although we firmly believe that Industry 4.0 is improving and will improve the industry globally, unfortunately it can also lead to several negative aspects in the socio-economic sphere and some uncertainties from a legal point of view

The main advantages of Industry 4.0 that have been listed in Table 1.1 are summarized below.

An additional investment is necessary

Although the commitment to Industry 4.0 offers many advantages from the economic point of view (it increases the profit of the organization), a significant initial investment is necessary with an uncertain return, since the rapid evolution of technology means that the investment has a certain risk.

However, in the long term, the cost will break even, resulting in a profitability of the business model. Organizations should consider that skilled labour is most needed at the beginning, and later, long-term operations are less.

Unfortunately, many companies have not committed to Industry 4.0 and do not intend to conduct a feasibility study due to the lack of information on the benefits, perhaps based on the belief that all companies do not need Industry 4.0. Furthermore, if there are financial problems, it is difficult for companies to adopt modernization of their production systems.

Need for highly skilled workforce and insufficient knowledge within companies.

The implementation of Industry 4.0 requires new skills and knowledge and a highly qualified workforce in technical (process understanding, IT security, cutting-edge knowledge), methodological (entrepreneurial thinking, research skills), personal (motivation to learning, sustainable mindset) and social (ability to work in a team, ability to transfer knowledge) competences (Sony, 2020).

Unfortunately, there is a lack of skilled workforce in the labour market capable of developing the skills described above in general terms. In the particular case of SMEs, this problem is even greater, generating a concern in the short and long term given the professional profiles trained in educational institutions.

Therefore, it is necessary for companies to empower employees to make the transformation to Industry 4.0 production systems. In general, employees should be able to manage the interaction between processes and cooperate to solve problems.

Acceptance of employees and trade unions suspicion

Industry 4.0 is expected to have a huge impact on both employees and the tasks that need to be performed, completely different from those performed in traditional manufacturing systems. In that sense, employees must accept and show a willingness to learn about the enabling technologies that make up the digital transformation of the company, which can be a significant concern for them.

On the other hand, trade unions are showing resistance to this transformation process, either because information on Industry 4.0 has not been properly disclosed or there has been no confidence in the preliminary phase of Industry 4.0 implementation. It is clear that Industry 4.0 implies a radical change in the way of working and there is suspicion of the elimination of jobs.

Unfortunately, some managers and employees remain unprepared to change their strategies and jobs, and in many cases, there is resistance to the use of new technologies.

Insufficient infrastructure and technology

Industry 4.0 needs to use the appropriate enabling technologies adapted to the manufacturing or service process that the organization is going to carry out. In this sense, Industry 4.0 should not be implemented in isolation since, in that case, it will not produce the expected results (Cugno, 2021).

It is evident that the transformation process is difficult, since the implementation of Industry 4.0 is different depending on the production structures or company sizes. In addition, coordination between production processes will increase costs, which will be very difficult for SMEs.

At a minimum, companies would need access to an infrastructure capable of interconnecting suppliers and customers. Therefore, the existence of an economic infrastructure is a prerequisite for the transmission of Industry 4.0 data. However, it must be borne in mind that an inadequate economic infrastructure can represent a serious risk to the competitiveness of companies.

Cybersecurity, data sharing, and legal uncertainties

The digital transformation process in which we are subjected will facilitate the exchange of data within a competitive environment, resulting in a more transparent business ecosystem and, at the same time, weaker with respect to data security. This degree of transparency will increase cyberattacks, industrial espionage and other issues arising from the responsibility and ownership of personal data and the protection of intellectual property.

In addition, the globalization that implies the establishment of Industry 4.0 could generate vulnerabilities due to the different regulations between countries. Therefore, it is necessary to define legislation regulating cross-border trade and cooperation within companies and between companies.

In parallel, the lack of standardization hinders collaboration between companies and the implementation of Industry 4.0 technology. Finally, the lack of trust prevents the exchange of information and collaboration between companies, particularly in SMEs.

1.6. Conclusions

The fourth industrial revolution has generated, and is still generating at this moment, a process of digital transformation both from the professional point of view and from the personal point of view. Such is the importance of this digital transformation process, that

nowadays a society that is not completely connected is not conceived, where all processes are trying to optimize in order to facilitate and improve our day-to-day life.

The development and application of the enabling technologies that make up Industry 4.0 is one of the fundamental aspects in the digital transformation process. Currently, we live in continuous change in the technological field, with mature and fully developed technologies and others that are still in the development phase. The interrelation of these technologies with each other and their optimized implementation within industrial processes and services is one of the fundamental objectives of professionals in companies' R&D departments.

Although there is a broad development of Industry 4.0 at this time, there is still a long way to go in the process of implementing this industrial revolution. In this area, some of the future challenges of Industry 4.0 are the following:

- Interoperability continues to be one of the great challenges of Industry 4.0, that is, defining how the information and communication flows should be between smart and connected systems.
- It is necessary to develop standards and specifications for the verification and testing of cyber-physical systems, so that there is uniformity at a global level in the implementation of digital transformation.
- Greater institutional support from governments will increase investment aimed at increasing the maturity and sustainability of projects based on the implementation of Industry 4.0.
- More advanced smart digital devices are required. For example, future IoT systems would have features such as self-configuration, self-optimization, self-protection, and self-healing.

These future lines of work in the field of Industry 4.0 indicate the completely changing environment in which the digital transformation process takes place, which shows the great challenge that will arise in the coming years to turn this great desire into a real fact.

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2. INTRODUCTION TO INDUSTRY 4.0 WITH A CONTRIBUTION ON SOCIETY 5.0

Learning objectives

After reading this chapter, you will be able to:

- Understand the concept of "Society 5.0"
- Identify the role of the digital technology, in the development of the next Society
- Identify the opportunity of "Society 5.0" for Digital Entrepreneur
- Understand the potential of the modern Entrepreneurial Strategic Posture "Humane Entrepreneurship"
- Develop a management strategy consistent with megatrends

2.1. The meaning of Society 5.0

The pandemic caused by Covid-19 has put us before the real need to change the way we live and do business. Today we are aware that to do business it is necessary to develop smart, sustainable, and agile firms, which have broader scopes than just revenue growth (Von Henning, Wolf-Dieter, Wahlster, 2011).

From the academic debate, it emerges that the development of digital technologies, enabling industry 4.0, is generating completely new and unknown application potentials with no less disruptive social and economic consequences (Avant, 2014).

As highlighted in the previous chapter "Introduction to Industry 4.0", Industry 4.0 is today a concrete answer for the survival, recovery, and renewal of the business, in a new post-crisis life (Czifra, 2020). Industry 4.0 is the strategic approach from which to start over to innovate production systems (Lorenz et al., 2015), innovate services (Lee, 2014), and develop new business models (Sendler, 2013; Ghobakhloo, 2018)

However, Industry 4.0 does not contemplate the regulatory dimensions as responsible/irresponsible or ethical/unethical (Müller, 2019), typical of the Society 5.0 model (Carayannis, 2020; Deguchi, 2020).

Society 5.0 is important because it is an economic-social growth model, which provides for the integrated use of the various technologies of industry 4.0 (Pereira, 2020), to increase the quality of life and mediate the specific needs of society (Mavrodieva, 2020; Miskiewicz, 2020), integrating innovation with the United Nations Sustainable Development Goals (De Pascale, 2021). Society 5.0, however, is not a directly applicable solution but needs to be structured within a strategic plan that includes five dimensions: Technology, Education, Communication Governance, and Entrepreneurship (Cabinet Office, 2016).

Today there is awareness of the potential impact that entrepreneurial behaviours have, good and bad, not only on economic development but also on many other aspects of individual and social life (Parente et al., 2018). To achieve, at the same time, the objectives of the Society 5.0 plan and those of the industry 4.0 strategy, it is necessary to look beyond the classic rules of the industry and rethink the role of the entrepreneur, through the framing of an enlarged entrepreneurial strategic posture (White Book, 2016). Many authors have analysed the differences and common elements between Society 5.0 and Industry 4.0 (Zengin et al, 2018; Deguchi et al., 2020; Ellitan, 2020).

The objective of this paper is to propose an application model (building blocks) based on Humane Entrepreneurship, which defined by the integration of three dimensions, EO, SO, and

HRO (Parente et al., 2018) can allow the simultaneous realization of the objectives of Industry 4.0 and Society 5.0, combining corporate interests with the development of a more sustainable and more human-centered society.

2.2. Society 5.0 and its relationships with Industry 4.0

As highlighted from Valverde in the chapter "Introduction to Industry 4.0" Industry 4.0 lead to fundamental changes in the economy, work environment, and skills development (Maresova et al., 2018). Many scholars (Tauser et al., 2013; Grmelova, 2018; Miklosik et al., 2019) indicate that the implementation of digital connectivity will improve efficiency and accelerate innovation and will bring new business models (Arnold et al., 2016; Frank et al., 2019) that could be implemented much faster.

Another important effect of industry 4.0, regards the impact on employment (Ejsmont, 2021). The technological innovations and organizational innovations that now derive have generated a radical impact on the working conditions of the people (Lasi et al., 2014). Valverde (2021) in the chapter "Introduction to Industry 4.0" pinpointed that Industry 4.0 is expected to have a huge impact on both employees and the tasks that need to be performed. In fact, Human Research is one of the main challenges of Industry 4.0 because the fourth industrial revolution has two phases namely the job disruption phase and the job creation phase (Natalia & Ellitan, 2019).

As highlight by the World Economic Forum analysts, (The Future of Job, 2018), the industrial revolution triggered by the progress of digital technologies is expected to generate 133 million jobs by the end of 2022 compared to the 75 million destroyed. A net balance of 58 million more jobs.

As reported in a recent report by the company Boston Consulting Group (Strack et al., 2021), if the destruction of millions of jobs will be compensated in numerical terms, by an even greater creation of new jobs, due to development technological, the imminent problem is to bridge the 'mismatch', misalignment between the jobs that will be lost and those for which there will be high demand.

As highlighted by Maresova et al. (2018) education, not only skills of workers, are one of the relevant themes for the development of Industry 4.0. Education relates to the concepts of digitalization and smart factory (Elbestawi et al., 2018; Prinz et al., 2017). As highlighted by Pereira and Romero (2017) skills development, which will lead to demographic and social changes, is one of the most important key factors for the successful adoption and implementation of the industry 4.0 framework. Many intelligent/smart technologies can assist workers to get better outputs and/or quality. However, the Industry 4.0 technologies will eliminate/replace repeatable and simple jobs (Ejsmont, 2021).

In addition, advantages and disadvantages of Industry 4.0 have been already highlighted in the previous chapter "Introduction to Industry 4.0"

Like any other industrial revolution, Industry 4.0 revolutions, apart from technological changes, also brought economic and social changes (Ejsmont, 2021). From the critical analysis of the social impact of the technologies of the 4th industrial revolution, in 2016 the Japanese government in cooperation with the private sector (Mavrodieva et al., 2020; Ellitan, 2020) developed the “Society 5.0” (or Super Smart Society) concept inside the “5th Science and Technology Basic Plan (2016–2020)”.

The objective of the 5th Plan is to concentrate the government's policy resources into scientific fields that are prioritization in the grand challenges (present and future) for Japan, like sustainability, the aging society, the depopulation of rural areas, and public safety related to both natural (earthquakes) and man-made (cyber threats) disasters (Deguchi et al., 2020). These problems are now important and urgent to be addressed also in other countries, including Italy (The European House Ambrosetti, 2019). In fact, the challenges that nowadays society is facing includes energy resources depletion, environmental degradation, aged care needs, and shrinking workforce.

Japanese government defines Society 5.0 as a new model of society where it's possible to resolve various social challenges by incorporating the innovations of the fourth industrial revolution (e.g., IoT, big data, artificial intelligence, robot, and the sharing economy) into every industry and social life (Holroyd, 2020). By doing so the society of the future will be one in which, balances economic advancement with the resolution of social problems, new values and services are wills created continuously, that making people's lives more comfortable and sustainable (Cabinet Office, 2017). In sum, society 5.0 represents the next step in human development, that follows Society 1.0 (of the hunter-gatherers), Society 2.0 (the development of agriculture and the beginning of permanent Settlements), Society 3.0 (the process of industrialization), and Society 4.0 (the information age of the Internet and communication technology). In this scenario, Society 5.0 is the response to the technological innovation increased use (Mavrodieva & Sawh, 2020) and its goal is to develop a human-centered society, data driven, and knowledge-intensive, where cyberspace with physical space is merging.

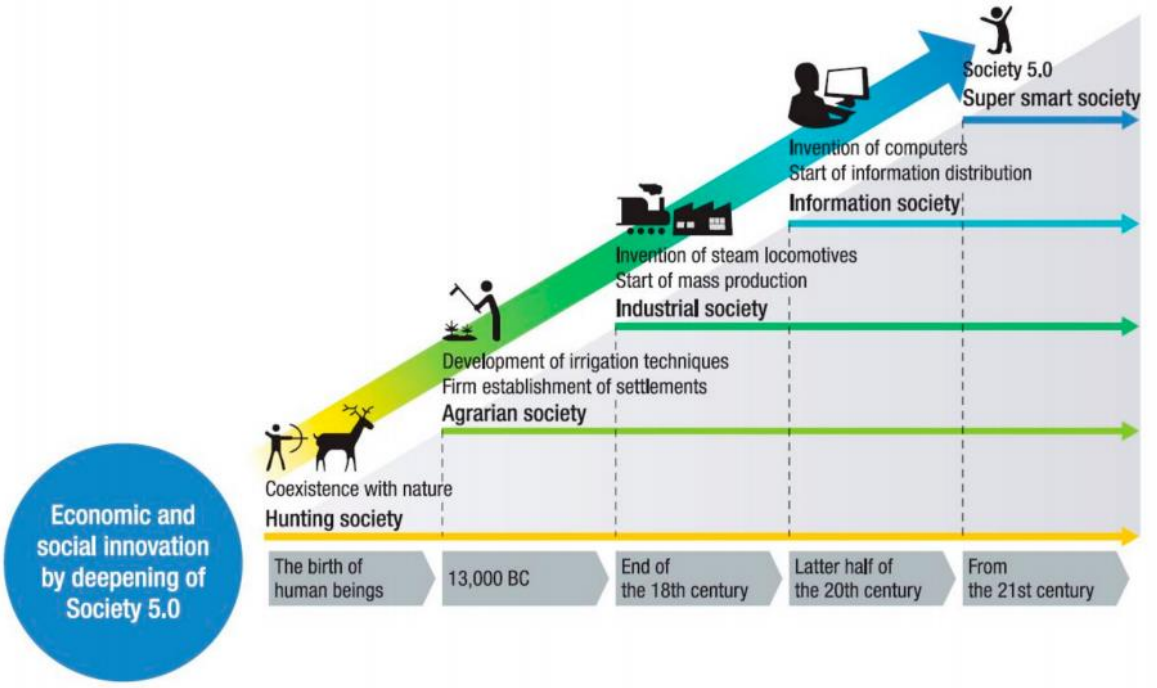

Figure 2.1. Evolution of human societies to Society 5.0

Source: (Fukuyama, 2018, p.49).

To understand the practice logic of Society 5.0 is useful to imagine a continuous cycle of analysis of data, useful to continuously adjust and improv the society itself. The data from the physical space (real world) are analysed in cyberspace (electronic world), to develop solutions for managing or improving society. Once these solutions are implemented in physical space, the outcomes are evaluated by new data that will have been generated. These data are then imputed back into cyberspace for analysis and, if there are any problems, further solutions will be derived (Deguchi et al., 2020). The goal of this approach is to obtain and implement better solutions to humans, in fact in Society 5.0, the source of economic value is in people and in data according to the Growth Strategy 2017 (Shibasaki et al., 2020).

As highlights the Table 2.1, the vision of a super-smart society, based on the spread of AI and Big Data, aims to face, and solve the profound challenges of sustainability in a broad sense (Keidanren, 2017) so that people can lead a fulfilling and happy life (Deguchi & Karasawa, 2020). The Human-centered society is inclusive of everyone and is trying to provide sustainable solutions not only in industry (Fukuyama, 2018) but also to environmental challenges (Mavrodieva & Shaw, 2020; Deguchi & Karasawa, 2020), and in areas more closely aligned with

daily life, balancing economic development with the resolution of social issues (Kuwabara, 2019).

Table 2.1. Economic and social changes in Society 5.0 – focus areas

Sector	Policies
Cities and Regions	Improved data sharing on energy, transportation, water, waste, human traffic, etc.; community decentralization in suburban and rural areas; respect for diversity.
Energy	Development of affordable sustainable energy; development of micro-grid systems to respond to local conditions.
Disaster Prevention	Information sharing across organizations; utilization of digital technologies; continuation of medical services and aid in the event of disasters.
Healthcare	Focus on prevention and individualized healthcare services; access to personalized life-stage data, utilizing AI-based medical services, such as telemedicine.
Agriculture and Food	Utilization of technology for crop growth and optimization of the food value chain; inclusion of various actors.
Logistics	Utilization of technology for automation of logistics; data sharing across the whole supply chain; personalized products responding to specific customer needs.
Manufacturing and Services	Focus on services, not hardware; customers will be able to order items specifically designed for their needs; support for small businesses to produce high-quality goods.
Finance	Diversification of financial services with the help of digital technologies; better distribution of funds across society; improved access to financial services, based on utilization of crypto-currencies and token economies, such as blockchain.
Public Service	Improved services by public administration based on digitization and improved data sharing; establishing safety nets in response to safety issues.

Source: (Mavrodieva and Shaw, 2020, p. 4).

The objective of firm 5.0 is to develop an ethical society, which using Digital Transformation and Smart Technologies, can solve the complex environmental, economic, and social challenges, implementing a broad sustainability approach capable of offering all humans a happy life. The construction of such a society cannot ignore an active and conscious role of human, as an individual, a consumer and a member of the community, who with his behaviour, values and choices have the power to influence the development of the future society (Keidanren, 2017; Nakanishi, 2019). The approach to sustainability in Society 5.0 overlaps with the vision of the SDGs (Fukuyama, 2018; Keidanren, 2017; Gonokami, 2017; Zengin et al., 2021) that concern all dimensions of human life and planet. Figure 2.2 describes how and to which extent Society 5.0 can clear deliver 16 of the 17 SDGs.

	SDGs activated by the Company 5.0 in the various sectors															
Sectors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Cities and Regions			x	x	x	x		x			x	x	x			
2. Energy							x		x				x			
3. Disaster Prevention and Mitigation			x			x					x		x			
4. Healthcare			x													
5. Agriculture and Food		x										x		x	x	
6. Logistics											x	x				
7. Manufacturing and Services					x			x	x							
8. Finance	x				x			x	x							
9. Public services	x		x	x						x					x	

Figure 2.2. Society 5.0 for SDGs

Source: Adapted from (The European House - Ambrosetti, 2019, p. 11).

For example, to realize sustainable lives anywhere, Society 5.0 has to the change energy mix and must use data to establish efficient energy networks. As shown in Table 3, in Society 5.0, through decentralized microgrids, energy will be developed integrating decentralized renewable energy, power storage systems, and demand-side controls, and these will be aligned with local conditions. In this way affordable and reliable energy will be available to anyone. With this approach in the Energy sector, Society 5.0 aims to satisfy SDGs 7, 13, and 9, that is

to guarantee access to affordable and reliable sustainable energy for all, fighting climate change, through the development of sustainable infrastructures (Keidanren, 2017).

As Figure 2.2 shows, Society 5.0 bases its development on achieving all SDGs. Even Industry 4.0, although not based on the implementation of the SDGs, is an approach that can lead to their achievement. As highlighted by Bonila et al. (2018), the development of Industry 4.0 can generate a positive impact in the fight against climate change (SDG13), on responsible consumption and production (SDG12), and the innovation of production processes (SDG 9). However, as highlighted by Andreia et al. (2020), Industry 4.0 is a concept based on a vision of the end of the 20th century, of the information society, based on the automation of production processes. Society 5.0, on the other hand, is a 21st-century concept, which aims to develop a new society, precisely the Super Smart Society, based on the digital transformation of society in a broad sense.

Both concepts are therefore based on the awareness that today we are still experiencing a technological revolution, however, they have different objectives.

Industry 4.0 focuses on the development of a smart industry, which uses data and digital technologies to improve production processes, making them more effective and efficient. The concept of Society 5.0 instead, envisages a merge between the real (physical) world with cyberspace to efficiently collect more precise and personalized data for improved problem solving and value creation at a higher level, social and collective (Mavrodieva & Shaw, 2020).

According to Müller and Voigt (2018) Industry, 4.0's attention is too focused on the production dimension, while Society 5.0 seeks to put humans at the center of innovation, it also exploiting the impact of technology and results of Industry 4.0, with the deepening of technological integration in the improvement of the quality of life, social responsibility, and sustainability.

We can say that Society 5.0 is like Industry 4.0 but takes a step forward, depicting a data-driven economy and society (a Super Smart Society), with a focus on human needs and capabilities (Schoitsch, 2020).

Therefore Industry 4.0 also achieves objectives related to sustainability, but its main objective is to innovate industrial production processes, to improve economic-firm performance. Society 5.0, on the other hand, sets its challenges starting from one or more sustainability objectives in a broad sense, because its dimension is not the firm level but the society level and consequently the people.

In the next paragraph, we will introduce a new entrepreneurship theory, that seems to be perfectly in line with both Industry 4.0 and Society 5.0.

2.3. Humane entrepreneurship: a theoretical approach to support Industry 4.0 and Society 5.0.

Entrepreneurship as an academic field began to form in the early 20th century as economists observed the emerging role of entrepreneurs in economic development (Schumpeter, 1934). Since then, "entrepreneurial behaviour" has been regarded as a purely selfish business orientation and the idea that the pursuit of profit is good for economic development and that profit maximization is the consistent means of measuring the performance of entrepreneurial behaviour has been widely accepted by economists and policymakers (Parente, El-Tarabishy, Vesci, & Botti, 2018). However, entrepreneurship is a social phenomenon, therefore social changes can influence the meaning of a phenomenon and its interpretation by society (Parente et al., 2018).

In the light of the socials change described in the previous chapters, today, Governments, Organizations, and Societies have highlighted the need for the development a new model of entrepreneurship, sustainable and capable of grasping the relations of purely entrepreneurial behaviour with the social challenges of the 21st century (Beltz & Binder, 2017; De Clercq & Voronov, 2011; Dobers & Wolff, 2000; McWilliams & Siegel, 2001; Hall, Daneke, & Lenox, 2010; Wagner & Maximilians, 2012). Following the publication of the Brundtland Report (1987), management scholars began to study how companies might reconcile their financial

goals with long-term sustainability (Elkington, 1994; Dyllick & Hockerts, 2002; Kuckertz & Wagner 2010). In this direction, the need to rethink the concept of entrepreneurship, adapting it to the economic and social changes of the 21st century, has been addressed by the scientific community of management scholars which, since 2016 (Kim, 2016) developed the concept of Human Entrepreneurship (HumEnt) (Parente et al., 2018; 2020; Kim et al., 2018; Vesci, 2018; Kim et al., 2021). Figure 2.3 shows the model on which human entrepreneurship is based, and the difference between Human Entrepreneurship and Entrepreneurial Orientation.

As Figure 2.3 shows, Human Entrepreneurship is an evolution of Entrepreneurship Orientation, in line with the logic of 21st-century management. Human Entrepreneurship is a strategic entrepreneurial posture, defined by the integration of three dimensions: Entrepreneurial Orientation (EO), Sustainability Orientation (SO), and Human Resource Orientation (HRO). These three dimensions are drawn from three theories, respectively. The Entrepreneurial Orientation theory (Covin & Slevin, 1991, Lumpkin & Dess, 1996; Miller, 1983), which indicates the entrepreneurial posture toward seeking and exploiting new business opportunities. The Corporate Social responsibility approach presents a panorama of theories and also a proliferation of approaches. (Garriga & Melé, 2004). According to Porter and Kramer (2006), an excellent definition of CSR was developed in the 1980s by Norwegian Prime Minister Gro Harlem Brundtland and used by the World Business Council for Sustainable Development: "Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

Servant Leadership Theory (Greenleaf, 1970). Greenleaf (1977) defined servant leadership not only as a management technique but as a way of life that begins with "the natural feeling of wanting to serve, of serving first" (p. 7). In fact, according to Schneider (1987), the most important part of building an organization with a successful legacy is the people within it, which includes both followers (i.e., employees and volunteers) and leaders.

According to the principles of the various underlying theories, Human Entrepreneurship offers a business model approach that combines business with the central role of caring for people and caring for society. Human Entrepreneurship offers a new approach to doing business that is more aligned with a sustainable view of unique living systems (Parente et al., 2018).

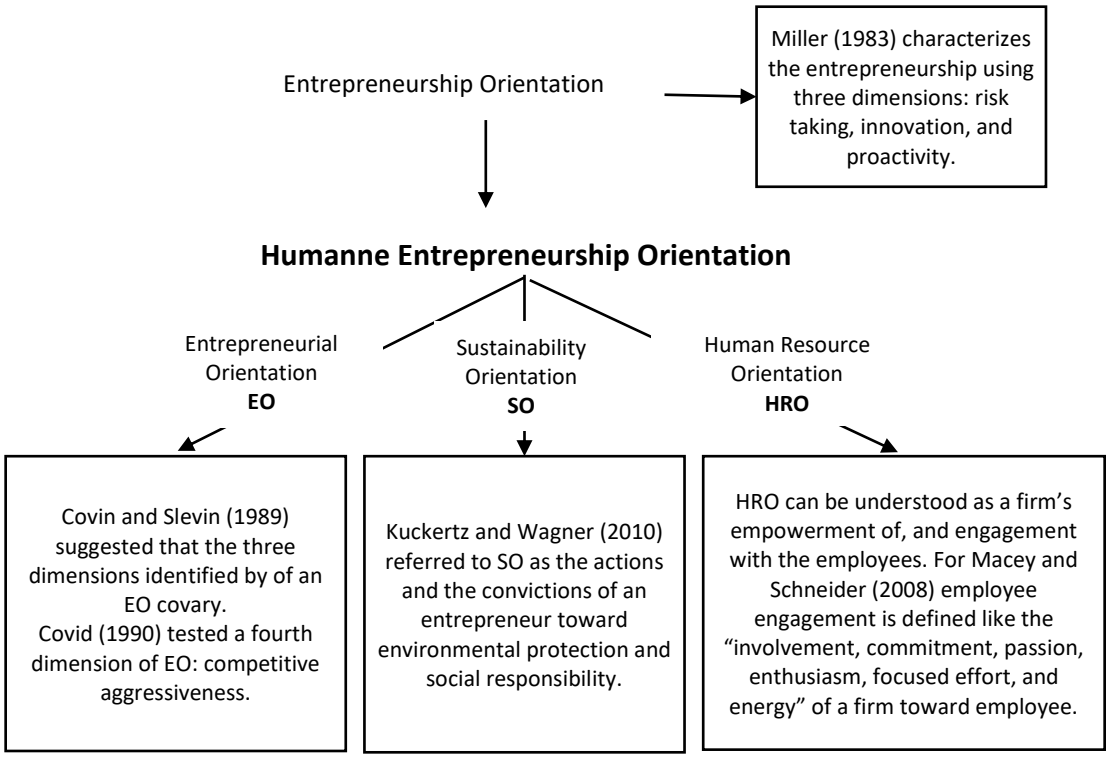

Figure 2.3. The structure of the Humane Entrepreneurship

Source: Made by the authors.

The HumEnt model represents a way to assess a firm's attention to environmental issues and the planet, communities and local communities, the humans both as people of a community and as employees or managers of a firm. Thus, HumEnt is based on the idea that entrepreneurs should extend their priorities beyond their profit margin, toward their employees, people, environment, and society (White Book, 2016). Put differently, HumEnt represents a new entrepreneurial strategic posture (ESP) that presupposes the pursuit of profit but considers it equally fundamental that the firm generates value by taking care of the interests of the environment, people, and society in general, and human resources. operating in the firm (Vesci, 2018).

HumEnt theory, expanding the Entrepreneurial Orientation theory advanced by Covin and Slevin (1989; 1990) and strongly discussed and developed by a number of scholars and studies, proposes an enlarged entrepreneurial strategic posture (ESP), called Humane Entrepreneurial Orientation (HEO) and defined by the integration of three dimensions: entrepreneurial orientation (EO), sustainability orientation (SO), and human resource orientation (HRO).

EO addresses a strategic choice problem, referring "to the processes, practices, and decision-making" (Lumpkin & Dess, 1996, p.136). Along this vein, in HumEnt's model, Parente et al. (2018) it refers to EO to capture how strategically entrepreneur is innovator, risk-taker, and proactive in accordance with the Miller (1983) approach.

SO is framed as a strategic posture of competitive culture that contemplates the firm's propensity to do business achieving sustainability objectives (Noble, Sinha, & Kumar, 2002; Roxas & Coetzer, 2012). A firm demonstrates SO when it exhibits a high level of commitment to the preservation of the natural environment, and when it behaves ethically by remaining accountable for its conduct and respecting society-driven initiatives arising from society (Parente et al., 2018; 2020).

The assumption behind HumEnt that firms generate higher profits by respecting employees and encouraging them to enjoy their work, rather than laying off workers to cut labor costs (Kim et al., 2018; 2021) is captured through the HRO. This component can be interpreted starting from the conceptualization of a firm's empowerment of, and engagement with, employees and executives proposed by Macey and Schneider (2008). HRO is like both EO and SO as it represents a firm-level strategic posture (Parente et al., 2018), and enables workforce empowerment, stimulates workforce engagement, and is a fundamental way to regenerate firm competencies. Being the people central, in HumEnt approach postulates to pay attention to the health and well-being of people in the firm, to improve quality of life in the local community, and to promote democratic business models, accordingly HRO.

The industry 4.0 and Society 5.0 firms, operating in a dynamic and hostile environment, to achieve their goals of productive efficacy and efficiency, both economic and social, need to adopt an approach that leverages innovation, proactivity, and risk-taking. Firms that are transforming production and business organization through the adoption of Industry 4.0 technologies, or are innovating their business model through digital, in a logic of sustainability in a broad sense, typical of Society 5.0, often do not have first movers to follow, and must therefore be innovators, in the reference sector. Thus, the EO, first component of HEO, represent a clear strategic posture needed to support Industry 4.0 and Society 5.0 firms.

Similarly, SO is already the strategic posture typical of 21st-century companies which aim to strategically use Industry 4.0 technologies preserving environment at the same time. At the same time SO, as depicted in HumEnt approach, fits perfectly with Society 5.0's philosophy and values inducing respect towards people and communities and the adoption of an ethical approach. In addition, SO can no longer be considered a strategic choice of differentiation, since it is an approach that companies are almost "forced" to consider, to meet the needs of consumers who are increasingly sensitive to the issue of sustainability (GfK Global report, 2020). As highlighted by Pfeffer and Salancik (1978) corporate choices, and therefore the entrepreneurial posture, are conditioned by the social pressure of the target of consumers to which it refers; social pressure is particularly relevant when it is rooted in environmental sustainability or when it is linked with the attention that must be paid towards people (Parente, et al. 2018).

Lastly, HRO has a fundamental role in the objectives of Industry 4.0 and Society 5.0. As highlighted in the previous paragraph, the highest goal of Society 5.0 is to build a society in which people are happy. Considering that each person spends a large part of his life working, the achievement of the goal of a happy life necessarily passes through the development of an HRO. As highlighted in the previous paragraph, human resource is one of the fundamental elements for the realization of Industry 4.0, therefore the management must take care of the employees, to be able to achieve successful business innovations, in the key to Industry 4.0. Society 5.0 and Industry 4.0 are united by the technological matrix; however, the human element plays a crucial role in the realization of both planes.

Based on what is presented in this paragraph, it is possible to understand how the HumEnt approach, based on EO, SO, and HRO, being consistent with Industry 4.0, represents a central Society 5.0 building blocks.

2.4. Society 5.0 building blocks

Based on the arguments developed in previous sections, we proposed a Society 5.0 building blocks model (Fig. 2.4) based on three vertical elements (technological systems, HumEnt, and governance models) and two horizontal elements (educational processes and communication systems). The different elements are pieces of a puzzle, which fit together, using the central element.

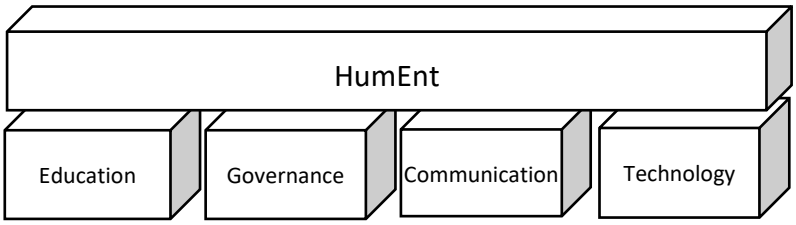

Figure 2.4 Society 5.0 Building blocks

Source: Made by the authors.

Society 5.0 starts from the leading technologies of Industry 4.0, therefore also in the building blocks Technology model it is included as a starting point. However, Technology in this case goes beyond the concept of opportunity offered by technologies taken individually and recognizes that the value of technologies derives from an integrated application of the same. In line with the indications of "The 5th Science and Technology Basic Plan", it is believed that the potential of modern technologies is still unexpressed today and that for it to emerge it is necessary to develop systemic application solutions, overcoming a "silos" structure (Ślusarczyk, 2020, Jabbour, et al. 2018).

A systemic application of technologies necessarily passes through widespread digitization, involving public administration, companies, and consumers/citizens. To achieve a "large-scale" digital transformation, it is necessary to build a far-sighted and wide-ranging governance model that involves scientific experts, technologists, and representatives of the public tried and the third sector. The third vertical piece of the model refers to this type of governance. The governance system necessary to achieve the objectives of Society 5.0 requires the development of a "control room" that can balance the needs of the different categories, becoming inclusive and participatory, involving actors who bring different instances and skills, capable of channeling the potential of modern technologies, in the development of solutions capable of responding to the specific needs and requirements of specific communities. In this direction, it is necessary to rely on a leadership capable of successfully implementing the logic and values underlying the "Triple Helix" model (Etzkowitz & Leydesdorff, 2000) and the "Open Innovation" philosophy (Chesbrough, 2006), successfully implementing the practices of Co-creation of value (Prahalad & Ramaswamy, 2000; Vargo & Lusch, 2004), involving the various components of society, called to have an active and participatory role in the development of the Society 5.0.

The elements characterizing the value co-creation process are based on overcoming the hierarchical barriers between public administration, businesses, and citizens/consumers, with a view to governance that is increasingly transparent and inclusive, which makes the best use of technologies to leverage on trends of social participation.

The governance that is needed is based on a leadership aware of the epochal change in progress, accelerated by the pandemic caused by Covid-19, which has transformed even the most analogical aspects of our life into digital, such as teaching and the work, bringing out definitively the transition to an “Onlife” society in which the barriers between real and virtual has fallen, where there is no longer a difference between "online" and "offline" (Floridi, 2014).

The first horizontal element of the model refers to the training processes. A fundamental building block of the Society 5.0 is represented by training models aimed at reducing the digital gap of digital knowledge, not only from a purely technical point of view but also in the sense of digital civic education, which is increasingly necessary in an "Onlife" firm. For permanent innovation to occur, both individual and organizational learning for change and flexibility are essential, and learning for technology does not suffice (Abreu, 2018; Palazzeschi et al., 2018; Ferreira & Serpa 2018).

The role of training in the society 5.0 model goes beyond just scholastic and academic training, which still plays the central role, but aims to develop a "Lifelong learning" process aimed at involving every citizen, in lifelong learning paths, having the aim of being able to increase its value both as an individual and as an element of society (Deguchi & Karasawa, 2020).

Industry 4.0 brought out a mismatch between the skills possessed and the necessary skills to face the last industrial revolution. Human resources, with their knowledge, represent a crucial element in the success or failure of digital transformation processes at the firm level.

The lockdown caused by COVID-19 allowed us to look beyond certain limits and understand how digital can also play a crucial role in the provision of training courses, at different levels. Access to the internet plays a strategic role in the development of digital education and training courses in a broad sense which, developed online, can overcome the constraints of space and time.

Therefore, the educational institutions from elementary school to university will have to shoulder this task along with companies and local communities. Educational institutions, businesses, and government each have their role to play in training up the human resources necessary for Society 5.0 and ensuring information literacy. The need for involvement at different levels, for the realization of a "digital education" process, brings out the central role of a modern and inclusive "Governance".

Concerning sustainability issues, the boundary between awareness/communication and education in recent years is becoming increasingly blurred, also because of increasing access to Massive Open Online Courses (MOOCs) and Webinars. Particularly interesting in this direction is the www.unsdglearn.org platform, created on the initiative of the United Nations, which aims to provide relevant and curated learning solutions on sustainable development issues to individuals and organizations.

The fourth piece of the model refers to the communication system, which is directly linked to the other blocks. Communication touches every aspect of the firm, from public administration to corporate marketing. If the role of communication, understood as a lever of promotional systems, has always been associated with the business world, now it is crucial in every aspect of our life. Also, in this case, the pandemic caused by COVID-19 has taught us how necessary it is to develop clear, captivating, but above all omnichannel communication campaigns, to be "heard" by citizens and consumers, thus being able to influence their behaviour and their choices. The “Communication” element is therefore to be understood as the development of communication strategies defined at the governance level, aimed at stimulating active citizenship behaviours and co-creation of value.

The importance of consistency between communication and the activities implemented is particularly relevant for companies that have already implemented digital transformation processes, adopting, a set of technologies that allow customers to have complete and instant visibility into what is happening in and around the production process (Parente, 2020).

Entrepreneurship and innovation, which by their nature move along with continuous reciprocity, are considered a drive for economic growth (Gungah, Jaunky, 2017), employment (Decker et al. 2014), increasingly, for developing social and, in a broader sense, for progress, particularly during the digital age (Carayannis, 2006). Not all companies and entrepreneurs operate in this sense. Operating in this direction are those companies that David Birch (Birch, Haggerty, and Parsons 1997) defined as gazelles and the only entrepreneurs that Schoar (2010) defined as transformational, thus distinguishing them from subsistence ones.

According to Alpkan et al (2020) entrepreneurs can be considered the key actors to find the opportunity and satisfy the unmet needs that the public welfare system does not satisfy or cannot satisfy, creating and sustaining social value (Dees, 1998; Nicholls & Cho, 2006).

The fifth piece of the proposed puzzle is therefore entrepreneurship, which, understood in the conception of Human Entrepreneurship, represents the element that unites the other vertical and horizontal dimensions described above, highlighting how this Entrepreneurial Strategic Posture (ESP) can be a catalyst for the development of the Society 5.0.

HumEnt is a strategic approach to the development of Society 5.0 because shares with it the centrality of the human being. HumEnt achieves sustainability in a broad sense, beyond firm boundaries, therefore it contemplates in every phase of management and development of new products, processes, and strategies, the needs of the human being, understood as the main stakeholder and co-creator of value (Vargo Lusch, 2004; 2006; Gummesson, 2007).

An active role of the human being (consumer, user, citizen) provides a necessary education, not only to technology but also to present and future challenges, which as a society we must face. The first step towards education is the development of communication campaigns aimed at raising consumer awareness and communicating how the transition from passive consumer to active citizen is essential for the development of a better society.

Technology is an essential element of society 5.0, however, it is not enough. The Cambridge Analytica scandal highlighted how modern data analysis technologies can influence not only the personal sphere of each individual but also the world political balance while not violating the rules of democracy. In the "Onlife" era there is a need for ethical leadership in business management, which can use modern technologies for the development of products, services, and strategies that do not affect the well-being of society, to increase company turnover. It would be even better if instead of adopting a neutral approach to external impact, firms committed themselves to generate a positive impact on the community as well. This ethical leadership approach necessarily passes through the definition of a new governance model, which must share this vision of growth, to transfer the underlying values to all company levels, and therefore, through communication and co-creation activities, also to stakeholders outside the company. Therefore, we believe that the strategic posture of HumEnt can be a catalyst for the development of a model of Society 5.0. novate their business model.

To date, as far as we know, there are no studies that focus on the relationship between Society 5.0 and Entrepreneurship, except social entrepreneurship (Alpkan et al, 2020). However, HumEnt differs from social entrepreneurship, since it is an ESP that can be adopted within pre-established traditional companies, which decide to innovate their organizational and strategic structure, adopting the HumEnt approach, which encourages innovative and creative recombination of corporate strategies.

As highlighted by Parente (2020), new digital technologies encourage companies to increase their level of attention to local communities and the environment, digitization can facilitate the adoption of a Humane Entrepreneurship strategy, increasing corporate competitiveness by connecting innovation strategy, care for the organization, care for society and care for the planet.

The implementation of modern technologies, as a tool to monitor and make firm operations transparent, is a strategic lever for companies that adopt the HumEnt posture, since, in this way, they can go beyond the limits of the tools used by companies to communicate their attention to sustainability. In this sense, one of the most used tools by companies is that of labels and certifications which, however, contrary to what is believed, although necessary, are not sufficient to alleviate market failures (Giannakas, 2002) linked to information asymmetries (Parente, 2020).

Digital technologies, such as blockchain, therefore contribute to making companies "houses of glass", and this could be strategically relevant for Human Oriented companies it is possible to imagine the triggering of a virtuous circle for which companies that operate according to the values underlying the HumEnt model may increasingly prefer to be transformed into a “house of glass”.

The transparency and traceability of the activities carried out help to increase the trust of the various actors with whom the companies interact along the value chain and with stakeholders in general. The element of trust is particularly relevant in the development and functioning of multilevel governance based on shared and demonstrable objectives and values, through the application of technologies.

We, therefore, believe that the adoption of a HumEnt posture can redefine the role of companies within society, transforming these organizations into key players in the development

of Society 5.0, which guided by the values of the Japanese model, can adapt to the needs of specific communities.

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3. DISRUPTIVE TECHNOLOGY

Learning objectives

After reading this chapter, you will able to:

- Understand the foundations behind Clayton's Christensen 'Disruptive Innovation Theory'
- Distinguish between "disruptive" and "sustaining" technologies
- Explain the characteristics of disruptive innovation
- Elaborate on how incumbents / traditional companies may defend themselves
- Gain an understanding why entrants may have a competitive advantage
- Identify mechanism how to recognize disruptive innovation
- Discuss advantages and drawback of Christensen's theory

3.1. The impact of disruptive technology

How can start-ups *disrupt* traditional companies? Or: How can successful companies, often market-leaders, be disrupted through technological innovations? What is the process behind disruption? Clayton Christensen's theory of "'disruptive' technology" can help us to understand why and how disruption works.

Both academics and managers have been concerned with the question of how technological progress fundamental innovations affect economic development (Schumpeter, 1911; Danneels, 2004; Mikl et al., 2020). Thus, the question why do long-established companies (incumbents) fail due to technological change, while at the same time new companies (entrants) successfully enter existing or new industries, is particularly interesting for business academics and mangers alike. The theory of "'disruptive' technology" by Christensen (1997) not only explains why existing companies are facing challenges stemming from technological development, but it also shows ways for successful innovation management.

3.2. What is disruptive technological change?

Technology as a process Christensen defines the term technology comprehensively as "the processes by which an organization transforms labor, capital, materials, and information into products and services" (Christensen, 1997, p. 8). This process-based view is therefore not limited to a functional or knowledge-based definition, but also includes, for example, business processes that at first glance have little to do with technology.

"Disruptive" and "Sustaining" Technology

Christensen divides technology and innovations into two categories, "disruptive" and "sustaining" (see Table 4.1). 'Sustained' innovations are characterized by improving products with incremental advances or major breakthroughs, thus leading to an increase in sales of the incumbents' product to most profitable customers. In other words, 'sustaining' technologies improve already existing and established services in the mainstream market (Christensen, 1997; Sandström et al, 2009) 'disruptive' technologies, in contrast, are initially underperforming along the dimension of mainstream customer demand and are regarded substandard by the majority of the incumbents' clients. This low performance generates a market that is characterized by uncertainty, thus incumbent companies find it unreasonable to 'ditch' their profitable clients for a newly established, but smaller market with an inferior technology. Only when the performance and the quality of the 'disruptive' technology rises, existing incumbents' customers

are willing to abandon the sustaining technology and adopt the new technology (Christensen et al., 2015; Sandström et al., 2009). Most innovations belong to the Sustaining Technology category.

In other words, the terms "disruptive" and "sustaining" refer to the effect the respective technology has on long-established companies, the incumbents. The distinction also contrasts with the typical categorization of innovations into "incremental" and "radical." While incumbents usually master 'sustaining' technologies and the associated technological change, 'disruptive' technology poses a challenge for them, as this technology usually gives an advantage to the new companies entering the market, the entrants.

Table 3.1. Disruptive innovation characteristics

	Performance *Targeted performance of the product or service*	**Customers** *Targeted customers or market application*	**Business Model** *Impact on the required business model*
Sustaining Innovations Incumbents typically win	Performance improvement in attributes most valued by the industry's most demanding customers. These improvements may be incremental or breakthrough in character.	The most attractive (i.e., profitable) customers in the mainstream markets who are willing to pay for improved performance.	Improves or maintains profit margins by exploiting the existing processes and cost structures and by making better use of current competitive advantages.
Low-End Disruptions Entrants typically win	Performance that is good enough along the traditional metrics of performance at the low-end of the main-stream market.	Over-served customers in the low-end of the mainstream market.	Utilizes a new operations or financial approach or both to earn attractive returns at the discount prices required to win business at the low-end of the market.
New-Market Disruptions Entrants typically win	Lower performance in "traditional" attributes, but improved performance in new attributes - typically simplicity and convenience.	Targets non-consumption: customers who historically lacked the money or skill to buy and use the product.	Business model must make money at lower price per unit sold, and at unit production volumes that initially will be small. Gross margin dollars per unit sold will be significantly lower.

Source: (Christensen & Raynor, 2003).

'Disruptive' technologies usually face a difficult start

As long as 'disruptive' technologies are still in the early development phase, they can usually only be used in insignificant or emerging markets. The new products they spawn are usually inferior to existing ones, which is why most customers reject them. However, small new groups of customers often exist who value certain features of the new products, even if they are inferior to the existing products in some respects. These new customers are initially uninteresting to the incumbents because they only use the often simpler, cheaper and more convenient 'disruptive' technology in areas that are not very profitable. Given these initially small and also uncertain markets, it is not very attractive for incumbents to invest in 'disruptive' technologies. Instead, it is more economical to stick to 'sustaining' technologies, as they ensure a secure and attractive market with a known customer base and higher margins. Although this behavior is understandable at first glance, it can quickly become a downfall. Christensen therefore also speaks of the innovator's dilemma, since there seems to be no way out for the innovator in this situation (Christensen, 1997).

Low-end disruption vs new market disruption

According to the theory of disruptive innovation, an industry can change along two characteristic development paths: low-end vs new market disruptions. The first type are *Low-End Disruptions*, were entrants typically win: Low-end disruptions occur in the same value network as a sustaining technology that already exists on the market. At the beginning of the disruption process, an existing Sustaining Technology exists which, due to continuous product

improvements, moves upwards over time within the performance dimension demanded by typical and demanding customers. However, this upward trend means that for customer segments that do not have high expectations for product performance, it is no longer possible for them to purchase the products they want because the performance trajectories of the incumbent technologies have exceeded the requirements of these customers. "Overshoot customers" emerge, paving the way for low-end disruption (Christensen, 1997; Christensen et al., 2015).

A popular example is the case study of the car manufacturer Toyota, which in the 1960s mainly offered inexpensive small cars with low fuel consumption in the USA. The established domestic producers, such as Ford or GM, ignored this market segment and concentrated on high-consumption sedans, pick-ups and SUVs with which they could earn high margins. In the coming decades, the price of fuel escalated repeatedly over longer periods of time due to various oil crises, so car buyers increasingly bought cars with low fuel consumption, such as those from Toyota. Toyota steadily expanded its product line and today offers high-margin sedans and SUVs under its premium Lexus brand.

The second type are *New market disruptions*: The second manifestation of disruptive technologies is the so-called new-market disruption. In contrast to low-end disruptions, which manifest themselves in an already existing value network, new-market disruption arises in a completely new environment. The decisive factor here is that the customer preferences of the performance dimensions required by the conventional value network differ significantly and new dimensions thus gain in importance (Christensen, 1997; Christensen et al., 2015). An often-cited example of new market disruption is the iPhone, which as a greatly improved smartphone ushered in the end of the traditional cell phone, ultimately leading to the demise of Nokia, the Finnish mobile phone manufacturer and former market leader in this product category.

Christensen et al. (2015) attribute the initial success of the iPhone to its attractive product features. What then made the iPhone a new market disruption for the entire cell phone industry shortly thereafter is that this smartphone was increasingly used by consumers as a PC substitute, for example to surf the internet in an uncomplicated way and to send short messages and e-mails quickly. As a result, the iPhone was increasingly purchased by completely new customers who had not previously been interested in smartphones. The company Apple continuously promoted the versatility of their iPhone by making better and better software available through the App Store and its value network of developers. This successful new business model in turn increased the popularity and sales of the iPhone. Nokia overlooked these developments and was unable to counter this new platform-centric business model. Instead, it tried to bring (even) better products to the market through evolutionary innovations and thus became a victim of the Innovator's Dilemma.

The value network

Whether the investment in a new technology is attractive depends on the value network in which the company operates (Christensen & Rosenbloom, 1995). The value network describes the context within which a company operates. It determines which customer needs are satisfied, how and by what means. The context also determines how the company perceives the economic value of a new technology. If the incumbent and the entrant are at home in different value networks, their valuation of a ‘disruptive’ technology will also differ. If the new market opened up by the ‘disruptive’ technology has sufficient growth potential, the technology, which is initially inferior in some areas, can be brought to a level that also appeals to customers in the established market through further developments. If the performance of the new products initially lags behind that of the established products, less demanding customers who previously bought the old product may nevertheless become interested in them.

From this point, the ‘disruptive’ technology's rate of improvement exceeds the demanded performance improvement rate of the incumbent market's less demanding customers. This process allows the entrant to gradually penetrate the incumbent's established market until the

underperforming technology has numerous competitive features and captures a significant portion of the market previously occupied by the incumbent (Christensen, 1997). This process is illustrated in Fig. 3.1. The replacement of the incumbent begins as soon as the service supply trajectory of the 'disruptive' technology intersects with the service demand trajectory of the less demanding customers in the incumbent market.

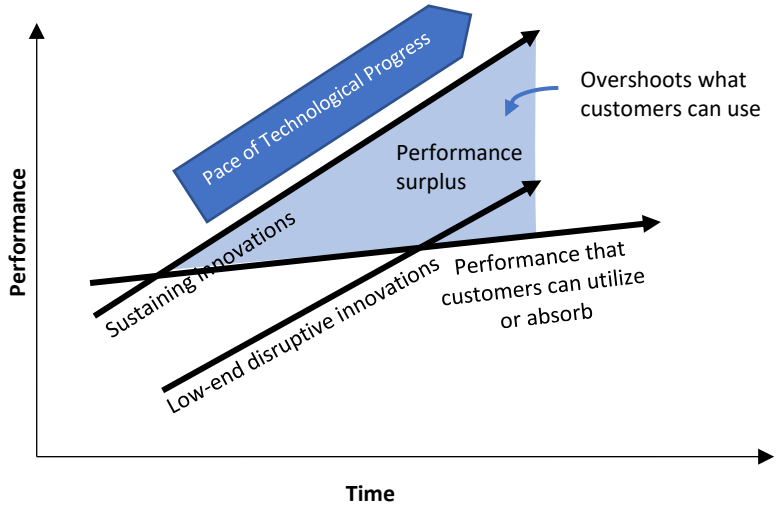

Figure 3.1. Disruptive vs Sustained

Source: (Christensen and Raynor, 2003).

The competitive advantage of the entrant

Their early entry into the newly created market allows entrants to build up specific capabilities and competitive advantages - for example, due to their development and manufacturing experience. In addition, their cost structures are adapted to the small markets, which is why they can usually produce more cost-effectively. While incumbents usually find it difficult to adapt their cost structures because of their established organization. If they then follow suit with their own new products, which are also based on 'disruptive' technology and are aimed at their existing customers, this often leads to cannibalization of their existing sales, which also reduces profitability. Christensen therefore concludes that entrants from emerging value networks have a competitive advantage over incumbents if they want to commercialize a 'disruptive' technology.

The incumbent's adaptation to its value network becomes a disadvantage Christensen's theory explains the incumbent's behavior primarily in terms of the power of existing customers. According to this theory, the inability to change strategy in time and the insufficient investment in 'disruptive' technology are based on the internal allocation of the company's resources (Lucas et al, 2009). All strategies that incumbents can choose are strongly influenced by the interests of their existing customers and investors, since these groups provide the resources (orders, capital) that are essential for the company's survival (Hillman et al., 2009). Existing companies thus invest in 'sustaining' technologies that are in the interest of their most important customers, instead of spending these resources on 'disruptive' technologies. According to this study, the failure of incumbents is not explained by their lack of technological competence, but by their inability to change strategy in favor of new value networks. These different behaviors of incumbents and entrants are based on the different organizational processes and values that have been formed by adapting to the respective value network (Hill & Rothaermel, 2003; Si & Chen, 2020).

3.3. What can the incumbent defend themselves?

The "innovator's dilemma" initially appears difficult to solve. To ensure that the management of an incumbent can nevertheless successfully cope with disruptive technological change, certain measures are recommended.

How to analyze the disruptive potential?

Firstly, it must be determined whether the technology is actually a 'disruptive' technology. In the 'disruptive' technology scanning phase, the technology is identified and analyzed for its disruptive potential. This includes defining and analyzing the current value network (Hüsig et al., 2005). Key disruptive characteristics of a new technology:

- Innovation overshoot: 'disruptive' technologies are particularly successful when existing technologies offer more performance than is demanded by customers (technology overshooting). This creates a vacuum at the lower end of the market which can be occupied by the 'disruptive' technologies.
- Initial inferior performance characteristics, but which can be quickly improved: 'disruptive' technologies start as inferior innovations that have poorer price/performance ratios, but these improve over time.
- Rejecting behavior of key customers: Typically, the 'disruptive' technology's services are unsuitable or too poor for the established market.
- Lower margins and profits: 'disruptive' technologies are too unprofitable from the perspective of the incumbents' value network until a suitable business model is found.
- Successful market entries: 'disruptive' technologies are regularly introduced by entrants into an emerging market where the specific characteristics of this technology are valued as an advantage.

Incumbents need to create an independent unit

In order to exploit the opportunities offered by a 'disruptive' technology, specific capabilities are required which incumbents are generally unable to develop within the existing organization (Nadkarni & Prügl, 2021). It is therefore advisable to establish independent business units or organizations for the development and commercialization of 'disruptive' technology. To avoid pressure from existing customers, a spin-out organization should be formed that is active exclusively in the new 'disruptive' technology value network (Christensen, 1997).

The development and commercialization of 'disruptive' technologies also requires an organization that has access to potential customers. This increases the likelihood that the necessary resources will be made available. Furthermore, a first-mover strategy has a greater chance of success than a follower strategy - unlike Sustaining Technology. This makes early market entry particularly important. Finally, the size of the new organization must be adapted to the size of the market (Chavez & Chen, 2021).

Don't underestimate the resistance to change

Whether it actually becomes necessary to create an independent organization depends on the existing processes and values in the one that already exists (Christensen & Raynor, 2003). Christensen understands processes as a pattern of interaction, communication, coordination and decision-making that create value by means of a transformation and with the help of resources. Processes are used to accomplish specific, clearly defined tasks. They may be completely unsuitable for other tasks - such as the commercialization of a 'disruptive' technology. Unlike relatively flexible resources, processes are intrinsically rigid and therefore difficult to change. Christensen suggests using 'heavyweight teams' to change processes because they are most likely to be able to institutionalize new processes.

Introducing new values into an existing organization is even more difficult. According to Christensen's theory, values correspond to the standards within the company, or corporate

culture, by which employees at all levels of the organization set priorities and make decisions. The company's internal values are influenced by the company's external value network. They define what a company considers important. Established companies and start-ups, both located in different value networks, have fundamentally different values. For example, one can observe a tendency for larger companies to move into even more attractive and even larger market segments, as small markets do not meet the growth needs of these companies. Whereas smaller startups looking to commercialize a 'disruptive' technology can achieve acceptable growth in smaller markets. Therefore, Christensen recommends a spin-off when large companies do not have the values needed to commercialize a 'disruptive' technology.

Does disruption really work?

There has been some criticism of the theory of disruptive innovation, for example, the selection of case studies used consists of very selective extreme cases, which are also not as clear-cut as Christensen (1997) portrays (which is particularly the case in the analyses on the hard disk industry). The extent to which a company is judged to have failed also depends very much on how success, entry and exit of a company are defined. This is because in (some of) the case studies used, the established companies prove to be much more persistent in the long term and find their way back to their old strength. In contrast, some of the companies described, which initially benefited from disruptive innovations, have not survived to this day.

In addition to the undoubtedly successful linguistic presentation of the perceived shortcomings, the methodological criticisms are at best valid in some areas, but in no way compromise the overall result. Perceived, presumed inconsistencies in the case study of the hard disk industry must also be placed in its creation period in the early 1990s. Today, we know exactly how the technologies have developed and what size the industry as a whole has assumed, and can make comparatively much clearer assessments in retrospect. Methodologically, Christensen's work cannot be seriously doubted. Regarding his selective case study selection, which he has been accused of, reference can be made to the well-received work of Eisenhardt (1989) on theory building with case studies, according to which exceptional or extreme case studies are suitable for developing relevant theories.

Furthermore, Christensen (2006) has described his theory-building process in detail and also admits that his basic theoretical framework from the 1990s and its extensions with the pattern of new market disruption could have additional components added to it in the future, further increasing its predictive power. In view of the large number of case studies available, it cannot be assumed that the data basis is insufficiently sound. The fact that some companies, which initially failed, have found their way back to their old strength does not contradict the theory of disruptive innovation in any case. In the case of large companies with extensive resources and various business areas, a resurgence does not seem entirely improbable. It is also possible that the management learns from its mistakes and takes appropriate measures at an early stage in order not to lose the connection in the industry again. Christensen and his co-authors (see Christensen et al. 2015) attribute the criticism of the theory of disruptive innovation to a considerable extent to the following misinterpretations:

Disruption is unique

The disruption of an industry is a process which, depending on the industry structure, can even take decades, as in the case of the success of the Japanese automotive industry in the USA. Often it is not clear in advance when the industry changes will start and whether the technologies and business models used will really have a profound impact. The process of change is neither linear nor uniform, so forecasts are inevitably subject to a high degree of uncertainty. Christensen et al. (2015) repeatedly point out that criticism of their conclusions is often based on timing considerations of individual case studies, which disregard the fact that deviations from the ideal-typical process of disruption are possible at any time.

Disruption can be successful for new market players

Pursuing a supposedly disruptive innovation path does not guarantee the individual success of a new market entrant or a startup. Usually, a large number of companies compete for the same market segment. Sustainable, individual success is then primarily dependent on the resources available and the consistent execution of the corporate strategy. Furthermore, the industry and the competitive situation can change fundamentally again. Startups have various disadvantages compared to established large companies. Basically, they have fewer resources (capital resources, personnel, brand, sales organization, etc.) and have a small customer base. They often have to develop their products, services and business models first and create routines for successful, organizational operations. This starting point suggests that small businesses often have little chance of prevailing against resource-rich large companies. One justification for this thesis is that the costs induced by research and development (R&D) can be amortized more quickly by large companies with comparatively higher profits and sales. In the same way, large companies would be better able to exploit economies of scale that arise because they can finance innovation more easily due to their access to capital markets and lenders. Nevertheless, startups are often successful, primarily due to the Innovator's Dilemma. However, in no case should a rule be derived from such successes.

Disruptive innovation leads to change

Sustaining innovations improve a product that already has a customer base in terms of established performance indicators. Christensen (1997) distinguishes disruptive innovation from these innovations. These types of innovations have the potential to change an entire industry by enabling new products and services with new business models. Disruptive innovation is a necessary element of why industry change can occur. It is critical to note for understanding the theory that disruptive innovation works through the business model. In this regard, Christensen et al. (2015) clarify that a technology alone cannot have a disruptive effect; only its combination with a business model can trigger fundamental changes in an industry. This is especially true if the innovator's dilemma means that competitive countermeasures by the incumbent company do not materialize for a longer period of time.

3.4. Conclusions

The theory of disruptive innovation was outlined in its basic form by Christensen (1997) in the late 1990s and has been further developed since then. Thus, new market disruption has been added to the basic theoretical framework as a second characteristic path of industry change, and other industries facing profound change are continuously analyzed. The Innovator's Dilemma remains the definitive reason why good companies – more or less of themselves – can fail.

In summary, the theory of disruptive innovation can explain much of the change in an industry after the fact. It certainly does not succeed in explaining change in all aspects. On the one hand, Christensen (1997) does not make this claim, and on the other hand, various misinterpretations of the theoretical foundations exist, which also lead to unjustified criticism and make a nuanced assessment of the benefits difficult.

The greatest weakness of disruptive innovation theory is certainly its limited predictive power with respect to exact, future industry conditions. How fast and how strongly the industry changes depend on many different specific industry factors and can only be accurately anticipated to some extent. Deviations from the ideal-typical course of the process do not mean, however, that the theory is wrong, but rather that the multi-causality of change means that forecasting the outcome of the change process is subject to a high degree of uncertainty.

Moreover, it can be argued that the diffusion of knowledge about the Innovator's Dilemma makes the ideal-typical course of disruption less and less observable. This is because, if the management of established companies is aware of the causes and possible consequences of the Innovator's Dilemma, it remains flexible and can take appropriate countermeasures, or even becomes a driver of change itself. Good companies therefore have a chance of remaining

successful and do not necessarily have to become victims of the Innovator's Dilemma. From the perspective of the average consumer, disruptive innovations with their new business models result in products and services being offered that did not exist at all before (new market disruption), or in goods that previously existed exclusively in the premium segment becoming affordable for him (low-end disruption).

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4. DIGITAL BUSINESS AND DIGITAL TRANSFORMATION IN BUSINESS

Learning objectives

After reading this chapter, you will be able to:

- Define what digital business is.
- Identify the digital business models.
- Define the pillars and key factors of digital business development.
- Point out key phases of digital transformation.
- Understand why digital transformation is a complex issue.
- Identify the enablers, barriers, and challenges of digital transformation.

4.1. Digitalization speeded up

The aim of this chapter is to present definitions and notions of digital business as well what digital transformation is in business practice. Its content aims at providing knowledge about what is digital business and what means to reshape business model into digital one. This chapter is divided into 2 parts.

The first one aims to present the terminology and typology of digital business. We also discuss business models created as a result of the development of digitalization. This perspective allows us to understand the context in which business organizations operate within the complex marketplace of the digital age. The next level of presentation is the factors and areas of digital business development. To sum up: this part shows that digitalization significantly influences social relations, and these strongly affect business and business relations, but also influence the whole economy. This is especially evident when we observe the progressive changes in the way of doing business as well as the changes resulting from the changes caused by the COVID-19 pandemic on society, business, and the economy.

The second part explains what digital transformation (digitalization – understood as a process of going digital) is. It covers key interpretations of digital transformation in business which are: technological (the use of new technology), organizational (impact of business model and organizational practices) and social (influencing not only organization but also customers). We explain how to transit from traditional ways of doing business into digital one takes place, what are its enablers and barriers, as well as challenges. This section brings closer the problem of transformation from analogue to digital work environment. Such change of business model significantly impacts customer and offers new ways of customer engagement due new capability of providing value of customer. This section also covers the consequences running digital business.

4.2. Digital business and related concepts

This digital workplace means “all the technologies people use to get work done” (Deloitte, 2011).

The digital revolution is fundamentally changing the economy and society, digitization has become a catalyst for change that is now self-perpetuating. Social changes accelerate changes in the structure of the Economy, and structural changes in the Economy affect social changes as well.

The changes brought about by the development of information and communication technologies imply a shift in society towards an information society. Information has never before been so widely available. A key element of development is especially the Internet, which allows access to a previously unimaginable range of knowledge. Thanks to the dynamic development of information and communication technologies, the cost of accessing information has either radically decreased or disappeared altogether. The ubiquity of information and knowledge and the development of digital technologies have become the hallmark of the digital revolution and the information society (Soltanifar, 2020). The rise of digital technologies is radically transforming products, services, businesses, industries, and ultimately people's lives. While digital technologies play a key role in digital transformation, they alone are not central to digital transformation. From a business perspective, the essence is the combination of these technologies along with business logic that can transform a business into a digital business (OECD, 2014).

Digitalization is increasingly seen as a factor in changing the business model as well as the entire business paradigm (Weill & Woerner, 2013). Digitalization is behind the change in the behaviour of consumers, whose needs are increasingly fragmented and individualized, whnile their base in the market is increasingly becoming active and engaged. On the supply side, the way value is created is changing, which for many products is not tied to their immediate tangible value. The way products and services are created is also changing, the process is no longer linear (Schaller et al., 2019; Swamy, 2020). Today's enterprises create and operate in vast ecosystems. Therefore, these new trends bring a new paradigm in which traditional businesses are redefined, as a result, the business model of traditional businesses is changing and digital businesses are creating their own business model different from the traditional (Krčo et al., 2019; Parida et al., 2019).

Digitalization and the intensive development of the productivity of new technologies has contributed to the development of new activities in both the private and public sectors. New digital technologies have proven to be a general-purpose technology/solution that has become a key component of and central to the business models of companies operating across the economy.

Definitions - Digitalization

What exactly is Digitalization in a business context, how digitalization is defined and how the market and science view digitalization:

- Digitalization is an immanent part of the 4.0 revolution. The development of Industry 4.0 is supported by digital technologies that change the specialization of the value chain and force changes in the relationships between actors. Industry 4.0 heralds greater operational efficiency and the development of new products, services and business models (Martín-Peña et al., 2018).
- Digitalization is the innovation of business models and processes that exploit digital opportunities (Weill & Woerner, 2015).
- Digitization (i.e., the process of converting analogue data into digital data sets) is the framework for digitalization, which is defined as the exploitation of digital opportunities. Digitalization by means of combining different technologies (e.g., cloud technologies, sensors, big data, 3D printing) opens unforeseen possibilities and offers the potential to create radically new products, services and BM (Rachinger et al., 2018).
- Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business (*Definition of Digitalization - Gartner Information Technology Glossary*, 2019).
- Digitization is the straightforward process of converting analogue information to digital. Digitalization refers to the use of digital technology, and probably digitized information, to create and harvest value in new ways (Parida et al., 2019).
- Digitalization means turning interactions, communications, business functions and business models into (more) digital ones which often boils down to a mix of digital and physical as in

omnichannel customer service, integrated marketing or smart manufacturing with a mix of autonomous, semi-autonomous, and manual operations (Clerck, 2017)

Digital Business Definitions

What is Digital Business, how to describe a way of doing business that uses technology as an advantage in the processes of creating products and services and in all activities and operations (*What Is Digital Business?*, 2018; 'What Is Digital Business - Definition, Meaning, Examples', 2021).

- It is the creation of new business designs by blurring the digital and physical worlds. It's the creation of new value chains and business opportunities that traditional businesses cannot offer (*Definition by* Gardner glossary, 2018).
- It uses technology to create new value in business models, customer experiences and the internal capabilities that support its core operations. This term includes both digital-only brands and traditional players that are transforming their businesses with digital technologies *(Definition by* LIFERAY, 2018.)
- Digital business creates competitive edge based on unique combinations of digital and physical resources. They do things that others cannot and in ways that build a comparative advantage (*Definition by* ACCENTURE, 2018)

4.3. Pillars of digital business development

The main pillars of the development of Digital Business are those elements that, on the one hand, are the basis of the ongoing business of the traditional enterprise and are the key to digital transformation. On the other hand, these are elements that have a development potential that we can define as infinite, both from the perspective of their possible use and possible change (Parida et al., 2019). The separation of these pillars is due to the fact that their use in the process of creating and running a digital business per se goes beyond a mere technological perspective. The pillars of digital business development presented below are also referred to as the five key components or key elements of digital development (Blaschke et al., 2017).

The 5 pillars of Digital Business growth are: People; Enterprise; Things; Data; Cloud (Blaschke et al., 2017).

1. People are the foundation of the digital economy, they are both the source of consumption of products and services created by Digital business, they are a key component of the external (customers) and internal (devices) service process. They are also the most important component of the creation process.

2) Companies in the traditional form operated in a stable environment, in the world of digital economy are forced to constantly evolve, adaptive changes within the business, as well as changes in the business model, which is forced by the instability of the market.

3 Things can be understood as tangible or digital products whose purpose can vary regardless of their properties, but only on how they are used (e.g. as products, tools or service intermediaries). Multifaceted solutions that tailor their utility to the recipient and the consumer, and at the same time, whose use can transcend existing divisions, models and applications. Here we increasingly use the term "smart things" or "digitally connected objects".

4 Data in traditional terms is part of static databases. In the case of Digital business, we talk about data in the form of computational, processed and multi-threaded processes. We also present it as self-collapsing algorithms operating within simple neural networks as well as artificial intelligence. Data is as much about databases as it is about collection mechanisms or the form of computation and inference. This comprehensive view means that Big Data can be collected, processed and used, algorithms, cognitive computing or analytical procedures can be created and self-developed.

5 The cloud, from a technical perspective, is just an infrastructure and storage technology. From the perspective of usability by digital business and beyond, it is a service with

unprecedented potential for collaboration and with specific properties such as support for abstract resources, multi-threading and multi-user access on demand and from anywhere, among others.

4.4. The reasons for going digital

The first element pointed out by companies is digitality, however, realizing what digitalization means and how this phenomenon therefore goes beyond the technological aspect of business, it is necessary to present those often hidden or undefined expectations that determine the choice of a digital business model (Krčo et al., 2019; Nosratabadi et al., 2019; Swamy, 2020; *What Is Digital Business*, 2021).

1. Flexibility

The changeability of the surrounding reality, including consumer preferences, forces the creation of entities that will be more resistant to change. This resistance is defined as the ease of adaptation to new situations. This means flexibility/flexibility of the company as an entity as well as its activities and way of operating. Implementing digital tools into the business process and changing the business model towards Digital Business increases the responsiveness and adaptability of businesses to changing realities. The collapse of supply chains, lockdowns during the COVID-19 pandemic have further increased the need for flexibility.

2. Scalability

Understood in two dimensions as the ability to increase or decrease the market (the scope of activity) and as the ability to change the size of the enterprise itself. The use of tools and techniques of digital work allows to match the size of the enterprise and the way it works with the volume of production and the needs of the market. As a result, the enterprise has the ability to better match the activity to the opportunities arising from its own production capacity and resources, both from the perspective of resources and production capacity and the size and scope of the market.

3. Culture

Digital business requires changing the way of operating and the culture of work and creation. Doing business according to the digital business model is different from the traditional model not only in the technological dimension, but also the entire organizational structure, relationships within the company.

4. Quality

Digital business means wider access to information about the product, customers, competition and environment. Thanks to this flow of information, it is possible to better monitor the creation process both by the company and by customers. This means a strong pressure to improve product quality, especially in confrontation with competitors' offerings. Digital technologies and the digital business model enable the quality of products and services to be increased and the organisational structure to be better utilised so that the quality effect is sustainable.

4.5. Determinants of digital business success

With the development of information and communication technologies, new business approaches have emerged. In these approaches resulting in the definition of a new business model, critical success principles have been identified. They are a certain reference, a framework for successful activities carried out by digital enterprises (Krčo et al., 2019; OECD, 2014; Parida et al., 2019). Wirtz defines this as Success factors of digital business. In doing so, he presents a framework for a successful Digital Business that requires four dynamic capabilities:

digital innovation, strategic and organizational flexibility, networking and integration capabilities, and ease of use (Wirtz, 2019).

Table 4.1. Success factors of digital business

Digital Innovation Capability	**Strategic and Organizational Flexibility**
• Market analysis/customer needs • Evaluation of risks and opportunities of an innovation • Physical vs. virtual goods	• Dynamic environment of the Internet economy • Focusing on customer relationship • Capability of adapting to market structure at different company levels
Capability for Networking and Integrating	**Easy of Use**
• Digital combination and processing of information • Resources and time advantage through electronic networking without media disruption • Network effects and lock-in effects	• Efficiency of and access to business/client interfaces • Transfer of offline basics to e-business • Focus on customer/user needs

Source: (Wirtz, 2019).

These success factors can be considered risk factors for failure. Failure to act in an area undermines the effectiveness of customer outreach or retention and leads to losses.

The first, example is the diversity of technological innovation. The biggest challenge in this area is to constantly update the knowledge related to innovation and the risks associated with its implementation or non-implementation so that the company's offer is as up to date as that of its competitors. The second element is creating both digital and analogue offerings and matching them to customer expectations and pricing strategy and market situation.

Strategic and organizational flexibility is the second key success factor for companies. The Digital business environment is volatile and prone to change, so organizational flexibility is necessary. Companies should focus on the customer. The challenge is to gain knowledge about the customer, their evaluations, and expectations, in the next step this involves establishing a relationship between the seller and the buyer. The flexibility of companies also increases as they grow and diversify their offerings and tailor their offerings comprehensively to meet customer expectations.

The third key factor is the ability to network and integrate resources. This includes creating business and partnership relationships within operating supply chains or ecosystems as well as leveraging information resources. Leveraging these capabilities allows for customer retention, more effective use of available data and information about the customer and the market and products. This allows for a strong customer bond with the company by, among other things, leveraging the lock-in effect.

The last key success factor is the ease of use of digital devices and applications. This applies to both retail and business customer applications. Enterprises should focus on customer habits, the intuitiveness of solutions, as well as the similarity of digital solutions to real world solutions. A good example is the shopping cart in online stores.

4.6. Comparison traditional model - digital model

Businesses use the digital tools available to them in the running of their activities. The extent to which these tools are used varies, with some using them for communication and others using data processing capabilities to reduce costs and expand their business reach into global markets (OECD, 2014). Technological change and the liberalization of trade and reduction in transportation costs have radically changed the way business is done. Extended and dispersed supply chains have increased the ability of companies to profit from global and geographically dispersed value chains. As a result, it is possible to centrally manage projects to create products or services using production resources, mainly human labour, dispersed in different countries (Weill & Woerner, 2013). This model has changed due to the Covid-19 pandemic. Companies are reducing dispersion and shortening supply chains, but replicating patterns and structures on a smaller, regional scale.

Digital Business has not produced a single business model, but it is undoubtedly possible to present how such businesses operate, as well as to present the differences between digital and traditional business models. It is also possible to present business models for different types of business. These models will clearly show the differences between the digital and traditional way of operating (Parida et al., 2019).

The business model of a traditional company is mainly based on the physical assets it owns (buildings, machinery, workforce) The business model of digital companies is based on the values and capabilities defined by companies based on digital assets (information, distribution, logistics, customer knowledge, digital platforms) (Nosratabadi et al., 2019). B. Wirtz explains that in digital business, the new norm is to build on the customer experience and cites as an example AIRBNB, which focuses on creating the optimal customer experience through digital services and data analytics (consumer habits and needs) while traditional hotels base their revenue on the availability of physical buildings and rooms (Wirtz, 2019). In addition to the base and resources, the main differences are the positioning of the customer in the concept of development and activity of the company, in the case of Digital business the customer becomes the central object of work and value creation, in the case of the traditional model the customer is the recipient, and the key element is the ability to produce. Other differences include the reliance not on resources, but on potentials and capabilities, and the use of traditional or digital tools for value creation. From this perspective, it is necessary to pay attention to the different model of value creation by digital businesses, which do it not on the basis of cost but on the basis of value created, which strongly differentiates the level of margins in each model - low margins in traditional business and high margins in digital business (Schaller et al., 2019).

Table 4.2. Traditional versus Digital Business Models

Traditional Business Model	Digital Business Model
Based on physical assets	Based on digital assets
Buildings, Machinery, Labour, Distribution	Digital Platforms, Business Intelligence, Information
Traditional Governance (slow iterations > 12 months)	Agile Governance (fast iterations < 12 months)
Increase productivity	Increase customer experience and value
Low growth and profit margins	High growth and profit margins

Source: (Gillior, 2020).

In a complex economy, it is not possible to contrast one model vs. another (traditional vs. digital). We must be aware that it is not possible to implement only digital business solutions in the economy. Traditional businesses offering traditional products and services will coexist with businesses creating digital products and services. This means that we will have both models operating simultaneously (*Traditional Business Vs Digital Business*, 2021). These models will complement each other and consequently evolve towards higher efficiency of each of them, but this efficiency will be counted by the success of the whole market, so it seems that this division will exist even if hybrid models combining elements of the traditional model and the digital model will appear (Soltanifar, 2020). Undoubtedly, the winners will not be companies that blindly adopt models that do not fit their business, the winners will be companies that are able to change the way they operate according to changes in the market and changes in their environment.

4.7. Digital enterprise business models

How the business models of new markets and the new economy are shaped. Companies should clarify to what extent they want to control the flow and creation of value - whether they want to control a segment of a linear value chain flow process or whether they want to be part of a complex ecosystem (Schaller et al., 2019). On the other hand, determine what should be the level of involvement in the relationship with the consumer and the level of knowledge gained about him (Brousseau & Pénard, 2007). In this way, it is possible to describe 4 different business models and represent them on a graph, where one axis is consumer knowledge and the other

is the level of production control. These models are: Supplier; Omnichannel business; Ecosystem driver; Modular producer (Weill & Woerner, 2015).

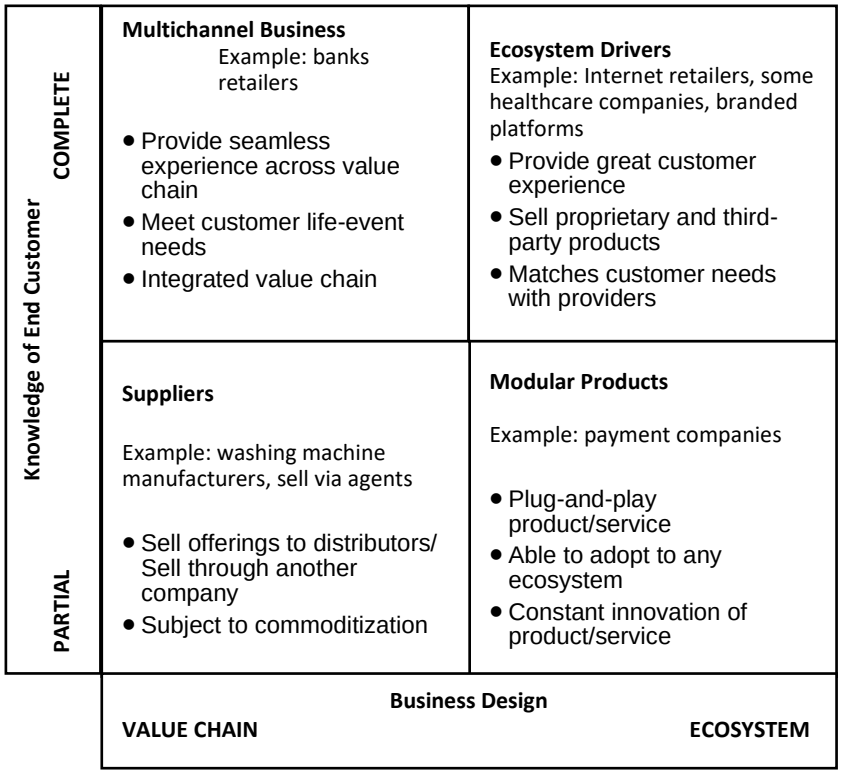

Figure 4.1. Four business models for the digital era

Source: (Akoyi, 2018; Weill & Woerner, 2015).

Supplier model

This model is characterized by a low level of knowledge about the end customer and operating in the value chain controlling only a portion of it. It is an example of a business model of a manufacturer without its own distribution network, whose offer is so limited that the end customer is not interested in the offer of this company without the possibility of buying other services or products. Examples of such enterprises are manufacturers of clothes, shoes, cosmetics, household appliances, consumer electronics products, food products, music publishers, book publishers, insurance sellers, etc. The characteristics of this model are concentration on production, a strong position in the supply chain and at the same time a strong dependence on the distributor.

These companies, wanting to change their operating model, increase their customer focus by expanding their offerings and opening their distribution networks reducing sales through retailers such as multi-brand stores. The use of digital tools makes it easier to reach the end customer but creating an independent distribution channel is difficult both from the perspective of logistics and potential customer interest. An additional aspect is the high cost of such a change.

Model omnichannel

Such companies provide customers with access to products and are the end of the supply chain. As a rule, these companies operate through multiple distribution channels (traditional and digital) and seek to monopolize the way they reach customers and control the entire integrated value chain. Additionally, these companies most often cluster multiple brands and products in their offerings. A specific feature is not so much the broad offer provided to the

customer, but its comprehensiveness and bundling of solutions in packages tailored to customer needs, e.g. sale of the product together with the service of delivery and installation, insurance, additional offer, supplements, etc.

These companies include corporate groups, sales chains such as hypermarket chains, multibrand stores.

Ecosystem driver model

The ecosystem in which enterprises operate is a complex business reality in which different services and products are combined in a single platform offering products and/or services. The ecosystem driver is the creators and coordinators of the activities of such platforms within which it becomes possible to do business supported by other users who may complement our offerings or be a competitor. However, it is the platform itself and not the individual manufacturers and bidders that are the greatest strength of this type of business. These platforms become the ultimate meeting place between the offeror and the client. They offer space and a one-stop shop for customers and bidders. Ecosystem participants profit from a wide range of offerings, bidders from easily accessible sales and service channels, platform owners' profit from ecosystem participants - both consumers and service providers.

Ecosystem driver companies include owners of sales platforms like Google and Apple, service providers like Airbnb, Uber, Alibaba, eBay, companies offering medical services, investment advisors, music, movie, social media platforms, etc.

Modular manufacturer model

Modular manufacturers provide plug-and-play products or services that can adapt to different ecosystems. Their product or service is just one part of the ecosystem e.g. product insurance, physical product assembly, payment processing, etc. The offerings of such companies need to be constantly updated, easily accessible as the market for modular manufacturers is highly competitive. Though often this market turns into an oligopolistic market, often with one dominant player.

Companies operating as a modular manufacturer include payment service providers, insurers, servicers, etc.

Table 4.3. Another breakdown on business models for Digital Business

1. Ad-supported model	A common model used by companies that offer a so-called free product/service and whose profit is to sell services or advertising through easy access to the mass customer.
	Examples: Google, Facebook.
2. Freemium model	A company provides a part of a product or service in a free version. Most common in the case of digital products and services, e.g. in the case of computer programs available in a "free" version and a full paid version (anti-virus programs).
	Examples: digital services like streaming platforms or music platforms Spotify.
3. On-Demand model	The model of paying for a service at a time, can work in the form of a one-time Access purchased allows you to use the service.
	Examples: Pay-per-view, Apple TV, streaming platforms.
4. E-Commerce	Selling products through the web. The business involves both physical and digital products.
	Examples: Amazon, Zalando, Zooplus.
5. Peer-to-peer model	It is a two-sided model consisting of providing a tool for buyers and sellers to meet. The activity of the tool provider is to maintain the infrastructure and handle the transactions. The company is not responsible for the transactions themselves.
	Examples: Airbnb, Booking.com, Uber, eBay, Allegro, Etsy.
6. Ecosystem model	The ecosystem is created in such a way that it makes particular vendors dependent by giving them an infrastructure that increases their sales capabilities. With broad access to vendors, there is also a noticeable lock-in effect for customers as services outside a given ecosystem are reduced.
	Examples: Google, Amazon, Alibaba

7. Access over ownership / Sharing model	This model relies on shared ownership. Firms without resources share the contact of bidders and customers. Similar to the bilateral market model, however, in this case there is no transfer of ownership, as well as the existing specificity shows a certain monoculture of supply.
	Examples: Airbnb, Zipcar,
8. Subscription model	Subscription allows you to use a particular service along with its updates. This mainly applies to digital services
	Examples: Office 365, Netflix,
9. Open-source model	This model is based on providing the product of a service in a free and open access manner. The way to fund the activity is through donations and grants.
	Examples: Firefox, Wikipedia
10. Hidden revenue model	Invisible to the consumer ways of financing the business. A business may, among other things, sell access to customers by providing access, e.g. for advertising purposes, to appropriately profiled customers.
	Examples: Google, Facebook

Source: (Digital Business Models Map, 2021).

Emerging new or evolving existing business models are and will continue to shape the way we do business. An important aspect of changes in the way we manage is the social and market changes that are the result of the radical change that is customer and data access. At this point, it is worth emphasizing that it is these changes that are responsible for the evolution and transformation of the market and management models, rather than the technological changes themselves. Technology is a support and a tool in the process of value creation, while the business model is changing as a result of digital communication tools and how their use changes social and economic relations. Companies that want to do business in the digital economy need to change their approach to business because the transformation from a traditional business model to a digital business is an extremely complex process.

4.8. Digital transformation

Definitions of digital transformation

The term digital transformation has many meanings in the literature. One of the most comprehend definition describes it as: "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2019). The analysis towards unified definition of digital transformation has showed that in scholar papers this term is associated with key primitives as: nature, scope, target entity, means, expected outcome, and impact. For example, regarding nature of digital transformation the authors refer to change, process, or transformation. When they mention outcome of digital transformation, they write about improvement, change in given business area, or innovation. Gong and Ribiere summed up the most frequent words appearing in descriptions of digital transformation and proposed the following explanation what digital transformation is:

> "A fundamental change process enabled by digital technologies that aims to bring radical improvement and innovation to an entity [e.g., an organization, a business network, an industry, or society] to create value for its stakeholders by strategically leveraging its key resources and capabilities." (Gong & Ribiere, 2021)

From this definition we can observe that digital transformation is a complex issue, therefore it will be not surprise that according to the survey from 2019 about 70% digital transformation projects were not fully successful (Tabrizi et al., 2019). Therefore transdisciplinary researches are expected as the most promising in terms of allowing better understanding of changes caused by digital transformation (Van Veldhoven & Vanthienen, 2021). Here, one important remark should be made. Digital transformation can be perceived as a new management fashion (Reis et al., 2018), a new form of previously well recognised in 90s. projects

referring to implementing IT into business mixed with business process redesign (reengineering).

According to another study about definitions of digital transformation conducted by Reis et al. (2018), three interrelated perspectives can be noticed:

- Technological, which is expressed by the use of new technology, its implementation changing not the way of doing business but focusing on hardware and software transforming tangible work artifacts (like documents, products) into digital form;
- Organizational, which refers to the changes made in organizational routines, reconfiguration of business model, like change in communication with customers via new electronic forms within Customer Relation Management system, or new communication channels of marketing in social media. It also relates to mentioned digital strategies described in Chapter 6. Simply, implementing IT should be done not because of intent on going digital, but due to set course of action – a strategy.
- Social, which touches the human side of organisation, what the best describes workers relations, building team spirit via internet communicating channels like MS Teams, Google Meets, Webex, etc., which most companies experienced during lockdown caused by pandemic COVID-19. However, this context of digital transformation is also referred to society and the changes within it, modification of professional and family relations.

In the next section we develop these perspectives underlining key aspects.

Digital transformation from the technological point of view

Technology is perceived very often as disruptive what is explained in Chapter 2. Disruptive technology. However changing paper-based organisation into virtual one, dealing partially or fully with digital content is the subject of many researches. Changing the tools does not mean radical change: it requires to learn how to use computer programme instead of traditional notebook. Still the type of activities remains the same (taking notes) however replacing paper and pen into installed software in computer environment is associated with some key points worth to consider before the organisation decides to implement procedure described in the next section of this chapter.

Digital transformation is not only changing system for the whole company, but also it requires to equip its workers into proper tools which enable access to data and exchange of information among workers. We will be not surprised that the surveyed workers pointed out as they pointed out as crucial to efficiently perform duties online: Wi-Fi/Lan connection (90%), laptop (89%), and online tools for communication (70%) (CBRE, 2020).

Digital transformation from the organisational point of view

In order to transform some preparation should be done first. Here we point out key issues prior any activities related to real change will takes place.

One lesson from digital transformation project is to remember about insider knowledge (Tabrizi et al., 2019). It is justified by disadvantages of using external consultants who try to implement benchmarks they know with less emphasizing the adjustment to organisations' specifics. It is also not only question about knowledge, but employees' attitudes towards digitalization. The difference in a mind-set regarding digitalization expresses the use of new technology as an assistant making job more interesting not as a replacement of human action. As usual in change management projects the starting point should be knowing the customers' needs. Grasping voice of customer via qualitative research methods allows for in-depth understanding of their expectations.

Digital transformation from the social point of view

We observed the changes in modes of work forced by digitalization thanks to research investigating the perceptions, opinions and attitudes of employees towards work from home

during lockdown. For example the surveyed workers asked what they missed the most, they pointed out following ones: clear separation between work and home (61%), the chats with working mates (64%), seeing other faces around (55%), and in-person meetings (51%) (CBRE, 2020).

This aspect represents customers who are currently interacting with each other via networks. Just assisting customers, learning more about and with them, treating them as business partners allow to better understand networked customers in digital age (Rogers, 2016, pp. 6–7). The shift in managing customer relationship shall include two-way communication, thinking in terms of economies of value for customer, building loyalty and advocacy (ibidem).

Society plays vital role in diffusion of digital novelties (Van Veldhoven & Vanthienen, 2021). Observing benefits of using new technology, improving of customer experience, a possibility of quick online discussion via social media, deliver quick feedback to technology provider.

The modes to transform into digital business

The topic of the modes (ways, means, methods) to change the business into digital can be presented from the point of view of implementation the IT systems into business or part of change management project with specific dates, budgets, etc. Both these spheres are overlapping so it is recommended to think about it as the complex process; otherwise some aspects can be missed making transformation not completed.

Here, we are focusing on transformation of existing business, however if you want to know how to create from the beginning digital business please see the following chapters:

- Chapter 6. Digital strategies
- Chapter 7. Digital firm's activities
- Chapter 9. Developing success digital venture
- Chapter 10. The six building blocks for creating high-performing digital enterprises
- Chapter 12. Digital business plan and start up

Digital transformation is sometimes described as the result of three phases: digitization, digitalization, and digital transformation (Verhoef et al., 2021).

Table 4.4. Three main phases of digital transformation

Phase	Description	Type	Digital concerns (selected)	Impact on organizational structure	Digital resources
Digitization	Transforming analog information into digital.	technical process	Incremental changes Lack of standards	None or weak	Digital assets
Digitalization	Using IT in business processes.	sociotechnical process	Business model modification Value-chain inertia	Significant	Digital assets + digital agibility and networking capability
Digital transformation	Changing the business model.	sociocultural process	Cultural inertia Lack of clear vision	Very significant, new units with own responsibility	Digital assets + digital agility and networking capability + big data analytics

Source: (Saarikko et al., 2020; Verhoef et al., 2021)

The digital transformation perceived as complex and challenging due to potential unexpected changes. Therefore, the agile approach is recommended as it allows for experimentation and withdrawing from solutions which do not bring expected results.

As Tabrizi et al. (2019) state: before you use digital tools firstly change your organizational culture.

Research on business model points out main actions undertaking by traditional companies towards transition which depends on focus of transformation (internally or externally) and

perspective (operational or strategic) (Loonam et al., 2018, p. 105). They refer to: technology-centric, customers-centric, organisation-centric, and strategy-centric.

The process of digital transformation should be guided by well communicated strategy.

4.9. Digital transformation: enablers, barriers, and challenges

As every project related to change in organisation also digital transformation possess some enablers, barriers, and issues requiring addressing. This section presents broadly understood conditions to transform which should be considered during transformation process described in previous sections. Some of them are more discussed in detailed in another chapter of this textbook. As cross-references we pointed out following sections: Chapter 15 presenting skills for disruptive digital business.

Enablers

Exemplary research on enablers to implement digital technology in one of engineer-to-order manufacturing company revealed the following list presented in Table 4.5.

Table 4.5. The enablers of digital transformation. Example of manufacturing company

Enablers	
Shared trust	Build trust Extended collaboration with unions Transparency of purpose
Shared visual understanding	Visual mapping and structuring Visualisation facilitates participation
Shared user perspectives	Flexible and versatile involvement Rapid release of functionality Communicating user needs
Shared learning	Train the trainer Digitalization as continuous improvement focus

Source: (Thun et al., 2021).

Vogelsand et al. (2018) demonstrated that success factors related to digital transformation can be classified to one of the three category: organisation, environment, and technology. According to them digital transformation requires:

- a flexible, agile organisation, ready to adapt to occurring change;
- a cooperative environment, because digitalization crosses the organizational boundary;
- a reliable technology which is a initial condition of effective implementation of IT.

Barriers

Mentioned above exemplary research also shows barriers to implement digital technology. The key categories with detailed items present Table 4.6.

Table 4.6. The barriers of digital transformation. Example of manufacturing company

Category	Example
Trusting the system	Compatibility with existing systems Speed and stability of networks System access and data security
Understanding the benefits	Putting the old tools away Effect measures, ROI and business cases Return on investment
Perspectives of economics	Budget change Economic conditions
Learning to manage scope	Large scale implementation and training Managing user feedback

Source: (Thun et al., 2021).

The synthesis of main barriers presents Table 4.7. It covers excerpts from 6 different research.

Table 4.7. Three main barriers to digital transformation

Source	Key barriers
Vogelsang et al. (2019)	Missing skills Technical barriers Individual barriers
Mahmood et al. (2019)	Lack of effective strategy Technological disruption Strategic alignment/integration
Raj et al. (2019)	High investment in implementation Lack of clarity regarding economic benefit Challenges in value-chain
Borangiu et al. (2019)	Conceptual (system design) Societal (human integration) Environmental (risk management)
Tripathi et al. (2019)	Data insufficiency and unreliability Absence of benchmarks and reference architecture Prediction disability
Lammers et al. (2019)	Financial Knowledge and skills Regulatory

Source: (Jones et al., 2021).

The synthesis of research paper dealing with this topic shows barriers associated with not only missing skills, technical barriers, or individual barriers, but also organizational and cultural barriers as well as environmental (Vogelsang et al., 2019).

Challenges

The list of challenges associated with digital transformation varies in literature. For example major challenges (dilemma) proposed by Heavin and Power (2018) includes:

- Defining priorities,
- Personalization based on aggregated data,
- Providing more resources to certain units,
- Selection of data,
- Machine vs human work,
- Security vs accessibility,
- Privacy of individuals vs better understanding of their behaviour.

Another list of challenges for large companies prepared Tiersky (2017):

- Resistance to change – only a small percent of workers enjoys of introducing new things into organizational realm. However, majority prefer existing status quo.
- Clear vision about digital consumer value is missing – offering guided by digitalization should results in re-definition existing customer in terms of meeting their needs by using digital tools.
- Customer data are not used efficiently – it is caused by big volume of data gathered about customer; however, their quantity does not make easy choice in selecting those allowing better understand the customers.
- Requirement for flexible technology – digital transformation is an iterative process what leverages existing routines with existing equipment which is not prepared for continuous development.
- Legacy of existing business model – digitalization of products and services do merely mean to sustain them as they were but adding digital selling channel. Such change is associated with more significant features like new way of monetization, new risks.

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5. OPPORTUNITIES AND THREATS FOR DIGITAL BUSINESS AND DIGITAL ENTREPRENEURSHIP

Learning objectives

After reading this chapter, you will be able to:

- Define what are the pillars of digital business and digital entrepreneurship development.
- Point out key modes of measuring digital business / digital entrepreneurship.
- Identify the current stage of digital business and digital entrepreneurship development.
- Identify key benefits as well as threats originating from an increasingly digitized world.
- Understand the complexity of digital business and digital transformation.
- Identify the enablers, barriers, and challenges of digital transformation.
- Point out some practical examples.

5.1. Doubled-edged consequences of digital business

The digital business perceived as resulting from billions of everyday online connections among people and here mainly suppliers and consumers, businesses, devices, data, and processes is based on hyperconnectivity. The latter means growing interconnectedness of producers, consumers, suppliers, and machines that results from the Internet, mobile technology and the internet of things (IoT) (Deloitte, 2021).

The research agenda on digital business and digital entrepreneurship is growing, becoming an important reference point for the analysis of challenges and problems experienced by people with disabilities in the socio-professional sphere (Adigun & Nzima, 2021; Raja, 2016; Tsatsou, 2021; Yu et al., 2019). Internet and digital transformation lying at the heart of digital entrepreneurship, create opportunities for inclusion and participation of persons with disabilities in various spheres of social life, especially in the labour market (Yu et al., 2019).

Digital business and digital entrepreneurship as nearly all socio-economic phenomena bring both opportunities and threats.

5.2. Opportunities for digital business and digital entrepreneurship

Opportunities for digital business and digital entrepreneurship are growing. They originate from easy and practically unlimited access to heterogeneous business information amplified by the Internet of Things and big data. These opportunities are illustrated here by digital connectivity, new value creation, and speeding up the process of launching new businesses. A special emphasis is put on digital businesses operating on the labour market and disabled people as employees[1].

Digital connectivity results – among others – in easy access to information that can be transformed into a business. The list of business opportunities from home is easily available in the Internet. The number of business ideas presented on the Internet varies from several to over one hundred (Graves, 2021). These ideas can be divided into two categories: for specialists and the general public. Examples of the first category could be white hat hacking, a systems integrator, an SEO (search engine optimisation) consultant, a web developer, a video games designer/developer. The second group contains jobs and activities requiring general entrepreneurial skills. Here one may find a virtual assistant, a social media influencer, a social

[1] This is partly because of the case-study titled: Working in Bed in the case-book.

media manager, an online dating guru, or dropshopping. A very popular category in this group is sale both traditional (pet products, thrift clothes, coffee, food waste, homemade products, handmade products, recipes, etc.) and modern/digital products and services (music, videos, ebooks, online courses, website theme and plugin, print-on-demand services, freelancing, multilevel marketing). Digital connectivity gives business entities new, fast, and vast ways to aggregate data and information. Data about the marker, competition, consumers behaviours and business opportunities (Aral et al., 2013). Information about consumers preferences, expectations and remarks.

The internet has changed or will change almost every branch of the economy. In the era of the digital economy, we can split business entities into two main categories: digital native and digital merging companies. The former exists through digital technologies which are conditioning their business model and the core activity of those companies lies on the internet, those companies may be exclusively digital – influencers, bloggers, and other content creators on platforms such as YouTube, Discord or Facebook; or the business model depends on the access to the internet – companies who operate in the sharing economy or gig economy, such as Uber, Bolt, and many other companies who depend on online connectivity as a tool for connecting customers and service providers. The latter are existing businesses that are transforming due to new possibilities and requirements that new digital technologies demand. This transformation process might be willing full – companies are looking for new markets or new ways to communicate with their customer base or forced by the market - companies need to digitalize part, or all their activities to keep up with the competition. Those companies perceive recent technologies as a way to improve or expand their existing activities (Jalan & Gupta, 2019).

The internet creates the greatest revolution in communication between consumers and companies, mainly by social media (Aral et al., 2013). Throughout social media, companies and consumers build relationships, interact with each other (Trusov et al., 2009), and in due course increase customer loyalty (Yadav & Pavlou, 2014). The former are delivering crucial business information such as their opinions, ratings, and critical remarks. Due to the development of new, interactive channels of communication interactions and flow of information may be much more efficient and intense than the traditional ways of communication (Turi, 2020). Internet allows for direct, two-way communication which is as a result can be both an opportunity and a threat to a company.

Although the digital transformation, understood as a set of available technologies, apply to both types of enterprises, the catalogue of opportunities, benefits and threats are not entirely alike. Some of business models are more prone to digitalisation, and depend on it more, and some are more rooted in traditional economy and relate on physical activities and contacts - you cannot get an online haircut. Despite this fact now days almost all business models, and business activities may gain on even partial digitalization of its activities, and due to digital connectivity, the internet is important, relevant and in some cases dominant way to find, attract and contact with the costumer - you cannot get an online haircut, but you can make an appointment reservation online.

Probably the greatest opportunity or advantage of digitalization of business is the ability to aggregate and use big data, to strengthen the business decision process with a vast amount of information and to be able to conduct bilateral communication with the customer base (Del Vecchio et al., 2020).

The second main opportunity is that digital businesses create new value in several fields of business activity, especially in business models, customer experiences and internal capabilities. Digital businesses are a heterogenous group thus one may differentiate between digital-only brands (for example social media or software as a service) and traditional players that are transforming their businesses with digital technologies (for example publishing houses). Although the progress of digitalisation can be observed in both fields, one may maintain that digital-only brands record faster growth leveraged by new applications and technologies like cloud services, augmented and virtual reality, artificial intelligence, and blockchain technologies.

The third is that digitalisation and working from home may speed up the process of launching new businesses. This is because of cost and red tape reduction. This trend has become particularly evident during the COVID-19 pandemic. When remote work became not only a convenient solution, but the only one available, due to numerous sanitary restrictions (Phillips, 2020).

Digital business is inherently combined with costs and energy reduction, production process efficiency improvement, better responsiveness to customer needs and increased product quality (Pereira et al., 2020). Benefits and opportunities for digital business notwithstanding, one may argue that digital entrepreneurship possesses some advantages over corporate businesses. Mainly thru social media a company can do advertise its products to a vast group of present and potential future users/customers on a scale unproportionable to the traditional (offline) ways of communication and build a bond with its customers – fanbase. But to keep its position, online attention, the company needs to constantly be present in social media, and be able to recognize emerging trends and opportunities to capitalize on those trends.

Digitalisation and working from home may speed up the process of launching new businesses because they eliminate the huge overheads associated with investing in a traditional office and physical supplies and minimalize the risk. The minimal capital investment allows spending more money on advertising. Operating online gives the chance to reach customers from all over the world.

A special attention should be given to opportunities for digital business connected with labour market. Modern digital technologies affect the supply and demand side of the labour market. They are changing the nature and tools of work (the way workers receive and perform their work), the place of work, the way they communicate with colleagues and clients, and the relationship between workers and employers (S. Raja et al., 2013). New practices and tools facilitating the functioning of employees and employers are bringing about structural and organisational changes in the labour market, both within companies and across sectors, including impacts on the situation of people with disabilities (United Nations, 2019).

The population of people with disabilities is not a homogenous group, it includes people with long-term physical, mental, intellectual or sensory impairments, which in interaction with various barriers may limit their full and effective participation in professional and social life (Convention on the Rights of Persons with Disabilities, 2006). It is estimated that there are more than a billion people with disabilities worldwide and that there are 100 million people with disabilities living in the European Union (*An Inclusive Digital Economy for People with Disabilities*, 2021).

Modern communication and information technologies, medical and assistive technology (Sachdeva et al., 2015) contribute to equal opportunities for people with different types of disabilities in education, employment, use of public administration, civic participation, up to financial inclusion and crisis management (D. S. Raja, 2016). E-inclusion strategies implemented around the world aim to improve the accessibility and participation of people with disabilities in the economic, social and community spheres (Nikolaidis & Xanthidis, 2015). Employment is rated as the most effective way to tackle poverty and marginalisation of people with disabilities (United Nations, 2019). In this context, the vocational activation of people with disabilities is seen as one of the primary challenges facing public policy makers, employers, community organizations, as well as the persons concerned themselves (*An Inclusive Digital Economy for People with Disabilities*, 2021).

The employment situation of people with disabilities is shaped by a variety of factors. On the one hand it is influenced by national variables: socio-economic, cultural, political (public policies) (Roulstone & Barnes, 2005). Challenges to the inclusion of people with disabilities in the labour market in many countries arise from similar issues, such as: inadequate public policies and standards of support; stereotypes, negative beliefs and perceptions about disability in society; insufficient funding to implement policies for this group; deficiencies in the provision of public services, their inadequate standard and incompatibility with the needs of recipients;

barriers to accessibility and adaptation of infrastructure; lack of consultation and inclusion of people with disabilities in policy-making; insufficient data on disability (WHO, 2011); Lack of enabling environment including inadequate attitudes and limited capacities of employers; insufficient activity and interest of trade unions and employers' associations in the needs of people with disabilities who want to enter the labour market (Fundación ONCE & ILO Global Business and Disability Network, 2019).

On the other hand, professional activity of people with disabilities will be stimulated by conditions, global trends such as: 1) technological revolution (including digitalisation, artificial intelligence, automation, robotics and big data), 2) demand for new, sector-specific skills (transversal skills will become desirable as knowledge and know-how will be constantly updated), 3) demographic challenges (ageing population, urbanisation and migration will result in strain on the labour market and social security system), 4) cultural changes taking place in society (resulting from new preferences, needs and requirements of the coming generations will influence the lifestyle and work), 5) climate crisis (transition to a low-carbon economy, adverse effects of climate change and new patterns in production models will also shape the future of work) (Fundación ONCE & ILO Global Business and Disability Network, 2019).

In order to reduce the risk of unemployment and maximize the employability of people with disabilities, the International Labour Organization has identified five key actions (goals) to be taken in the future in the area of labour market inclusion of this group of people with disabilities (Fundación ONCE & ILO Global Business and Disability Network, 2019): 1) Creation of new forms of employment and labour relations inclusive of OzN, 2) Development of skills and lifelong learning inclusive of signs, 3) New infrastructure, products and services created according to the principles of universal design (i.e. accessible, understandable and usable by all), 4) Accessibility and affordability (affordability) of technologies supporting functioning of persons with disabilities, 5) Inclusion of persons with disabilities in growing and developing fields of economy. Inclusion of persons with disabilities in the digital labour market, including digital entrepreneurship is to be served by: 1) Ensuring the availability of digital tools for OzN at every stage of the employee's life cycle - from acquiring skills, through job search, applying for a job, participating in the selection process, to performing the required tasks; 2) Promoting and developing digital skills among OzN, as an important action contributing to the real inclusion of this group in the labour market; 3) Supporting digital employment (implementation of projects that include OzN and promote experiences in the digital labour market) (Fundación ONCE & ILO Global Business and Disability Network, 2021).

The participation of people with disabilities in digital entrepreneurship and the broader digital economy has been attributed with great importance (Yu et al., 2019), although the scale of the above solutions for this group is difficult to assess due to lack of data. Digital solutions offer opportunities to compensate for dysfunctions and deficits associated with disability in various spheres of OzN life, including creating new employment opportunities for OzN. At the same time, the potential of digital entrepreneurship in reducing social inequalities is assessed critically, pointing to many barriers to digital inclusion (Martinez Dy, 2019). These limitations are related to personalised (directly affecting OzN), and environmental factors (Samant et al., 2013), as well as the type of tasks to be performed and contextual factors (Kim & Han, 2017). Research points to the importance of OzNs' personal preferences, attitudes and beliefs, technological skills, literacy, affordability of the necessary tools for the job, as well as revealing the role of law and policy, stakeholders' approaches to supporting accessible ICT solutions (Dobransky & Hargittai, 2006; Macdonald & Clayton, 2013; Tsatsou, 2020). At the same time, the primordial role and involvement of different stakeholder groups (public policy makers, the commercial sector, community organisations, universities, people with disabilities and the civil organisations representing them) for the successful professional and social inclusion of people with disabilities is emphasised (Fundación ONCE & ILO Global Business and Disability Network, 2019, 2021).

Finally, the current COVID-19 pandemic should be mentioned here as an example of the opportunity for digital business and digital entrepreneurship. Digital business (the perfect

examples being Zoom and Microsoft Teams in the education sector, and food and product delivery by drones in the retail sector) has been growing nearly exponentially during the pandemic[2].

As stated by businessofapps.com, "...over the course of May 2020, Zoom was seeing 200 million daily meeting participants. The following month, this figure had risen to 300 million. This compares to 10 million in December 2019. The UK cabinet and 90,000 schools in 20 countries were among new users of the app" (https://www.businessofapps.com/data/zoom-statistics. Accessed October 2021). In 2020 Zoom generated $2.6 billion revenue, a 317 percent increase year-on-year. Zoom's valuation exceeded $100 billion during the pandemic, a 383 percent increase on its value in January 2020 (https://www.businessofapps.com/data/zoom-statistics. Accessed October 2021).

Digitalisation for entrepreneurs is both an opportunity and a challenge. Entrepreneurs must absorb the fundamental mechanisms of digitalisation and then develop their strategies. Rödl and Partner (2021) formulate four basic entrepreneurial questions which must be answered:

- How does the digital transformation affect the structure and borders of our sector?
- How is the creation of the value chain and its associated competitive activities influenced?
- What new strategic decisions do companies have to make to secure a competitive advantage?
- What organisational effects does the new product type have and what challenges are associated with the product? (Rödl and Partner, 2021).

Since social media became the leading component of a strategy (Kreutzer & Land, 2015), the lack of skills and competencies to deal with social media may result in losing a competitive position or even in the elimination of a firm from the market. Staying with the needed skills for a while it is worth remembering about five trends shaping the digital future identified by Soltanifar and Smailhodžić (2020): (1) mobile computing, (2) cloud computing, (3) social media, (4) the Internet of things and (5) big data require the need for adopting a digital entrepreneurial mindset. These trends can also be seen as challenges, which leads us to threats of digital business and digital entrepreneurship.

5.3. Threats of digital business and digital entrepreneurship

Like the opportunities above, also threats of digital business and digital entrepreneurship can be illustrated by a few examples. Here one may mention resistance to new technologies, digital monopoly, online reputation systems, threatening the privacy and security of the users, and cybercrimes.

Old versus new is probably the first technology threat that needs to be addressed. New business models, such as Uber or Airbnb (digital platform-based sharing economy venture), thru technology, revolutionise markets and are considered as a serious threat to traditional companies in those markets, such as taxi corporations and traditional hotel services (Garud et al., 2020). New digital services may lead to the elimination of a specific model of traditional business – the case of video rentals that have been eliminated from the market by streaming services (Arditi, n.d.). On the other hand, on the mentioned above example, we can show the risk for new digital enterprises, old companies may, and do lobby for laws, which may hinder or prevent the operation of entities that are trying to gain a market advantage due to the innovative technology (OECD, 2018). In this context, technology should be seen as a double-edged sword. Its implementation may pose a risk to existing companies or entire industries, whose current business model may not be sustainable in the face of new technology. On the other hand, by implementing and investing in new business models and technology, companies risk that their activities may encounter legal problems and barriers. The state can introduce regulations that will make it difficult or even impossible for them to operate to protect the

[2] Useful statistics can be found in *Statista*. Also McKinsey initiated a new stream of reports and analytical analyses on the influence of COVID-19 pandemic on businesses.

existing market or the economy and society from the negative externalities of digital business models (Panchenko et al., 2020). It should also be emphasized that breakthrough technologies and innovative business models based on them not only create challenges for existing business models, but also constitute a kind of socio-economic challenge that, in addition to obvious benefits, generate costs and losses in both the economic and social sense. This issue goes far beyond the usual issue of Corporate Social Responsibility (CSR). In this context, new technologies pose a kind of challenge that creates new ethical problems. This issue goes beyond the micro-level of a single company but refers to the macro-impact of entire sectors of the economy.

New digital monopolies are another prominent issue and they are companies whose products are markets themselves, such as Google (Alphabet), Amazon, Facebook, Apple, and Microsoft (GAFAM). Those new monopolies present many risks for digitalization (Loertscher & Marx, 2020; UNCTAD, 2019). Those companies possess monopolistic or quasi-monopolistic positions in crucial business areas such as online marketing and they set their own rules and may use the asymmetry of information for their gain (Crémer et al., 2019). Due to their market size, they may use their power to beat the competition from smaller companies (UNCTAD, 2019). Digital entrepreneurship depends on corporate social media such as Facebook, Twitter and Youtube. Those mainstream corporate platforms create their own rules and regulations and have an unclear system of control and demonetization of content or account suspension. This is a threat for companies that base their business model on creating content for social media and get paid mainly for advertising.

The prominent aspect of the digital economy is online reputation systems – quality ratings, ubiquitous on every e-commerce platform (Floyd et al., 2014). Throughout product ratings and reviews, consumers share their opinions and provide feedback. This tool supports buying decisions of consumers and build trust, by this its help's both business owners and customers (Fang & Huang, 2020). But there is a risk of unfair feedback. The system may be rigged us as a tool for unfair competition. Companies may pay to receive good feedback, to bust up their online recognizability and attractiveness for the customers (Rezvani & Rezvani, 2020). This practice hits honest enterprises operating in the market. In the online market, where reputation is built as an ongoing evaluation process by customers, a good rating is a significant business advantage (Cabral & Hortaçsu, 2010; Floyd et al., 2014).

There is also the problem of digital illiteracy – the lack of skills and knowledge about Information and Communication Technology (ICT) and how to implement such technology. Lack of competence in how the modern digital environment functions and the digital market rules. This is a challenge for the process of business digitalisation, especially for small and medium-sized enterprises (SMEs), that are managed by elder entrepreneurs (Istifadah & Tjaraka, 2021). This issue is not only a challenge from the perspective of the process of digital transformation of business activities, and therefore a potential negative impact on the competitive position of a given entrepreneur, but also poses a security risk. It creates danger of fraud, digital crimes, data leak, platform failure or simple errors in everyday operations. Those digital crimes - hacking an account, website or database, information leakage, virus, extortion by encrypting data on disks, data loss (including cloud data loss), consumer piracy, risk of hacking a Wi-Fi network or connecting to Wi-Fi controlled devices, digital identity theft, including hacking into a social media account may be a source of a major loss for a company or even a breaking point, that might result at the end of business activity (Teoh & Mahmood, 2017).

Furthermore, unequal access to digital technologies and uneven capacities to make effective use of them may harm some companies, especially micro-, small and medium-sized enterprises. Digital services create conditions for global competition, even in the local market (UNCTAD, 2018, 2019).

Last but not least is the security of digital business transactions since digitalisation leads to the emergence of cybercrimes and security breach incidents that threatens the privacy and security of the users.

The scope of the cybercrimes is big and growing. It can be illustrated by The FBI's Internet Crime Complaint Center statistics released by Statista (see Fig. 5.1).

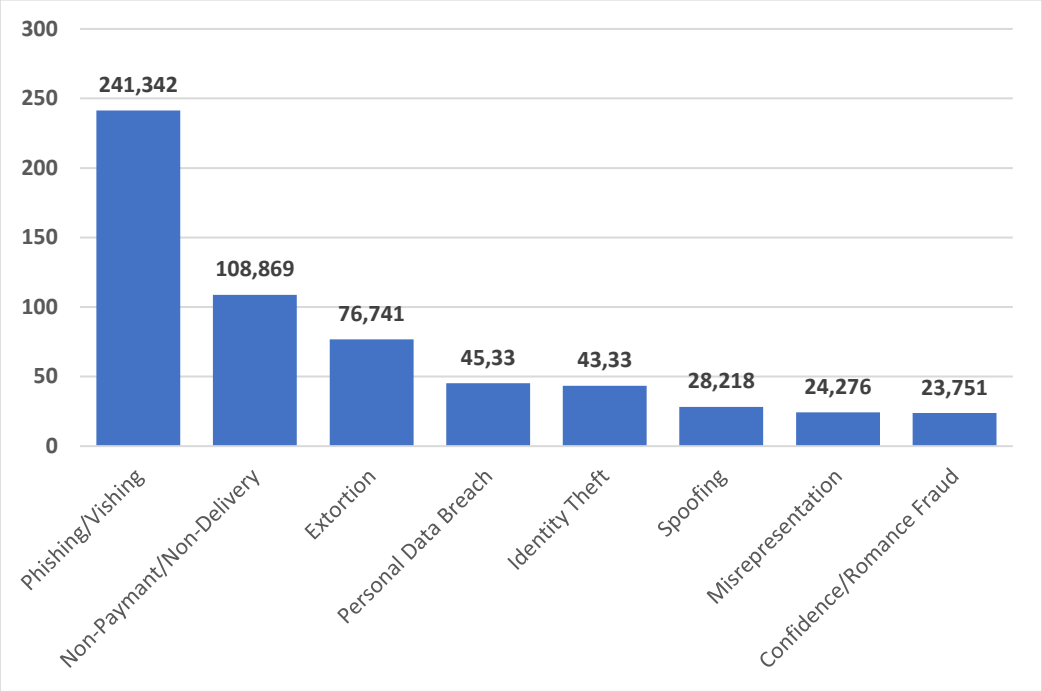

Figure 5.1. The most common types of cybercrime in the US in 2020

Source: https://www.statista.com/chart/24593/most-common-types-of-cyber-crime/ Accessed October, 26, 2021

One can see that the total number of cybercrime victims in the US in 2020 alone reached 591,857 and the total victims loses from the listed crimes was approximately $ 1,64 billion.

Various institutional, organizational and technical measures aimed at countering cybercrime are in operation. They in turn can be perceived as an opportunity for new entrepreneurial small firms specializing in cybersecurity. Examples of the technical measures could be blockchain technologies and digital forensics: cloud forensics, social media forensics, and IoT forensics (Alghamdi, 2020).

The above-mentioned threats are directly related to the digitization of economic activity, however, apart from them in the world of the digital economy, there are still classic threats and challenges for business but in a new form. Threats such as plagiarism, fakes, imitations, extortions, and the problem of information asymmetry are still present, in a new digital version.

Some of the above-mentioned threats are challenges that companies undergoing the process of digital transformation must face. For some of them, the solution is training and improving the competencies of employees, purchasing modern technologies or appropriate software. However, some of them are the result of maladjustment of norms and formal and legal solutions, and thus the pace at which states and governments adapt to changing technological conditions. Companies undergoing the process of entering the digital economy must be aware of the risks associated with it.

The opportunities versus threats balance is positive since one may observe the dynamic growth of digital business and digital entrepreneurship.

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6. DIGITAL INFRASTRUCTURE

Learning objectives

After reading this chapter, you will able to:

- Understand the difference between "hard" and "soft" digital infrastructure
- Identify the impact of Internet of Things on the quality of digital infrastructure
- Investigate digital infrastructure of tourism, medicine, environment and ecology
- Find out technologies, products and services of digital infrastructure
- Analyze the latest Blockchain technology
- Identify socio-economic benefits and threats from digital infrastructure
- Create a smart infrastructure of the city

6.1. Digital infrastructure: essence, types

"The best way to predict future is to create it"
(Abraham Lincoln)

The formation of a high-quality digital infrastructure is the key to the success of the effective functioning of digital entrepreneurship in the innovative conditions of economic management and global challenges. Digital transformation of business lays the foundation for development of digital ecosystem of entrepreneurship through the prism of virtual mobility, which has intensified in the 1920's. The logic of structuring this section is aimed at clarifying the features of the application in digitalization of business components of "hard" and "soft" digital infrastructures. After all, they are aimed at accelerating the development and implementation of new digitized business processes and business conditions in the development of Industry 4.0 and laying the foundations for the formation of socio-economic, innovative, institutional, environmentally oriented foundations of Industry 5.0 to ensure a new quality of life 5.0. The synergetic potential of social, mobile, cloud technologies, data analysis technologies, Internet of Things individually and in combination can lead to transformational changes in doing business in digital age and make digital business efficient, reactive, valuable.

"Hard" and "soft" digital infrastructure

Technological changes that are characteristic of XXI century in terms of "merging" of telecommunications, ICT and innovations, led to the introduction into scientific circulation of the concepts of "digital technology", "digital infrastructure", "digital business ecosystem", "digital entrepreneurship", "digital economy". The latter is a type of economy characterized by the active introduction and use digital storage technologies, processing and transmission of information in all spheres of human activity.

"Digital vortex" (Aizekson, 2017) created by digital technologies opens up unique opportunities for the development of all national economies and the improvement of people's quality of life. The rapid and profound consequences of the transition to "digital" will be possible only when digital transformation becomes the basis of society, business and government agencies, will be commonplace and every day, intertwined with our genetic code, will be "a key agenda on the path to prosperity and foundation welfare" (*Digital Agenda of Ukraine – 2020*, 2020[b]) and the formation of Society 5.0.

Infrastructure has always been particularly important for poverty reduction: access to minimum infrastructure services is one of the important criteria for determining the well-being of the population. There is a large proportion of the world's population living below the poverty line, without access to clean water and living in unsanitary conditions, with extremely limited levels of mobility and communications (Manzhura et al., 2020).

People with such living conditions have more problems with health, education (lack thereof) and fewer employment opportunities. Such settlements are located mainly outside the cities in developing countries and the least developed countries, do not have sufficient and proper infrastructure (Marchenko et al., 2021[b]).

For these reasons, digital technologies of the Fourth Industrial Revolution and Internet are becoming the foundation of society and a universal synonym for digital infrastructure. Although Internet is one of the most important advances worldwide, digital infrastructure is a more complex concept because it also includes cellular infrastructure and satellite networks. Combined with other digital technologies, such as personal computers and smartphones, these innovations have changed the daily life of society and the way of doing business around the world (Chmeryk & Kralich, 2018; Shtepa et al., 2021a).

Digital infrastructures are complexes of technologies, products and processes that provide computing, telecommunications and network capabilities of electronic interaction, data exchange, signals, etc. and work on a digital (rather than analog) basis (Kliushnyk et al., 2019). Today, there are two types of digital infrastructures, namely: basic ("hard") and service ("soft") (Figure 6.1, Figure 6.2).

Digital infrastructure is a system of digitized equipment and technologies, electronic communications, digital services, which provides innovative and digital activities in society. Digital technologies are changing the nature of economic relations, forms of relations between different institutions, areas of digital enterprises. Thanks to modern digital technologies, new opportunities for relationships in the business environment.

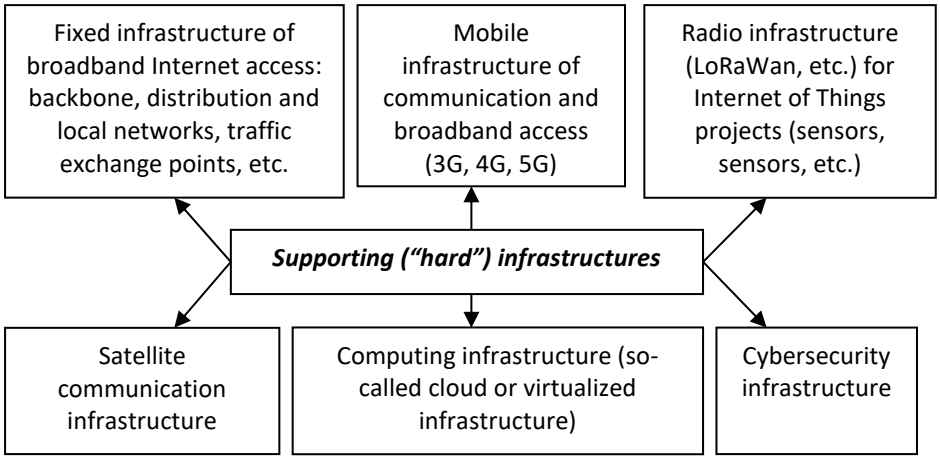

Figure 6.1. Base ("hard") digital infrastructure

Digital infrastructure of Industry 4.0 is primarily an infrastructure access to the latest generation backbone and mobile networks, along with a service infrastructure. Digital infrastructure is a platform for the development of all spheres of society in the country (*Digital Agenda of Ukraine – 2020*, 2020b; Menard, 2017).

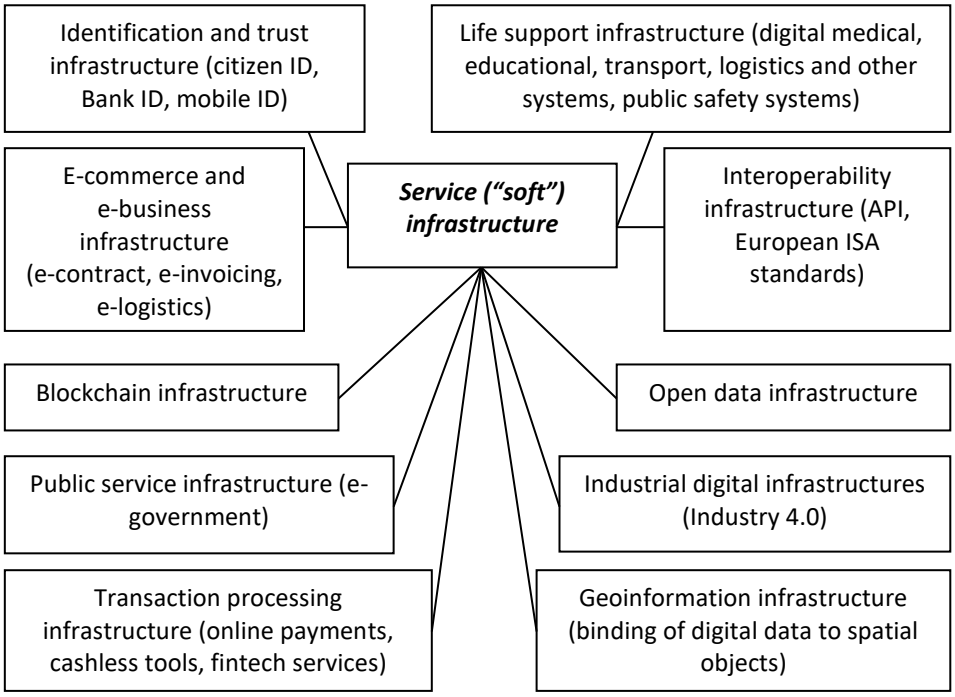

Figure 6.2. Supporting ("soft") digital infrastructure

The "hard" and "soft" digital infrastructure of Industry 4.0 together are special industrial areas with prepared engineering and transport infrastructure, Universities 5.0, a set of necessary services, simplified regulatory procedures and a package of investment incentives, institutional rules and regulations for production, scientific-research and digital enterprises (*Digital Agenda of Ukraine – 2020*, 2020b; Manzhura et al., 2020d).

Not surprisingly, one of the main directions of the previous EU Framework Program "Horizon – 2020" was the development of European research infrastructure (including e-infrastructure) until 2020, which will further promote innovation potential and complement the EU's international cooperation policy. European approach to research infrastructure has made significant progress following the effective work of European Strategic Forum on Scientific Infrastructure (ESFSI) and its "roadmap" for the integration and opening of national research institutions and the development of electronic infrastructure underlying digital infrastructure of European Research Area. The purpose of digital infrastructure is to support partnerships between relevant policy and funding institutions, cartography and monitoring for decision-making, as well as activities in the field of international cooperation in the field of innovation.

With a high-quality digital infrastructure, high-quality fixed and mobile Internet, computing and virtualization, Internet of Things backbones, e-business interaction, e-payments, e-government, interoperability are possible (system units can exchange information with each other. However, aspects related to processes, similarly, distributed systems allow access to information and data of one system by other systems in the network), open data, cybersecurity, blockchain, identification and trust, etc. Information security, cybersecurity, protection of personal data, privacy and rights of users of digital technologies, strengthening and protection of trust in cyberspace are, in particular, prerequisites for simultaneous digital development and appropriate prevention, elimination and management of associated risks (Table 6.1).

Table 6.1. Comparison of components of "hard" and "soft" infrastructures

"Hard" digital infrastructure	"Soft" digital infrastructure

1. Fixed telecommunication infrastructure (trunk, distribution and local networks, traffic exchange points, etc.) 2. Mobile telecommunication infrastructure (3G, 4G, radio and satellite technologies, wi-fi) 3. Digital television infrastructure (terrestrial, cable, satellite) 4. LoRa radio infrastructure (long range frequency, unlicensed frequencies) for Internet of Things projects (sensors, sensors, etc.) 5. Computing infrastructure – data processing and storage centers (so-called cloud or virtualized infrastructure) 6. Cyber-security infrastructure 7. Specialized infrastructures (special networks, video surveillance, related engineering systems)	1. Interoperability infrastructure (API, European ISA standards) 2. Geographic information infrastructure (binding of digital data to spatial objects) 3. E-commerce infrastructure (b2b digital buying and selling platforms, e-contract, e-invoicing, e-supply chain) 4. Transaction processing infrastructure (online payments, cashless tools, fintech services) 5. Infrastructure of identification and trust (trust services, citizen ID, BankID, mobileID) 6. Open data infrastructure 7. Public service infrastructure (e-government). 8. Life support infrastructure (digital medical, educational, transport, logistics and other services, public safety services) 9. Industrial digital infrastructure (Industry 4.0, cyber systems)

Source: compiled by authors based on source (Kraus & Kraus, 2018; Smart Sustainable Cities at a Glance, 2021).

For an efficient and well-functioning digital infrastructure, it is important to create a digital institutional environment of the economy. This environment should be in the form of standards, laws, norms and rules, one of which is the decision that digital forms of formal interaction should be the first and analog the second. This applies to the state level, as well as at the levels of interaction between states and business, citizens and business, suppliers and customers of goods and services (Kryvoruchko et. al., 2017; Nikiforov, 2021).

Criteria for the level of development of digital infrastructure and digital business ecosystem are:

- Level of development of national scientific and technical potential;
- Educational level of the country's population and their digital competencies;
- The level of digital development in the country of technopolises, technology parks, technology transfer centers;
- The level of development of small innovation and digital business incubators in the country;
- Level of development of venture financing system;
- The degree of involvement of the subjects of national digital infrastructure in the international exchange of scientific and technical achievements;
- Level of ICT development;
- The level of digital development of the country's financial system (Boldyrieva et. al., 2019; Manzhura et. al., 2019).

The impact of the IoT on the quality of digital infrastructure

It should be noted that advanced technologies such as broadband, data centers, cloud services, big data and IoT – are key factors that will contribute to the next wave of economic benefits from investment in information and communication and digital technologies (Kraus, 2020; Osetskyi et. al., 2019).

Today, the so-called cloud market is in the process of forming demand. The demand for cloud technologies is growing, the initial experience of cloud solutions is gradually accumulating. This fact is reflected in the main level of awareness of the end user about cloud computing. The development of the cloud market as a component of digital infrastructure is directly dependent on the level of use of cloud solutions by IT companies, as well as their intensive study of these technologies. Therefore, the positive experience of end users will ensure the rapid penetration of cloud technologies into the consumer market.

Internet of Things (IoT) is technology (Table 7.2) that supports a network of computer devices with Internet (Burch, 2019; Osetskyi et. al., 2020[a]).

Table 6.2. Positive and negative consequences of the impact of IoT technology as a structural element of digital infrastructure

Positive effects of IoT technology as a structural element of digital infrastructure	Negative consequences of the impact of IoT technology as a structural element of digital infrastructure
1. Reducing the cost of providing services 2. Greater transparency and resource efficiency 3. Productivity growth in the industrial sector 4. The emergence of additional knowledge, as well as values based on connected "smart" things reducing the cost of providing services	1. Loss of jobs by low-skilled workers 2. Violation of confidentiality 3. Loss of control 4. Malicious intrusion (hacking) and security threat

Source: (grouped by authors based on sources (Marchenko et al., 2021b; Markevych, 2021; Prianikov & Chuhunov, 2017).

At the heart of each device in the IoT system are sensors that collect and transmit data to the "cloud" for further analysis, processing and making "smart" decisions. The gradual introduction of high-speed Internet provides a strong connection between millions of devices and sensors, allowing IoT to work efficiently. According to the forecasts of the London market analysis company IHS, the number of IoT devices will increase from 15.4 billion in 2016 to 75.4 billion in 2025 (Chmeryk & Kralich, 2018). In 2020, this technology was expected to spend $ 749 billion, and the forecast of global spending in 2023 is $ 1.1 trillion. Studies of the state of broadband access at social facilities show that, for example, less than 1% of total number of health care facilities in Ukraine are connected to broadband Internet. Thus, the gap between available and universal access for hospitals is 99%. In other words, in fact, citizens of Ukraine do not have the opportunity to meet their own needs in telecommunications health care services. This leads to unequal access to quality medicine, although Article 49 of the Constitution of Ukraine obliges the state to create conditions for effective and accessible medical care for all citizens. A study of the state of broadband access in secondary schools shows that only about 47% of them have sufficient channel capacity to transport traffic within the educational process using digital content, and 53% (10 067) of schools are not connected to broadband networks at all (*Digital Agenda of Ukraine – 2020*, 2020b).

Strategy "Europe 2020" envisages the implementation of "Digital Agenda for the Development of Digital Technologies in Europe". The aim of this plan is to achieve a sustainable economy and social benefits by creating a common EU digital market based on broadband access. According to EU Directive IP/10/581 Brussels (19 May 2010), "Digital Agenda for Europe" aims to ensure that by 2020 100% of EU citizens have broadband access at 30 Mbps and 50% of European households up to 100 Mbps. Thus, the countries of Europe and the world have gradually raised the issue of the importance of broadband access to ensure the legal rights of their citizens through their own "Digital Agendas" (*The Digital Single Market designates the 2014-2019 strategy*, 2013). Implementing strategy "Digital Single Market", the European Commission adopted a number of initiatives and legislative proposals on 14 September 2016 (Tapscott & Tapscott, 2016). Thus, it is expected that these and other measures should ensure the competent participation of citizens in the formation of a modern digital society.

6.2. Digital infrastructure in various fields

6.2.1. Digital tourist infrastructure

The sphere of tourism in digital infrastructure has undergone transformational changes. This is due to the fact that the infrastructure of the tourism sector is in constant contact with telecommunications networks and non-cash payment instruments. In addition, the model of Smart Tourist Destination at the regional and local levels is a new model of territorial development, management and marketing of tourist destinations in order to fully meet the needs of modern tourists.

Digital tourism infrastructure is designed to provide:

- Operation of websites of tourist destinations with content localized for the needs of tourists;

- Collection and analysis of statistics in real time using the technology of the Internet of Things, large and open data;
- Creation of virtual tours, 3D-modeling, arrangement of tourist objects with webcams, introduction of QR-codes, RFID-tags, non-cash payment systems;
- Introduction of loyalty programs and electronic tourist cards; creation of tourist mobile applications (with route maps, audio guides, geolocation);
- Electronic tickets at tourist facilities and leisure facilities;
- Digitization of museums (electronic multilingual catalogues, virtual and augmented realities, audio guides and electronic guides) (Andrusiak et. al., 2020).

6.2.2. Digital infrastructure for environmental protection and ecology

Digitized environmental infrastructure is designed to create such national analytical systems that would be easily and instantly integrated into the European online Shared Ecology Infrastructure System. It's worth to analyze short-term and long-term trends in biodiversity change, environmental pollution, weather conditions and ecosystem development. Digitized work of business working with ecological products and services allows to carry out high-quality plan measures to prevent harmful changes; stimulating the creation by the public and business of digital mobile applications of environmental "patrolling" of natural resources with the possibility of notifying law enforcement agencies of illegal activities (pollution, poaching, tree felling, illegal landfills).

In the course of business implementation in digital age, ecological expertise is based on the use of information (any data) about the state of the environment and knowledge about the processes that take place in it. Information recorded in a certain form of storage and transmission suitable for further processing is called data, and an organized array of data stored in a computer system is called a database. The set of databases and special methods and tools (software, organizational, etc.) that allow a digital enterprise to work with information about the state of the environment to a wide range of users is called a digitized information system. Computers have made it possible to process virtually any type of environmental information, and the term "information" has often been used as a synonym for the term "data", which is often used to denote primary digital information about the state of the environment.

The methodology and degree of filling of large blocks of ecological information determine the peculiarity and specificity of the information base and the effectiveness of all systems of digitized environmental management. Currently, only a digital information space is being formed, which is focused on environmental issues. Digital business information systems, which are used in all spheres of public activity, are currently in third stage of their development.

First generation systems (Data Processing Systems) were based on the application of a "task approach" (to solve each problem in the system separately formed data and created an appropriate algorithmic model). Second generation systems (Management Information Systems), focused on operational data processing, which is characterized by a structured flow of information, integration of data processing tasks. These systems have a positive feature for digitized business in the field of ecology – collective access to data, i.e., the creation of a single database with centralized management. Main disadvantage of systems with such a structure is the presence of an excessive database with a description of the data itself.

The structure of third generation information system (Decision Support Systems) focuses on joint data analysis and algorithmic models of decision making for the purpose of effective functioning of digital infrastructure of environmental protection and ecology. They have not only a common information support – a database, but also a common algorithmic software – a database of models. It is the third-generation information system in its capabilities and capacity to meet the class of tasks facing environmental management systems in Industry 4.0. Today the modernization and development of specialized accounting of the ecological direction has practical value for systems of ecological management of digital business. No less important is digitized state natural cadastres, digital environmental monitoring system, digital environmental mapping, environmental economic balances, geographic information systems, digital

environmental certification. Specialized digital information systems are also being developed: protected areas, depressed areas, potentially dangerous objects, basin information systems, etc. Operating within regions (sometimes at the interregional and interstate levels), these digital systems require proper structural and organizational design. The issue of their interaction with regional digital information systems that need to be created needs to be resolved first. In general, the solution of the problem of formation of regional and international digital information systems requires the application of a systematic approach to a set of methodological, organizational, legal and other issues in the field of environmental management information systems.

6.2.3. Digital medical infrastructure

An important element in the development of digital infrastructure medicine is the introduction of telesystems to provide remote medical services to citizens and support the work of doctors, especially in rural areas. Medicine in the XXI century transformed: periodic diagnostics becomes online diagnostics, Internet of Things allows sensors to constantly monitor human health, operators of medical and related services and infrastructure become participants in digital platforms – all this affects the quality, efficiency and functionality of health care and support citizens.

It is expected that digital medicine should provide interaction between patients, healthcare professionals and institutions through information and communication and digital technologies. The transition of medical records to electronic format is one of main tasks of digital infrastructure of medicine. In our understanding, digital medical platform is a dynamic set of systematized electronic data on the state of health of an individual patient, which provides information exchange between participants in the process of production and consumption of medical services (Marchenko et. al., 2020a).

Digitalization in the field of medicine is realized with the help ePrescription (electronic prescription), that is based on 3 procedures:

- eCapture – formation of an electronic prescription by a doctor of a medical institution;
- eTransfer – confidential transfer of an electronic prescription to a pharmacy;
- eDispensation – data transfer from the pharmacy back to the medical institution, confirmation.

The experience of *eHealth* in medical field is interesting. It is characterized by the following semantic features of the application in the course of work, namely:

- introduction of *Blockchain* technology in the formation of a personal single electronic medical card;
- equipping the eHealth system with rating tools from licensed healthcare facilities, doctors and pharmacies;
- patient register (does not contain medical information);
- register of health care institutions of any form of ownership (including private offices, private individuals, LLCs, etc.), providing health care at the primary level of the health care system;
- register of medical workers who provide primary health care (primarily doctors);
- a register of contracts and agreements between health care facilities and the National Health Service, between the primary care physician and the patient; register of medicines; register of prescriptions for medicines reimbursed by the state.

6.3. Digital infrastructure technologies

6.3.1. Technologies, products and services of digital infrastructure

Digital technologies, products and services that launch “soft” and “hard” digital infrastructure (they are presented in Table 7.1) (Kraus, 2017; Manzhura et. al., 2020[a]), give it signs of virtual reality and which are currently considered innovative trends in the modern

socio-economic environment are presented in Table 6.3 and Table 6.4. For example, *WealthTech* – technology for managing personal finances and well-being of a business entity, an individual; *Biometrics* – the technology involves digitally capturing and storing the unique characteristics of individuals, such as customers (e.g., fingerprints, retina, voice, facial features) primarily to enhance the security (and convenience) of financial transactions.

Table 6.3. Digital infrastructure technologies as innovative trends of the modern socio-economic environment

Technology	***General characteristics***
BioTech	From the Greek "bios" – "life", "techne" – "art, skill") – the use of living organisms and biological processes in production, agriculture and medicine with the use of high technology. Biotechnological processes using microorganisms and enzymes at the current technical level are widely used in the food industry.
RetailTech	From English "retail" and "tech" – "technology". RetailTech is a technology developed by startups for use in trade. These technologies include: 3D body scanning, consumer tracking by AI-enabled assistants to help retailers and consumers. (AI (Adobe Illustrator) – file format developed by Adobe Systems for storing vector images. Adobe Illustrator uses extensions to store AI files *.ai*. AI support almost all programs related to vector graphics. This format is the best intermediary for transferring images from one program to another. In general, inferior to CorelDRAW in illustrative capabilities (can contain only one page in one file, has a small workspace – this parameter is very important for outdoor advertising – only 3x3 meters), however, it has the greatest stability and compatibility with PostScript, which is the focus of almost all publishing and printing applications).
FinTech	Technological projects in the field of financial services, which are considered one of the most promising (and therefore in demand) areas for startups, despite the complexity of government regulation, which have to face when working in this area. There are two main types of products based on FinTech. The first, presented on the market for a long time, provides software and financial services, i.e. uses B2B model. The second, which has been actively developing recently, is focused on the end consumer, i.e. covers B2C market, and seeks to fulfill an extremely ambitious task – to compete with traditional financial service providers in the fight for a mass customer.
LegalTech	Digital technologies in the legal field of business, specializing in information technology services for professional legal activities, and since the late 2000's – in the provision of legal services to consumers using information technology. In the latter case, there may be on-line mediation between the client and the law firm or the provision of tools for legal self-service, which eliminates the need to turn to professional lawyers. In addition, we can talk about legal tech movement, which aims to revise traditional views on legal issues through the introduction of modern information technology in the field of legal services.
InsurTech	InsurTech (the field of the latest insurance technologies) is given a large place in financial and technological arena. Insurtech is the implementation of innovative solutions designed to maximize the efficiency of new technologies in the insurance market. Insurtech – it is the connection and interpenetration of the traditional concept of insurance with the latest technologies by analogy with the concept of Fintech. InsurTech provides an opportunity to change "rules of the game" for insurers, allowing you to innovate, increase the relevance of proposals and grow. InsurTech receives funding along with investments in FinTech sector. InsurTech's great potential lies not in giving existing insurance products a digital form, but in radically changing the product or the process of concluding a contract for its provision in order to improve the quality of customer service.
GovTech	GovTech includes all IT products, solutions, developments, services that help solve public sector problems. What are challenges of GovTech solutions? ✓ participation. Creating platforms for citizen collaboration, e-petitions, crowdsourcing. Expanding the possibilities of electronic identification. These technologies are better known as CivicTech; ✓ infrastructure (digital sensors, control sensors); ✓ provision of services in education, health care; ✓ regulation (decisions for assessment of objects, inspections);

	✓ administration – licensing, cloud technology management, software.

Source: authors' development.

We believe that in this section, it is worth presenting the content of the popular in the 20s of the 21 century *NanoTech.* It is high-tech centers, enterprises engaged in the development, enclosure, testing of microelectronic products, namely semiconductor wafers, silicon crystals, integrated circuits with high quality control standards. Nanotechnology is the technology of colloidal systems, it is colloid chemistry, colloid physics, molecular biology, all microelectronics. It is no less in demand *SupTech* Supervisory Technology is a variant of RegTech technology for financial regulators that allows you to automate and optimize administrative and operational procedures, digitize data and working tools, and improve data analytics.

Specialized regulatory technology that helps financial institutions meet the requirements of regulatory authorities, providing verification and data protection, reporting automation. *RegTech* provides companies with the necessary tools to address regulatory issues and comply with legal requirements, bringing together trade, fiscal and financial regulations. RegTech technologies help to quickly and easily integrate and adapt ready-made solutions for full compliance with all standards of financial regulators and are used to combat money laundering. Financial institutions will be increasingly interested in RegTech, as this will allow them to play on the lead: to form and submit reports, identify and eliminate risks, effectively comply with ever-changing regulatory requirements.

A popular tool used in digital infrastructure in the 21st century is *Digital marketing.* Digital Marketing is a set of promotion tools that involve digital channels. This is the use of different ways to promote the product to the masses using digital channels. It is not identical to Internet marketing, as it includes channels such as television, radio and even outdoor advertising. Internet marketing has evolved into digital marketing, which uses comprehensive methods of on-line strategy, website development and mobile applications, creative and copywriting, contextual advertising and SMM, as well as other interactive products. The most popular forms of digital channels: search promotion; contextual and teaser advertising; media and banner; promotion on social media and blogs; creation of mobile applications for smartphones, tablets and other media; viral advertising.

Table 6.4. Products and services of digital infrastructure as innovative trends of the modern socio-economic environment

Product name/services	***Content of digital infrastructure product/service***
Blockchain	Translated from English "block chain" – built on certain rules of a continuous sequential chain of blocks containing information. But it is better to give a definition based on the purpose of blockchain technology. Blockchain was designed as part of a very specific task, namely – how to build a decentralized (without a single control center) financial system, the correctness of which could be verified by anyone. Based on this, you can define a blockchain as a way to store and reconcile the database, a copy of which each participant has.
CRM&BPM	CRM – sales system: ready-made processes for managing all types of transactions. Bpm'online CRM combines the capabilities of a customer relationship management (CRM) system and a business process management system (BPM). This is the first application solution developed on the bpm'online platform.
Grid-technology	Grid computing is a geographically distributed digital infrastructure that combines many different types that a user can access from anywhere, regardless of their location. Grid provides a collective distributed mode of access to resources and related services within globally distributed organizations (digital enterprises that share global resources, databases, specialized software).
	Digital strategy in the insured – it's not just online sales, but the transformation of the entire business in the direction of working with e-policy. Digital insurance allows insurance companies to reduce costs, increase the speed of customer service. Consumers have the opportunity to receive timely updates on changes in the company's insurance policy.

Digital-insurance	Digitalization provides standardization and improves the quality of responses and services provided. A significant advantage of Digital Insurance is the presence of social networks, which helps to improve the quality of service and establish a close relationship between the insurance company and the client. A significant advantage of Digital Insurance is the reduction of the probability of fraud and increase the security of insurance operations. After all, if you purchase a policy through an insurance intermediary, there is a risk that the latter will not pay the insurance premium and, as a result, the insurance contract will not enter into force. Speed of data processing and settlement of claims is another advantage of Digital-insurance. Adaptation to digital format has a positive effect for both the insurer and the client. After all, all stages of insurance, from filing an application to settling claims, are much faster. The use of cloud platforms reduces the likelihood of errors, and the process itself becomes open and allows you to track the status of claims settlement. In addition, the introduction of cloud platforms provides insurance companies with greater speed, flexibility and scalability, improve responsiveness and optimize processes.

Source: authors' development.

Technologies in digital infrastructure are necessary to increase the efficiency of digital industry and the emergence of digital entrepreneurship, and in some sectors, they become the basis of product and production digital strategies (Manzhura et. al., 2020b). Their transformative power changes traditional business models, production chains and causes the emergence of new products and innovations. Digitalization has a positive social character (*Digital Agenda of Ukraine – 2020*, 2020a; Andrusiak et. al., 2021), as it focuses on improving the quality of social security infrastructure, quality of social services, organization of transparency and targeting of social assistance, and reducing costs.

6.3.2. The latest Blockchain technology

We consider it necessary during the analysis of digital infrastructure to focus on the latest Blockchain technology, which is the basis of digital transformation of entrepreneurship. Blockchain is a digital critical technology that underpins digital products/services such as: *BioTech*, *NanoTech*, *RetailTech*, *FinTech*, *LegalTech*, *Digital-marketing*, *Grid-technology*, *GovTech*, *e-ID*, *TeleHealth*, *ePrescription*, *e-democracy*, *Digital-insurance*.

The latest Blockchain technology, which focuses on trading financial assets, is potentially the most interesting for both the transactional banking and payment domain, and for processes within and between organizations. And, in fact, the needs of the market and led to the emergence of new terms.

For example, the term "Value Web" for technologies using Blockchain was introduced in Fintech by Chris Skinner, but the idea is also known as "Internet values" for other applications. It is worth noting that "Internet values" refer to the next mass evolution of Internet, which is expected to be characterized by a combination of different technologies, and Blockchain will be key. It is expected that the "world of finance" will be different (Kupriianovskii et. al., 2017a; Marchenko et. al., 2020b; Marchenko et. al., 2020a).

It is also necessary to mention the role of Blockchain technology in the payment sphere. Blockchain is able to transform the payments ecosystem by increasing the efficiency of financial transactions around the world. Banks and other financial institutions have the ability to improve operational efficiency in real-time cross-border transfers, but as transactions increase, Blockchain algorithms will be affected by multiple participants, which increases the risks.

In the future, the realization of the potential will require significant investment from the participants to ensure security and transparency of all agreements (Paton, 2016). The stages of development of Blockchain technology are presented in Figure 6.3, and the stages of development in time section of Blockchain technology are presented in Table 6.6.

According to leading scientists, Blockchain's innovative technology will determine the trend of global economy of the 21 centuries. Thus, according to experts, Blockchain will completely or partially change the industries that generate one-fifth of US GDP (about $ 3.6

trillion) (Shtepa et. al., 2021b). And the first in line – the field of financial services (Karcheva & Karcheva, 2017).

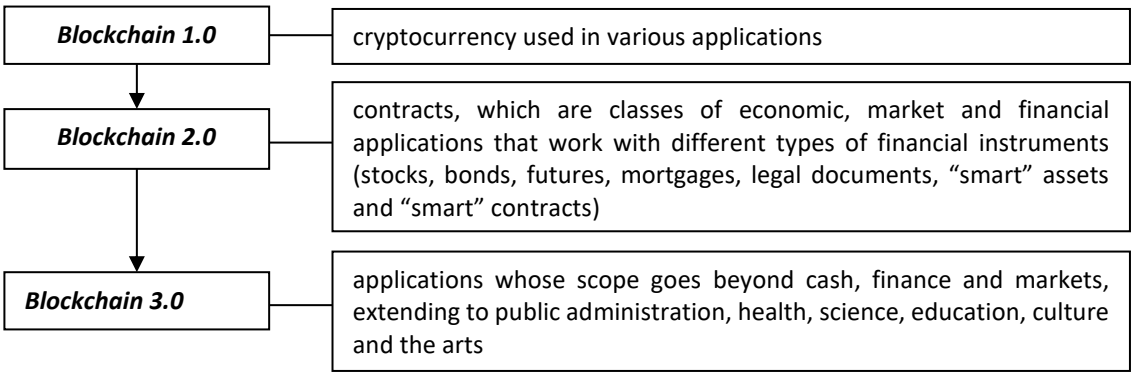

Figure 6.3. Stages of the development of Blockchain technology as a leading technology of digital infrastructure

Source: compiled on the basis of sources (Karcheva et. al., 2017; Kraus & Kraus, 2010; Kraus & Kraus, 2018b).

Table 6.5. Stages of the development of Blockchain-technologies in terms of time

Stage number	*Time period*	*Contents of the stage of development of Blockchain technologies*
Stage 1	2014–2016	Analysis of Blockchain implementation opportunities for the financial services industry
Stage 2	2017–2018	Verification of concepts that can affect business and Blockchain solutions to ensure the activities of financial institutions. Today, experts identify seven promising areas of implementation of Blockchain-technologies, namely: documentary operations, syndicated borrowings, clearing and mutual settlements, digital identification, lending, contracts
Stage 3	2019–2020	The emergence of a common infrastructure, API and interfaces to expand the scope of Blockchain
Stage 4	2021–2025	Active development of Blockchain networks, completion of formation and approval of interoperability standards and communication channels

Source: compiled on the basis of sources (How banks will develop blockchain solutions in 2017, 2017; Kraus et. al., 2021).

In essence, Blockchain technology provides a close link between the financial, logistics and commercial components of trade and economic transactions with the ability to unify payments and delivery. Mail can be the sole intermediary between merchants and customers, reducing their need for coordination and offering more efficient e-commerce solutions. Post offices will promote the growth of e-commerce (in particular, cross-border e-commerce) and increase their market share and increase revenues (Kupriianovskii et. al., 2017a).

Blockchain it is a multifunctional and multilevel information and communication technology, which is designed to make the accounting of various assets reliable and instantly accessible. Technology of reliable distribution of storage of records about all whenever any transaction is carried out. Blockchain is a chain of data blocks, the volume of which is constantly increasing as new blocks are added with records of recent transactions. This is a chronological database, i.e. a database in which the time when the record was made is inextricably linked with the data themselves, which makes it non-commutative (Pogosian, 2017). Blockchain is a distributed database that contains information about all transactions (more generally –

communications) conducted by system participants, while the information is stored in the form of a "chain of blocks", each of which records a certain number of communications. A summary of the principles of construction and operation of Blockchain is given in Table 6.6.

Table 6.6. Principles of construction and operation of Blockchain as a leading technology of digital infrastructure

Principle	*The content of the principle of construction and operation of Blockchain*
Network integrity	The purpose of trust within the system is pursued and in fact it is said about the consensus of the participants, their equality
Load distribution	Energy costs are distributed throughout the peering network
Value as an incentive	The system equalizes the incentives of all stakeholders, i.e. participants are interested in developing the technology and maintaining its stability
Confidentiality and protection of rights	One of the principles of Blockchain is trust. The presence of this principle eliminates the need to identify others to interact with them
Security	In addition to the fact that each member of the network must use encryption, security measures are built into the network and provide confidentiality and authenticity of the fingerprint. Also, each user has two keys: one for encryption, the other for decryption

Source: compiled by authors based on sources (Stanislavyk et. al., 2020; Svon, 2017).

One of the main benefits of Blockchain technology comes from the ability to speed up processes and reduce the complexity and risk of transactions. New benefits will emerge as this technology can be integrated with outdated IT, legal laws and existing assets such as currencies, stocks, bonds. For this reason, existing financial services can be strengthened by Blockchain systems, which allows financial institutions to enter at potentially lower costs, better products and accelerate time to market (Kupriianovskii et. al., 2017a). The use of Blockchain as a technological innovation will help build effective and transparent systems for tracking and recording financial transactions, as well as increase the efficiency of the financial sector, as these technologies allow you to work without third parties and high risks (Karcheva & Karcheva, 2017). Possible applications of distributed registry technology in Blockchain applications in terms of classes and areas of application are presented in Table 6.7.

Table 6.7. Application of digital infrastructure of distributed registry technology in Blockchain applications

	Application class	*Scope of applications*
Blockchain 1.0	Information about a specific transaction and its values, purpose in the system	Cryptocurrencies in various applications related to financial transactions, such as transfer systems and digital payments
Blockchain 2.0	Financial transactions	Securities, shares of companies, crowdfunding, bonds, mutual funds, derivative financial instruments, annuities, pensions
	Warranty obligations	Execution of warranty obligations, tripartite arbitration, multilateral signature, agreements using Escrow accounts
	Documents that need to be certified	Insurance certificates, property certificates, notarization of documents
	Registration of intangible assets	Patents, trademarks, copyrights, reservations, etc.
	Private documents	Debt receipts, contracts, agreements, signatures, wills, power of attorney
Blockchain 3.0	Information and documentation in the field of housing	Data and information on various transactions in the field of housing and communal services: indicators of consumption of electricity, water, telecommunications services, the operation of "smart home" systems, etc.
	Information and documentation in the field of	Data on the medical history of patients of medical institutions, information on the results of examinations, registration of access

	medicine	rights of medical staff to certain data and specific patients
	Information and documentation in the field of education, science and culture	Data and information about students and teachers, scientists, cultural and artistic workers, various transactions in the field of education, science, culture (including the performance of institutions, individuals)
	Certificates certified by state authorities	Identity cards, passports, voter registration certificate, driver's license, birth, marriage and death certificate
	Certificates and licenses certified by state institutions	Certificates of ownership of land and real estate, certificates of registration of vehicles, licenses for the right to engage in certain activities

Source: compiled by authors based on sources (Pogosian, 2017; Karcheva et. al., 2017; Stanislavyk et. al., 2020).

6.4. Socio-economic benefits and threats from digital infrastructure

In 2010, the era of fiber access began in Europe. The most promising solutions are FTTH (Fiber–to–the–Home – fiber directly to the subscriber's home). The number of FTTH access network subscribers is growing in all regions of the world. High-speed broadband access in European countries is financed through EU instruments (for example: European Regional Development Fund, English Rural Development Program, European Agricultural Fund for Rural Development, EU Competitiveness and Innovation Program, etc.).

Existing conditions in Europe make it possible to provide universal access and close digital divide between urban and rural areas in the shortest possible time. The EU's policy of creating various types of development funds has played a significant role in this. The principles of universal access are based on the understanding that all citizens have the right to access means of communication.

In global practice, this provision is formulated as follows: "The state recognizes that access to a variety of unlimited sources of information and means of communication is a fundamental right of all citizens". The information infrastructure of the state cannot be considered complete until it is available in all regions of the country and for all its inhabitants and until proper and inexpensive access to the full range of traditional and latest intelligent technologies and services is provided, taking into account different user needs and taking into account their gender, age, ethnic and linguistic differences and special needs (*Digital Agenda of Ukraine – 2020*, 2020[b]).

The International Telecommunication Union (ITU) stipulates that universal service is a long-term goal, which is to ensure the availability of means of communication for each member of society individually or at the family level. The concept of universal access is also formulated – a short-term goal, which is to provide convenient and cheap access to communications at the community or local level by combining public communications (payphones, collective Internet access points, etc.) and individual private services. The basic principles of universal service provision are set out in Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 (*Digital Agenda of Ukraine – 2020*, 2020b).

The state is important in creating both "hard" and "soft" infrastructure. Broadband access using fixed and mobile technologies (4G, 5G) should become a priority for the development of solid infrastructure. Speed, number of connections, and data rates are critical for Industry 4.0 and digital services based on AI and predictive analytics. Socio-economic benefits, utilities, hazards and threats to the functioning of digital infrastructure are presented in Table 6.8.

Table 6.8. Socio-economic benefits, dangers and threats from the functioning of digital infrastructure

Socio-economic benefits from the operation of digital infrastructure	*Dangers and threats arising from the digitization of infrastructure*
1. Introduction of electronic document management. 2. A more open and accessible market. 3. Increasing the level of production. 4. Simplification of financial transactions, increasing the role of electronic and digital money. 5. Development of remote work capabilities. 6. Reducing the cost of goods and services. 7. Reducing the level of bureaucracy. 8. Enables the integrated interaction of virtual and physical, i.e. creates hyperphysical space.	1. Cybercrime (quite often even some states are involved in the work of anonymous hacker groups and data theft). 2. For the average user, the issue of preserving their personal data and securing their digital life is more relevant. 3. Digital inequality and discrimination. 4. No guarantee of digital rights.

Source: compiled by authors.

We consider it necessary to note that digital inequality determines the situation that arises when there are social groups in society with different opportunities for access to modern digital communication technologies (primarily Internet), which provides digital infrastructure. This definition, related to the presence or absence of access to technology, can be applied to different societies within one country (internal digital inequality) and to several countries or regions (international digital inequality). The term is used both for differences between countries (for example, in Iceland, more than 86% of the population has access to Internet, and in Liberia – 0.03%), and for differences in the opportunities of different social groups within one society.

Age gaps are associated with young people's desire for openness and innovation, while middle-aged and older people tend to be stable. Gender problems arise in societies in which a woman is seen as an underprivileged person in society due to religious or other beliefs. People with physical disabilities are often deprived of the ability to communicate online, as not all computers are adapted to the needs of visually or hearing impaired, and only a small percentage of sites are equipped with audio programs for text or graphics. As a result, a situation is created when the latest technologies not only do not contribute to the full realization of any individual, but act as a catalyst for "gaps" between different groups. One of the significant inequalities that hinder the implementation of quality network communication is the language disparity, formed on the basis of the dominance of English as main language of Internet and software and hardware support of computer and telecommunications facilities. And although in recent years there has been an active promotion of national languages in digital world, English remains the most common in online information and communication resources.

Digital constraints prevent citizens, including socio-economic disadvantaged groups, from enjoying all the benefits that digital technology can provide. Promoting digital infrastructure in the outermost regions is a key factor in maintaining inclusiveness, but public authorities must also systematically make a number of policy decisions aimed at fostering social and economic cohesion through innovation that enables disadvantaged regions to catch up with more developed urban areas (Vyshnevskyi, 2018).

6.5. Smart infrastructure of the city

High-quality and efficient "soft" and "hard" digital infrastructure contributes to the accelerated development of smart cities. In 2014 The International Telecommunication Union has proposed the definition of a "sustainable smart city", which is proposed to be interpreted as an innovative city that uses ICT and other means to improve the quality of life, increase the

efficiency of urban operations and services and competitiveness while clearly meeting the needs of present and future generations in economic, social and environmental terms (Shyn, 2016). Smart Cities Council defines a smart city as one that collects data from devices and sensors built into its driveways, power grids, and buildings and other objects (Osetskyi et. al., 2020b). With the help of an intelligent communication system, this data is transmitted by wired and wireless communication, which with the use of "smart" software generate valuable information and digital advanced services. Digital technology is a means to an end for the city's goals. A "smart" city in its system of government focuses on the interests of citizens.

With the efficient use of smart infrastructure, city dwellers will receive a comfortable and safe living environment. This primarily concerns the digitalization of the housing, utilities, energy, construction and public transport sectors, the large-scale use of integrated digital platforms in urban governance, education, medical sector, and environmental monitoring. However, smart infrastructure is not a "panacea" for all the problems of the city, and in some cases can generate a number of challenges: breach of privacy, the risk of technical failure, reduced cultural development and more. The levels of smart-infrastructure depending on the degree of human participation in the decision-making process are presented in Table 6.9. In general, the consequences of smart-infrastructure development will depend on making multidisciplinary and at the same time effective decisions (Marchenko et. al., 2020[b]).

Table 6.9. Levels of smart-infrastructure depending on the degree of human participation in the decision-making process as defined by the Royal Academy of Engineering

Levels of smart-infrastructure depending on the degree of human participation in the decision-making process	***General characteristics***
Smart infrastructure	generates and processes data, resulting in the necessary actions that are completely autonomous, dynamic and adaptable to changing conditions
Intelligent or semi-smart infrastructure	collects and processes real-time data, which is then used by the infrastructure itself or by the operator to make optimal decisions. Examples include a traffic system that detects traffic jams and informs drivers
Semi-intelligent infrastructure	collects and records data on own use, structural indicators, environmental conditions, etc. without any possibility to make decisions on the basis of the received data

Source: (Fang et. al., 2012)

Lack of trust in digital technologies and uncertainty are main challenges that users face. They may be hesitant to use digital technologies because they are unsure of their potential to meet their own needs, and information and evidence that can reduce this uncertainty are often difficult to understand. The development of digital infrastructure is subject to uncertainty, much greater than for conventional innovative products/services. From the beginning, no one knows the critical parameters of digital technologies or how they relate to the desired performance of future products, and potential users can not always determine their needs in terms of using new technology (Marchenko et. al., 2020b).

6.6. Conclusions

The values pursued by digital infrastructure are: self-control and accuracy of decision-making; reliability; efficiency and cost savings; security, protection and resilience; interaction and empowerment of users; optimization of decision-making to ensure sustainable use of resources; minimization of excess components in the system, which reduces energy consumption and saves resources; response time (early detection of critical events, preventive maintenance and rapid overcoming); minimization of GHG emissions and energy consumption;

improving the quality and expanding the range of services provided by the infrastructure to improve living conditions.

Today, within the post-classical discourse, the practice of postmodernism as an epistemological concept of real space research is transformed into a metamodern paradigm based on cognition and creation, in the economic context, of virtual economy and its basic component – finance, the space of financial relations, which is increasingly separated from the economy of the real sector of production in a specific area of research (Liashenko, 2018; *Our Vision*, 2012). With a well-functioning digital infrastructure, efficient and productive use of digital technologies and services by businesses, the state, and citizens is possible, which is enhanced by the relevant digital culture and ecosystem. In digital infrastructure, data is generated and provides electronic communication through the operation of electronic devices, tools and systems.

Digital infrastructure is the result of transformation processes of the latest general-purpose technologies in the field of information and communication, the formation of which testifies to new level of use of information and communication technologies in all areas of socio-economic activity. Robotics, artificial intelligence, cloud technology, 3D printers and *Blockchain* – are already firmly entrenched in our daily lives. Smart cities, courier drones, driverless cars, "printed" in one day at home – are waiting for us tomorrow. Ideas of fantasy novels become reality. Technological progress has arbitrarily invaded business and forced all industries to change. Digital businesses will accelerate the work to distribute their capacity between digital and off-line customer service channels. The belief that digital innovation will break down the boundaries between divisions in companies and create some integrated business. Brands will eventually build holistic service models that will go beyond contract points.

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7. DIGITAL STRATEGIES

Learning objectives

After reading this chapter, you will able to:

- Understand the impact of digital disruption and the reasons why both firms and entrepreneurs need a Digital Strategy
- Clarify how Digital Strategies align and/or integrate with and support firms' business goals and objectives
- Develop a framework for Digital Strategy formulation and implementation
- Identify opportunities and threats arising from the digital media and technologies
- Detect firms' strengths and weaknesses in answering to the digital change
- Setting visions and goals for Digital Strategy
- Select the most effective Digital Strategy among the available options
- Successfully implement transformation programmes
- Adopt a future looking perspective considering the rapid pace of digital change

7.1. Understanding the impact of digital disruption

'We live in disruptive times'
(Sean Culey)

In 1942, Joseph Schumpeter, he coined the seemly paradoxical concept of 'creative destruction' as a process that 'incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one' (p.83). In so doing, Schumpeter described the potential impact of innovation. Behind the creative destruction, there is the disruptive innovation that is its inner development. It means, therefore, that disruptive innovation is the input of the process and the creative destruction is its outcome (Schneider, 2017). Particularly, 'disruption' occurs when new products/services successfully target overlooked market segments or segments ignored by existing incumbents in the industry. It happens mainly because incumbents usually focus on improving their products and services for their most demanding (and usually most profitable) customers, thus exceeding the needs of some segments and ignoring the needs of others (Christensen et al; 2018). Then, new entrants may deliver more-suitable functionality - frequently at a lower price; move upmarket, delivering the performance that incumbents' mainstream customers require, eventually displacing existing competitors. When mainstream customers start adopting the entrants' offerings in volume, disruption has occurred and entrants create new markets, destroy or modify the existing ones, and reshape business models (Schneider, 2017). In such a way, creative destruction and disruptive innovation complement each other.

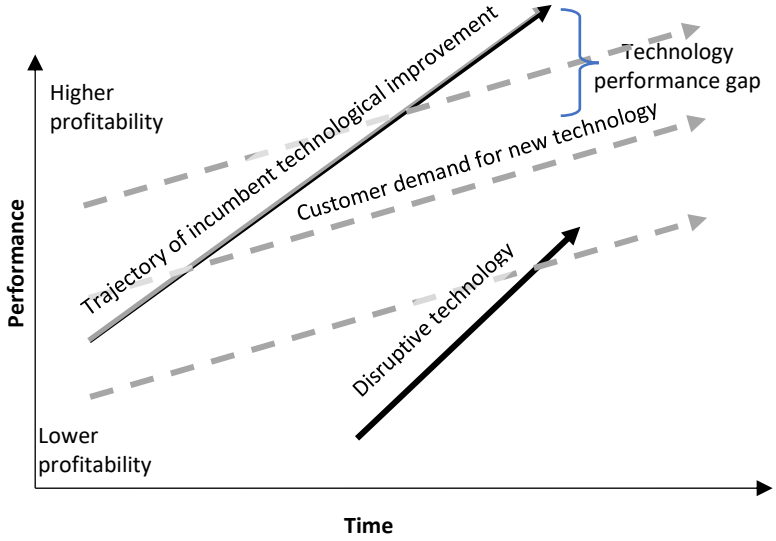

Figure 7.1. Model of Disruptive Innovation

Source: Christensen et al; 2018

Some examples of disruptive innovations are: the personal computers that destroyed mainframe computers; the laptop computers that destroyed personal computers; and the mobiles that destroyed the fixed line telephony and create new markets.

The Fourth Industrial Revolution characterizes for the rapid growth of disruptive technologies which have changed people work, shop, sell and live, as well as the way firms do their business and remain competitive.

But exactly, how do disruptive technologies (and digitalization) modify the way firms compete?

A useful way to understand the impact of new technologies on industry competition and profitability, is by examining the Porter's model of the five forces that shape industry competition (Fig. 7.2) and exploring how digitalization impact on industry structure (Porter and Heppelmann, 2014).

In any industry, 'whether it is domestic or international or produces a product or a service, the rules of competition are embodied in five competitive forces: the entry of new competitors, the threat of substitutes, the bargaining power of buyers, the bargaining power of suppliers, and the rivalry among the existing competitors' (Porter, 1985, p.4).

The composition and strength of these forces collectively determine the nature of industry competition and the average profitability for incumbent competitors. Industry structure changes when new technology and digitalization, globalization of the markets, changing in customer needs, or other factors modify these five forces.

Porter (2001) suggests that new technologies and the use of the Internet intensify the **rivalry among competitors**, making industrial structure more competitive. Particularly, the use of IT widens geographical markets, increase the number of competitors and reduce the differences among them. It means that companies are impelled to differentiate the products and the services they offer (and the do by the means of IT) in order to survive and gain a competitive advantage. Thus, digitalized and smart products provide the firms with new source of differentiation and price realization, enabling them to tailoring offerings.

The **bargaining power of buyers** also increases, since IT shifts the power to the end consumers and reduces the costs of switching to a new manufacturer. (Porter and Heppelmann, 2014; Porter, 2001). Thanks to Internet, the buyers are able to compare prices and quality and to collect information about products very quickly and easily. Based on these information, the buyers can select the most suitable product/ service for themselves. On the other side, IT also allows companies to better knowing buying behavior and customers' needs, enhancing their ability to customize products, set prices, extend value-added services, and develop much closer customer relationships.

IT also affect the **bargaining power of suppliers**, the last one advantaging of the elimination of the intermediaries standing between them and the buyers (Laudon and Laudon, et al., 2012). Moreover, thanks to Internet, suppliers have access to more distribution channels, as well as to a higher number of customers. Finally, IT affects the relationship between suppliers and the end users, allowing firms to collect information by the consumers As suppliers capture product usage data from end users, they can also provide new services to them, as GE has done with Alitalia (Porter and Heppelmann, 2014).

An opened debate refers to the **threat of new entrants**. According to some scholars (Laudon and Laudon, 2012, Internet reduces the barriers to entry, thus increasing the **threat of new entrants** in the business: new companies can enter a market much easier thanks to digitalization (that reduces transportation costs for a variety of products and services) and the reduction on communication costs.

By the contrast, as Porter and Heppelmann (2014) noted 'New entrants in a smart, connected world face significant new obstacles, starting with the high fixed costs of more complex product design, embedded technology, and multiple layers of new IT infrastructure' (p. 11). According to the authors, smart, connected products also raise the barriers to entry, because of the higher buyer loyalty and switching costs.

Threat of substitutes increases to a great extent because of the emergence of smart and connected products, as well as product-as-a-service business models[3].

Table 7.1 shows the main impacts of IT and Internet on the 5 forces' business model.

Table 7.1. The impact of IT Internet on Porter's five competitive forces

Competitive Forces	Impact of Internet and IT
Rivalry among competitors	Increases, since IT increases the number of competitors and reduces the differences among them.
Bargaining power of buyers	Increases, since IT shifts the power to the end consumers and reduces the costs of switching to a new manufacturer
Bargaining power of suppliers	Increases, since suppliers have access to more distribution channels, as well as to a higher number of customers than before, thanks to IT and Internet diffusion
Threat of new entrants	Increases, since IT reduces reduces the barriers to entry (lower transportation and communications costs) Decreases, since IT support the emergence of new smart and connected products, that raise the entry barriers
Threat of substitutes	Increases because of the availability of new smart and connected products, as well as of new product-as-a-service business models

Source: authors' elaboration.

Of course, the strength of changes varies considerably from industry to industry.

As example, Internet profoundly impacted on travel industry, retail, music, book, retail brokerage, software, telecommunications, and newspaper industries, changing the whole business and its rules of competition. Moreover, Internet provided the chance for the emergence of new products, services, and business models (Ex.: Amazon, eBay, iTunes,

[3] New technologies enables new substitutes to emerge with new approaches to meeting needs and performing functions. A variation of product-as-a-service is the shared-usage model. An example is the shared bike systems. Thanks to a mobile app, users locate the docking stations where bikes can be picked up and returned, and pay for the time they use the bikes. Sharing services allow people do not buy their own bike and do not use cars for urban mobility (Porter and Heppelmann, 2014).

youTube, Facebook, and Google, etc.), transforming industries and forcing firms to change the way they compete.

As Bharadway et al. (2013) already noted, businesses should '*adapt their business infrastructure to the new digital era*' (Bharadwaj et al. 2013, p. 472), which means they should adapt their whole value chain to the emerging requirements of the new technologies (Porter and Heppelmann 2015; Klotzer and Pflaum 2017). As a result, entire business models can be reshaped or replaced (Downes and Nunes 2013); all companies must clearly define their strategic orientation and develop a digital strategy aiming to 'integrate the entire coordination, prioritization, and implementation of digital transformations within a firm' (Matt et al., 2015, p. 339).

In such circumstances, Digital Strategies (DSs), which coordinates the digital transformation of a company, should be considered a crucial and an integrated component of firms' strategic management (Lipsmeier et al, 2020).

7.1. IT vs Digital Strategy

Digital transformation often resembles a patchwork of ambitious, but uncoordinated initiatives. But companies need a *Digital Strategy* (DS) and a digital agenda in order to establish guide rails so that they don't get lost in the jungle of possibilities. Despite this, DS is a young and still unexplored topic embedding its *core* in the field of business research. Figure 8.3 shows the evolution path of digital business strategy starting from the 80s' when discussions about strategic planning and IT strategy rose among the scholars (Lipsmeier et al., 2020).

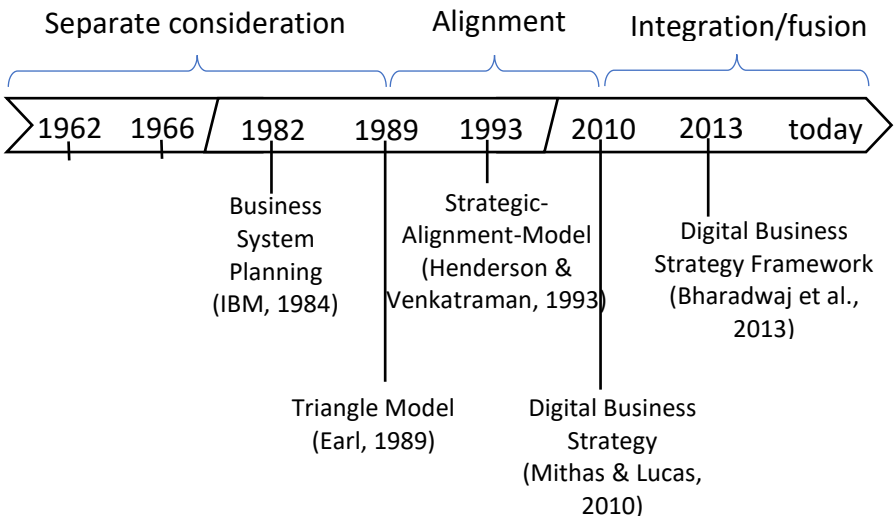

Figure 7.3. Evolution path of Digital Strategy

Source: (*Lipsmeier et al., 2020).*

In 1982, approaches like *Business Systems Planning* firstly introduced as cornerstone of the IT-Strategies, the last ones concerning with the technological infrastructure necessary to fulfill the requirements of the information strategy (Earl, 1898; Allen, 1985). Particularly, IT strategies mainly deal with the management of the IT infrastructure within a firm, positioning itself at a functional level (Bharadwaj, 2013; Henderson and Venkatraman, 1993). During this first time, IT-Strategies received a separate consideration from the business strategies and even with the introduction of the *Strategic Alignment Model (SAM)* (Henderson and Venkatraman, 1993), IT remains essentially subordinated to the business strategy (Henderson and Venkatraman, 1991 & 1993; Luftman et al. 1993). During the 90s, the 'Triangle Model' (Earl, 1989) and the SAM

were developed advocate the need of 'Strategic Fit' and 'Functional Integration' among business strategy, IT strategy, business infrastructure, and IT infrastructure (Henderson and Venkatraman, 1993). This kind of strategic alignment refers to the extent to which firms' operational decisions are consistent with the strategy, and the firm must successfully implement its strategy to achieve its fundamental goals (Henderson and Venkatraman 1993, 1991; Luftman et al. 1993). However, during the last 10 years, the disruptiveness of new technologies has profoundly affected traditional business strategy, as well as the structure of relationship in the business space (Becker and Schmid, 2020; Bharadwaj, 2013), thus the pure alignment of the strategies was no longer sufficient. Because of that, scholars (Mithas et al., 2016; Woodard et al., 2013) introduced the notion of *Digital Business Strategy* (or Digital Strategy – DS) to merge IT strategy and business strategy in a wider and overarching concept. As consequence, the IT strategy may be no longer considered a strategy on a functional level, but an integrated part of the business strategy (Mithas et al., 2010).

According to Lipsmeier et al. (2020), a DS 'describes the overall vision of a company in the context of digitalization, including the strategic measures to achieve it. It defines concrete, short-, medium- and long-term digitalization goals and initiatives in the context of products, services and value creation as well as for the organization and culture of a company' (p.175). Similarly, Rauser (2016) states that a DS refers to a company's strategy applied to all its digital initiatives. This includes the entire process: from gathering all required information to planning, recognizing risks and opportunities, and maintaining the digital strategy

Fundamentally, a DS should provide consistent direction for an organization's online activities and channel integration. The aim is to integrate the digital with other firms' activities to ultimately get the success of the undertaken business initiatives. Therefore, DSs often describe what firms desire in terms of future business purposes, that partially or totally base on digital technologies.

7.2. Level and positioning of Digital Strategies

Like mentioned before, different perspectives followed time by time about the relationship between IT strategies and DSs. Similarly, scholars developed diverse approaches to interpret the positioning of DSs within the three firms' strategic levels (functional, business, and corporate) (Lipmeiser et al., 2020).

According to Grant (2005), two basic levels of strategy exist within a firm: *corporate strategy* and *business strategy*. *Corporate strategy* defines '*the scope of the firm in terms of the industries and the markets in which it competes*' (Grant, 2005, p.23-24). *Business strategy* contains specifications of the corporate strategies and it mainly refers to the way firm competes in a given market that means how the firm establishes its competitive advantage. Thus *corporate strategies* refer to which business or businesses the firm wish to be in, as well as to the company mission statement and its core competences (Hofer and Schendel, 1978; Grant, 2005); *business strategy* including the definition of the firm's business model and other specifications (firm strategic position, products, services and markets, etc.) of the corporate strategies. In addition to the *corporate* and *business* strategies, *functional strategies* are also determined at individual functions, such as production, R&D, marketing, human resources, and finance. The distinction among *corporate*, *business*, and *functional strategies* mirrors the usual organizational structure of a multibusiness corporation, with the top management team formulating the *corporate strategies*, individual business (divisions and/or business units) implementing the *business strategies* and functions managing sub-strategies.

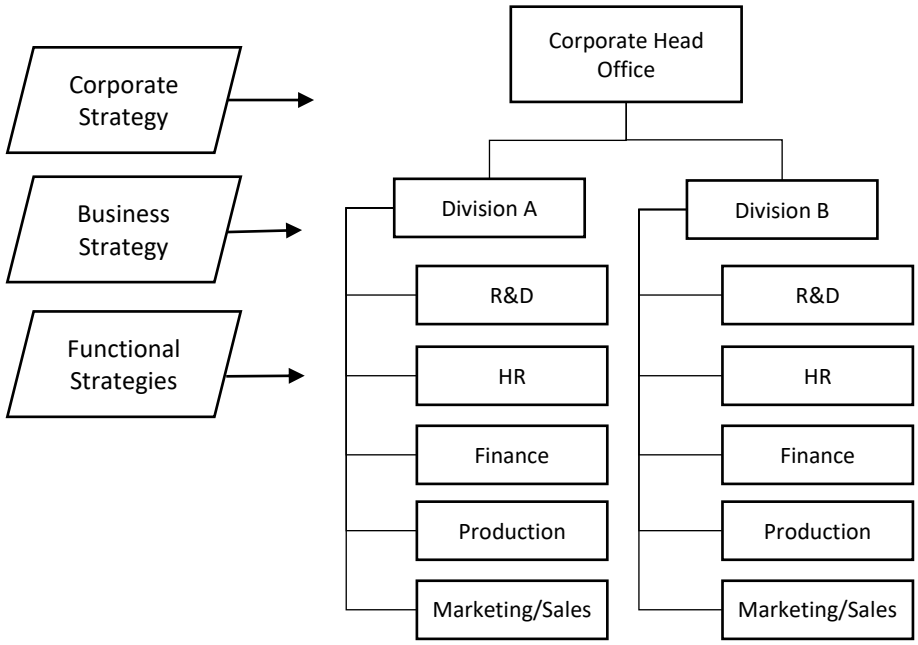

Figure *7.4*. Levels of strategies

Source: Grant (2005)

When referring to DS, different perspectives and approaches arise about the relationship between *corporate* and *business strategies*. As Schallmo et al. (2019) noted, sometimes DSs are detached from *the corporate strategy; other* times, they are considered part or equal to corporate strategies. However, positioning a DS a recognizing who is responsible for digital transformation is a very challenging issue. Moreover, defining whether a DS should be integrated into the already existing strategies is a complex matter.

Lipsmeier et al. (2020) compared 12 publications focusing on DSs to understand how DSs position in the established strategies levels (Table 7.2).

Table 7.2. Digital Strategies positioning level

	Strategy-Level & Positioning				
	Corporate Level	**Business Level**	**Functional Level**	**Integrative Positioning**	**Separate Positioning**
Author					
Appelfeller and Feldmann (2018)	x	x	x		
Gobble (2018)	x				
Yeow et al., (2018)		x		x	
Goerzig & Bauernhansl (2017)	x				
Kofler 2017	x			x	
Cordon et al. (2016)	x			x	
Morabito (2016)		x		x	
Petry 2016	x	x		x	x
Bharadwaj et al. (2013)		x		x	x
Mithas et al. (2013)		x		x	
Lerner (2015)		x		x	

Source: Lipsmeier et al., (2020).

Particularly, they found that no consensus exists among the scholars. Moreover, no consensus prevails to whether a DS should be integrated in existing strategies.

Despite this, some considerations may be pointed out:

- DS are usually positioned in a separate document at the first stage of digital transformation, with separation reducing with the digital maturity of the firm;
- Multi- business companies can have multiple digital strategies. In such circumstance, alignment between DSs and corporate strategic aims is strongly suggested. Exceptions are diversified conglomerate companies whose portfolios cannot be worthy synchronized.

7.2. Digital strategy formulation

> 'In contrast, a lack of digital strategies inevitably leads to isolated, small-scale implementation projects at the operational level … Such an uncoordinated approach induces that important synergy effects remain unused and the organization as a whole wastes capacities'
> (Lipmsmeier et al., 2020)

As previously noted, the novelty and complexity of the digitalization for organization and management cause difficulties for many companies, formulating a DS represents a major challenge for companies (Holotiuk and Beimborn, 2017).

Thus…

How can firms reach their goals? How do firms reach their future states?

Unfortunately, academia still lacks in providing guidelines for DSs formulation, development, and evaluation (Korachi et al., 2020), thus most existing studies detailing a limited number of relevant themes and dimensions of digital transformation (Nikmehr et al., 2021)

Bharadwaj et a. (2013) identify four key themes guiding discussion about DS, namely the *scope* of DS, the *scale* of DS; the *speed* of decision making, and the *source of value creation*.

The *scope* of a digital business strategy refers to the portfolio of products, services and activities carried out by the company. The adjustment of corporate scope enables firms to take advantage of Internet connectivity, exploiting the existing relationship among hardware, software, IT infrastructures, and industries. Thus many firms formulate their strategies and develop their IT capabilities around new products and services (Rai et al., 2012; Sambamurthy et al., 2003). A good example is Amazon's choice to expand the typical activities of online retailers by incorporating cloud computing services as a critical digital resource.

Scale is a driver of profitability, thanks to the reduction of production costs enabled by the growth of produced quantity. Because of digitalization, scale should be referred to both physical and digital infrastructures. Moreover, the abundance of information, the network effects and multisided business models, and the increased chance of partnership and collaboration distinguish the scale of DS. The increased availability and reliance on cloud computing services provide the firms with the capability to scale up/down their infrastructure. Under such circumstances, scaling ability became a strategic issue for firms in their efforts to adapt to the requirements of digital markets. As more products and services become digital, network effects increase significantly on both the demand and the supply side, affecting how firms differentiate from competitors and create value. Finally, *scale* with DS requires the firm's ability to capture and manage the enormous amount of available data, information, and knowledge and its capacity to relate with other firms across different traditional boundaries (Bharadwaj et al., 2013).

The adoption of DSs can *speed* the product launch, accelerates firms' capacity to respond to customers, hastens the supply chain orchestration, and speeds up the network formation and adaptation. Since 'time,' or more specifically, reducing time, has been recognized as an essential driver of firms' competitive advantage (Stalk and Hout, 1990), the firms should

consider the listed dimensions when formulating their DS, since, DS 'brings in additional dimensions that alter the nature of *value creation and capture'* (Bharadwaj et al., 2013, p. 477).

According to Bharadwaj et al., (2013), formulating and executing a DS means reasoning about its effectiveness in leveraging value from information and multisided business models and capturing and appropriating value through the coordination of networks and the control of the firm's digital architecture. Therefore, posing relevant questions on each of the four themes may help firms to plan and implement more effective DSs (see table 7.2).

Table 7.3. Scope, scale, speed and source of value creation and capture in Digital Strategy

Key themes of ds	Key questions in formulating ds
Scope	• What is the extent of fusion and integration between IT strategy and business strategy? • How encompassing is digital business strategy, and how effectively does digital business strategy transcend traditional functional and process silos? • How well does digital business strategy exploit the digitization of products and services, and the information around them? • How well does digital business strategy exploit the extended business ecosystem?
Scale	• How rapidly and cost effectively can the IT infrastructure scale up and down to enable a firm's digital business strategy to bolster a strategic dynamic capability? • How well does digital business strategy leverage network effects and multisided platforms? • How well does digital business strategy take advantage of data, information, and knowledge abundance? • How effective is digital business strategy in scaling volume through alliances and partnerships
Speed	• How effective is digital business strategy in accelerating new product launches? • How effective is digital business strategy in speeding up learning for improving strategic and operational decision making? • How effectively does digital business strategy bolster the speed of dynamic supply chain orchestration? • How quickly does digital business strategy enable the formation of new business networks that provide complementary capabilities? • How effectively does the digital business strategy speed up the sense and respond cycle?
Source of Value Creation and Capture	• How effective is digital business strategy in leveraging value from information? • How effective is digital business strategy in leveraging value from multisided business models? • How effective is digital business strategy in capturing value through coordinated business models in networks? • How effective is digital business strategy in appropriating value through the control of the firm's digital architecture?

Source: Baharadwaj et al. (2013)

Since the existing literature about DS seems to lack in providing guideline for DS design (Nikmehr et al., 2021), Matt et al., (2015) introduced the so-called *Digital Transformation Framework* (DTF), a blueprint that supports the assessment of firms' current abilities in formulating a DS, as well as in governing digital transformations (Fig. 7.5)

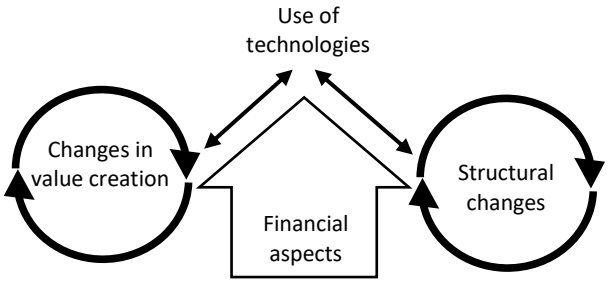

Figure 7.5. The Digital Transformation Framework

Source: (Matt et al., 2015).

Regardless of the industry or firm, digital transformation strategies always base on four common dimensions, namely:

- The use of technologies;
- changes in value creation
- structural changes; and
- financial aspects.

The *use of technologies* mainly refers to the firm's attitude towards new technologies. Developing a DS requires firms recognize the strategic role of IT and are able to explore and exploit it. Moreover, firms should decide whether creating their own technologies (market leader) or to make use of already existing technologies to manage business operations. While being a technological market leader can lead to competitive advantages, it might be more risky and requires certain technological competences. Technological changes usually implies *changes in value creation*, that means firms have the chance to expand the products and services they offer to the market (Becker and Schmid, 2020), often requiring for additional and new technological competences. With different technologies in use and different forms of value creation, firms also need *structural changes* in order to successfully managing the challenges of digital transformation. Particularly, firms' organizational structures should be aligned to the new needs, placing the digital activities and integrating them within the corporate structures. However, the use of technologies, changes in value creation and structural changes depend on the availability of financial resources, since *financial aspects* 'are both a driver and a bounding force for the transformation' (Matt et al., 2015, 341). Both internal and external source of finance should be considered when dealing with digital transformation.

All of these four dimensions are taken into account as part of the DTF framework. After having defined these cornerstones of the transformation, firms define its strategy to deal with the new competitive forces and using IT to get success. Formulating a DS is always a process along which detailing the firm's strategic direction represents a crucial step.

7.2.1. The strategy formulating process

A DS is the strategic form of digitization intentions of companies. The short and mid-term objectives are to create new or to maintain competitive advantages. Within the DS, digital technologies and methods are applied to products, services, processes, and business models. In order to develop a digital strategy, the company and its environment have to be analyzed as a basis for several future scenarios. Thus, formulating a DS always implies the progression of different phases.

After having conduced a detailed literature review on digital transformation, Schallmo et al., (2019) developed a roadmap for the final development of a DS, basing on 6 different interactive stages (see Fig. 7.6).

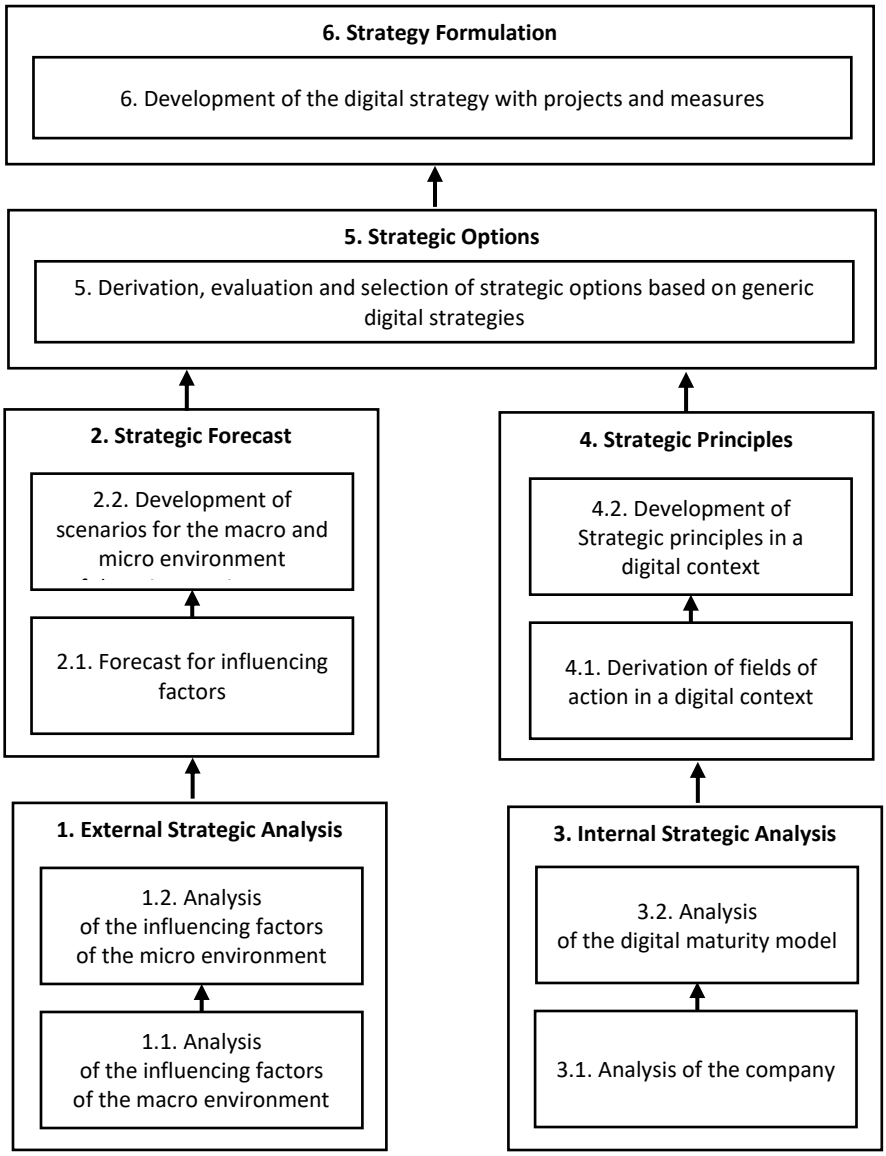

Figure 7.6. Integrated Roadmap for Digital Strategies

Source: Schallmo et al., 2019

The *External Analysis* allows firm to explore the macro-environmental forces, in order to identify both opportunities and threats arising from changes in Political, Economic, Social, Technological, Legal, and Environmental (PESTLE) forces. Moreover the analysis of the micro-environment enables a deeper understanding of industry and how the 5 competitive forces affected it under the pressure of IT (for details, please, refer to section 1.1) (Kraewing, 2017; Greiner et al., 2017; Rauser, 2016; Peppard and Ward, 2016). Detailing the influencing factors in both the macro and the micro-environment serves to develop scenarios (*Strategic Forecast*) with reference to most relevant dynamics for the future development (Schallmo et al., 2019).

The *Internal Analysis* aims to assess firm's resources (IT infrastructures, systems, technologies, etc.) and capability in managing its digital initiatives (Chaffey and Ellis-Chadwick, 2019), and its digital maturity level. The definition of *Strategic Principles* follows both the external and internal analysis and aims to define the strategic principles of the firm acting in a

digital environment (Kraewing 2017; Greiner et al. 2017; Rauser 2016; Petry 2016)[4]. *Strategic Principles* consist of 5 elements: Strategic success factors, strategic aims, values, vision, and mission.

Particularly, a digital *vision* embodies the company's future ideas (5-8 years) of the in the field of digitalization. A digital *mission* defines reasons for the digital transformation of the company and answers the question of why the company is engaged in digitization (Lipsmeier et al. 2020). Thus *vision* and *mission* statements describe the specific goals of the DS, how, and why they should be pursued (Kraewing, 2017).

The fifth step of the process is the definition of *Strategic Options*, basing on the available generic strategies, their evaluation, and their selection. Selecting the strategic option enables the final step of *Strategy Formulation*, the last one aiming to develop the strategy that best fit with firms' projects, measures, corporate strategy and strategic principles (Schallmo et al., 2019; Kraewing, 2017; Rauser, 2016; Peppard & Ward 2016; Petry, 2016; Cordon et al. 2016).

7.2.2. The external strategic analysis

As mentioned above, scanning macro and micro environment enables firms to identify which forces are shaping the digital landscape and which forces may affect firms' strategic initiatives. In 2020 Covid-19 pandemic caused profound economic, social, and technological changes. Mainly, pandemic affected customers' behavior, increasing their demand for digital products and services. As consequence, firms developed new means of communicating with customers, offering additional customer service options, and new ways to obtain products and services. External changes impelled firms to modify their strategies and the way they get success.

Particularly, the following forces (commonly labelled with the acronym PESTLE) may trigger macro-environmental changes:

- Political forces;
- Economic forces;
- Social forces
- Technological forces;
- Legal forces;
- Environmental forces

thus shaping opportunities and threats for firms acting in a digital environment.

Particularly, *political forces* may affects DS by shaping the conditions – Ex.: legislation to protect privacy or control taxation – affecting the trading environment, as well as the rate of market digitalization (Ex.: investments in digital infrastructure; control of the operation; and use of the Internet). Moreover, *economic forces* (market growth and employment – economic growth, Interest and change rates, and globalization – economic disruptor) influence business success, by affecting supply and demand. Therefore, firms should identify and monitor those changes that are relevant for their strategic activities. *Social forces* are closely linked with culture and have relevant implications for DS: demographic changes, education, living conditions of population affect the type of products/services demanded by the market and the way they are delivered, as well. *Technological forces* relate to the changes affecting production, materials and the technology required to produce something. Among them, the most common are automation, Internet connectivity, 3D technology, cryptography, and wireless charging. Knowing technological trends is fundamental to anticipate competitors and running a successful business. *Environmental forces* mainly refer to climate changes, pollution, the availability of both non-renewable and renewable resources, and the laws that regulate the environment. Taking into account the environmental damages caused by the business activities,

[4] In contrast with Schallmo et al., (2019), Lipsmeier et al (2020) sustain that "*The first step to develop a digital strategy is the formulation of a strategic direction in terms of digital guiding principles at corporate level, together with the single business levels*" (p. 176). Thus defining digital guiding principles at both corporate and business level is the first step in the process of developing a DS.

and the growing attention toward environmental concerns, these forces have strong implications for firms' planning and strategic initiatives.

Analyzing the external environment means exploring macro-environment forces and micro-environment dynamics, as well. The micro-environment is basically the environment that has a direct impact on a particular business and characterizes by forces (Porter's 5 competitive forces) able to affect firms' profitability. As already reported in section 1.1. the development of IT and smart products had a transformative effect on the industry structure, reshaping the competition and the way firms get profits. Additional explanation for the issue are provided in section 8.1.

7.2.3. The internal strategic analysis

In 2001, Grant defined strategy as "the match an organization makes between its internal resources and skills and the opportunities and risks created by its external environment" (p.122). Since digital transformation intensifies the rate of changes on the external environment, internal resources and competences became increasingly important for the foundation of a long-term strategy.

Particularly, in technology-based industries, firms should formulate and implement their strategies around specific technological competences. In 2017, Holotiuk and Beimborn identified a total of 40 critical success factors of digital business strategies, emphasizing the importance for firms to deploy digital resources in accordance with DS. Similarly, Sebastian et al., (2017) explained how large-scale old enterprises develop digital competence to face the challenges and catch the opportunities of digital transformation. Robert et al. (2017) also sustain that formulating a DS always implies allocating resource and competence in accordance with the firms' strategic objectives. In line with the mentioned perspectives, Bharadwaj (2000) developed the concept of IT as an organizational capability and empirically examined the linkage between IT capability and firm performance. According to the author, firms can and do differentiate themselves on the basis of their IT capabilities (IT infrastructure, human IT resources, and IT-enabled intangibles) that are difficult to acquire and imitate.

The success of a DS depends on firm's ability to allocate resources and develop its capabilities. Therefore, formulating (or reformulating) a DS requires a systematic appraisal of a company's resources and technological capabilities, in order to deploy firm's strengths to maximum advantage and minimize its weaknesses.

7.2.4. Setting visions and goals for Digital Strategy

After having defined digital market opportunities and threats, and firm's digital strengths and weaknesses, both visions and strategic goals should be defined. Porter (2001) strongly criticized the lack of goals setting in many firms while developing their Internet-related strategy. Since every strategy concerns with "*competing for tomorrow*", establishing objectives for the future and determining how they will be achieved is a relevant step in the whole process of strategy formulation and implementation. Future objectives relate to the overall purpose of the firm (*mission*), what it seeks to become (*vision*) and specific performance targets (Grant, 2001). They should be clearly defined, and respects the properties listed in the so-called SMART acronym (Day and Tosey 2011; Doran 1981; Druker, 1954) SMART stands for:

- *Specific:* this property refers to the extent to which an a strategic objective is well-defined and details what exactly the firm wants to accomplish
- *Measurable:* when an objective is truly measurable, different metrics may be employed to assess firm's results and their contribution to the success of the organization.
- *Achievable*: goals must be achievable based on the firm's skills, resources and knowledge.
- *Relevant:* this property refers to the relevance of the objectives for the achievement of the firm's strategic goals. If the defined objectives are not relevant, they should be dropped in favor of others which will further the organization's strategies.

- *Time- related:* refers to the time available to reach a given objective. Setting a date or time by which the objective should have been accomplished is necessary to create urgency and to make objectives measurable.

Formulating SMART objective makes clear to everyone in the organization what the target is, suggesting actions to put the company back on the target, if necessary.

Strategic Options and Strategy Formulation

Strategy Formulation involves the identification of alternative strategies, the assessment of the alterative options and the selection of the DS that best fit with the firm's external environment, its resources and capabilities, and its strategic principles.

According to Porter (1985), firms can adopt three generic strategies for achieving above-average performance in an industry: *low-cost leadership*, *differentiation*, and *focus* on market niche, this last one varying between *cost focus* and *differentiation focus* (Fig. 7.7). The decisions for traditional markets are the same as the strategic decisions for the digital markets.

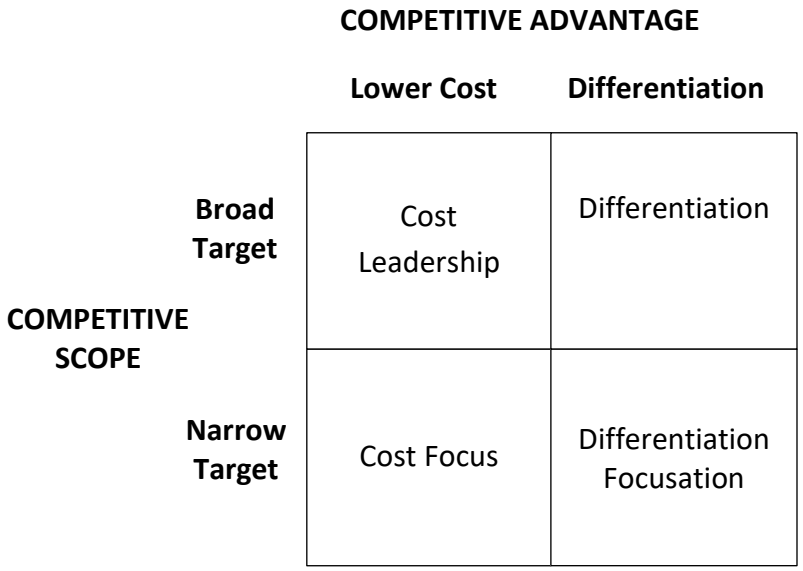

Figure *7.7*. Porter competitive strategies

Source: Porter, 1985

Pursuing a *cost leadership* means that a firm aims to become low-cost producer in its industry. Particularly, firms should be able to perform value chain activities at a lower cost than competitors (Porter, 1985), thus charging the same prices as competitors and enjoy higher profit margins. Alternatively low cost producers can charge lower prices, while increasing their volume of sales (Day and Wensley, 1988; Pearce and Robinson, 1994). Basically, economies of scale, proprietary technology, preferential access to raw materials are important sources of cost advantage, even they vary and depend on the structure of the industry (Porter, 1985; Pearce and Robinson, 1994).

Companies following a *differentiation* strategy strive to be unique in their industry adding to the products/services offered one or more attributes that customers perceive as important. In so doing, the firm uniquely posits into the market, thus reducing the customers' price sensitivity. The firm's superior ability in fulfilling customers needs enables it to charge a premium price for the products and services offered. (Porter, 1985; Aaker, 1991; Pearce and Robinson, 1994).

The third generic strategy is *focus*. Adopting a *focus* strategy, namely a *cost focus* or a *differentiation focus*, the firm selects one or more segments in the industry with the exclusion

of the others. In the selected segments, the firm tries to achieve its competitive advantage. Particularly, "*cost focus exploits differences in cost behavior in some segments, while differentiation focus exploits the special needs of buyers in certain segments*" (Porter, 1985, p.15).

When dealing with his generic strategies, Porter (1985) assumes that firms can get their competitive advantage only when selecting one of the available generic strategies. "*A firm that engages in each generic strategy but fails to achieve any of them is "stuck in the middle" and possesses no competitive advantage*" (p. 16).

As consequence, firms that are "stuck in the middle" have a competitive disadvantage, being worst positioned than the cost leaders, the differentiators, or the focusers.

Recently, many scholars debated Porter's notion of the "stuck in the middle", arguing that organizations who successfully combine low costs and differentiation "*create synergies that overcome any trade-offs associated with the combination*" (Parnell, 2006, p. 1141). Particularly, the development of IT enables firms to achieve lowest operational costs and the lowest prices (Kim et al., 2004). Thanks to IT and web technologies, firms can also obtain much more information about their customers, interact with them, in order to develop more effective marketing policies (Yelkur & DaCosta, 2001), and serve more efficiently a lager target than before (Kim et al., 2004). As result, IT allows firms to refine their offer and to better satisfy customers' needs (Wang and Lo,2002). Therefore, pursuing differentiation and cost reduction (or some combination of them) is likely to be a more viable strategy, especially in changing competitive environments (Salavou, 2015; Anderson, 1997; Pine, 1993). Amazon is an example of firm that has successfully employed a combination of cost leadership and differentiation (Merrilees, 2001). Amazon.com employs software enabling it to customize its offer and to differentiate from competitors. Moreover, the company routinely offers low list prices on much of its merchandise, prompt delivered to final customers. This combination of strategies makes very difficult to classify Amazon.com into pure *differentiation* or *cost leadership*.

Salavou (2015) argues that the combination of three generic strategies is better than the combination of two, which is better than a single, distinctive strategy. This kind of *hybrid strategy* helps firms to be more responsive to the market changes; to satisfy customers' needs in a more efficient way; and to benefit from multiple sources of advantages (Salavou, 2015; Beal and Yasai-Ardekani, 2000; Miller, 1992).

Research by Pertusa-Ortega et al. (2009) and Claver-Cortés et al. (2012) agree with this position, pointing out (among the others), that *hybrid strategies* that combine competitive advantages based on low cost and differentiation are more difficult to imitate and replicate, thus being more sustainable. Particularly, making purchasing decisions, customers examine both price (cost reduction) and perceived quality (differentiation). The combination of the mentioned dimensions contributes to define 8 potential strategies, the last ones explained by Bowman in his Strategy Clock (Bowman & Faulkner, 1997).

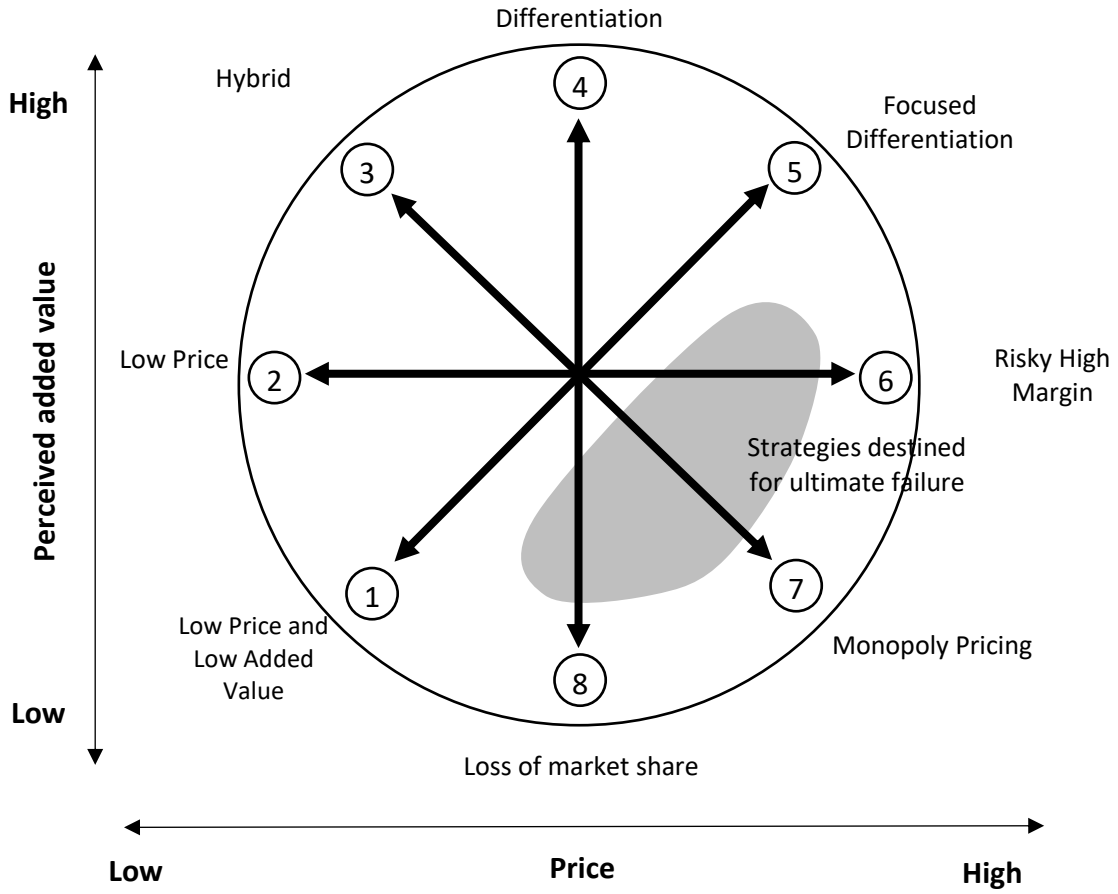

Figure 7.8. The Bowman's strategy clock

Source: Based on (Hales and Mclarney, 2017).

Different strategies arise in correspondence of different combinations of price/perceived added value by the customers, with hybrid strategies developing for high levels pf perceived added value and low levels of price.

Position 1: low price/low perceived added value characterizes firms able to achieve efficiency, but unable to differentiate themselves by the competitors. Companies pursuing this strategy commonly target commodities markets, price-conscious consumers, and consumers unconcerned about differences among products. *Dollarama* is an example of a large company (Quebec, Canada) that uses this strategy (Echchakoui, 2018);

Position 2: the combination low price/perceived added value equal to a market preference (named low price strategy) is consistent with Porter's generic strategy of cost leadership. This position relies on customers who are concerned about the price. Walmart pursues this strategy (Echchakoui, 2018; Laudon & Laudon, 1012).

Position 3: low price/high perceived added value characterizes the *hybrid strategies*. this position combines low cost and differentiation**.** Ikea, but also Uber are reported as example for the adoption of *hybrid strategies* (Echchakoui, 2018; Hales & Mclarney, 2017)

Position 4: equates with Porter's generic strategy of *differentiation*, characterizing for high price/high perceived added value. Kellogg's uses this strategy.

Position 5: establishes for the combination high price/ high perceived added value with reference to a niche market (Bowman and Faulkner 1997). Ferrari uses this strategy.

Position 6, 7 and **8** represent the so-called "swamp" or not competitive strategies, because the price is higher than the value added perceive by the customers. Therefore, they represent strategies destined to failure (Bowman and Faulkner, 1997).

Hales and Mclarney, (2017) applied the model to interpret the competitive strategies adopted by Uber. Uber was founded in 2009 Uber as a ride-hailing company that has soon expanded its services from ride-hailing (UberX, Uber Black, Uber Pool) to food delivery (Uber Eats), freight transportation (Uber Freight), and electric bikes and motorized scooter rental (through a partnership with Lime). Actually, Uber is considered the largest taxi company in the world, accounting for 110 million users in 2019, even it Uber does not own any cars or vehicles for the services it offers. By downloading the app and linking it with a credit card, people an immediately hail a ride by specifying the destination and pickup location. The app estimates the price to be paid and, once having agreed, it provides the rider for the name of the nearby driver, the number of the car and the estimated time for the pickup. At the end of the ride, the rider is asked to leave a tip and rate the driver[5].

This new effective and efficient system is perceived to provide superior value by customers, who overcome the disappointments arising with the traditional taxi service (delays in picking up; lack of information about routes and prices; uncomfortable cars, etc.). Moreover, Uber's low cost structure enables it "*the luxury of reducing prices without hurting its bottom line*" (Chan, 2014, p. 4). Thus, Uber is able to provide for its services at a lower price than the competitors (Ex.: traditional taxi operators). Therefore, Uber has successfully developed a *hybrid strategy* without remaining "stuck in the middle" (Hales and Mclarney, 2017).

7.3. Corporate digital strategies

As already mentioned, formulating strategies always involves two organizational levels (or even three): the business units active in a specific industry and pursuing their competitive advantage by the means of the available generic strategies; and the corporate operating across multiple industries (Goold and Campbell, 1987; Porter, 1987). In the digital age these two levels usually integrate because of both theoretical and practical reasons. It is common, for example, that firms deliberately losing money in one business, take advantages in others or that large players, like Google or Amazon, exploit their resources across multiple and diverse markets (Menz et al., 2021). As it happens for the generic strategies, using IT and digital channels support firm's growth and its development in existing and new markets.

In 1957, Igor Ansoff, the father of strategy, created a growth strategy matrix that set the direction for business strategy through two dimensions, product (existing products and new products) and market (existing markets and new markets), which remains very relevant today, when dealing with digitalization (Fig. 7.9).

[5] Info about Uber case studies were retrieved by Tang and Wirtz (2021).

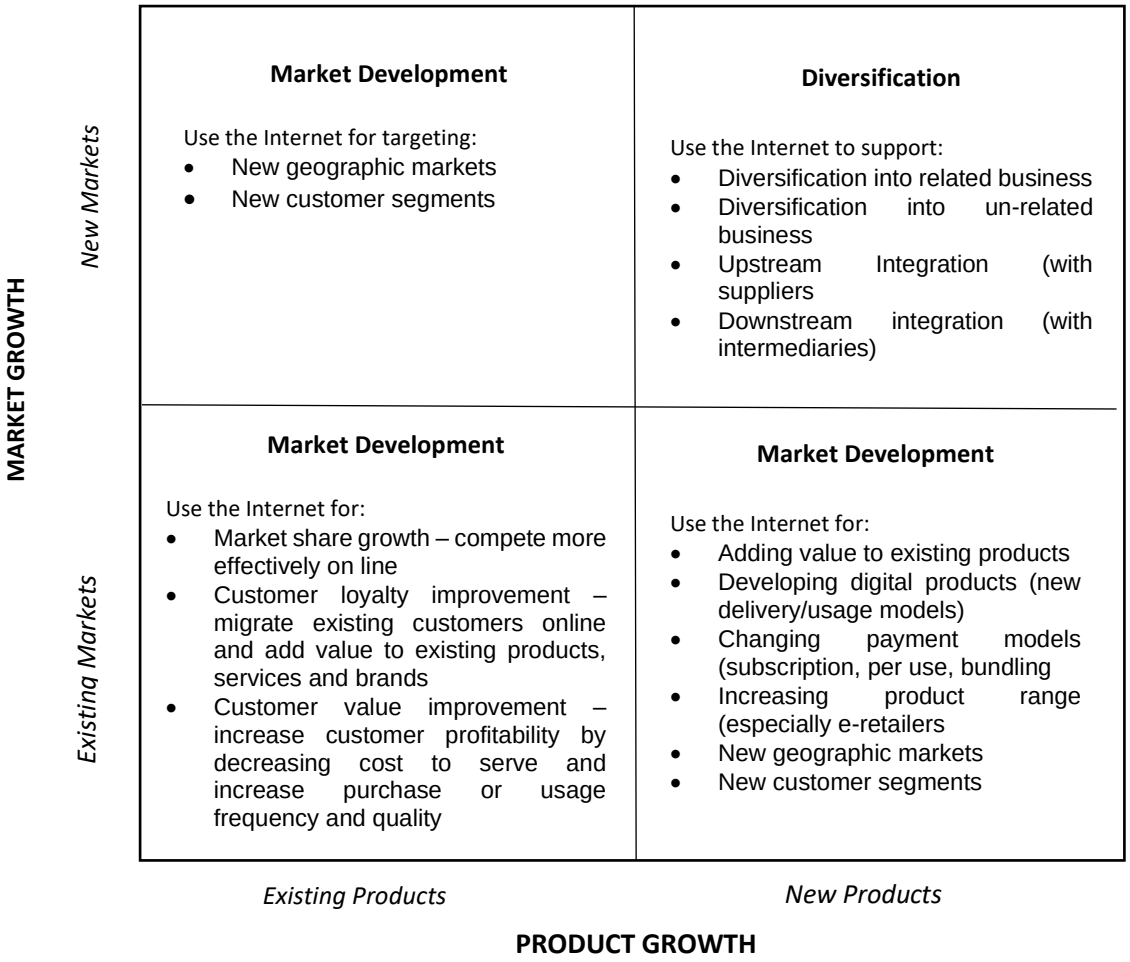

Figure 7.9. Growth Strategies and Digitalization

Source: (Chaffey & Chadwick, 2019).

Figure 8.9 shows the different growth strategies emerging in correspondance of each combination market (existing/new) and product (existing/new). Ansoff (1957) identifies four growth strategies: market penetration, product development, market development and diversification, showing the opportunities for revenue growth through the development of new products, new markets or both. The development of each strategy may be supported by th Internet and the use of digital channels.

As example, when dealing with *Market Penetration* (Existing markets/existing products), using digital channels allows firms to sell more existing products into the existing markets. Particularly, 3 main market penetration techniques may be employed to improve the firm's selling:

- *Market share growth* aiming to convert online visitors to buyers. The availability of efficient web-sites and effective online communication skills support this technique.
- *Customer loyalty improvement* aiming to attract migrating existing customers and improving their loyalty by adding value to existing products, services and brands. Developing an online value proposition support the improvement of customer loyalty.
- *Customer value improvement* aiming to increase the customers' purchasing frequency and to reduce costs and price to serve. The use of the Internet allows many firms to offer competitive online prices or discount in order to attract migrant customers and increase their market share.

The Internet and the use of online channels helps firms to pursue their *Market Development* strategies, thus targeting new geographic markets, new customers' segments or both of them. As reported by Chaffey and Chadwick (2019), EasyJet and Ryanair advantaged from low costs services enabled by the Internet, thus entering new markets (low cost routes). Similarly, the Internet offers the opportunities to enter small customers segments and market sub-segments that have not been previously targeted.

Referring to *Product Development* strategies (new products/existing market), the Internet is used to adding value to existing products (ex.: providing for products information, services and/or introducing new delivering processes), to offer new digital products (tailored brochures, books, music, video, etc.); and to enlarge payment models (subscription, per use, bundling).

Finally, *Diversification* (new products/new markets) may be supported by the Internet to the extent to which digital channels enable firms to reach new markets offering products and services at a lower cost than before (Chaffey & Chadwick, 2019)

Recently, Verhoef, et al.(2021) broaden the Ansoff's matrix by relating the growth strategies to platform firms. In figure 10, strategies in the black arrows are unique to digital platform-based firms and add to those proposed by Ansoff (with arrows). Looking horizontally, the use of platforms offers the opprotunity to enlarge markets, by attracting new customers, that have never used the product or service before (Market Development – platform). As Verhoef, et al. (2021) report, about 30% of Netflix users did not watch TV, but streamed content using digital devices. Similarly, the introduction of voice-controlled products by Google and Amazon created the market for smart speakers. Ttraditional retailers can also add online channels to increase their market share, by attracting consumers from other retail stores.

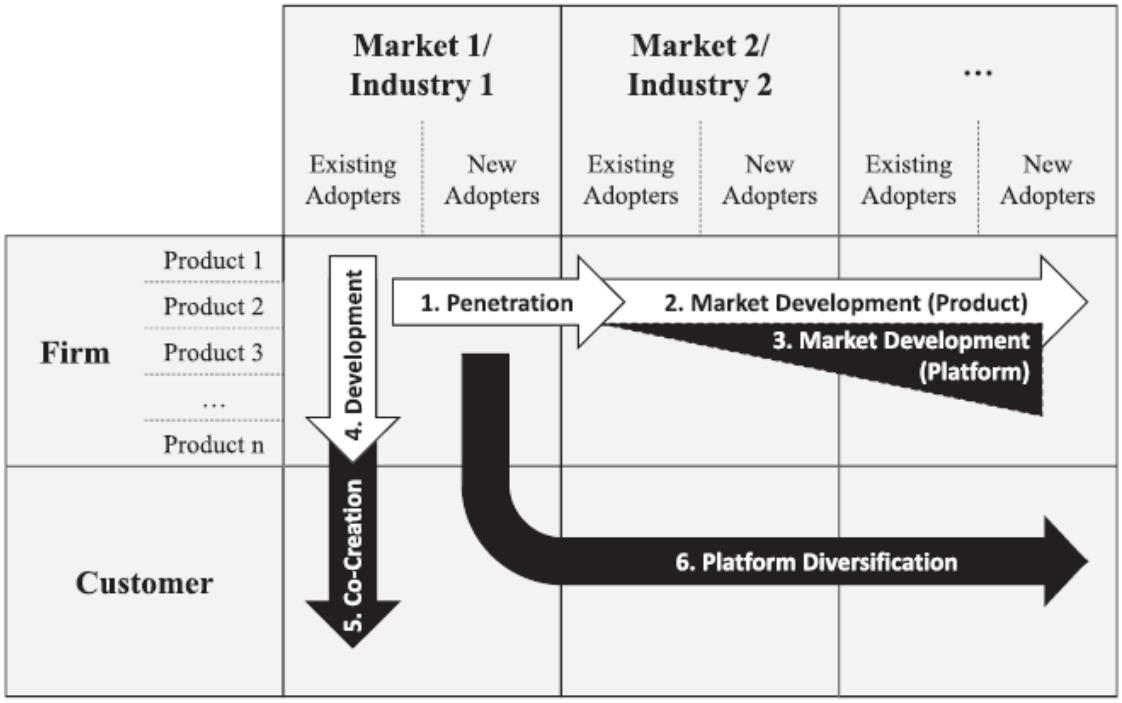

Figure 7.10. Digital Growth Strategies for Platform Firms

Source: (Verhoef, et al., 2021).

Looking at the vertical dimension, digital firms can employ the *product development* strategy in a more efficient way, using platforms to launch new products/services. Additionally, platforms firms may develop interactive platforms that actively involve the final users in the process of value co-creation (Cui & Wu, 2016; Grönroos & Voima, 2013). In such circumstance co-creation strategies emerge characterized by custustomers shifting their role into producers or suppliers by the means of technology. Finally, some firms are able to combine all approaches in a single strategy, which Verhoef, et al.(2021) name *platform diversification*. According to the

authors "*this growth strategy is often deployed by large, successful platforms aiming to create additional growth in unexplored markets with new products. This approach consists of expanding the platform to serve new markets, update the product and service assortment, and open the firm to co-create value by partnering with sponsors (Google and Android), or with other interoperable platforms, suppliers, consumers and complementary service providers (Facebook's Libra coin)*" (p.894-895)

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8. DIGITAL FIRM'S ACTIVITIES

Learning Objectives

After reading this chapter, you will be able to:

- Manage your supply chain and be aware how to turn it into digital supply chain;
- Learn and understand the digital evolutions;
- Manage digital marketing strategies and instruments;
- Understand and control the use of CRM systems within firm's reality.
- Successfully implement digital firm's activities.
- Develop a digital vision of your firm's activity, knowing where to invest and what learn to struggle against the digital evolution.

8.1. Approaching digital firm's activities

This chapter aims to describe the digital activities implemented by the firms starting with the digital supply chain and its features, and then shifting to the concepts of Digital Marketing and the Customer Relationship Management (CRM) system. In the literature, there are multiple approaches to analyze the activities of companies, such as the functional approach of Sciarelli (2001), the value chain approach of Porter, and, finally, the process-based approach.

Sciarelli identifies a strategic design based on the administration of the company's functional activities, which are classified into primary, support, and auxiliary activities. Primary activities include manufacturing, sales, and finance, while support activities are comprised of logistics, personnel, research and development, and accounting. In addition to these, each company has support functions such as procurement, personnel, research and development, and accounting, and ancillary functions such as transportation, distribution, plant maintenance, and advertising. In this approach, the management of the company's functional activities takes place by estimating the impact of each functional activity on the costs present in the company's income statement. From this analysis, the company can identify the activities on which to intervene to achieve specific levels of efficiency and, consequently, save resources. This analysis is carried out by the finance function, which is included in the primary activities.

Unlike Sciarelli, Porter approaches the activities of companies considering their ability to transform corporate inputs into outputs and, consequently, create value for end consumers. In this regard, Porter identifies both primary activities and support activities within companies. The former includes inbound logistics, operations, outbound logistics, marketing and sales, and, finally, service. The latter includes support activities as procurement, human resource management, technological development, and infrastructure. The usefulness of the Porter model is to identify which primary activities can create value directly and indirectly for the company but, above all, to understand how the support activities influence the primary activities in the creation of value (e.g., how human resource management affects the company's sales volume). Therefore, the Porter model clarifies the relationship between the primary and support activities, as the latter can impact the costs or the generation of value of the former.

The last approach used to analyze business activities is that of the process approach to management (BPM), which is aimed at orienting the business activities to the satisfaction of the final consumer, facilitating the structure of the process, execution, and improvement of the organization of the process (Mehdouania et al., 2019). Moving from a functional approach to a process approach allows the firm to get closer to customers' needs and achieve a certain degree of competitiveness in the market. In this way, the company can overcome the boundaries

between its internal functions to ensure greater flexibility in the company structure and create value for the final consumer. The companies that follow this line of thought, therefore, have a strong customer orientation and are able to keep up with the changes in their needs. Furthermore, these companies have a culture aimed at the continuous improvement of business processes and the accountability of each activity performed. In this way, BPM-based companies appear collaborative and emphasize the involvement of all company personnel to achieve high levels of quality and competitiveness (Papulova, 2020).

The following chapter will follow the BPM approach, as it will analyze the activities implemented by companies to achieve a flexible and responsive supply chain and, at the same time, have an offer that can meet customer needs. In this way, the author decided to adopt a holistic and systemic vision of the company, abandoning the clear division of the company's activities into primary and ancillary activities, combining them all in a single apparatus. This interconnection, as will be explained later, is guaranteed by the implementation of technology and artificial intelligence.

8.2. From Supply Chain to the Digital Supply Chain: the literature background

Supply chain is the network between companies and their suppliers built for production and distribution of a specific product. Nowadays, the supply chain is missing some important attributes, which are necessary to fit with todays and tomorrow's requirements. In response to this urgent lack, the literature is developing a new concept of Supply Chain, properly named "Digital Supply Chain" (DSC) which is the result of the last revolution of Industry 4.0. Moving from the Supply Chain to Digital Supply Chain is likely to turn the chain into an integrated system that runs flawlessly. That is why the Digital Supply Chain has changed the linear structure of the Supply Chain in a circle, so that everything is linked and interconnected.

The supply chain is defined as "*a goal-oriented network of processes and stockpoints used to deliver goods and services to customers*" (Hopp, 2003). In other words, it includes many kinds of processes as manufactural, financial, and technological whose purpose is both to develop and to produce the product or service of the firm. Stockpoints, which represent locations in the supply chain where inventories are held (Hopp, 2003), are another important element, because they are the mirror of the entity's decisions (as the retail of stocks) and problems (in case of damaged stock). The supply chain is the network between the processes and stockpoints and represents the paths flowed by goods and services.

The concept of Supply Chain has lived four revolutions since now: Industry 1.0, Industry 2.0, Industry 3.0, and the current Industry 4.0. The first revolution is dated 1760 and it related to the appearance of the new manufacturing model based on the use of water and steam. This demanding environment is named as "Simple Market" in literature because of its unique dimension *product and volume* (Yin et al., 2018). At this period, the variety of products was very low and most of commodities were agricultural product. In this situation, the only driver of the market was the harmonic balance between supply and demand. However, the implementation of water and steam in the supply chain raised the productions of the enterprises because machines got more feasible and faster. Consequently, this type of supply chain had to face up with the shortage of the supplies, which were the result of craft production implemented by workshops or families or small communities (Yin et al., 2018). This issue was solved with the Industry 2.0 between the 1760 and 1840, with the introduction of electricity, mechanical and electric devices in the production system. During the second revolution, the production system had two main dimensions: volume and variety. The literature identified this environment as a "*Stable Market*" (Yin et al., 2018). In this era, there are several important authors as Frederick Taylor, Henry Ford and Taiichi Ohno.

Then, the Third revolution followed with the change of analogue to digital to further automation in production. As matter of fact, Industry 3.0. introduced automated systems in the assembly line with the purpose to replace the human activities. However, this automated system still relied on the human input and interventions, so that the human force was still an important element of the chain. During this period, in addition, product lifecycle reduced

drastically for the major part of electronical products, that is why the firms had to introduced flexible production system to faster respond to the business changes. This new urgence was solved by dismantling the linear assembly and adopting *serus systems* (Zwierzyński & Ahmad, 2018)[6].

The environment of the third revolution, in this way, had three main dimensions: volume, variety and delivery time. The literature defines it as a "*Volatile Market*" which caused flow line and TPS malfunctions (Zwierzyński & Ahmad, 2018).

Finally, the Industry 4.0 started with the smart machines, storage systems and production facilities that can automatically and independently exchange information, trigger actions, and control each other without any human support.

These revolutions have had an important impact on the supply chain model used by the enterprises. As matter of fact, it introduced the technology innovation as internet of things (IoT), big data, electric vehicles, 3D printing, cloud computing, artificial intelligence, and cyber-physical systems (Zwierzyński & Ahmad, 2018).

As it is common accepted in literature, the Supply Chain has many constructs: Supply chain Flow (SCF), Supply Management Process (SCMP), Supply Chain Management Components (SCMC) (Garay-Rondero et al., 2020).

The Supply Chain Flow is the trip of the products, services, information, knowledge, money within the supply chain.

During the fourth revolutions mentioned above, this construct has had different states. As matter of fact, until the beginning of the third revolution, the information flow through technology did not exist. So that, the management had to manage the different flows without the help of technology, using writing and verbal communication. With the start of the third revolution, the enterprises both introduced and gradually integrated the technology into their supply chain. It was a revolutionary innovation because it improved the manage of information flow as well as the finance, risk, and merchandise flows, making possible to develop new production systems and distributions. However, the first technology introduced in the enterprises still relayed on the human activities and commands: the employees had to turn on and off the technology as well as to constantly monitor the activities of them. Nowadays, instead, enterprises are using smart technologies which are all interconnected: computers, smart materials and intelligent materials communicate with one another, moreover they interact with the environment (Ghobakhloo, 2020), and eventually making decisions with minimal human involvement.

The Supply Management Process includes all processes which belong to the firm's activities. So that, it includes the production and manufacturing process, the relationship with clients and suppliers and the returning process. Walking through the past it is evident that the management process has changed during these years. As matter of fact, the management process was done physically and taking written notes about the firm's life; nowadays, instead, management can supervise its employees and the activities using technology systems without staying physically at the firm. An evidence of this new attitude is the smart working during the current pandemic situation.

The Supply Chain Network is the relationship which the firms entertain with internal and external stakeholders. So that, it incorporates the care of the intermediate[7] and final customers, the commercial relations with both suppliers and retailers and all other stakeholder with which the firms are in touch.

Considering the four industrial revolutions, it is possible to end up that, until the beginning of the third revolution, the network was exclusively physical because of the absence of

[6] Seru system was introduced in the 1992 by several Japanese electronics companies and it was created for replacing the assembly line which was not flexible to the fast innovation changes. The serus production is defined as a "*production type that belongs to the cell production group, whose main assumption is the creation of production sites for a family of parts or products with similar process requirements, clustering of various processes in close proximity, and designing supporting social engineering systems*".

[7] *In this paper, the name "intermediate client" deals with Wholesale and Distributor of the B2B Business.*

automation. As commonly shared, the network industries' scheme began with a linear shape as planned by Ford with the line system, then it turned to a *U shape* (seru system) (Zwierzyński & Ahmad, 2018) a circular form. This last shape is the result of networks' evolution into a complex digital channel, transforming goods, adding additional services, and feeding synergies between different processes. Despite of the positive effect on production process, technology is causing a not negligible collateral effect: the increase of pollution as well as the replacing of several human works. Consequently, the actual enterprises must face up with new issues related to its employees and the environment.

The Supply Management Components is related to all structural management activities as planning and control, communication, and information flow facility structure (ICT) as well as behavioral management components as the definition of risks, management methods, power, and leadership, cultural and attitudes. Walking through the four evolutions it is understandable that even management component has had a change during these periods. Nowadays, in fact, the management must struggle against a multitude of difficulties related to different business: cybersecurity and data collection, social and environmental sustainability, the smart stakeholders, and the block chain initiative.

In this moment, the Industry 4.0 is constantly pulling the shifting from the supply chain to digital supply chain, which is a complex and interconnected network of processes, all goal oriented. The digital supply Chain appears as the following pictures:

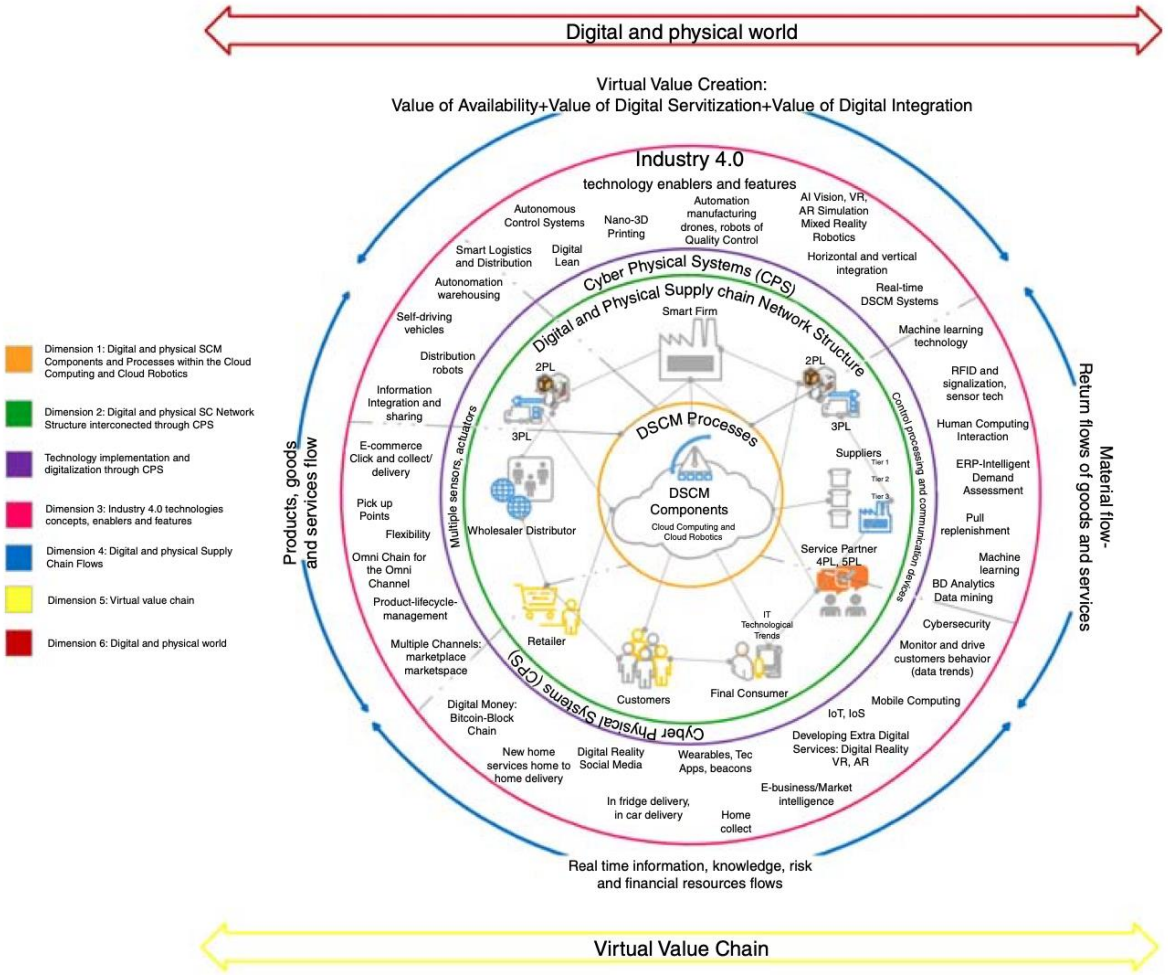

Figure 8.1. Digital Supply Chain Model in Industry 4.0

Source: (Garay-Rondero et al., 2020).

The Digital Supply Chain Model is characterized by the presence of six main dimensions in the digital supply chain system.

The first dimension is at the center of the scheme, and it deals with the artificial intelligence of the technological systems composed by CC e CR. The Cloud Robot is a "brain" which received information from big data, global acts, and description of objects (Bogue, 2017). The capacity to develop supply chain system based on the interconnection of CC, CR and artificial intelligence/machine allows to create an interconnectivity between each elements, process, flows, actors and technologies of the chain to the point to turn it into a digital supply chain.

The second dimension is related to the CC of the digital supply chain which permits to establish physical and digital networks between physical and digital SCMP components. The network structure is composed by a variety of external stakeholders as the suppliers, consumers, the second and third part of logistics, the main company, a local firm or smart firm, the wholesaler or distributor, the retailer and finally the last consumers and a part of internal like the fourth and five part of the logistic. The third dimension is the link between the physical and digital network SC (Supply Chain) with Industry 4.0 (Lee et al., 2015).

The fourth dimension of DSC is related to the different flows which belong to the supply chain which can be material flow, service/goods flow, information flow, knowledge flow, financial resources flow, risk return flows of good/services. In order to create a long-lasting flow within the network structure is important to present new digital product and services which guarantees a virtual value creation. This last concept coincides with the fifth dimension, which will be deeply explained in the next paragraph. The sixth dimension incorporates the whole DSC System, so that it includes the main features of the DSC as the continuous interactivity with the communication channels, continue evolution of the system, design and production in separated locations, high level of customization, easy and digital access to innovation (Garay-Rondero et al., 2020).

8.2.1. The concept of virtual value creation

Nowadays, the enterprises are operating in two main and different markets defined as "marketplace" and "market space". The former is related to the whole historical physical market, the latter deals with the virtual world. That is why the enterprises are a source of both physical and virtual values. In the following paragraph, we will discuss about the creation of the virtual value.

The Virtual Value creation is the result of several elements, like the availability value, the value of digital services and value of digital integration. This type of value is created through the "*virtual value chain*" which is a new business model proposed by John Sviokla and Jeffrey Rayport (1996) coexisting with Porter's Value Chain. The virtual value chain is related to the implementation of the information technology within the enterprises' reality. The main components of it are the gathering of information, the organization of information, the selection of information, the synthetization of data and the distribution of the selected information Firstly, the enterprise must gather all useful information for its business, then it must reorganize them – second phase – to use them easier. The third phase is the focus on the information, which could create value for the enterprise's customers. The last two steps are the synthetization of the collected data in the correct form for the firm's purposes and then to deliver it to the final consumers. Instead of the physical supply chain, the distribution of the information is done through the technology appliances, so that the data are directly addressed to the final consumers or available in a common website. That is why the virtual value is influenced by its direct and immediate availability and its integration. It is important to underline that on the one hand, the Virtual Value Chain is able to catch up new markets and new trends following the five steps of the information, but on the other hand it empowers the physical supply chain thanks to its visibility and mirroring capability. Regarding the first point, the management is now able to plan, coordinate, measure, and control business process by having a holistic vision of what is happening within the society. As matter of fact, the information is easily at hand of all, and management can access at it in the course of operating activities; in this way, the management could perceive the supply chain as an integrated system instead of a set of discrete though related activities. Based on the available information, it could state both

its plans and strategies. The second point is the mirroring capability, which is the ability to apply the virtual knowledge at the physical world. In other words, the management starts to do some changes on the physical supply chain based on the information about the business. So that, it asks to himself what to do for growing the efficiency of the enterprise as well as what changes to do with goal of empower the physical supply chain. It is shared the fact that, without the information, these decisions would be myopic and would be done very slowly.

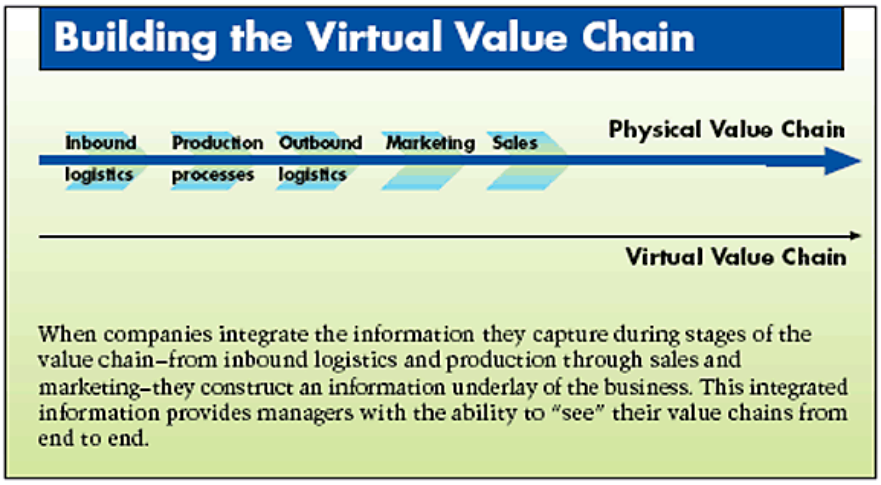

Figure 8.2. Virtual Value Chain

Source: Jeffrey, F. R., & Sviokla, J. J. (1995)

8.2.2. The drivers of Digital Supply Chain

The introduction of the digital supply chain in the firms is due to internal and external drivers. The internal drivers are related to operational and performance problems (Accorsi et al., 2018), caused by the complexity of the current supply chain. As matter of fact, the increase of labor cost and operational problems are reducing the reliability of manual work, that's why enterprises are adopting and developing technological devices for cutting costs and doing operations faster and more reliable. Another important internal driver is the new strategic approach of the enterprises. In fact, the enterprises need new business models which embody technological appliances as a part of the core business of the firms. This strategy is based on the concept that technological drivers could be a catalysator of disruptive innovative process, which can get the supply chain more flexible, interactive, and intuitive. Actually, there are several technological devices available for the enterprises as: 3D Printing, Advanced Robotics, Artificial Intelligence (AI), Autonomous Vehicles (AVs), Big Data Analytics (BDA), Blockchain, Drones, the Internet of Things (IoT) and Augmented Reality (AR). The 3D printing is related to the process for creating a physical object starting from digital data. Artificial Intelligence (AI) is defined as "*agents that receive percepts from the environment, which enable those agents to map percept sequences in order to perform specific actions*" (Russell & Norvig, 2016) and it refers to the demonstration of machine intelligence. Autonomous vehicles are vehicles, which are capable of "*intelligent motion and action without requiring either a guide or teleoperator control*" (Lozano-Perez, 2012), as matter of fact, they can directly understand the environment where they work and efficiently respond to difficult and unexpected situations. The big data refers to the capacity of main memory, local disk and even remote dis (Cox & Ellsworth, 1997). Block chain is a database that stores encrypted blocks of data then chains them together to shape a chronological single-source-of-truth for the data. Drone refers to unmanned aerial vehicles and micro aerial vehicles that were firstly created for military purposes. Nowadays, instead, is being

used in supply chain for delivery, reduction of CO2 emissions, stock tacking etc. Robotics are electro-mechanical machines, idealized to substitute or assist human tasks (Eckert et al., 2016; Gunasekaran et al., 2008), especially in the manufactural business for handling products, picking, inspection to save costs, to ensure sustainability and increase capacity. Internet of thing (IoT) is the network of technological devices, wireless transmission, and computation capability (Atzori et al., 2010; Sarma et al., 2000) and it allows the communication between "*people and things, and thing and other things*" (Vongsingthong & Smachat, 2014). IoT includes different kind of things as sensors, pumps, washing machines, actuators (Hopkins, 2020) which are designed for future supply chains with the purpose to understand counterfeit products, real time tracking, prediction of future sales and costs, reduction of overproduction and the accomplishment of sustainable standards. The last two technological drivers are Virtual Reality (VR) and Augmented Reality (AR); the former allows people to have realistic electronic simulations, wearing cloth with sensors and head mounted goggles (Steuer, 1992) without a physical contact with real world. The latter places the 3D objects in a real environment, in real time (Azuma, 1997). Both are recognized as valid instruments for the digital supply chain, especially for training activities, simulation of real environment, and improvement of picking/inventory management. The external drivers of digital supply chain are the customers, suppliers, and competition within the market (Yang et al., 2021). It is shared the fact that enterprises are adopting digital supply chain for responding to the new cyber customers, who are more demanding and caught by shop online. In favor of this new market tendency, the enterprises are using innovative marketing strategies, which are embodied in the concept of "digital marketing" which will be discussed in the next paragraph. The second external driver deals with the digitalization of the suppliers, which catalyzes the innovation process also in the firm. As matter of fact, the enterprises are introducing technologies systems and devices in order to keep close cooperation with supply chain partners. The last driver is the market competition, which is typical for enterprises, which use to emulate their competitors. Consequently, these enterprises are pulled from the market situation to introduce technological devices because it is the only strategy for survive and stay at the same level of the other firms.

8.2.3. Comparison between Digital and Traditional Supply Chain

The Traditional and digital supply chain are very different in several aspects.

This Table has the purpose to summarize the most important differences (Garay-Rondero et al., 2019) taking into account the following elements, which typically characterized a supply chain: structure, purpose, knowledge, behavior, flexibility, target, communication, and cost

Table 8.1. Traditional Supply Chain vs Digital Supply Chain

Element	Traditional Supply chain	Digital Supply chain
Structure *It represents the design and shape of the supply chain.*	It is linear and hierarchical. Each component has a specific position in the supply chain without flexibility and possibility to change it.	It has a circular shape. That means that the DSP is a holistic system; within each component is a part of another.
Purpose *It represents the goal and the orientation of the Supply chain.*	It is planned for logistics activities and manufacturing operations.	It is planned to satisfy the customers, their needs, and every kind of requests, via digitalization.
Knowledge *It represents the knowledge within the whole system achieved through the communication between the SC elements.*	This structure does not have the perception of all risks, returns, value flows, because there is not a direct communication between the different functions and elements of the chain.	This model can embody risk, return and values flows thanks to the implementation of Cloud Technology, which guarantees the interconnectivity between different elements of the chain.
Behavior	Planning and Control activities are performed in an archaic way	This structure encourages research and experiment in order to obtain a product

It represents the decision making process of the firm to detect the firm's strategies.	because of the autocratic leadership. This is caused by the lack of the communication between parts and with the external world. In this way, the decision- making process is for few people.	responding to the costumer's needs. In this way, the management is open minded, and it is continually in touch with firms' functions. It is able to change is decision approach in function to different situations.
Flexibility *It represents the capacity of the firm to react to changes (as market conditions, customers' requests).*	The rigid and closed structure causes the lack of flexibility and agility. That is why, the traditional SC recommended for aa standard or a specific manufacturing production.	The strong interactivity and openness with the external system allows to have a responsive SC to the customers' needs and able to forecast the future trends of the market. In this way, the structure is very flexible and proactive.
Target *It represents the business to which the firm belongs.*	This SC is optimal for a specific target market, which does not present many changes.	The DSC is a traversal structure, which could be used for customized market as well as mass production and services ecosystem (physical and digital).
Communication *It represents the communication channel within the firm.*	This SC has different communication channels, which do not trend to converge in one.	The communication channel is based on computational intelligence based on algorithms for self-learning, self-regulations and autonomous generation for decision-making patterns.
Cost *It represents the cost of the firm due to Supply Chain features.*	The lack of a strong interactivity between parts arises the internal costs of DSC. That is why, it more expensive in term of money and time.	Every process is interconnected with others, so that the firm's management is omniscient and always receives updates about the enterprise's life thank to technology system. In this way, the DSC is less expensive in terms of time. Moreover, of AI and BI tools in the firm replace the human being in some process activities, that's why DSC presents less employees' costs.

Source: Author's elaboration

8.2.4. How to turn the Traditional Supply Chain into Digital

Today the enterprises have a new challenge: "to turn their traditional supply chain into digital". The winning strategy is the implementation of innovative technology in their process, which is strictly linked with a new production approach based on the efficiency and accuracy of delivery or logistics on the supply chain, known as "On time- in Full" (OIT). Specifically, the firms aim to have a stock synchronized with the customer request as well as to deliver its products in time and in accordance with the purchase order of the customers. That is why firms are adopting *Business Intelligence* systems, which leverage services and software to turn data into actionable insights used by management for their strategic and tactical process. In fact, today's businesses feel the need to implement efficient, effective, and predictive decisions. All this is possible by developing integrated and interconnected internal communication systems such as to save time and costs, to support a forward-looking and complete decision-making approach model. Thanks to the use of specific technologies (Industry of Internet of Things), in fact, the management would be able to consider all the possible variables of an event, both present, and future, thus producing weighted and complete decisions. The tools available include specific dashboards reproduced by the systems adopted within digital companies, showing the data of all company functions. Specific predictive analyzes will be added to them, always carried out using determined tools capable of predicting future trends in market demand. In this way, the company will be able to keep up with market trends and, at the same time, develop effective and efficient production. In addition to revolutionizing their strategic approach, companies need to replace human activity through special technological devices (Artificial Intelligence) to respond to the requests of the final consumer instantly, as happens with chatboxes and recommendations engines. These AI allow you to have the opportunity to solve the problems of the final consumer immediately and recommend a product that meets his preferences. To sum up, the firms need to turn their supply chain into digital supply chain to

achieve a specific degree of flexibility, a circular and interconnected structure, which allow save many resources and predict the market trends.

In the following paragraph, we will analyze in depth how companies have switched to a digital CRM and Digital Marketing through technology.

8.3. The Digital Marketing

According to scholars, Digital Marketing is the way firms toward make their products accessible on digital channels like versatile applications, website pages, and social media. In other words, digital marketing means promoting products and services utilizing search engine marketing (SEM), web publicizing, social media marketing (SMM), email marketing. Therefore, Digital Marketing seems a broad term, which includes various sorts of marketing, which utilizes digital advancements, like social media, search engines, and sites to target customers.

The spread of Digital Marketing started in the 1990s and 2000s during the third revolution when technology took part in the business processes.

Today it is a complex reality and includes many components, which we will analyze in the following pages:

- Search engine optimization (SEO),
- Pay-per-click advertising (PPC),
- Web design,
- Content marketing,
- Social media marketing,
- Email marketing,
- Affiliate Marketing,
- Marketing Analytics,
- Marketing Automation.

Search Engine Optimization (SEO)

Search Engine Optimization is the science of driving website traffic to websites. Specifically, this is a process for increasing the ranking of websites on Search Engine Page rising the number of visitors and generating creative leads and technical activities affecting traffic website (Nosrati et al., 2013). Generally, the Search engines page rank pages higher for catchphrases that show up right on time and more frequently on that page.

SEO is very advantageous because of its low cost, positive impact on website traffic, and effectiveness against market competitors.

Pay-per-click advertising (PPC)

Pay-per-click advertising is a model of digital marketing that charges the publicities each time a likely client clicks on its advisement (Johansson, 2012). Essentially, it is a way for buying visitors to your website instead of attempting to earn them organically. Paying each time someone visits your website allows you to manage and control the amount spent on your advertisements. Basically, visitors click on the ads out of genuine interest, thus this form of advertising seems more successful than traditional marketing (Drolias, 2007). This kind of advertising should be possible through search engines, social networks, and online stages. A contextual advertising system scans the text of a website for keywords and returns advertisements to the webpage based on those keywords. The advertisements may be displayed on the webpage as pop-up ads. For instance, if the user is on a sports website using contextual advertising, some advertisements of other companies related to the sport will appear on the website page.

Web Design

Web design refers to the design of websites that are displayed on internet. Therefore, it relates to the image of your website. A winning web design is user-friendly, responsive and it

loads quickly, and fits the enterprise brand. The three mainstays of web design are convenience, content and usefulness. The first aspect is strictly connected with the information written on the web site, which have to be helpful for customers when they want to shop online. The convenience can reduce the customer time consumption in effort to deal with the process (Salehi et al., 2021). Regarding this last point, the Author Srinivasan has described the convenience in e-commerce as *the range to which customer feels that a website is simple, sensory and user-friendly* (Srinivasan et al., 2002). Regarding the content of the website, it is associated with the creation and distribution of valid, relevant and coherent content to attract and retain a defined audience and, to govern a profitable client action. Concerning the last mainstay, the web design has to be useful for the customers for understanding the quality of the product, its availability, its composition as well as the delivery time.

Content Marketing

Content marketing is a marketing strategy that has been taking a turn in recent years to respond to the ineffectiveness of traditional strategies.

Company are currently using it to increase brand awareness and reputation, create engagement with the customer, generate leads for data monitoring, and, above all, increase sales.

The first path for having a successful content website is to put yourself in the shoes of the final consumer, hypothesizing how they would react to the information on the site, drawing a real *empathy-map* (Srinivasan et al., 2002). This approach would allow companies to identify the most popular algorithms and the items that consumers pay the most attention. Once the company has identified the profile of the final consumers, the company will have to proceed with establishing *smart* goals (Drucker, 1954), that is, specific, measurable, achievable, realistic, and time-based. Based on this approach, the company has to determine the product to sell and its price, and then it has to decide the presumable sales of these products in a pointed time.

Having clarified this, the company also needs to set digital sales goals, i.e. create highly engaging content for the consumer. One of the best strategies is to develop *10x*[8] content, i.e. content that thoroughly explores key topics and does it better than other competitors in the industry. This type of content is achievable through excellent *UX (user experience)* on any device. The UX represents the relationship between the product and a person, it involves all the experiential, affective aspects, the attribution of meaning, and value connected to a product or service, to the interaction with it and related to it, but also includes personal perceptions on aspects such as usefulness, the simplicity of use, and the efficiency of the system.

The realization of a successful UX involves a series of phases to follow: it starts with the User Experience Research phase, which consists of the analysis of the user's behavior and attitudes, the content or use, any critical issues in the experience of the user. The involvement of the end-user is directed through specific market surveys or interviews. Then we move on to the User Experience Design phase, which is generally oriented by the research activity and aims to develop solutions for optimizing the experience. At the end of these two steps, there is the UX Design, which consists on the design of the interface, which is the place of contact between the person and the website.

Social Media Marketing

Social media currently play a fundamental role in people's lives. People are using them for always being in touch with others, and for reading daily information. It is useful to underline that social media are playing an important also in the commercial business both for B2B and B2C markets. Many companies are using social media as advertising strategies for their products and services. In this way, *Social Media Marketing* (SMM) is growing its importance in the range of business strategies. In The SMM consists of a form of digital marketing, which uses social networks and platforms for advising products and services of a company. Considering

[8] 10x content means that the content is ten times more attractive than other are.

the operative aspect, the Social Media marketers use to create pages on Facebook, Instagram, Pinterest, Twitter and other social networks for developing this commercial strategy.

Having understood the importance of SSM, the same social networks offer entrepreneurs tools to sell and advertise their products online, such as the Facebook Marketplace or the Instagram online shop. Furthermore, the same social networks give the possibility to create "targeted" advertisements for a defined category of consumers for a certain period. In this way, the company can determine which products to advertise, to define the advertising slogan and any restriction of the advertised products and, finally, quantify the budget to be allocated to advertising according to its duration.

Email Marketing

Direct marketing also includes *direct email marketing (DEM), which* consists of using email as an advising instrument (Mogoș & Acatrinei, 2015). It is often used for sending a personal message about private promotions or new products to convince customers to buy (*call to action*). Companies benefit from the ability to quickly and cheaply reach the audience. An advantage is the fact that an *opt-in system* regulates email marketing that means that the customer has authorized the company for treating his data for its advertisements (*permission marketing*). The use of a strategy based on the authorization to send advertisements increases the effectiveness of marketing campaigns; in this way, the reading rate is higher precisely because the advertisements are sent exclusively to those who have authorized the sending. The dispatch of DEM can be made based on a list of recipients own (i.e., on a proprietary database), or with the use of lists provided by third parties (publishers, agencies and advertising agencies). In this second case, these are real advertising campaigns that are based on the use of profiled lists to identify new customers (prospecting). According to a purely advertising logic, usually the client company pays a cost for each shipment made; the reference unit of measurement is Cost Per Mille or CPM. Companies could add other recipients identified through specific CRM systems that use navigation data provided voluntarily by users or professional email marketing platforms. These platforms can develop specific behavioral models, called behavior patterns, capable of dynamically identifying clusters of consumers who are more receptive to particular types of advertising messages or specific product offers. Thanks to these tools, companies can promote relevant and personalized proposals, thus implementing the effectiveness of direct email marketing campaigns creating a strong barrier in the competition (Friedlein, 2003).

Using these instruments, DMS has now left the one-size-fits-all mass mailing approach, developing an alternative focus on consent, segmentation, and personalization.

Affiliate Marketing

Direct marketing also includes *an affiliate marketing* strategy, which consists of selling products of other companies online. So that the affiliate is properly a dealer who gains money each time he resells a product. Therefore, this strategy involves three main actors: the affiliate, the publisher and the consumer (Nosrati et al., 2013). Each of them earns money from this mechanism: the dealer receives the commission, the publisher earns from selling his product, and, finally, the consumer is satisfied with his purchase. Doing affiliate marketing is not just about promoting and selling products created by others, but you could also be the one to affiliate your product. In this way, there are two main actors: the merchant and the affiliate. The former is the creator of the product; the latter is the dealer of it.

Especially beginners implement this last choice because by joining these affiliate programs and sites (Amazon, Clickbank, Walmart, eBay…), they can promote any product of that company after which person gets commission.

Marketing Analytics

Marketing analytics is a set of tools and processes aimed at analyzing qualitative and quantitative data related to the marketing strategy. The ultimate goal is to guide the continuous improvement process of the Online Customer Experience and business performance. A digital marketing measurement model must focus on three areas of investigation: acquisition, extraction and results. The first element relates to the management of the traffic of data and the analysis of the principal investments. The important aspect of this phase is to define specific filters in order to avoid discarding useful information provided by the web (Labrinidis & Jagadish 2012). The second element relates to the extraction of the gathered information in order to understand the expected behavior of you customers (Labrinidis & Jagadish, 2012, p. 2), in other words, you have to identify the successful contents of your strategy and the possible faithful clients. The third point is concerning the results that could make value for your website.

Marketing Automation

The term marketing automation refers to specific platform implemented by marketing departments, which need to automate repetitive actions, develop email-marketing advertisements and to track the activities of possible and actual customers.

The current marketing automation platforms allow automating the "drip marketing" activities (*Lead nurturing*) through the automated sending of emails and messages based on the actions and behavior of users (customers, prospects, target users) and the predefined phases of a marketing campaign. The purpose of lead nurturing is to acquire a prospective customer (lead) and leading him through a multi- stage process to making a purchase (Świeczak, 2013). At the end of this process, the customer is satisfied with the purchase made and fully aware of why and for what purposes he made a purchase. Moreover, marketing automotive tools automatic assign action scores according to various predetermined parameters (demographic data, online behavior, timing, and frequency of actions) and automatic classification of action priorities (*Lead scoring and grading). Furthermore, they make available dashboards for optimizing the advertisement action (segmentation)* (Świeczak, 2013, p.6). *Besides, they monitor and analyze the content of the conversation with social networks users (social listing) for updating the database and the dashboards. They are also able to connect and synchronize the information with CRM systems. Thanks to these platforms, the company can manage in a holistic way the entire advertisement strategy*.

8.3.1. Advantages of the Digital Marketing

Digital marketing implementation has several advantages considering all instruments described above. Firstly, it allows reaching a target audience cost-effectively and measurably. Moreover, it increases brand loyalty and improves online sales. This improvement is accomplished thanks to the openness and personalization of the offers gained with the digital market strategies. Actually, the digital marketing allows you to greet customers with target offers at the moment they visit the website. Moreover, the company can attract new customers by getting involved with social media and managing it carefully.

Once these strategies are in place, the company can measure their effectiveness of thanks to data analytics tools and dashboards of specific digital marketing platforms. We can conclude that digital marketing is a new personalized of planning, managing and improving sales and brand reputation using automatic tools.

8.3.2. Differences between Traditional and Digital Marketing

The main difference between traditional and digital marketing consists of the medium implemented for reaching the final customers. The former involves the traditional channels like billboards and printed media; the latter, instead, uses social media or websites. That is why the client relationship in digital marketing faster than traditional one. Even the management of the sales is different: in traditional marketing is very difficult to quantify the return on investment,

in digital marketing, instead, it is possible thanks to the dashboards and data analytics tool. Regarding the same point, the tradition marketing does not allow to track instantly the trend of sales, while the direct marketing reports a pointed analysis of the sales results. Another difference is about the customers range: in the traditional marketing the customers are not global because they are the result of an attentive study of the marketing strategy; in the direct marketing, instead, the range of customers is wide and global thanks to the implementation of social networks. We do not have to forget that digital tools send messages faster and instantly to end consumers. In this way, the company can quickly change its marketing strategy according to market changes. This process would not be possible with the use of traditional marketing tools. Therefore, it can be assumed that the two strategies also have a very different level of flexibility and reactivity. In conclusion, to keep up with the times and to be able to get the new consumer, we recommend abandoning the traditional marketing model and going to the digital one. In this way, the company will increase its value in terms of turnover and terms of process efficiency, and brand.

8.4. The Customer Relationship Management (CRM)

The new dynamic and technological world are affecting the customers' expectations, that's why the enterprises are more careful about the customer relationship by developing a customer centered approach, where the value chain begins and ends with the customer. This new business approach can be achieved using both new organization approaches and technological tools like the CRM (Customer Relationship Management), which are based on several dimensions like customer identification, customer attraction, customer retention and customer development.

CRM is the evolution of Relationship Management (RM), which started at the begging of the 80s years in response to the difficulty of selling products in the matured market. Actually, the traditional target marketing was not so gratifying under these market circumstances because enterprises were not more able to cultivate new customers. At this point, the firms understood that the only way to survive was to product fitting the customers' needs. After the adoption of the RM, the technology developed fast and it was consequently embedded by the concept of RM which consequently became "Customer Relationship Management" in the 90s. That is why, the CRM is commonly known as the union of information technology with marketing (Satoshi, 2006).

After its spread, CRM has been defined in several ways, such as a business philosophy, a business strategy, a business process, or a technological tool (Rababah et al., 2011). The first definition underlines that CRM looks at the relationship and retention of both customer and customer value through process management (Ryals & Knox, 2001). The second definition, instead, emphasizes the goal of CRM to increase customer satisfaction and loyalty by offering a customized and responsive product to it (Croteau & Li, 2003). Regarding the business process, Customer Relationship management is definable as a macro process that integrates several sub-processes, as the identification of potential customers and the creation of the knowledge of the customers (Srivastava et al., 1999). The last definition identifies CRM as a technology enabling to achieve a closer relationship with the customers (Hsieh, 2009). This chapter will focused on the last definition, identifying the CRM as a technological tool for getting closer to the final customers.

Going deeply through its definition, the CRM is a tool that *identify prospects, and then process, analyzes and retains customers* (Khlif, 2021). In this way, it guarantees a personalized follow-up, offering a customized product. In this way, the consumer is placed at the center of the company's business, guaranteeing him a product that meets his needs and purchasing habits.

8.4.1. CRM types

There are usually three kinds of CRM Systems: analytic CRM, operational CRM and collaborative CRM (Charoensukmongkol & Sasatanun, 2017).

Analytical CRM

Analytical CRM is concerned with back-office activities and allows the firm to make integrative decisions from data, being aware of the customers' behavior, and forecasting their future purchases. The Analytical CRM arrange customers' information and organizes them in a specific repository, moreover it provides personalized interactions with customers for getting better the relationship with them and potential customers. At the same time, it plans the financial prevision with the metrics analysis of the activities using specific dashboards. Consequently, CRM provides decision makers and managers with tools to monitor the performance of marketing, sales or customer services department (Khlif, 2021).

Operational CRM

Operational CRM focus relates to the daily management of the relationship with the customer, using all points of contact (remote contact center by telephone or internet, salesforce tools). Thanks to it, the management can monitor the different channels of interaction between the company and its customers by synchronizing information for marketing, sales, and all services. In this way, CRM systems help automate the firm's activity, and it allows having better processes offering better sales experiences to its consumers.

Collaborative CRM

Collaborative CRM is the collaboration between one or more value chain actors (e.g. suppliers, partners, customers and further external factors such as e-markets); it facilitates the intelligent relationship within the firms by integrating the communication between the departments such as logistics, finance and distribution.

8.4.2. Components of CRM

Customer relationship Management tools are composed by different parts: marketing automation capabilities, sales force automation tools, lead management, contact center automation, location-based services, human resource management, which we will analyze deeply in this section.

Marketing Automation Capabilities and Lead Management

The marketing automation can be defined as a technology leveraged to improve the effectiveness and the efficiency of marketing operations via automated, personalized and analytical-driven activities (Mero et al., 2020). Thus, it consists on the appliance of software and tactics to automate marketing processes, such as customer data integration, customer segmentation, and campaign management (Todoor, 2016). The main components of CRM platforms are: lead management, campaign management, email marketing and progressive profile and dynamic Content. Regarding the first point, it relates to the track and the management of prospective customers. Moreover, it generally follows these steps:

- *Lead generation:* During this step, the company creates consumer interest in its products and then performs market analysis with appropriate marketing services. Contextually, the firm put in place several advertising campaigns as white papers, advertisement in social media, and advertising blogs.
- *customer inquiry and capure*, which happens when the consumer replies to the advertisements, and they data are recorded.
- *Filtering, ranking, distribution, and contact*, which happens when lead are ordered by the validity of the request, prioritized based on likelihood of becoming a customer, distributed to sales representatives to be contacted.

- *Leads nurturing*, which means that leads are classified by contacted or uncontacted and scheduled for follow-up processes. During this phase, the enterprise can decide to contact directly the customer or to put follow-up campaigns.

Contact center automation

Contact center automation means to get front office functions automatic. Enterprises implement this function in order to improve the efficiency of the processes, the customers' experience and give them ways to self-serve. There are many activities to automate the contact center function such as the automatic speech recognition (ASR), the automatic voice response (IVR), chatbots and automatic listening, statistical machine learning, deep learning neural networks. The first two instruments enable to have an automatic recognition of the customer's voice: in this way, the firm can apply a customized response to his request. The chatbots and automatic listening are tools implemented by the firm in order to get standard assistance to consumers. Additionally, statistical machine learning are used to continuously improves systems by using algorithms to extract interaction data to identify patterns in associate activity, solutions, and customer feedback from each interaction. Finally, deep learning neural networks make machine learning similar to human one. They are starting to be employed in the contact center to rank, learn from, and make better conversations with consumers, but also with associates and the systems, they work with.

Location-based services

Location-based services (LBS) allow companies to know the position of customers. The location of the customer is the most important information because it enables the firm to choose and filter information considering the customer in the reality (Álvarez et al., 2002). Nowadays, companies are adopting location-based services to exploit information about location of the customer in order to provide a personal service, and therefore is key information to help CRM processes satisfy customer needs. Thus, the technology LBS is any technology depending on real-time location tracking to function. In this way, the application is continuously monitoring both the physical and geographical location. A few example of these technologies are GPS, Wi-Fi, QR-Codes and RFID.

Human resource management

Human resources are a fundamental asset for the firm's reality because they recruit and select employees, they calculate the compensation and eventual reward programs, and they calculate the performance of the employees taking in account into employee's skills. Hence, CRM systems have also to consider the HR aspect of the firm. In this way, it appears improper to define CRM focused only on the customer care, because it also manages the HR aspect. This approach is called Employee Resource Management (ERM) and it consists on a specific process, which fills the gap between a company and its employees to create an emotional and professional bonding among them. The common aspects of ERM are profile management, payment/compensation, training, leave management, meeting and certifications, generate online letters and data, online alerts, export/import facility. Profile management is the part for managing the all employees' profiles and it contains information, which are currently exposed in the HRIS tool. Payment/compensation reports the payroll details, and the salary statements. Training part contains manual training and allow employees following courses online. Meeting and certifications permit managers and employees to organize meeting or to book available meeting rooms; the system automatically sends an email to them for remembering the planned meeting. Leave management function is a dedicated portal to apply or notify for their leaves; at the time of the application, the manager is automatically informed, and he can decide to accept or reject it. Generate online letters and data allow writing offer letter or response letter to the new joined employees; in this way, employees do not have to insert their data again in the system. Online alerts are implemented any time an employee has something to do (e.g.

complete a survey, renew any software license). Export/import facility means the fact that each employee can easily import or export any sort of data available on the portal to and from excel sheets.

8.4.3. CRM Process

Customer relationship management has a specific process: it starts with data gathering and analysis of the arranged data, then the firm and implements marketing strategies. After all, the firm measures the performance of the process The first step is done through the implementation of technological appliances, which are directly interconnected with the CRM tools. The collected information are the base of the customers' relationships and they are used for analytical analysis.

The main analysis implemented by the firms is Online Analytical Processing (OLAP), Click stream Analysis and Personalization and Collaborative Filtering. OLAP means generating online reports, to analyze the result and submit a more detailed query in order to understand the result data. OLAP is focused on providing a set of data attribute from a specific database arranged around a certain dimension, such as location and time. In this way, the enterprise can have a detailed report about the sales for a specific product in a specific location. Clickstream analyses are related to the customer's footprint data such as how long the customer has been on the website, what did he visit, and when he returned. Related to this analysis can be the monitoring of the duration of a product on the cart to understand the attractiveness of the company's products. The last strategy consists of personalized communications in order to convince them that the firm knows them thanks to their information, which the company often uses thanks to the customer's explicit permission. For example, the enterprises can suggest adding another product based on his interest and tastes.

8.4.4. Advantages of CRM

The use of CRM systems by firms can empower the relationship with the customers. Actually, it has several positive effects: a better knowledge of the customers and efficient segmentation of them, better customer retention and forecast of their needs, better and speedier communication, and better data protection. The sales department has all the information contacts of customers and their tastes using CRM tools in this way it can easily create customized communication for them. Moreover, it can also save all activities, projects, sales, emails, invoices, orders, contacts and requests of each customer. The implementation of CRM allows sales department segmenting consumers with different criteria as their location, sex, age, in order to plan specific marketing strategies for each segments. In fact, CRM tools have standard communication models to send to costumers filling with their personal data available on the CRM systems. The free access to this information and the purchases chronologies allow the firm to forecast customer needs and plan a special offer for them. Finally, it is not to forget that CRM tools embody GDPR functions, which can help the company to obtain and document its contacts' permission; to store and use their data (consents); to send automatic notifications to all new contacts informing them that the firm wishes to archive their data manage their subscription; to email communication preferences and even set rules to update personal details for contact groups. Consequently, the firm will be compliant with GDPR rules and will loyal the trust of its clients.

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9. DIGITAL BUSINESS ECOSYSTEMS

Learning objectives

After reading this chapter, you will able to:

- Develop the infrastructure of digital business ecosystem
- Find out the competitiveness and benefits of digital business ecosystem
- Investigate the experience of some institutions of digital business ecosystems
- Describe digital platforms and areas of operation of digital business ecosystems
- Consider digital business ecosystems through the prism of different realities
- Visualize digital business of augmented reality space
- Identify innovative changes in ecosystem enterprises in the context of digitalization

9.1. Introduction to the features of digital business ecosystem

Digital business ecosystem, which is characterized by network interconnections and interactions in the future, will have synergetic effects for digital business. Digital business ecosystem is the key to the success of the effective functioning of digital entrepreneurship, as it allows through network interactions to respond quickly to overcome socio-economic challenges in terms of innovation. Digital transformation of business and its systematic modernization lays the foundation for the formation and development of Industry 5.0 on the basis of digital ecosystem of entrepreneurship. The logic of structuring this section is aimed at presenting the features of digital business ecosystem, in particular using some visual representation. During the study of this section, students will be able to get acquainted with the features of the infrastructure elements and components of digital business ecosystem, the operation of digital platforms, areas of ecosystem functionality (Value Chain, Innovators, Incubation, Experience and Testing). In addition, the section presents the structure of the ecosystem, identifies its competitive conditions, and points out the advantages. The material of the section gives an idea of the content and features of the functioning of such organizations of digital business ecosystem as: Key Enabling Technologies Technology Centers, European Institute of Technology, Digital Innovation Hubs, Factories of the Future, Joint Research Center. As a result of studying this topic, students will get acquainted with the visualization of digital business ecosystem through the prism of augmented and virtual reality.

9.2. Digital business ecosystem infrastructure

9.2.1. Digital business ecosystem

Recent changes in the economy and society cause adequate changes in world economy. Today's economic concepts and categories are being replaced by new ones, which can be generalized as the emergence of a new economy in the world – digital with its specific definitions, laws, models of world development, economic development as a science, as an industry gaining momentum in history (Koliadenko, 2016). In the 21st century, the interest of scientists and economists in the formation and development of digital business ecosystems has grown significantly in economic research. After all, they provide real opportunities for economic growth. The development of "digital" infrastructure and digital business ecosystem is a matter of harmonization of initiatives and development programs of 3 levels: telecommunications infrastructure, data management, services and digital skills. Focus and resources at one level or

another are determined by the priorities of digital ecosystem. Thus, the regulator is a tool for harmonization and development of digital ecosystem (*Digital Agenda of Ukraine – 2020*, 2020).

Digital infrastructure, like the data, creates the conditions and forms the ecosystem for the development of digital innovations. A broader view of infrastructure indicates the need for development, in particular, the so-called analog innovation infrastructure, such as clusters. Clusters combine several important elements of the ecosystem – R&D centers, laboratories, incubators, accelerators, schools, venture funds, innovation teams, technology business, and industry (Shtepa et. al., 2021). One of the cluster options is intersectoral alliances. In addition, digital age is changing the approach to doing business, as well as the requirements for the information technology used: marketing management systems, sales and service; telephony and messengers; document management and personnel management systems; accounting systems and many other enterprise applications.

Digital business ecosystem is a network of organizations, including suppliers, distributors, consumers, competitors, government agencies, etc., that are involved in producing a particular product or service through both competition and collaboration. Digital business ecosystem is a set of own or partner services united around a number of companies (Senyo et. al., 2019[a]). The ecosystem can be centered around several areas of the client's life or penetrate into several of them at once. Digital business ecosystem is not a monolith and not a set of identical business units (Adner, 2017). The idea is that each business participant in digital ecosystem influences and is influenced by others, developing relationships that are constantly evolving and have synergistic effects from cooperation. Digital business ecosystem is not possible without the synergy of the state, business and research environment. It is aimed at collective action in the field of knowledge flows, support for technological development and commercialization of innovations (Senyo et. al., 2019[b]).

Ecosystems are forms of collaboration in which companies combine their individual offerings into integrated solutions that are ready to satisfy the consumer (Adner, 2006). Digital ecosystem can also be considered as a dynamic set of organizations and institutions, a mobile set of their multidimensional internal connections (Bramwell, 2012). An ecosystem is a system of energy exchange and mutually beneficial connections between its members.

It is believed that the ecosystem is also some territorial communities aimed at collective action in the field of creating flows of knowledge, supporting technological development and commercialization of innovations (*Entrepreneurial ecosystems around the globe and company growth dynamics*, 2013). An ecosystem can be understood as a networked community, whose members combine their resources on mutually beneficial principles for the joint achievement of innovative results (Chessell, 2008). That is, digital business ecosystem is a dynamic and adaptive "organism" that creates, consumes and transforms knowledge and innovative and digital products/services. Relationships in digital business ecosystem must be flexible and transparent, and participants must be quickly adaptable to challenges and changes to survive as in a biological ecosystem.

Digital business ecosystems create strong barriers to entry into the industry. Non-digital business ecosystems must compete with a whole system of independent, but complementary, in the process of implementing business projects, each other's enterprises and suppliers, forming a network with strong digital interconnections. As part of business ecosystem, digital enterprise can apply the mechanisms of technology use, excellence in research and business competence, and effective competition against non-ecosystem companies. Goals of the business ecosystem also include:

- promoting new cooperation to address social and environmental challenges;
- use of creativity and innovation to reduce production costs or allow ecosystem members to reach new customers;
- acceleration, on the basis of deep digitalization, of the educational process for effective cooperation and exchange of ideas, skills, experience and knowledge;
- creating new ways to meet basic human needs and desires.

It is for these reasons that in today's fast-paced business world, companies are joining digital business ecosystems.

Digital business ecosystem with its infrastructure is able to guarantee maximum efficiency of investment in innovative-digital projects and encourage innovators to produce innovative products and digital services (Holubka et. al., 2019). Digital entrepreneurship in the business ecosystem combines both organizational and technological innovations and involves the use of IT based on internal and corporate information networks.

The ecosystem allows the introduction of incentives to modernize, scale and accelerate business development. Digital infrastructure resources enable businesses and citizens to consume and use information and communication and digital technologies. The ecosystem, in turn, makes digital technologies quickly available, increases economic activity, creates jobs, increases tax revenues and domestic demand, simplifies the modernization of obsolete assets and creates new ones. The ecosystem is a digital organization based on a technology platform that allows in real time on the basis of big data to form the best offer for the customer by connecting external providers.

The issue of considering possible support for the development of innovation ecosystems in cities (innovation/technology hubs, centers, parks, clusters, etc.), innovation policy of municipalities and stimulating the involvement of citizens in the development of urban smart city solutions (startup movement and living laboratories). Author's presentation of digital business ecosystem with its infrastructural elements and innovation-digital development institutions is presented in Figure 9. 1. The subjects of digital business ecosystem are all participants involved in the process of creating innovations (students, universities, entrepreneurs, professionals, private investors, organizations, research centers, investors, foundations, companies).

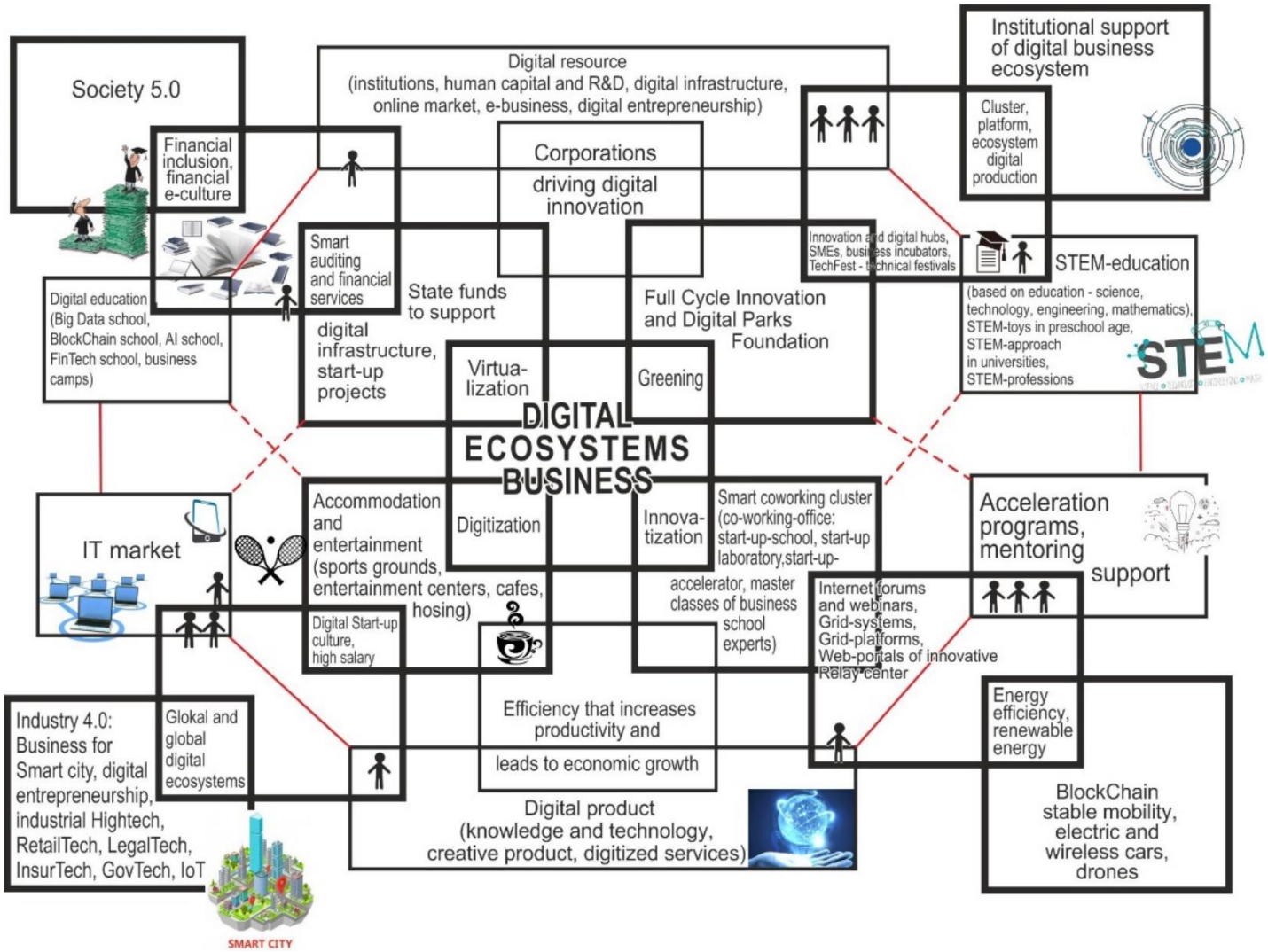

Figure 9.1. Digital ecosystem and its scientific-educational, technical-technological, social-ecological, innovation-entrepreneurial structural components

Source: authors' development.

Figure 9.1 shows a conditional visualization of some digital business ecosystem. Each individual square represents technological, educational, innovative, financial, technical, marketing, etc. structural component of business ecosystem. Since they are all in a close constant relationship, they result in the products of their interaction. These interaction products/services within business ecosystem are represented at the intersection of squares. Dark lines show close interaction, light lines – weaker cooperation.

Explaining the meaning of Figure 9.1, it should be noted that digital business ecosystem is based on five key components, such as:

- Science, engineering and technical communities, institutions of higher education, which play the role of major suppliers of innovative ideas for commercialization;
- Digital infrastructure that ensures the functioning of innovative companies, the implementation of digital entrepreneurship. It can be both tangible (technology parks, business incubators, development institutes, etc.) and intangible (a variety of services specifically tailored to the needs and specifics of innovative companies, e-business (Adner, 2017; Leong et. al., 2016), such as intellectual property protection services, on the introduction and promotion of innovative and digital product/service in foreign markets);
- The venture capital industry, which provides the attraction of financial resources and business competence in digital ecosystem, necessary for the formation of innovative companies and their transformation into full-fledged digital business structures;
- Steady demand for high-tech products, technologies and startups (primarily the demand of big business and other real sector companies for high-tech products, technologies, as well as innovative companies together with all their developments and intellectual property (as promising objects for acquisition);
- Legislative legal field (Stanley & Briscoe, 2010), which provides comfortable conditions for innovators and researchers.

Main goals of digital ecosystem, which we clearly show in Figure 1, are accelerated growth, modernization and improvement of competitiveness of key sectors of national economy, growth of new segments through better preparation for digitalization, perception of innovation, new business models. It would be most productive to consider digitalization as the introduction of business processes and methods that allow organizations to effectively compete with competitors in an increasingly digital world. Figure 9.1 shows how we visually present the infrastructure of digital ecosystem, under the influence of open innovation, service prices, digital entrepreneurship, access to broadband Internet, takes the form of a chain of type:

"Developers-Owners-Providers-Advertisers-Regulators-Users".

In addition, author's vision and understanding of digital business ecosystem is presented through the following components, namely: cluster, platform, ecosystem digitized production; a full-cycle foundation for innovation and digital parks; digital coworking cluster (co-working-office: start-up-school, start-up laboratory, start-up-accelerator, master classes of business school experts); STEM education; digital education (Big Data school, Blockchain school, AI school, FinTech school (Leong et. al., 2017), business camps); Industry 4.0: business for Smart city, digital enterprise, industrial Hightech, RetailTech, LegalTech, InsurTech, GovTech, IoT.

The functioning of the ecosystem is ensured by the availability of innovation and digital resources (institutions, human capital and R&D, digital infrastructure, digital market, digital business), stable mobility, mentoring, acceleration programs and results in an innovative product and digital service (knowledge and technology, creative product). Under the conditions of an effectively functioning digital business ecosystem, we can trace the acquisition by national economies of all the features of circular, blue, green, digital, platform, sharing and innovation economies.

When studying the institutions of digital business ecosystem development, one should not ignore hackathons, which are modern forms of virtual-real meetings. Hackathons are held as virtual events-meetings, during which a large number of innovators in the field of software development work intensively and cohesively to solve a current problem or create a new application or service. Hackathons last from one day to a week. Groups from representatives

of research, design, production divisions of innovation and digital enterprises from other branches of science and technology are involved in hackathons.

For the purpose of high-quality functioning of digital business ecosystem, it is necessary to realize effective start of accelerators of industrial hi-tech, to develop X.0 Centers, to involve venture funds, grants, to carry out timely audit of ecosystem for the purpose of timely monitoring of quality of work of digital business ecosystem.

Today, due to the need for managers of institutions and organizations to have access to Internet always and everywhere (the concept of Access Anytime and Anywhere), wireless networks have been developed. Today, there is the emergence of Internet of Things – an ecosystem of billions (and by some estimates trillions) of autonomous devices that interact with each other: sensors, controllers, robots, appliances, cars, machines and more.

In the near future, we are looking at what is called 5G, i.e., a set of organically integrated radio access technologies. We are on the verge of an incredible revolution that will change the business world forever. In this new world, every controller, every device, no matter where they are, will share information in real time. Over the next 10 years, managerial and business technologies and innovations will undergo more changes than over the last 100 years (Kraus & Kraus, 2018; Levchynskii, 2018).

Partner, technology ecosystems include hundreds of developers from around the world – from large and well-known companies, as well as innovative startups and system integrators at regional level. Digital business ecosystems form coordination centers, where universities and companies that form clusters meet in the framework of innovative cooperation (Figure 1). By working with small and medium-sized businesses and startups, investors have the opportunity to eliminate inaccuracies that occur in projects. In the course of the functioning of the ecosystem, identify and inform the government about the "bottlenecks" that exist in the legislation of the country in which the ecosystem operates.

9.1.2. Competitiveness conditions and advantages of digital business ecosystem

Digital business ecosystem can quickly achieve a synergistic effect by combining private, regional, European and national sources of funding. In the future, it is worth carefully, reasonably considering the quality application of the latest basic conditions and investment tools and mechanisms to strengthen the existing digital business ecosystems. Work and functioning in the ecosystem can take place in a startup school, digital business incubator, intellectual property center, and be presented, for example, at the events "Festival of innovation and digital projects" or "Startup Fights" (Figure 9.1).

Among the benefits of digital business ecosystem may be:

- Large resource base – the flow of students, graduates, graduate students and scientists with engineering education, as well as in other technological areas;
- Scientific-technical and digital infrastructural support of innovators by departments;
- Opportunities to create startups in various scientific and technical fields and in industry (and not only in IT);
- The possibility of developing new leading and breakthrough markets for digital goods/services;
- The work of foreign trade missions, which act as a multiplier of EU efforts and exponentially increase the combined efforts of digital business ecosystems;
- High level of management of innovation and digital projects;
- Development of full-scale demonstration projects;
- The possibility of transition to the sixth and seventh technological structure of the economy;
- Organization of an international trade mission;
- The possibility of strengthening cooperation between industrial enterprises, research organizations in the course of achieving synergy;
- A unique method of growing startups and innovations.

Partnerships of high-tech companies with innovation and entrepreneurship universities in digital ecosystem should take the form of innovation and be extended to all categories of education workers and training providers, taking into account advanced training. Close collaboration between existing companies and startups provides opportunities to effectively combine the resources of large companies with creative innovators and the flexibility of innovative startups.

Conditions for the competitiveness of digital business ecosystem can be considered:

- Corporate startup cooperation;
- Targeted funding of innovations;
- Coordinated cooperation between e-government and society and their full involvement in the effective operation of digital business ecosystem;
- Support for entrepreneurial talent and gender equality;
- Digital compatibility of business entities;
- Harmonization of legislation and standards.

A well-functioning digital business ecosystem is a seamless process that requires flexible thinking and the creation of an organizational structure that will enable businesses to engage in digital trends, solutions and digital skills at all times. Digital business ecosystem digital solutions strategy is focused on digital products/services with the addition of information that provides new value to customers. Working with information in digital business ecosystem can be represented by a chain such as: *"Search-retrieval-recognition-analysis-filtering-enrichment-constructing information-application"*.

Strategy of digital solutions of business ecosystem stimulates the introduction of diversified digital products/services into integrated solutions. At the same time, these products/services themselves are being improved due to the accumulation of information and experience, which allows to solve customer problems quickly and efficiently. Over time, digital solutions can transform business model in such a way that main revenues will bring unprecedented sales and value proposals. They are the most effective way to provide a regular income.

9.2.3. Experience of some institutions of digital business ecosystems

In countries with developed innovation and digital sphere, small and medium-sized businesses are increasingly involved as a structural component of ecosystems of universities, institutes, research centers, literally "sticking" them to jointly develop advanced technologies (this is one of the embryonic forms of sharing economy, i.e., economies of sharing, use, participation), which are then transferred to large business.

Global innovation centers in Silicon Valley, New York and London continue to accumulate global venture capital, talent and digital innovation. In turn, countries and cities that focus on innovation and digital development create exclusive conditions for the introduction of start-up ecosystems. Corporations are moving to open innovation platforms, learning to develop new solutions not within a single company, but by turning to a society of global talent. Foreign investors are increasingly inclined to choose target teams with creative ideas and support potential opportunities instead of detailed business plans.

Modern government agencies in different countries are focused on simultaneously improving the quality of services, optimizing the number of employees and reducing costs. Digital platforms (ERP, CRM) systems and digital business ecosystems allow to solve these tasks and dramatically increase efficiency, reducing the cost of activity and execution time. Government agencies use digital platforms to simplify and optimize internal processes, improve interaction with citizens and reduce costs (*Digital Agenda of Ukraine – 2020*, 2020). The cost of access to digital infrastructure depends on both the level of income and the development of digital infrastructure, as well as on territorial features (mentality, traditions, norms of behavior and prohibitions). Theoretically, the cost of access should reflect the balance between supply and demand in the Internet services market, respectively, changing consistently with changes in other indicators, but this is not always the case.

The general pattern of projects implemented by digital business ecosystems is consumer-oriented and comprehensive use of information as a driving resource, taking into account the specific features of a particular consumer in a particular place, and global use of digital transformation technologies of real business processes. For these reasons, digital projects produced by the ecosystem are characterized by very specific circumstances of their implementation in a particular place and only with the accumulation of economically positive results can become the subject of standardization and other regulations. One of the features of building a tree of goals of digital transformations is the implementation, maturity of opportunities and their completeness at the present stage of certain digital projects and accounting for risks in their implementation. Digital teams of business ecosystem should focus on three key functional activities, namely: to develop a digital strategy, manage digital activities through their national companies, as well as turn their digital performance into an operational advantage (Kupriianovskii et. al., 2017).

Collaboration in the field of startups is increasingly seen as an attractive option, as small companies that produce them have the maneuverability to move dynamically, quickly adapting to new market trends and requirements. In addition to attracting talented young people, the latest technologies and creative ideas, the starts are usually free from the infrastructure, culture and regulatory burden of large companies.

The main reasons a startup may need a partnership are gaining access to a wider customer base and benefiting from the resources and brand of a large corporation. A well-planned exit strategy helps to maximize the benefits to both parties. Strategic alliances with other major market players are another potential model, although many companies face difficulties due to cultural differences, income sharing disputes, and conflicts over future business. The general characteristics and features of the functioning of some organizations on issues of digital development are presented in Table 9.1.

Table 9.1. Some organizations of digital business ecosystem

Institute of Innovation and Digital Development	***Content, features of functioning and general characteristics***
Key Enabling Technologies Technology Centres	help industrial enterprises, including small and medium-sized businesses, to develop and produce new products based on technologies that include micro- and nanoelectronics, nanotechnology, industrial biotechnology, modern materials, photonics and advanced manufacturing technologies used in various industries. Such centers carry out applied research, helping companies reduce the time required to implement innovative ideas and enter the market. The services provided by the centers may include: access to technical expertise and means of verification; laboratory testing; development and testing of prototypes; pilot production and demonstration/pilot lines; product verification/certification.
Factories of the Future	created by applying the mechanism of public-private partnership in order to increase the technological potential of production. More than € 100 million has been invested in the pilot lines under Horizon 2020.
European Institute of Technology	supports the development of partnerships between leading universities, research laboratories and companies within the EU. Among main areas of activity of the institute: climate change, digital products, innovations in the field of energy and extraction of raw materials.
Digital Innovation Hubs	non-profit complexes that support companies, including SMEs, in their quest to digitize their activities. In a notice on digitalization of European industry adopted in April 2016, the EC announced plans to invest € 500 million from Horizon 2020 (2016-2020) in the development of digital innovation hubs, their networking and innovation experiments for SMEs. Thanks to such centers, it has become possible to gain access to knowledge and testing tools for companies from various industries focused on digitalization. On the basis of such centers there is a technological organization or university laboratory that offers a variety of services (experiments with smart technologies, such as artificial

	intelligence, supercomputers, blockchain, 3D printing) to understand new opportunities, learning to make the most of digital innovations (expansion of partnerships, exchange of training programs and materials).
Joint Research Centre	whose activities are aimed at attracting researchers working in the fields of nuclear and chemical research, biological and physical sciences, as well as ICT.

Source: compiled by authors based on sources (EU SCIENCE HUB, 2021; European Institute of Innovation and Technology, 2021; Proposal for a Decision of the European parliament, 2016)).

9.3. Ecosystem enterprises in the conditions of digitalization

9.3.1. Digital platforms and areas of operation of digital business ecosystems

Platforms and clusters play a leading role in creating digital business ecosystems. Among the key characteristics of digital platforms of the business ecosystem are the following: Network structure, network effect; Resource creation (1 + 1 = 3); Domestic currency, tokenization (one of the areas in the future); "Win-win-win-win" – manufacturer – seller – buyer – platform owner; Digital twin – operation in two economic formats (virtual and analog); Scaling platform – Internet; Data capitalization, data – resource.

In addition, digital platforms encourage industrial transformations on the ground, offering solutions for system upgrades, opportunities to experiment and scale innovations. SMEs working in digital ecosystems are more innovative in terms of innovation, register more patents and create more new jobs than when they operate outside clusters and platforms. Figure 1 shows a fairly detailed picture and explains how at the output we receive innovative products and digital services or do not have them (and accordingly they are replaced by imports). Thus, during the operation of digital business ecosystem, we observe the passage of several zones, namely:

- Value Chain area (innovation cycle management). It consists of actors who play the role of enablers & policy makers. Their mission is to manage the challenges and gaps that arise at different stages of the innovation cycle and at different levels, from national to sectoral. Typically, these are a variety of digital clusters and associations, development, innovation and investment agencies;
- Zone of innovators. It includes institutions that typically generate innovation (Table 1). We are talking about innovation and entrepreneurship universities, their research laboratories, design offices of large companies, research institutes or startups;
- Incubation zone, as includes organizations that create opportunities for incubation and acceleration of innovators. This is a fairly simple area to understand, but a relatively complex and unusual area for industrial entities. We are talking about incubators, accelerators, the presence of business angels (Figure 1), various funds, donor institutions, because without this type of organization, it is impossible to further move the innovative idea to the prototype;
- An area of experience and testing that contains elements that allow innovations to be tested for viability. This area is final one for rapid testing and innovation in the market. There is a big difference between industrial markets and B2C (consumer). For these reasons, there should be organizations in this area that promote faster testing, testing and certification (if necessary) of new innovative products and solutions (*Landscape Industry 4.0 in Ukraine*, 2019).

Production networks represented by the industrial core in digital ecosystem of economic entities with different functions, competencies and resources are interested in cooperation and joint creation of various values. Cooperation in the cultivation of innovations may include the joint production and active management of intangible assets.

Digitalization is a significant factor in technological evolution of business ecosystem, which allows manufacturers to overcome territorial constraints, reduce transaction costs of decision-making and agreements, allows to develop new business models based on network effects, involve consumers in the process of creating goods (Babkina, 2017).

Working within digital business ecosystem allows you to achieve:

- Success in digital entrepreneurship through a synergistic effect, combining the capabilities of partners;
- Reduction of transaction costs due to the refusal of intermediary services;
- Opportunities to combine the needs of the corporation with the capabilities of people outside it;
- Acceleration of digitalization and innovation of the economy.

In addition, the presence of spatial coherence in digital business ecosystem allows: to bring together novators and innovators from different fields of knowledge in order to identify the competitive advantages and disadvantages of individual countries and to develop ideas and strategies for digital development; "build" effective business interaction.

At present, in the course of the formation of digital business ecosystems in most countries, the issues for urgent solution remain in the part of:

- Creation of a new quality of ecosystem of interaction of citizens with social programs, services and information necessary for the choice of services;
- Creation of regional innovation and digital networks and intensification of international cooperation. As cities do not have sufficient capacity and experience to implement smart solutions, they can team up with others with similar difficulties, as well as with technology partners to develop, implement and apply them, as well as share experiences and search financing;
- Creation of a high-quality ecosystem of interaction of social services, departments, non-governmental organizations, service providers for joint concerted actions to meet the needs of citizens;
- Formation of consortia and expansion of the mechanism of public-private partnership for the introduction of new technologies;
- Creation of urban innovation centers and "living" laboratories for digital business ecosystem. Innovation centers and laboratories can become platforms for demonstrating new ideas and concepts. "Live" laboratories (a place for innovative experiments) will allow experiments and can be used to test, develop and disseminate innovations to build digital infrastructure.
- Creation of an innovative ecosystem of industrial high-tech, which provides for the implementation of the following development tasks: full independent audit of existing elements of the ecosystem, such as design bureaus, the system of higher education institutions, science parks, etc., with targets; their development to target model of the innovation ecosystem of industrial high-tech segments; setting up technology transfer from research institutions, science parks, R&D laboratories, as well as from international centers and corporations to end customers; creation of networks of the most effective structural elements of the "Industry 4.0" ecosystem – examination centers, R&D laboratories, technology parks, incubators and accelerators of Industry 4.0 startups, etc.; establishing cooperation with international standardization bodies in order to develop interoperability standards and other standardization measures necessary for the implementation of technologies related to digital infrastructure; attraction of investments and funds.

The formation of digital ecosystems is undergoing a transformation from a linear to a network model of value creation, which involves the transition:

- From the use of own resources to the coordination of others;
- From the emphasis on the quality of internal business processes to the improvement of external communications between users of the platform;
- From maximizing consumer value alone to the overall value of the entire digital ecosystem.

The content and general characteristics of the principles functioning of digital business ecosystems are presented in Table 9.2. In particular, the basic principles of forming digital business ecosystem include:

- The principle of decentralization and balance of interests (management of the digital business ecosystem is distributed among the state, key partners, venture investors, innovators);
- The principle of taking into account the innovation-digital potential (key areas of research are determined within the digital business ecosystem as a result of interaction of management parties, with 80% of resources focused on priority research areas with high commercialization potential);
- The principle of adaptability (activities aimed at developing industries attractive for commercialization);
- The principle of publicity and information transparency (the system is open to new participants with innovative ideas (no information asymmetry between participants and external parties; positive return on investment, high investment risk is offset by portfolio diversification);
- The principle of taking into account changes (provides for the need to study and use a problem-oriented approach in the development and implementation of innovations).

Table 9.2. Principles of functioning of digital business ecosystems

Principle	***General characteristics***
The principle of a systems approach	It is the introduction of a wide range of interrelated measures and tools for the development of digital entrepreneurship, which reinforce each other, will promote cooperation between different actors to achieve a common goal – to increase the level of quality services/goods.
The principle of ensuring the interaction of stakeholders	Is involved in the development of digital infrastructure of central and local authorities, private and public enterprises, leading TNCs, business associations, banking institutions, NGOs, educational and research institutions, as well as the population in order to realize the interests of the parties during development of such infrastructure.
The principle of scientificity	It is based on real opportunities and takes into account the specifics of the national economy using the world experience of digital business ecosystems.
The principle of strategic orientation	According to this principle, the actions of actors (both local government and business) involved in the process of building digital business ecosystems are aimed at achieving long-term development goals.
The principle of equal participation of all stakeholders	It involves establishing and maintaining a balance of interests between all stakeholders, which helps to achieve the effect of synergies in the interaction between the parties, development institutions, i.e., business agents of digital ecosystems.
The principle of focusing on market needs	It involves a thorough study of market needs and identify types of innovations that can meet the needs of consumers and ensure competitive advantage.
The principle of social responsibility	Provides effective and social benefits for the population and digital entrepreneurship. This principle must be followed when building a digital business ecosystem.
The principle of safety and control	It involves evaluating the results and analyzing the factors of implementation of smart technologies in the physical infrastructure. The principle is extremely important, given that any technology, as has been repeatedly stated, is associated with risk.

Source: (grouped by authors based on source (Markevych, 2021; Entrepreneurial ecosystems around the globe and company growth dynamics, 2013; Chessell, 2008)).

The positive expectations from the functioning of digital ecosystems include:

- Introduction of incentives and motives for modernization, scaling and accelerated development of digital business;
- Encouraging businesses and citizens to consume and use information and communication and digital technologies;
- Make digital infrastructures accessible;

- Increase economic activity, create new jobs, increase tax revenues and domestic demand, simplify the modernization of obsolete assets and create new ones.

Digital business ecosystems representing high-tech industries must pursue the goal of working "without borders", as this will allow to reach a critical mass in the specific sectoral innovation ecosystems of each country.

9.3.2. Digital business ecosystems through the prism of varieties of realities

Given current global challenges and provoked by the limitations of the COVID-19 pandemic around the world, there is a need for scientific analysis of the features of digital business ecosystem in the context of virtual and augmented realities, due to the fact that business is increasingly moving to an online format. In the course of our research, we also attempted to outline the content and distinguish between these new categories (Table 9.3). Today, these categories are often used by both economists-theorists and economists-practitioners, and not everyone fully understands the semantic and deep, significant differences between them.

Table 9.3. Functioning of digital business ecosystems through the prism of different realities

Types of reality	***Content and characteristics of reality***
Virtual reality	is based on the exchange of virtual goods within the online environment of digital business ecosystem. Virtual reality creates an opportunity to interact with the artificial world with the help of virtual digital platforms with the available information funds of the online innovation market and "numbers", the ability to work with cloud technologies.
Enriched reality	contactless information interaction, which realizes with the help of complex multimedia-operational business environments the illusion of direct entry and presence in real time in a stereoscopically represented "digital world".
Augmented reality	combining virtual and real spaces through hardware and software, telecommunications, computer networks, forming a digital infrastructure and business ecosystem.
Mixed reality	is formed by a combination of several and/or all of the above types of reality; means various innovation and digital projects, the action of which is aimed at complementing reality with any virtual elements on digital sharing platforms.

Source: (developed by the authors).

Virtualization reduces the initial capital cost of deploying the necessary digital ecosystem infrastructure through the use of cloud technologies and software-defined architecture. Virtual business space is gradually covering more and more segments of people's daily lives. Already today, Internet has become an indispensable tool for the implementation of numerous financial transactions, trade in various goods, exchange of scientific and technical achievements. Virtual reality has already demonstrated the ability to exert an unprecedented impact on people's consciousness, overcoming state, national, cultural, religious and other borders (Manzhura et. al., 2021[a]; Manzhura et. al., 2021[b]). World practice shows that the permanent staff of virtual innovative business structures is minimal. Virtual innovative business structures use the potential of both research institutes and, if necessary, industrial enterprises (often informally). That is, such business structures are engaged only in the promotion of ideas and the organization of their commercialization, giving all other functions to third-party institutions.

Thanks to digital technologies, the system of economic contracts is moving to an interactive mode, which is not based on market price signals, but on the direct connection of sellers and buyers of innovative products and digital services through web-sites. In an environment where production is increasingly industrialized and the manufacturer determines its parameters in direct cooperation with the consumer, traditional resellers are being replaced by digital and network platforms owned by Internet companies. By forming databases on the requests of numerous users and grouping them by preferences, these companies create an on-line institutional environment and develop various hubs, around which global innovation networks, digital business ecosystems are formed (Katukov et. al., 2012; Manzhura et. al., 2019).

Today, one of the tools that can quickly and effectively initiate the perception and search for innovation by both small and large business structures is the creation of on-line communities for the search and exchange of digital technologies. In most developed countries, either public portals of "open innovation" or portals of private venture enterprises already operate. Internet portals of "open innovations" maximize the information base of digital enterprises in the field of innovation and facilitate the search for the necessary information. After its analysis, assessment and possible non-compliance, the information goes to various decision-making units. It formulates and makes the necessary changes to short-term and long-term innovation plans of digital enterprises. In the end, a package of necessary innovations is formed, both internal and external, obtained through "open innovations" (Dzhazovskaia & Khokhlova, 2010; Manzhura et. al., 2020[a]).

9.3.3. Visualization of digital business space augmented reality

By analogy with the construction of the well-known Rubik's cube ("Magic Cube" by Hungarian sculptor Erno Rubik) (*Rubik's cube*, 2021), we tried to visualize, for better perception and understanding, some digital space that forms a new business economic augmented reality. From Figure 10.1 we see that the formation of an effectively functioning digital business ecosystem is possible under the conditions of achieving simultaneous harmonious relationships "science – business", "power – science", "power – business", "education – science", "education – power", "education – business" (obtaining a square of faces of a cube of one color). As a result, a special environment is formed – digital cubic space of new business economic augmented reality (Figure 10.2), which provides the implementation of innovative digital opportunities for communication, exchange of knowledge, ideas and experiences between government, universities and business through the use of digital computer technology in real time, space and laws of existence.

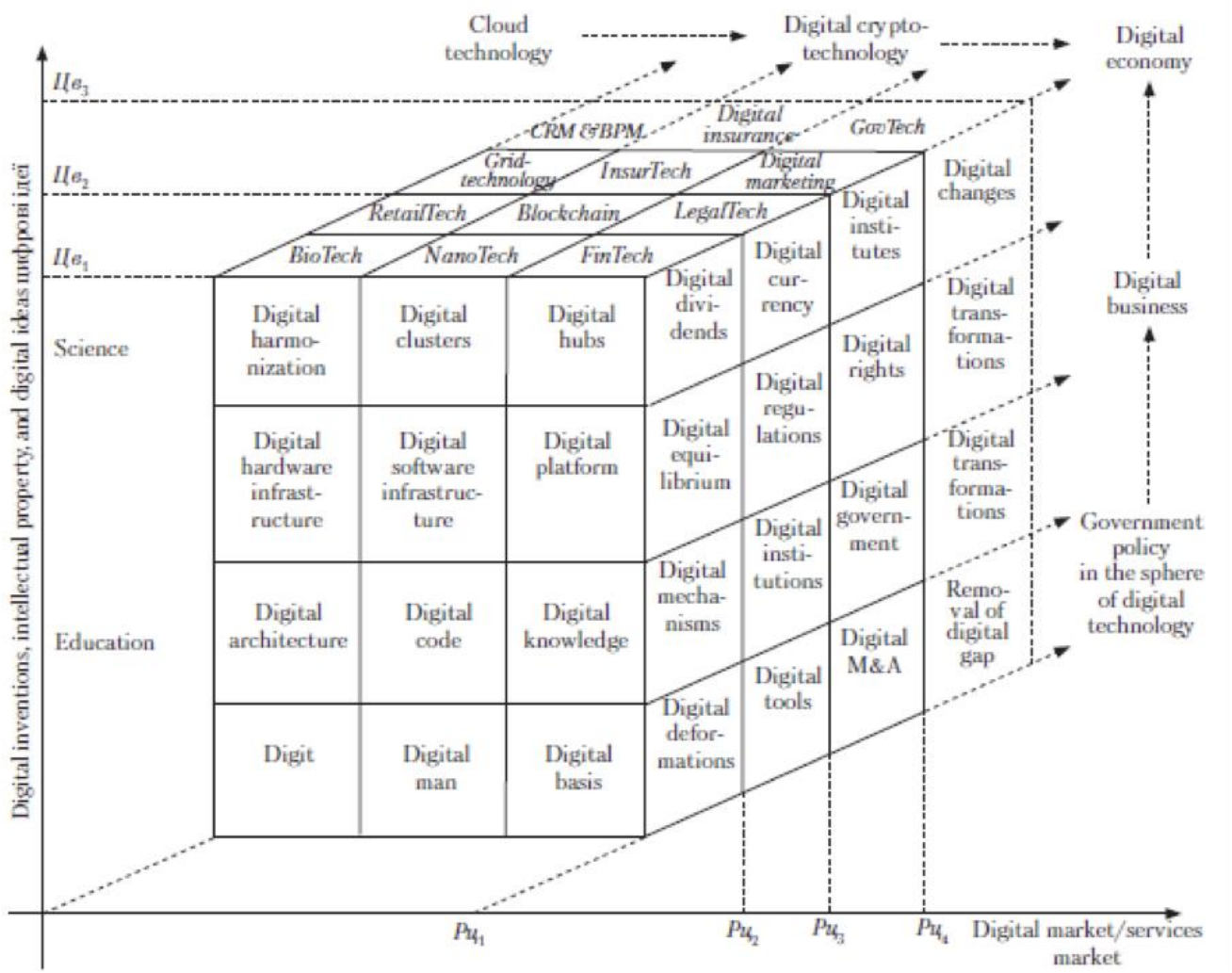

Figure 9.2. Digital cubic space, which forms a new business economic augmented reality

Source: (authors' development).

In Figure 9.2 on the horizontal axis of the point $Р_{ц1}$ reflects the initial state of digital products/services market before the emergence of the latest technologies used in education, business and government, and points $Р_{ц2}$, $Р_{ц3}$, $Р_{ц4}$ – changing the state of digital products/services market as a result of the introduction of digital critical and cloud technologies. Along the vertical axis on the graph is a point $Ц_{в1}$ demonstrates the initial number of inventions, open and patented ideas, while points $Ц_{в2}$, $Ц_{в3}$ – a growing number of digital discoveries, inventions and ideas in various sectors of the economy.

An effectively functioning digital business ecosystem is possible under the conditions of integrated application of software and IT solutions that will make education better and more interesting, living in cities – more comfortable, doing business – easier, and will bring the interaction of community and government to a qualitatively new level. Digital business ecosystem of new economic augmented reality is not a trend, but a way of development, progress and transition to a new level of civilization (Manzhura et. al., 2020[b]; Osetskyi et. al., 2020).

It is this space that contributes in every way to the creation and distribution of digital goods/services. At the same time, science and education are both generators of knowledge and innovative ideas, digital initiatives, the owner of intellectual property, in the commercialization of which are interested and actively involved both government (government support in the form of digitalization policy) and business (profit through Institute of Digital Market). It should be noted that for the full operation of digital environment, education requires constant systematic work on the stable functioning of digital system in the regions of the country based on effective interaction of major participants in digitalization and aimed at creating new areas of digital business, entrepreneurship.

Convergence with a blockchain connection enabled transforms the value chain. Autonomous robotics, AI, IoT and Blockchain will digitize logistics and distribution, reducing its importance and thus increasing the ability of companies to make a profit. Producers working in digital ecosystem will be able to get more value that they create, and consumers will be able to pay less. In the long run, technical deflation will curve the exponential curve, as much of 3D production, as well as virtual and augmented reality, make it cheap to design and allow you to print products at home. And it will also be a certain new technology, which in the future will be determined by economic benefits (Kupriianovskii, 2017).

Digital business ecosystem provides the necessary conditions for the implementation and operation of smart-innovations. The main components of digital business ecosystem are the following digital infrastructure elements:

- Applications (services, application software, data management);
- Data-centers (servers, data storage centers, data processing centers, redundancy);
- Information and communication networks (Internet, broadband networks, sensor networks, data networks, Wi-Fi);
- Information collection systems (sensors, gadgets, smart-video surveillance systems, terminals) (Maslov et. al., 2021).

The connection in digital ecosystem between “soft” and “hard” digital infrastructures and electronic business operations is due to hardware, software, telecommunications.

9.3.4. Innovative changes of ecosystem enterprises in the conditions of digitalization

Stages of transformation of digital technologies by businesses and enterprises operating in the ecosystem are presented in Table 9.4.

Table 9.4. Step-by-step transformation of digital technologies by an enterprise operating in an ecosystem based on the introduction of innovative changes

Stage of transformation	*Step-by-step characteristics of the stage*	*General ideas about the step-by-step course of digital technology transformation*	*Features of digital technology transformation*

I. Wave of transformation (2000–2010)	*Front office* 1. Mobile technologies 2. Digital marketing 3. Digital customer engagement	*Front office* – a group of departments or processes in the organization, responsible for direct work with the client, customers	1. The activity was focused on the front office and the quality of customer service. 2. Organizations sought digital opportunities through strategic acquisitions (e.g., startups). 3. Startups entered the market and played a significant role.
II. Wave of transformation (2011, completion is expected in 2022)	*Back office* 1. Digital transformation of the enterprise 2. Digital supply channel *Middle office* 1. Leading business models 2. Digital business strategy	*Back office* is a division of an organization that conducts business processes, increases productivity by optimizing workflows, and eliminating inefficient manual operations throughout the lifecycle of business processes. *Middle office* is a group of divisions or processes in a company that manages risks, calculates profits and losses and is responsible for information technology. The middle office attracts resources from both the front and back offices.	1. Digital focus only at front office does not provide a competitive advantage. 2. In order to implement a full-scale digital transformation, organizations are required to focus on restructuring operations that go beyond customer service. 3. Organizations will spend more on digital technology in middle office and back office than in front office.
	Omni-business	*Omni-business* is an approach whose principles are the integrity and consistency of the user experience	Its main advantage is that users are free to switch between information channels, such as mobile device, laptop, social networks and off-line store.

Source: (author's development)

During the implementation of the model of digital transformation, enterprises must take into account comprehensive adaptive capabilities that allow them to respond to inevitable changes. These opportunities provide resources to engage everyone structural layers in order to implement continuous improvement and implementation of innovations during the formation of digital entrepreneurship; be able to constantly adapt to changing customer needs and new opportunities in global digital market (Kupriianovskii et. al., 2017; Maslov et. al., 2019). Digital citizenship and digital entrepreneurship should be the expected result of the effective functioning of digital business ecosystem, which forms a new economic augmented reality.

The presence of web-site for digital enterprises provides the following opportunities:

- Customer service;
- Supply of innovative products and provision of digital services on-line;
- The ability of visitors to form orders for innovative products and digital services on-line;
- Monitoring the status of placed orders;
- Personalized information content of web-site for regular or repeat customers;
- Links to web-site of digital enterprises in social media;
- Announcement of open vacancies or submission of an application to fill vacancies on-line;
- Staff training and acquisition of digital competencies (Marchenko et. al., 2020; Marchenko et. al., 2021[a]).

Thus, digital age of society is changing the approach to entrepreneurship, requires the use of information technology and modern means of communication. Fundamental in building digital economic relations is the use of ICT and Internet by businesses to maximize automation and digitization of business processes within the enterprise and building relationships with other business representatives, consumers and government agencies through the use of modern ICT (Osetskyi et. al., 2021; *Proposal for a Decision of the European parliament*, 2016).

9.4. Conclusions

Digital business ecosystem is a set of organizational, structural and functional institutions and their relationships involved in the creation and application of scientific knowledge and technologies that determine legal, economic, organizational and social conditions of the innovation-digital process and ensure the development of digitalization and innovation both at the enterprise level and at the level of the region and the country as a whole on the principles of self-organization and synergy.

The clarity and detail of the relationship between the subjects of digital business ecosystem will have a positive effect on reducing uncertainty, information asymmetry and risks, improve the quality of project implementation, which will signal further joint activities. An effectively functioning digital business ecosystem will demonstrate the ability to interact for a set of other actors involved, the number of which will increase over time as investment projects increase. As a result, it should be noted that the ecosystem that uses "digital technologies" is called "digital", and the sphere that creates, implements and maintains them – "digital" industry. Digital entrepreneurship and the development of digital business ecosystem require titanic organizational, legislative efforts on the part of the state, but success can be achieved only by relying on the innovative and creative potential of e-business and digital individuals (*Digital Agenda of Ukraine – 2020*, 2020; Marchenko et. al., 2021b). We deeply believe that digital augmented reality business ecosystem is the driving force behind the competitiveness, innovation, productivity and brilliant economic growth of each country in global digital virtual-real environment.

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PART II

DIGITAL ENTREPRENEURSHIP PLANNING

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10. DEVELOPING SUCCESSFUL DIGITAL VENTURE: RESOURCES AND COMPETENCES ANALYSIS

Learning objectives

After reading this chapter, you will able to:

- Identify elements that characterize the digital entrepreneurial mindset;
- Identify how technological trends that contribute to the digital entrepreneurial mindset generate entrepreneurial opportunities in digital entrepreneurship;
- Identify and define the set of resources and skills to support the development of entrepreneurial opportunities in the digital context;
- Define and identify the main dynamic capabilities in the context of digital entrepreneurship.

10.1. The digital entrepreneurial mindset

Digital technologies are changing our lives and people are becoming more and more familiar with cloud services, augmented and virtual reality, artificial intelligence, blockchain and other similar services. In the same way, digital technologies are reshaping business (Nambisan et al., 2019) pushing entrepreneurs to adopt a digital entrepreneurial mindset that is impacted by five trends (Valacich & Schneider, 2018): (1) mobile computing, (2) cloud computing, (3) social media, (4) Internet of things and (5) big data.

The development of communication technologies in recent years has changed consumer behaviour and these changes have been accelerated by the Covid-19 pandemic emergence. So, entrepreneurs need to be aware about the need to adapt their business model in a new digital and responsive way, reacting quickly to the demand product innovation, providing added-value services, and improving the customer experience. In a world characterized by the progressive development of ever faster internet connections and by the proliferation of social media platforms, entrepreneurs are enabled to better connect with their customers engaging them in the development and launch of new products (Soltanifar and Smailhodžić, 2021). To catch these opportunities, digital mindset and analytic capabilities are becoming key competitive factors in the entrepreneurial activities.

To date, a unitary theory of entrepreneurship does not exit, and Scholars have essentially focused on: a) the detection and exploitation of entrepreneurial opportunities (Baron and Ward, 2004; Gaglio and Katz, 2001; Shane and Venkataraman, 2000), b) the nature and traits of entrepreneurs (Busenitz and Barney, 1997), and c) the decision-making process (Covin and Slevin, 1991; Lumpkin and Dess, 1996; Miller, 1983; Shapero and Sokol, 1982).

The concept of being an entrepreneur relates to the concepts of being entrepreneurial. In fact, part of the literature conceptualizes entrepreneurship orientation in term of proactiveness, innovativeness and risk-taking as three standard dimensions of entrepreneurial behaviour (Covin and Slevin, 1989; Lumpkin and Dess 1996; Covin and Lumpkin, 2011). So, being entrepreneurial involves the creation of value admitting the uncertainty deriving from the exploitation of opportunities (Soltanifar, 2016). In this sense, digitalization offers new business opportunities.

Often, to discuss about entrepreneurship overflows with the concept of entrepreneurial mindset. The concept of a mindset belongs to cognitive psychology and organisation theory. In the cognitive psychology literature, a mindset expresses the cognitive processes activated in

response to a given task or to specific information (French, 2016). So, it could be summarized in term of individual knowledge, including personal beliefs about the world. In organisation theory literature, a mindset is correlated with organisational change and the culture of an organisation (Gleeson, 2019).

In a more general way, the mindset of an entrepreneur is a product of histories, and it evolves through an interactive process guiding him/her in collecting and interpreting new information. From time to time, however, new events happen, and new data appears that could be inconsistent with the existing mindset. When this happens, entrepreneur either rejects the latest information or change his/her mindset. The mindset can change (Dweck and Yeager, 2019) but it depends as on the individual awareness about the current mindset as on the willingness to think and act in a new way.

To act in a digital business landscape also requires changes in the entrepreneurial mindset. For example, looking to a manufacturing company we can see as it is moving away from the traditional linear model of supply, manufacture and distribution towards a networked and connected model in which all data is stored in clouds and is accessible to the entire value chain at all times. In this scenario, as entrepreneurs as employees are enabled to observe and influence the whole supply chain process in real time. Such opportunities redefine the decision-making processes of entrepreneurs and making sense of the high volume of available data that has grown exponentially across supply chain. So, the digital entrepreneurial mindset can be defined as "… the inclination and ability to discover, evaluate and exploit opportunities while adopting digital technologies more quickly than a regular entrepreneur" (Soltanifar and Smailhodžić, 2021, p. 7).

In a clearer way, to implement a digital mindset should result in a business recognising and exploiting opportunities arising from phenomena such as (Soltanifar and Smailhodžić, 2021, p. 8):

1. Technological developments in infrastructure
2. Artificial intelligence used to enhance the quality of decisions through data driven strategies
3. Augmented reality used to broaden entrepreneurs' horizons
4. Cloud services
5. Borderless connections in exploiting emerging opportunities
6. The sale of digital products or services across electronic networks

10.2. Phenomena implementing the digital mindset in digital venture

Soltanifar and Smailhodžić (2021, p. 8) identified six phenomena to implement a digital mindset: technological developments in infrastructure, artificial intelligence, augmented reality, cloud services, borderless connections, the sale of digital products across electronic networks. These phenomena impact on traditional business models in differ ways (Tab. 10.1).

Table 10.1. Impacts of digital technology on traditional business models

Digital phenomena	Impact of technology
Technological developments in infrastructure	Reduction of consumption; improvement of the efficiency of tourist ecosystems; improving the efficiency of urban transport and air mobility; road congestion reduction and more efficient and environmentally friendly mobility; automate construction processes, data collection.
Artificial intelligence	AI-assisted; AI-supported; AI-driven
Augmented reality	Improvement of customer communication because of the visual aid; remote maintenance, repair and assistance; creative learning for employee training.
Cloud services	Increase services at short notice, reduce infrastructure costs and energy savings, upgrade reducing and maintenance costs
Borderless connections	Sharing information, opportunity to seize emerging opportunities, obtain money, the advantage of

	transparency, hedging of risks, expansion of potential customers
The sale of digital products across electronic networks	Recover or increase sales

Source: Author's elaboration

Below, we comment on six phenomena to implement a digital mindset and their impacts on traditional business models, separated into six sections.

Technological developments in infrastructure

The infrastructure sector is a key driver for the world economy that has important impacts on the business. Some cities more than others are progressing in technological developments of infrastructure (Nam and Pardo 2011; Benevolo et al. 2016; Polese et al. 2019; Botti and Monda 2020), such as building smart cities in Copenhagen, Berlin, Songdo, Santander, etc.

Technology is revolutionising virtually every aspect of infrastructure. New developments span all sectors but affect three segments mainly: energy, ground-based urban transportation and air mobility (Global Annual Review, PWC).

In the energy sector, companies use different technologies to connect with consumers. At the distribution level, sensors and related data analysis systems allow for remote fault prediction and maintenance, improve the supervision of network conditions. Consumers can use smart meters to reduce consumption. Overall, this technological transformation is challenging the business models of service companies. To compete effectively in a more decentralized and unbundled market, these companies now need to invest in new types of services, such as grid management and home energy services.

The technology is also improving the efficiency of tourism ecosystems (Polese et al., 2018a; 2018b; Troisi et al., 2019), in particular urban transport and air mobility. Technological developments in transport allow for greater respect for the environment, allow cities to reduce road congestion and make mobility more efficient. Additionally, the technology is also aiding the construction and delivery of transportation projects, for example by using robotics to automate construction processes. Using the vast increase in bandwidth offered by 5G networks, it is now possible to place advanced sensors on the transport infrastructure to collect real-time data that enables the creation of digital twins for ongoing projects. One successful application is the work of UK-based Sensat on the country's HS2 high-speed rail link. Sensat is modelling the route of the proposed railway line to help monitor project progress and ensure workflows are efficient.

Entrepreneurs need to take advantage of technological developments in infrastructure and develop a strategy to prioritise opportunities emerging from technological developments and digital technologies and address the impact such technologies have on their businesses and their financial performance.

Artificial intelligence

Recent developments in AI technology have led to groundbreaking discoveries in the applicability of AI in many areas. These usability changes and improvements allow many companies to use AI in many applications. In the commercial arena, 51% of marketers already use AI, while 27% of them intend to incorporate it into their digital marketing strategy (Leftronic, 2019). Examples of AI applicability are shopping tips, facial recognition, or voice assistants (Intel Corporation, 2020).

AI offers new opportunities for companies and is therefore of particular interest to entrepreneurs at potentially every level impacting their business. Specifically, adopting AI can influence the business model of an entrepreneur in different ways. Pfau and Rimpp (2021), providing practical examples through case studies, highlight three roles of AI in enhancing the business model: AI-assisted, AI-supported, AI-driven. Authors defined AI-assisted business processes that are improved or supported by AI but do not directly contribute to strategic elements and therefore do not affect any element of the business model. The focus remains on

operational tasks. AI-supported refers to AI services that directly influence one or more elements of a company's business model and modify it without fundamentally changing the established business model. The impact on the business model can be described as moderate. Finally, AI-driven refers to AI services that enable the introduction and performance of a new type of business model. A key factor is the necessity of AI to drive the business model. Therefore, Pfau and Rimpp (2021) showed that AI not only assists or supports but also has the potential to drive new business models.

In all three cases, the use of AI requires access to the relevant data. The output quality of AI depends on the quality and quantity of available data (cf. Agrawal et al. 2018, pp. 98–99). For this reason, corporate digital entrepreneurs try to obtain quality and quantity data and come up with operating models to best manage data. Thus, a data-driven operating model may foster corporate digital entrepreneurship.

Augmented reality

Augmented reality (AR) represents the enrichment of human sensory perception through information, electronically manipulated, which would not be perceptible with the five senses. The AR can be an effective way to foster creativity in business model development processes and business idea development (Azuma, 1997). It helps us visualize data and information in the real world to give a realistic perspective of an idea or concept. Digital technologies such as AR enable entrepreneurial activities and facilitate the process of bringing ideas to life or improving communication (Elia et al., 2020). One of the great purposes of augmented reality is the visual aid to support departments and customers. Many companies have explored the use of augmented reality to bridge the gap between working with customers remotely.

The AR has been applied in different fields, from the cultural to the medical one. In the latter, AR is useful in the pre-operative planning phases or to provide contextual information during surgical interventions. For example, the global medical technology firm Becton Dickinson uses the software Help Lightning, which allows them to give remote assistance and support to engineers and medical firms that rely on their products through an application on a tablet that shows data and visual content about their machines (York, 2020).

The AR enhances the interaction and visualization of ideas, which allows for greater creativity. It shows great potential in adding value to external activities, such as customer service and marketing, as well as internal business activities such as design, cooperation and efficiency (van Lopik et al., 2020). This technology not only benefits creative industries, such as art, music, architecture or design, in which it allows to enrich the lived experiences with multimedia or information content (Yang and Liao, 2014; Geroimenko, 2021) but it can also be used creatively in any industry in various forms. Indeed, AR can prove to be a very effective creative learning method for employee training. Training with integrated AR technologies is more immersive and interactive and allows employees to be more effective and time-efficient (Hamdouna, 2018). It enables trainees to use their imagination and contribute through digital content, which increases overall creativity and collaboration. These benefits are further enhanced by the ability to simplify difficult processes and instructions. In just a few years, this tool has moved from its first phase of adoption to standardization in various sectors. This makes us think that technological advancement in the future will offer many opportunities for AR technology and that it will continue to have a great impact on creative processes.

Cloud services

Organizations and companies benefit to different degrees from the advantages offered by the cloud. Among the key benefits of cloud services is the ability to scale up services at very short notice obviates the need for underutilized servers in anticipation of peak demand (Goscinski and Brock, 2010). When an organization has unanticipated usage spikes in computing above its internally installed capacity, it has the ability to request more computing resources on the fly. Cloud computing offers organizations the ability to effectively use time-distributed computing resources. One example is that of an internet photo website Smugmug.

The company has relatively stable computing workloads throughout the year; however, during the months of December and January the required resources spike to five times the usual workload. Cloud computing allows the company to meet the excess requirements during the two months without incurring the costs of hosting a traditional infrastructure for the rest of the year (Marston et al., 2011).

Cloud computing leads to reduced infrastructure costs and energy savings as well as reduced upgrades and maintenance costs. Economies of scale for datacenters cost savings can lead to a 5- to 7-time reduction in the total cost of computing.

One of the components of maintenance costs is the management of technology, which is potentially made much simpler by using a cloud computing service (Buyya et al. 2009, Botti et al., 2017). Preset configuration of servers and virtual machines allows for a more secure environment with the company having better control of the resources on their network. Cloud computing services allow an organization to control when, where, and how employees have access to the organization's computer systems, all managed over a simple web-based interface (for example, Amazon Web Services (AWS) can be managed easily through the AWS Management Console). Employees like the arrangement too since they are able to make full use of the company's computer systems using less powerful devices such as a smartphone or a netbook.

Borderless connections

Technology is transforming the way businesses are operating, changing the environment in a borderless world. The absence of borders allows new business models to establish themselves regardless of space and time.

Entrepreneurs can exploit the growing connections and technical skills to share information and seize emerging opportunities (Le Dinh et al., 2018). Think, for example, of the online sharing economy (Richter et al., 2015). The sharing economy was born as a business model based on sharing and collaboration that takes place mainly between peers (peer-to-peer) or that can take place, albeit to a lesser extent, in a Business-to-Business and Business-to-Consumer dimension. Over time, the sharing economy evolved, exploiting the possibilities that digital environments offer to users (Richter et al., 2017). Today, even entrepreneurs use the sharing economy model to sell their work (Troxler and Wolf, 2017). Therefore, the online sharing economy is a possible type of digital business model, which moves existing activities to the network, integrating the phenomenon of private equity sharing with other participants in the digital world. Think, for example, of Uber, BlaBla Car, AirBnB, etc.

Similarly, crowdfunding is among the possible existing business models that exploit borderless connections. It is a form of bottom-up microfinance, through which the promoter of an initiative of an economic, social, cultural or charitable nature requests from the general public (crowd), through a website (the portal or platform), sums of money, even of a modest amount, to support the project exposed (funding).

The absence of borders, therefore, determines a series of advantages for the digital entrepreneur. In the case of crowdfunding, for example, the absence of borders means obtaining money, the advantage of transparency, risk coverage, expansion of potential customers, creation and innovation through crowdsourcing.

The sale of digital products or services across electronic networks

Linked to a digital mindset, there is the possibility of selling digital products or services across electronic networks. The sale of digital products or services across electronic networks offers a number of advantages for aspiring entrepreneurs having other online ventures and represent a real career opportunity for those with expertise, passion or talent in a particular field.

The growth in demand for digital content in various forms such as video, blogs, music, podcasts or ebooks is an exciting opportunity for entrepreneurial contents producers. In fact, the changes in digital media consumption habits and the economics of digital goods favour the

development of digital entrepreneurship (Guthrie, 2014). Digital entrepreneurs produce and sell digital goods based on personal knowledge, experience or talent using ubiquitous multimedia tools and distribute them across inexpensive online platforms.

COVID-19 also accelerated this growing trend. The pandemic was an accelerator of the structural change in consumption and the digital transformation in the marketplace. Managers might adapt to the digital transformation in the market to recover or even grow further the sales after COVID-19 (Kim, 2020).

Ultimately, to implement a digital mindset it is not enough to introduce digital technology into strategic plans. Entrepreneurs, directors and individual employees need to share a strategy to develop an organization-wide digital entrepreneurial mindset. For example, an open line of communication between an organization's leadership and its employees, which embraces a growth mindset, a culture of freedom to choose and innovate or a shared vision and purpose, might undoubtedly facilitate an organization-wide digital entrepreneurial mindset.

The implementation of the six phenomena above mentioned is undoubtedly helpful in the process of digital transformation. Through the adoption of these tools, a digital entrepreneurial mindset is more likely to be adopted throughout an entire organization.

10.3. The resource-based view in a digital environment

The resource-based view (RBV) originally emerged to explain how unique firm-specific assets — conceptualized as resources or capabilities — lead to sustained competitive advantage (Barney, 1991; Mahoney and Pandian, 1992; Peteraf, 1993; Wernerfelt, 1984). Over the past three decades, this framework has been established as a dominant theory in explaining how firms, embedded in ever more dynamic markets, make the strategic choices that can lead to a sustaining competitive advantage. In its core assumptions, the RBV theory describes how managers select and arrange organizational resources to achieve and sustain this advantage and postulates that some tangible and intangible resources have certain qualities that make them the driving force of such an advantage (Figure 10.1).

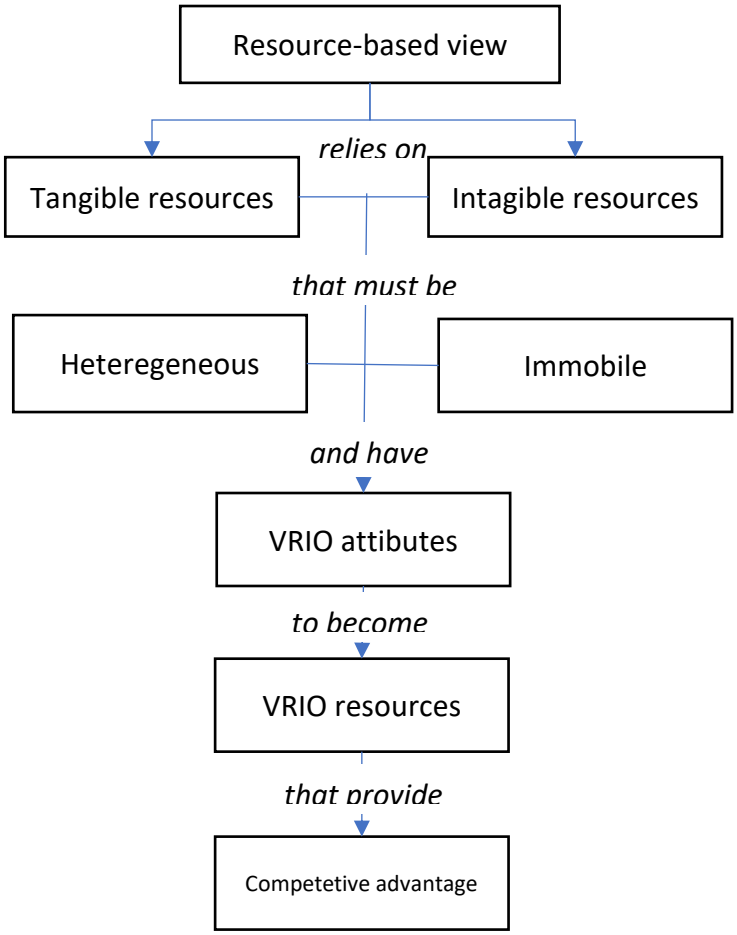

Figure 10.1. The Resource-based theory of the firm

Source: www.strategicmanagement.com

For its robust applicability in a wide range of industry and organizational settings, scholars have applied the RBV framework broadly to established organizations in order to understand how managers classify and select resources[9] to achieve such an advantage (Barney, 2001a, 2001b; Crook, Ketchen, Combs, & Todd, 2008; Barney, Wright, & Ketchen, 2001; Nason and Wiklund, 2018; Newbert, 2007). It must be noted that often companies suffer from slack resources and are able to obtain some strategic resources (e.g., knowledge) through market transactions or collaborative relationships (e.g., technology-based joint ventures).

In the entrepreneurship domain, Alvarez and Busenitz (2001) contend that the RBV can theoretically and practically advance and extend existing research on entrepreneurship. The Authors indicate that it is through the entrepreneurial process of "cognition, discovery, understanding market opportunities, and coordinated knowledge" (p.22) that inputs become heterogeneous outputs. Accordingly, entrepreneurial opportunities emerge when certain

[9] According with the RBV, if a resource exhibits VRIO attributes (Barney, 1991), the resource enables the firm to gain and sustain competitive advantage. The title of this framework is an acronym composed of the first letters of its elements' names, namely Value (is the resource valuable in terms of neutralizing the threats and exploiting the opportunities from the environment?), Rarity (is the resource rarely present among existing and potential competitors?), Inimitability (is the resource expensive or impossible to imitate?), Organization (is the resource used by the company, or is the company organized in a way that allows efficient usage of the resource?)

individuals have intuitions for the value of specific resources that others do not. In this sense, entrepreneurial alertness, entrepreneurial knowledge, and the specific ability and attitude to coordinate resources are viewed as resources in their own right. The underlying ambiguity characterizing this process is seen as the essence of entrepreneurship itself, because the entrepreneur's increasing knowledge base and absorptive capacity through experiences and learning are crucial in order to achieving a sustainable competitive advantage through resources discovery and exploitation. The Scholars also highlight that social complexity is central to entrepreneurship, as it may be essential to the exploitation of complex technologies and unique to certain types of entrepreneurs and hence difficult to imitate. From the firm-side, Alvarez and Busenitz (2001) suggest that entrepreneurs fulfill a critical role in recognizing the value and opportunities presented by specialist knowledge and integrating it to create rents. Given the resource constraints that often plague, especially start-up ventures, entrepreneurship researchers find in the RBV a useful framework to evaluate their resource utilization that may lead to a competitive advantage.

The emphasis placed on the processes and practices of resources' management is crucial not only because of their impacts and implications for firms' efficiency but also because they represent an area in which entrepreneurs use and leverage their creativity to develop or radically review existing business models and ways of doing things in their business: resource management is indeed the field where new organizations operationalize and boost their business models and strategies, bringing them to life. Hence, a focus on resource management also highlights an important yet unrecognized source of heterogeneity among firms and startups.

Scholarship in the RBV domain has long held that firms should engage in activities for which they have superior resources (Argyres, 1996; Barney, 1999; Madhok, 1996, 2002), a rationale that has been refined and elaborated by combining it with transaction-costs and property-rights theories (see for example Argyres and Zenger, 2012; Kang et al., 2009; Kaul, 2013; Mayer and Salomon, 2006; Mayer et al., 2012). These conceptualizations broadly fit with Chandler's (1977, 1990) descriptions of successful firms that emerged and grew in the second industrial revolution. Chandler highlighted how firms increased in both scale and scope through developing and redeploying resources and capabilities as well as internalizing parts of the value chain by adopting new communication and logistics technologies that allowed them to take advantage of these capabilities and to reduce transaction costs.

In the last ten years, technology trends such as mobile services, social media, cloud computing, Internet of things, big data and robotics (European Commission, 2017) sustained new ways of collaborating, designing products, matching complex demand and offer, and developing new standards and solutions. These trends affect firms' organizing resources practices as well (Markus and Loebecke, 2013). Such a quick progress has deeply transformed the competitive environment and rewrote traditional business strategies, models and processes (Bharadwaj et al., 2013). The arising technology paradigm is leveraging the potential of collaboration and collective intelligence to design and launch more robust and sustainable entrepreneurial initiatives.

Digital technologies enable the establishment of new entrepreneurial ventures and digital start-ups, and represent vital components of their business model and operations. In this sense, digital technologies also enable the entrepreneurial activity itself (von Briel et al., 2018) and they manifest in various forms such as digital products or services (Lyytinen et al., 2016), digital platforms (Tiwana et al., 2010), digital tools or infrastructure (Aldrich, 2014), digital artefacts (Ekbia, 2009), or Internet-enabled service innovations (Kuester et al.,2018). Examples of such transformation are online ventures able to engage with customers and stakeholders through new channels (e.g. Netflix), connect multivariate demands and highly personalized offerings (e.g. Uber and Airbnb), use social media to outsource activities and collect money (e.g. Upwork and Kickstarter), or test the potential of a business idea (e.g. Quirky). Moreover, digital technologies favor the formation of new environments where a constellation of actors with diverse goals and motives interact dynamically to carry out business and innovation processes

(e.g. Linkedin). The pervasive diffusion of digital technologies has thus shaped new avenues for the development of entrepreneurial projects by leveraging collaboration and collective intelligence (Anderson, 2014). Such relentless convergence between entrepreneurship and digital technologies is giving rise to a new breed of entrepreneurs that use digital technologies and Internet to execute most of the processes required to launch a new venture (Giones and Brem, 2017).

These technologies, and the collaborative dynamics enabled by the same, are really changing and transforming the overall entrepreneurial process, including the aspects related to resources discovery and exploitation (Dong, 2018). In particular, scholars wonder how digital technologies may influence the nature and interactions among actors for identifying resources and partners of the entrepreneurial process in a digital environment. In an increasingly digital environment, likewise, some ventures and startups have made great use of digital platforms to access resources, markets, and customers worldwide. In so doing, these startups have succeeded in revising their respective industries' supply chains, redefining needed resource bundles. In turn, this has enabled entrepreneurs to reduce their resource needs and even gain first-mover advantages that enhance their prospects of success.

Drawing from the definition of digital entrepreneurship proposed by Davidson and Vaast (2010), it is possible to link the concept of digital firms/or digital ventures, that basically focuses on two central features. First, these firms employ, to a significant degree, digital resources such as data, software, and artificial intelligence (AI) that are essentially scale-free, such that firms' marginal costs remain low for large production quantities (Adner et al., 2019; Levinthal and Wu, 2010). Second, digital firms distribute their offerings largely through the internet and cloud platforms (Siebel, 2019), and thus have immediate access to global markets at scale.

In practice, firms may differ in the degree to which they are "digital," which would in turn affect the degree to which their resource bundle is scalable. Consider Amazon's online retail business and its Amazon Web Services (AWS) cloud business. Clearly Amazon's retail business uses a greater share of non-digital resources such as warehouses, inventory, packers, and other employees, and has a greater share of non-digital outputs (e.g., physical products, delivery), and thus AWS has the more digital (and scalable) resource bundle of the two. While acknowledging these heterogeneities, we use the term "digital firm" to indicate an archetypal firm that has largely digital resources and outputs, and contrast it with an archetypal "industrial firm" that doesn't.

Moreover, since many digital firms are organized as digital platforms or intermediaries (Cennamo and Santaló, 2019; Kretschmer et al., 2020), they can also experience demand-side increasing returns to scale (Teece et al., 1997; Teece, 2013), reflecting the sentiment that "in the world of technology, the more of something you make, the more valuable it can become" (Wessel et al., 2017). In practice, firms can vary in the extent to which they are "digital," and thus have scalable resource bundles with a combination of resource and market-based returns to scale. Similarly, some industrial firms may also have resource bundles that enjoy a significant degree of scalability. That digital firms (which are highly digitized along the two dimensions — resources and markets — described above) will on average have more-scalable resource bundles than traditional industrial firms, and their scalability will be sustained over much a larger range of output. Thus, digital firms provide an interesting (and important, due to their rapid proliferation) context for advancing RBV theory on firm boundaries, while also exhibiting distinctive features indicating that such advances might indeed be necessary. Digital resources are often considered fungible, that is, applicable to a variety of value-adding activities (Adner et al., 2019; Agrawal et al., 2018; Brynjolfsson and McAfee, 2014), which could in theory favor more integration: these digital firms seem to shrink on the vertical dimension and at the same time grow very large in scale (Adner et al., 2019; Hoffman and Yeh, 2018).

The scalability of a firm's resource bundle reflects the types and relative shares of scale free and non-scale free resources in the bundle (Levinthal and Wu, 2010). In particular, digital firms' resource bundles, which include a significant share of digital resources and produce mostly digital products and services, are likely to be more scalable as a whole than industrial

firms' resource bundles. Digital resources — such as IT systems, cloud platforms, big data, and AI algorithms — tend to be scale free by virtue of almost error-free replication, combined with low-cost global digital distribution and improvements in cost and performance as more users adopt and contribute data to them (Adner et al., 2019; Agrawal et al., 2018; Brynjolfsson and McAfee, 2014). These digital resources do not face many limits on the extent of their application, so the firm is subject to fewer capacity constraints as it grows in scale in the focal market (e.g., a cloud service can accommodate numerous additional users at minimal marginal cost). However, to create value, even these scale free resources need some complementary resources (Tambe et al., 2020) such as co-specialized human and managerial resources (Castanias and Helfat, 1991; Teece, 1986), which are typically subject to capacity constraints regarding time and attention (Ocasio, 1997; Penrose, 1959). For example, software and AI platforms need experienced engineers to develop, maintain, and improve them, marketers and salespersons to sell their outputs, customer service professionals to improve service quality, and managers to oversee and direct the enterprise. Often, physical resources may also be required, such as factories, offices, and warehouses, and even hardware and telecommunication infrastructure to host and deliver digital products. The use of these complementary non-scale free resources follows the logic of opportunity costs (Levinthal and Wu, 2010); e.g., an engineer working on a project can't simultaneously work on another, and warehouses or application servers face congestion costs when they are used to serve too many customers simultaneously.

In this way, combinations of co-specialized scale free and non-scale free resources in a firm's resource bundle (Teece, 1986) interact to yield the composite attribute of scalability and in building firms' competitive advantage. Scalability captures the aggregate effect of all the resources in the firm's resource bundle, and measures the extent to which the value they create increases with the extent of the resource bundle employed in a particular "activity" (equivalently a "stage of production"). The opportunity costs described above imply that firms need to choose whether to allocate their entire resource bundle to one activity or split it among activities. In turn, the scalability of digital resource bundles within a given activity increases the opportunity costs of integration because it implies splitting resources between activities. As noted earlier, the scalability of resource bundles does not depend only on the production attributes of the constituent resources, but also on characteristics of demand. This is because scalability is ultimately about the ability to create value, and there is no value in increasing output if there is no demand for it. In addition to fewer constraints on reaching large volumes of customers on the demand side, digital firms also experience network effects that can sustain (or even increase) prices as sales grow because demand for the offerings increases as they attract more consumers. By contrast, industrial firms may have lower returns to scale on the supply-side due to physical production limits, difficulties in replicating capital-intensive processes (Knudsen et al., 2014; Penrose, 1959), and substantial costs associated with the transportation and distribution of physical goods. At the same time, downward-sloping demand also forces industrial firms to reduce prices to sell larger output volumes, which leads to decreasing demand-side returns to scale.

10.4. How to combine resource and competencies in a digital venture: the role of dynamic capabilities

The domain of digital entrepreneurship is characterised by rapid and continuous changes and in such contexts, entrepreneurs cannot rely on the initial stock of resources and competencies that they have collected to enter the market and to exploit the entrepreneurial opportunities coming from the phenomena previous analyzed. The dynamic nature of digital context requires a continuous process of renewal and transformation of resources in order to sustain the competitive advantage. In other terms in digital contexts, entrepreneur needs to be able to renew, re-combine and acquire further resources in order to maintain its competitive position (Daniel and Wilson, 2003).

To this end, the concept of Dynamic Capabilities (Teece, 2007; Teece et al., 1997; Helfat et al., 2007) becomes relevant in order to explain how firms respond to rapid and continuous

technological and market changes and to understand how organizations may dynamically adapt routines and resources to maintain a competitive advantage (Teece et al., 1997). As highlighted by Teece et al. (2016), in fact, dynamic capabilities are necessary elements in context characterized by deep uncertainty such as those experiencing rapid change and digital contexts.

Dynamic capabilities refer to the firm's ability to integrate, build and reconfigure internal and external competences (Teece et al., 1997). Strong dynamic capabilities, that are the essence of firm-based innovation, help firms to reconfigure resources and competencies as required to meet the changes in the competitive environment (Pisano and Teece, 2007; Teece et al., 1997). The focus of "dynamic capabilities is on building (through investment and through learning) unique specialized assets and on keeping the enterprise aligned with its business environment" (Teece, 2017, p. 709).

Teece identifies three different categories of dynamic entrepreneurial capabilities (Teece, 2007):

- Sensing, identifying, and assessing new entrepreneurial opportunities.
- Seizing necessary resources to exploit new opportunities.
- Transforming resources, competencies and assets of the firms.

According to the literature and with reference to the specific context of digital technologies (Warner and Wager, 2019) sensing capabilities refer to the capabilities to learn, to sense, filter, shape, and calibrate opportunities. Further, these capabilities include the scanning of the external environment in order to identify emerging and unexpected trends (Day and Schoemaker, 2016; Dong et al., 2016; Giudici et al., 2018; Helfat and Raubitschek, 2018). Teece (2007, p. 1322) sustains that "sensing (and shaping) new opportunities is very much a scanning, creation, learning, and interpretative activity. Investment in research and related activities is usually a necessary complement to this activity". In other terms, to find and identify new opportunities, firms need to activate a continuous process of search and exploration across technologies and market both at local and global level. Further, firms need to invest in activities aimed to understand the latent demand, the structural evolution of industries and markets, and the possible strategy partners and competitors. As highlighted by some authors (Helfat and Peteraf, 2015) sensing capability involves not only a reactive approach, through the recognition of existing opportunities, but it involves a proactive approach in anticipating competitive threats. In this perspective, investment in R&D activities represent a necessary complement to previous sensing activities as they could support and stimulate the creation of new technological opportunities.

In contexts characterized by great uncertainty, as is the case of digital entrepreneurship (Nambisan, 2017) the set of digital sensing capabilities to sense and/or generate new entrepreneurial opportunities can include four different capabilities: generative sensing, sense making, use of scenario planning, and the "purchase" of real options (Teece et al., 2016).

Generative sensing capabilities is about hypothesis development and learning and expresses the adoption of a proactive behavior by entrepreneurs and managers. With this kind of capability firm is able to develop hypotheses about the implications of observed events and trends, and verify these hypotheses defining processes for new products and services.

Scenario planning could be defined as "a disciplined methodology for imagining possible futures in which organizational decisions may be played out" (Schoemaker, 1995, p.25). It represents an important mechanism for managing uncertainty and facilitating rapid response to emerging needs.

Finally, real options is another important dynamic capability. A real option is "the right—but not the obligation - to purchase the underlying asset on which the contract is written, investment in a real option conveys the opportunity to continue investment" (McGrath, 1999, p. 14). Firms with strong dynamic capabilities are able to purchase real options (e.g., through R&D investments) and then exercise them at the right time.

Second dynamic capability, seizing capabilities, refers to the capability to address the new technological or market opportunity trough new products, processes or services. It refers to development and selection of business opportunities that fit with the organization's

environment and its strengths and weaknesses (Teece, 2007). In other terms, seizing is about implementation of sensed opportunities and expresses the capabilities to mobilize firm's resources to capture value from those opportunities. Day and Schoemaker (2016) affirm that seizing is an experimental capability that could be expressed using different techniques such as rapid prototyping.

According to Teece, several firms fail to invest in new opportunity because of path dependencies by which the firm tend to prefer incremental innovation rather than radical ones (Teece, 2007). To overcome such inertia, the concept of agility becomes relevant (Birkinshaw, 2018; Rigby et al., 2016; Weber and Tarba, 2014). Teece et al. (2016, p. 17) define agility as "the capacity of an organization to efficiently and effectively redeploy/redirect its resources to value creating and value protecting (and capturing) higher-yield activities as internal and external circumstances warran". In order to qualify digital seizing capabilities, Karimi and Walter (2021) discussed about Entrepreneurial Agility as a critical cognitive ability in the context of digital entrepreneurship composed of three elements: opportunity foresight and systemic insight in addition to entrepreneurial mindset discussed above. More specifically, opportunity foresight refers to the ability to anticipate the threats and opportunities deriving from technology and market changes and is the necessary condition to identify how resources and capabilities are exploited to create value. Systemic insight is an entrepreneurial cognitive ability to visualize technology-enabled business opportunities and associated risks when designing aggressive actions for new products or services and when anticipating possible countermoves by competitors. How to reach and maintain an entrepreneurial agility becomes a key issue for digital ventures. Different tools and approach could be adopted to this end. Among these, open innovation approach (Chesbrough, 2006) and lean start up methodology (Ries, 2011; Blank, 2013) are considered by researcher and practionaries as the most powerful.

Open innovation represents an emerging approach to the R&D processes opposed to the traditional idea of closed innovation and proposed for the first time by Henry Chesbrough in 2003 (Chesbrough, 2003). Chesbrough defines open innovation as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation respectively" (Chesbrough, 2006, p. 2). Open innovation can reduce time and cost of innovation processes and can accelerate internal innovation processes. Firms can apply different kind of open innovation: outside-in or inside-out processes (Chesbrough, 2004). With the first process, ideas and technologies from outside are channeled into the innovation process of a company. In the second case, companies allow that the knowledge that they do not use or under-use inside themselves is made available to those who wish to exploit it in their own activities and in their own business models. In this perspective, open innovation methodologies can develop agility of firm by enriching and speeding up new product development to meet nascent market opportunities.

The lean startup is a methodology proposed in 2008 by the digital entrepreneur Eric Ries in his book "The Lean Start up" (Ries, 2011). The term Lean Startup derives from the application of the theories developed by Eric Ries himself of Lean Thinking (to think in a lean way) and from the use of methodologies called "agile" (set of methodologies that allow to implement changes, without the "cost of change "is too burdensome). The lean start up approach favors experimentation and prefers learning to elaborate planning. The basic idea of the approach is to rapidly test the product or the idea thanks to customer feedback and through a continuous cycle called: Built, Measure and learn. Based on the key principles of lean manufacturing philosophy, customer development and agile development methodology, its aim is to eliminate wasted time and resources by developing the product iteratively and incrementally (Blank, 2013).

The last dynamic capabilities concern transforming capabilities referring to the capabilities to realize the full potential of strategic change (Bharadwaj et al., 2013; Karimi and Walter, 2015; Teece and Linden, 2017). According to Teece (2007, p. 1319), transforming includes "enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets". Day and Schoemaker (2016, p. 65) affirm that an

organization with “transforming capabilities is one where agile, entrepreneurial mindset is actively cultivated within, with a broad expansive approach to external network-building as well”. The transforming capability supports the continuous change of assets and organizational structures of a firm in order to favor responsiveness in fast-changing contexts (Agarwal and Helfat, 2009; Teece, 2014). It refers to an implementation capacity and a firm with a high transforming capacity is able to constantly implement projected renewal activities by defining responsibilities, allocating resources, and ensuring that the workforce possesses the necessary (Kump and Kessler, 2019).

In digital entrepreneurship context, digital transforming capabilities consist of: navigating innovation ecosystem, redesigning internal structures; improving digital maturity (Warner and Wäger, 2019).

Navigating innovation ecosystem relates to active collaborations with external partners and refers to the need to build or join a digital ecosystem to work with new partners on “co-creation” and “‘co-opetition” activities, which help redefine the speed of collaborative behaviors and invent new business models. Redesign internal structure refers to the change and renewal of formal corporate culture with a new digital innovation corporate culture. Finally, improving digital maturity of workforce is a fundamental capability for the ongoing digital evolution of firms that could be reached for example through the involvement in the firms of younger “digital natives” and the promotion of digital culture training program.

The dynamic capabilities framework in addition to provide a powerful lens to analyze how firm can maintain and sustain their competitive position, represent a concept strictly related to business model (Teece, 2018). As highlighted by the author there is a strict connection between dynamic capabilities and business model because the implementation and change of business model could be considered as outputs of dynamic capabilities. In this perspective, Teece affirms: “The strength of a firm's dynamic capabilities is vital in many ways to its ability to maintain profitability over the long term, including the ability to design and adjust business models” (Teece, 2018, p. 40).

This relation is even more important in digital economy where firms need to build strong dynamic capabilities to rapidly create, implement, and transform business models in order to remain vital and competitive (Karimi and Walter, 2015, 2016; Teece, 2018; Teece and Linden, 2017; Velu, 2017). In this direction in fact, when firms dispose weak dynamic capabilities, even if show an ability to identify emerging opportunity, they will be more like to implement traditional business model, that is business model that are based on existing assets and organizational processes. On the contrary, when firms dispose strong dynamic capabilities, they have greater freedom to define and implement business models that require radical changes of resources or activities.

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11. THE SIX BUILDING BLOCKS FOR CREATING HIGH-PERFORMING DIGITAL ENTERPRISES

Learning objectives

After having read the chapter, you will be able to:

- Recognize the different building blocks for creating a high-performing digital enterprise and the way they may be developed within firms to get success;
- Identify the firms' capabilities and their linkage with each block of the model
- Employ the model in practice.

11.1. How creating high- performing digital enterprises

Since technological changes and digitalization have become increasingly important (Becker & Schmid, 2020; Haffke, 2017), during the last decade, business are accelerating their transformation, leveraging digital tools to create new processes, services, products, and business models. According to the Boston Consulting Group (BCG), the 80% of companies are accelerating their digital transformation. Similarly, the International Data Corporation (IDC) predicts that, through 2022, 70% of organizations will have "*accelerated use of digital technologies*, *transforming existing business processes to drive customer engagement*, *employee productivity and business resiliency*." The digital destiny of the economy is a matter of fact, with the 65% of global GDP digitalized by 2022. Successful transformations created 29% more value, improved capabilities by 20%, and met 32% more targets on time.

Unfortunately, not all digital transformation initiatives get their goals. The BCG reports that only the 30% of transformations achieve their objectives[10]. The reason is quite simple: managing transformation is not easy. The technology is important, but both organization (operating model, processes, and culture) and the human dimension (people knowledge; competences; value and beliefs) are crucial to get success, since organizational routines and embedded behaviors may be an obstacle to change (Canestrino & Magliocca, 2016). Getting success implies a continuous improvement in the firms' ability to master digital technologies, establish a digital mindset, and implement digital ways of working. A balance between exploration and exploitation abilities is therefore required to guarantee organizational agility, thus ambidexterity establishes as a necessary condition for the successful digital transformations (Lee et al., 2015).

Because of the high rate of failure of digital transformation initiatives, both scholars and consultants provide for frameworks to support firms' digital change.

Among them, MIT created one of the first digital transformation framework together with CapGemini, identifying 5 five building supporting firm's development and scale of digital offering (Fig. 11.1).

Three of the five digital building blocks are technology platforms: an *operational backbone*, a *digital platform*, and an *external developer platform*. The other two building blocks are organizational capabilities: *shared insights* about what customers value, and an *accountability framework* that coordinates the efforts of autonomous teams.

[10] To determine how companies succeed, consultants belonging to the BCG asked executives to assess their transformations: as results, some essential success factors were detected, allowing companies to their odds of success from 30% to 80%.

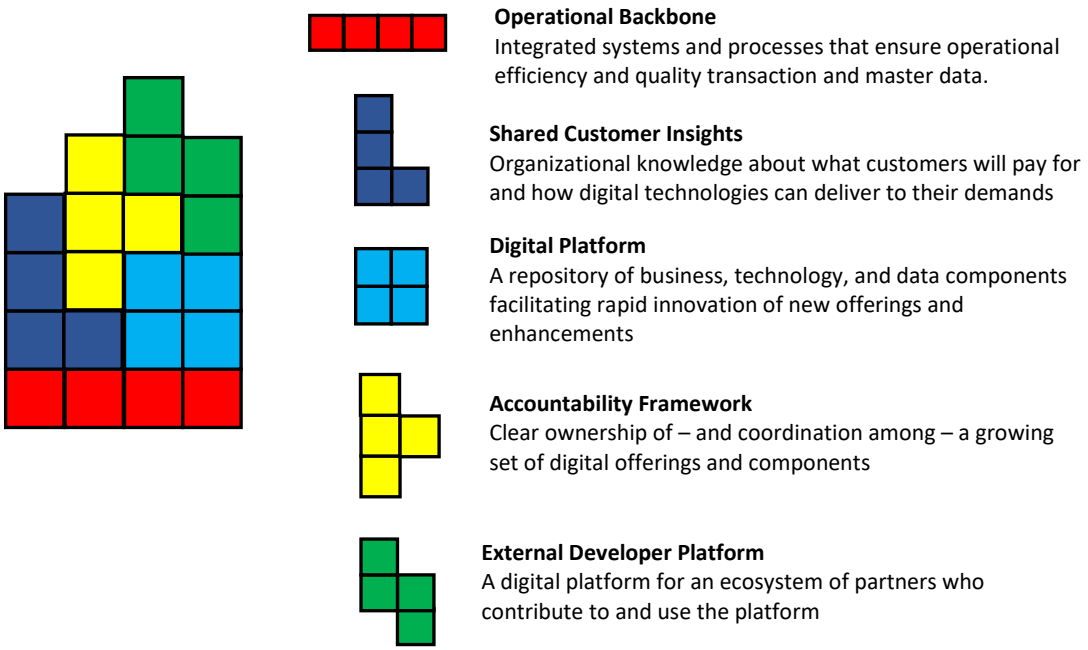

Figure 11.1. The five Building Blocks of Digital Transformation

***Source**:https://cisr.mit.edu/publication/2018_0601_BuildingBlocks_RossMockerBeath*

An *operational backbone* is a set of integrated and shared systems (e.g., ERP, CRM), processes, and data that ensure efficiency, reliability, and transparency of operations and transactions. The backbone usually incorporates customer resource management, enterprise resource planning, and other enterprise wide systems and processes. Developing digital offerings requires a powerful backbone upon which the other building blocks may be build. By the contrast, the lack of operational backbone, mines the leadership capacity to develop and commercialize digital offerings.

A *digital platform* is a repository of business, technology, and data components facilitating rapid innovation and enhancement of digital offerings for customers.

A digital platform provides components - business, data, and infrastructure - that the firm can assemble and reuse creating create digital offerings for its customers. Moreover, a digital platform allows the firm to personalize their offering for different customers' needs.

An *external developer platform* is an extension the firm's digital platform a digital platform that allows an ecosystem of partners to contribute to and use digital components. An example is Amazon which extended its platforms to enable the whole integration of partner offerings.

Shared customer insights mainly refer to the organizational knowledge about what kinds of digital offerings customers want and are willing to pay for. Developing successful digital offerings requires for knowledge about customers problems and potential solutions. Establishing this organizational knowledge involves many experiments and tests to explore what target customers are really looking for.

Accountability framework refers to the clear ownership of, and coordination among, a growing set of digital offerings and components. It means that company' responsibilities should be organized around components rather than functions, product lines, or geographies. Therefore, people and teams are expected to decide about the performance and cost-effectiveness of their components, more than of functions.

According to McKinsey, companies that have successfully transitioned to become high-performing digital enterprises are able to orchestrate six building blocks: strategy and innovation, the customer decision journey, process automation, organization, technology, and data and analytics (Fig.11.1).

1. Strategy and Innovation
Focus on future value and drive fueled by experimentation

2. Customer Decision Journey
Deep analysis and ethnographic research to understand how and why customers make decisions

3. Process Automation
Reinvented processes and customer journeys through automation and agile processes

4. Organization
Agile, flexible, and collaborative processes and capabilities that follow strategy

5. Technology
2-speed IT to support core functions and rapid development

6. Data and Analytics
Usable and relevant customer analytics tied to goals and strategies

Figure 11.2. Six building blocks for creating a high-performing digital enterprise

Source: (Desmet et al., 2015).

Now, not every digital initiative requires each building block to be developed and used to the same degree. Some blocks will also serve as more natural starting points, depending on a company's circumstances. Despite the mentioned, McKinsey found that this framework provides executives with a coherent structure for thinking through and managing large-scale digital program.

Strategy and Innovation

Managing a successfully digital transformation depends on the clear definition of the firm's strategy that means detailing its purpose, strategic positioning, and vision. Prioritizing which opportunities the firm wishes to exploit is the first step to craft a new digital business model, to further strengthen the firm strategic position and its reap long-term success. In so doing, the firm should also determine which of its activities are superior to those carried out by competitors, thus exploiting competitive advantage. Therefore, the best digital strategies shape a vision based on where the firm believes the value is likely to shift over the next three to five years. While the McKinsey focus on DSs emphasizing their role in supporting the success of the digital enterprises, both scholars (Chaffey & Ellis-Chadwick, 2019; Mithas & Lucas, 2010) and consultants sustain that creating value and opening further opportunities for innovation and experimentation always requires a tight alignment between DS and the whole corporate strategy, and a continuous enhancement of firm's customer experience. Mainly, strategic alignment refers to how firms' operational decisions are consistent with the strategy. However, during the last 10 years, the disruptiveness of new technologies has profoundly affected traditional business strategy and the structure of relationships in the business space (Becker & Schmid, 2020; Bharadwaj, 2013); thus, the pure alignment of the strategies is no longer sufficient. Consequently, IT strategy should be considered an integrated part of the business strategy (Mithas & Lucas, 2010), aiming to innovate continuously.

Digital technology has become increasingly important to get firms' success. Mainly because of digitalization, a new arena for innovation is opened up - one in which physical and digital components are combined (Yoo et al., 2012). As Nylen and Holmstrom (2015) noted, digital technology's unique properties enable new types of innovation that are different from the innovation developed in the Industrial Age. Mainly because of the arising of digital components, firms engage in the design of 'hybrid' or 'smart' products, via which digital components are embedded in traditional products. This kind of 'smart products' also enables firms to match physical goods with online and mobile services that use the data generated (Bharadwaj et al., 2013).

Some examples of firms' uncertainties are

- Engaging in digital innovation impels firms to face several challenges
- detecting the factors that direct the adoption of digital products and services,
- defining the boundaries between different products and services, and
- constantly identifying new innovation opportunities

Therefore, improving new skills and coordinating improvisational efforts in multiple digital innovation projects is crucial in organizing firms' innovation efforts (Nylen & Holmstrom, 2015).

Customer decision journey

Enormous potential rewards for organizations may arise by the complete and outstanding customer journeys.

The customer decision journey includes four different stages through which the consumer draws a pathway from:

- Consideration of existing offers (awareness);
- Evaluation;
- Purchase;
- Post-purchase experience (Hudson & Thal, 2013; Vazquez et al., 2014).

During the first stage of this journey (pre-purchase), consumers first contact the organization, the product, or the brand. The amount and the clarity of information available in offline and online communication sources affect the formation of the desire for purchasing (Tussyadiah & Fesenmaier, 2009).

At stage 2, potential customers engage in information search to compare and evaluate the available options. The relevance of credible digital influencers, blogs, review platforms, and online brand communities in the buying decision process is widely reported in the literature (Hudson & Thal, 2013; Kang & Schuett, 2013; Kapitan & Silvera, 2015; Alic et al., 2017). In the

purchase stage, consumers decide what to choose, how to order, and payment (Lemon & Verhoef, 2016).

The post-purchase phase refers to the consumption experience in which the critical touchpoint is the contact with the product or service itself (Lemon & Verhoef, 2016). In this stage, consumers use social networks to share their personal consumer experiences (Kang & Schuett, 2013) through content that can be positive or negative. Negative reviews affect brand credibility and reputation and impact consumer decisions about replacing one brand with another (Ruiz-Mafe et al., 2016).

McKinsey's research shows that organizations understanding customers' behavior and the different ways they act is crucial for successful businesses. Notably, organizations able to skillfully act on complete customer journeys get huge rewards. Customer satisfaction raises up to 20%, revenue increases by 10 to 15%, and the cost to serve lowers by 15 to 20%. Since nearly 50% of all business-to-business transactions have been managed on digital platforms since 2015, the ability to offer a genuinely customer-focused journey is likely to become an increasingly important differentiator for firms.

Process automation

The changes in digital technologies can bring about in a company's business model, which result in changed products or organizational structures or automation of processes (Clohessy et al., 2017). The improvement of business processes and costs savings (Pagani, 2013) are benefits of digital transformation. Particularly, when well implemented, business-process automation can result in significant competitive advantage, enabling the firm to quickly scale without significant additional costs. Within the field of process automation, robotic process automation (RPA) has gained great attention by the scholars, because of its potential to automate many administrative business processes and activities (Lacity & Willcocks, 2016). According to Gartner, RPA is a tool '*mimic the manual path a human worker would take to complete a task, using a combination of user interface interaction describer technologies*'. In sum, RPA replaces humans in managing tasks that they have previously handled (Willcocks et al., 2015), avoiding the risk of repetition of simple tasks on employees (Aguirre & Rodriguez 2017). Thus standardization is one of the most suitable criteria when dealing with the application of RPA (Osmundsen et al., 2019; Wellmann et al., 2020). Accordingly, RPA is usually employed in financial services (Lewicki et al., 2019; Marek et al., 2019), telecommunications (Lacity et al., 2015; Schmitz et al., 2019), or in public accounting (Cooper et al., 2019), that all characterize for several repetitive administrative processes. In such circumstance, RPA benefits companies with large cost-saving potential (Schlegel and Kraus, 2021). Studies demonstrate that RPA is more easily implementable than other technologies. Moreover, it has a positive effects on economic performance indicators (Osmundsen et al., 2019). According to a study led by PwC (2020) among 141 firms in the region of Germany, Austria and Switzerland, the 54% of the examined companies already use RPA, and RPA expected to play an important role in the field of digital transformation in the next years. Despite this, knowledge shortages in the organizations can mine the RPA implementation, especially in smaller firm contexts (PwC, 2020). As the McKenzie noted, digitizing processes has more to do with the company approach the development, than with technology. Digital transformation and process automation are complex processed requiring digital leaders focusing on small solutions that target high-value customer journeys and expectations. Moreover, small teams are expected to employ agile development techniques to continuously build out elements of the product as prototypes, then testing and adapting them based on feedback. Despite the mentioned difficulties, when well executed, digitizing processes can unlock significant value, by compressing timelines and eliminating duplication or inefficiencies.

Organization

Digital transformations entail complex challenges dealing with the changes in the organizational system (structures, processes and culture), and with the way these changes

should be managed (Ancarani & Di Mauro, 2018). The current transformation landscape has placed more pressure on companies and their organizations – to change their technology, their systems, their traditional ways of working, their approaches to solutions has led to faster changes, which involves more than the formal organizational structure as it engages with many stakeholders (Andersson, 2018). Particularly, hierarchical structures that have characterized the companies for the last years are no longer effective, digitalization requiring more agile, flexible, and increasingly collaborative structures (Kotter 2012), while keeping the rest of the activities running efficiently (Desmet et al. 2015). Change and transformation are vital in building an organization that could ultimately prosper and thrive in the current digital age. However, most companies are failing at this and organizational changes often turn into a simply exercise of cutting costs (Catlin et al., 2015; Sánchez et al., 2017).

Thirty years of research about IT and organizational changes reveals that many organizations trouble in shifting their practices and structures to take advantage of IT (Kling & Lamb, 1999). Gjellebæk et al. (2020) examined the management challenges for digitalization in healthcare sector, revealing a certain degree of apprehension among employees due to the changes in their work tasks, and to the scarce involvement in the overall changing processes. In such circumstances, incentives can be relevant in supporting organizational changes, mainly because '*people need good reasons to change their organizational practices*, *and they need the time and the training to make those changes*' (Kling & Lamb, 1999 p. 20). Adequate leadership and political activities associate with technology implementation, promoting and thwarting the changes required for the extensive use of a new technology are also important (Olsen & Tomlin, 2020).

According to the above, companies need to invest in building and setting up an organization or workforce, equipped with capabilities to fulfil the needs of transformation, to survive and stay competitive,. Moreover, it is crucial for their management to balance both the technology shift and human capital within the organization (Gupta, 2018).

Technology

Technology is an enabler for each of the building blocks discussed in the McKenzie's framework. It drives strategy, process automation, and organizational changes quickly, allowing firms to anticipate and adapt to the market requests. Particularly, McKinsey proposes the so-called two-speed IT model (or bi-modal IT), suggesting companies moving to a two-speed IT velocity when implementing digital transformation. Therefore, slowly transforming core systems designed for stability and high-quality data management follows the quick development of customer-facing programs. According to this, high-speed IT teams rapidly iterate software, release updates in beta, fix kinks and bugs in near-real time, then rereleasing.

Horlach et al (2016) refer to the 'bi-modal IT' (instead of two-speed IT) in order to involve different architectures, processes and organization when discussing the speed of digital transformation. As the authors report, notion of 'bimodal IT' emerges from the analysis developed by the Gartner. Particularly, Gartner (2015) defines the 'bimodal IT' as '*the practice of managing two separate*, *coherent modes of IT delivery*, *one focused on stability and the other on agility*'. Mode 1 (or core IT) is a linear process that emphasizes safety and accuracy. Delivering efficient IT services and getting operational superiority are the main aims of the Mode 1, this last one mainly focusing on risk aversion and cost savings (Henthorn-Iwane, 2015). In contrast, Mode 2 (also called 'agile IT') is non-sequential and mainly bases on lean, iterative and agile principles (Bils, 2014). In line with the Mode 2, digital services are quickly developed in order to follow the short terms market changes. Mode 2 mainly focusing on value creation for business units, partners, and customers (Horlach et al., 2016).

Table 11.1 synthetizes the characteristics of Mode 1 and Mode 2 with reference to the main aims, culture, trigger, approach, application, and speed of service delivery.

Table 11.1. 'Core IT' vs 'Agile IT'

Issues	Core IT (Mode 1)	Agile IT (Mode 2)

Aims	Stability	Agility & Speed
Culture	IT-centric	Business-centric
Trigger	Performance and security improvement	Short term market trends
Approach	Waterfall development	Iterative, agile development
Applications	Systems of records	Systems of engagement
Speed of service delivery	Slow	Fast

Source: (Horlach et al., 2016).

Despite the mentioned differences, scholars usually agree on the need to align Mode 1 and Mode 2 and to integrate the according IS infrastructures, processes, structures, skills, methods, and IT architectures.

Data and analytics

According to data, companies that make extensive use of customer analytics benefit of the 126% profit improvement over competitors. Not surprising, McKinsey claims organizations need to "*focusing the analytics on delivering on goals with clear and useful insights, and having the right capabilities and processes in place act on them*" (2015, p. 6). People able to translate data output in into business insights are necessary to avoid the risk of collecting redundant information and misinterpreting data with negative consequences for the while organization. A recent study by Accenture and General Electric (Columbus, 2014) reports that, "*87% of enterprises believe Big Data analytics will redefine the competitive landscape of their industries within the next three years. 89% believe that companies that do not adopt a Big Data analytics strategy in the next year risk losing market share and momentum*". Yet, investment in big data still poses a lot of challenges due to the missing link between analytics capabilities and firm performance (Akter et al., 2016).

Combining data analytics and human skills is the way forward. Accordingly, some scholars suggest that investing in Big Data Analytics Capacity (BDAC) is crucial to sustain firms' competitive advantage. Kiran et al., (2014) define BDAC as the competence to provide business insights using data management, infrastructure (technology) and talent (personnel) capability. Particularly, BDAC has '*the potential to transform management theory and practice'* (George et al., 2014, p. 325), and the way in which firms do business (Barton & Court, 2012; Davenport et al., 2007).

Il line with the above, Akter et al., (2016) proposes a hierarchical BDAC model drawing on the resource-based theory (RBT), consisting of three primary dimensions (i.e., management, technology, and talent capability) and 11 sub-dimensions (i.e., planning, investment, coordination, control, connectivity, compatibility, modularity, technology management knowledge, technical knowledge, business knowledge and relational knowledge). In such a way, the model helps to identify what capabilities (technical and non-technical) an organization should acquire to be successful in big data efforts.

All the mentioned frameworks form a foundation on which companies can rapidly develop and scale their digital offerings, but unfortunately do not come with assembly instructions. Focusing on the building blocks allows companies to gain much greater benefits, but the real value is in being able to integrate them and manage the cross-business contingencies and dependencies of a large-scale digital initiative. Particularly, research found that high performance digital enterprises base their advantage on what there are actually able to offer in terms of creativity, leadership, and capabilities. While digital transformation frameworks alone cannot ensure success, they can mitigate failure.

11.2. From the digital building blocks to the digital capability framework

In spite of the growing attention to digitization, digital transformation and the adoption of effective DS, most of the available contributions about the topic, mainly focus on the role played by technology, neglecting the "human" side of digitization (Kohnke 2017). Adopting an organizational perspective, Ancarani and Di Mauro (2018) sustain that firms, when digitalize,

need to develop new forms of leadership able to drive the organizational changes. Moreover, new skills and competences are also required, which in turn entail building new organizational capabilities, and changing culture. Particularly, dynamic capabilities describe a company's capacity "(*a) to sense and shape opportunities and threats*, *(b) to seize opportunities*, *and (c) to maintain competitiveness through enhancing*, *combining*, *protecting*, *and*, *when necessary*, *reconfiguring the business enterprise's intangible and tangible assets*" (Teece, 2007 p. 1319). Adopting a dynamic capabilities framework provides for the most effective tools of investigation when dealing with the strategic change in the organizations (Barreto, 2010; Peteraf et al., 2013; Schilke et al., 2018). Building strong dynamic capabilities allow firms to rapidly create, implement, and transform business models to remain relevant in the emergent digital economy (Achtenhagen et al., 2013; Karimi and Walter, 2015, 2016; Teece, 2018; Teece and Linden, 2017; Velu, 2017). According to Teece (2014), dynamic capabilities distinguish from operational capabilities. Differently from operational capabilities (mainly dealing with the firm's ordinary activities, such as finance, human resource management, and marketing, dynamic capabilities are harder to imitate, supporting the firm's competitive advantage (Teece, 2014; Helfat and Winter, 2011; Grant, 2001). Particularly, dynamic capabilities consist of three capacities: *sensing*, *seizing*, and *transforming*, that are powerful lens for examining the digital transformation of incumbent firms in traditional industries (Warner & Wäger, 2019; Teece, 2014).

Sensing involves the "*identification*, *development*, *co-development and assessment of technological opportunities in relationship to customer needs*" (Teece 2014, p. 332). However, *sensing* does not only refer to technological opportunities, but to all the opportunities arising from the environment. Exploring external changes, collecting information and detecting potential opportunities are relevant actions for the development of effective DSs, since external changes can be implemented ad part of the firms' strategic approach (Yeow et al., 2018).

The second capacity is *seizing*. *Seizing* enables the firm to act on the opportunities that had been identified, detailing which specific changes the firm should employ in order to advantage from the external opportunities (Teece, 2007, 2014)[11].

Finally *transforming* involves the reconfiguration of the whole organizational resources that means the "*asset alignment*, *co-alignment*, *realignment*, *and redeployment*" (Teece, 2007, p. 1.336). This capacity is important reconfigure existing resources to align them to the new strategy. Because of the novelty of digital transformation and the rapidity if external changes, many firms cannot possess the resources and competences to develop their own DS, thus accessing to external resources become essential in aligning to the new emerging needs (Rindova et al., 2016).

Warner and Wäge (2019) develop a process model that identifies nine digitally based sub-capabilities that underpin the building of *digital sensing*, *digital seizing*, and *digital transforming* capabilities that are used by the companies to modify their internal resources, processes, and structures, in order to adapt to changing environment. The starting point of the model is represented by external triggers, including disruptive digital competitors, changing consumer behaviors, and disruptive digital technologies, which trigger the building of dynamic capabilities for digital transformation (Fig 11.3).

[11] As such, *seizing* involves the following actions including: *designing*, *selecting*, and *committing*. *Designing* refers to the design of new firms' structures and processes. *Selecting* refers to the selection among different available options to catch opportunities. Options may include the selection of suppliers and platforms - that may be provide complementary services - new products, processes/ services and, even, business models. Finally *committing* deals with the way firms put in practice what have previously decided. Moreover, it refers to the decisions about partners, services, processes, or business models (Teece, 2009).

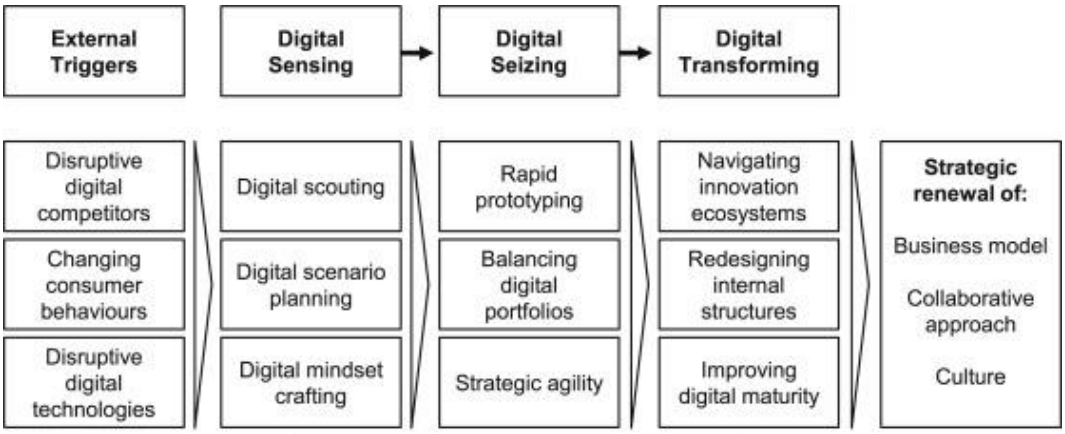

Figure 11.3. Building dynamic capabilities for digital transformation

Source: (Warner & Wäge, 2019).

Digital sensing consists of: digital scouting, digital scenario planning, and digital mindset crafting.

According to the authors' investigation, detecting technological, customer, and competitor-based trends requires firms develop of new capabilities in both digital scouting and scenario. Sometimes, firms make use of formal and informal networks to collect info about technological trends; also emphasizing the relevance of big data analytics and artificial intelligence to sense new customer-centric trends, otherwise impossible to foresee. Developing sensing capabilities also bases on crafting a digital mindset throughout the organization, as well as on establishing a long-term digital vision.

Warner and Wäge (2019) also finds that digital seizing consists of sub- capabilities relating to strategic agility, rapid prototyping, and balancing digital portfolios. The authors report that business model innovation is an essential component of an incumbent's digital transformation. Integrating strategic agility into firms' business model enables them to quickly exploit technological and market opportunities. Strategic agility may be reinforced by rapid prototyping that provides for the opportunity to accelerate the incumbents' digital transformation. Finally, balancing digital portfolios offers to the incumbents the chance to scale up or down on business model innovation. In so doing, the incumbents have the potential to enhance existing customer needs and demands.

Lastly, navigating innovation ecosystems, redesigning internal structures, and improving digital maturity contribute to the firms' digital transforming capabilities. Research results show navigating innovation ecosystems allows firms to get a whole understanding of customer needs, advantaging them in comparison with firms that maintain a traditional product-based business model. These strategic activities help to increase the digital maturity of the organization and support the incumbent's digital transformation. Particularly, firms pursuing a digital transformation need to redesign internal structures. One way to get the point is to decentralize the business units, establishing independent subsidiaries.

As Warner and Wäge (2019) note, digital transformation requires the development new firms' capabilities, and the management of "a wide range of tensions that relate to balancing internal and external collaboration, redesigning flexible and manageable governance structures, and improving the digital maturity of an externally recruited and internally promoted workforce" (p.328).

Therefore, the authors' findings on digital transforming capabilities emphasize the need for digital technologies that provide rapid responses to technological and market change (Eisenhardt & Martin, 2000; Teece et al., 1997).

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12. BUSINESS MODEL INNOVATION IN THE DIGITAL LANDSCAPE

Learning objectives

After reading this chapter, you will able to:

- Analise the construct of Business Model Innovation (BMI) in the new digital landscape;
- Identify the relevant resources in the boundary area and take care of their management;
- Understand the key role of boundary management capabilities to implement new BMI;
- Successfully exploit the opportunities offered by the new digital technologies by creating more innovative and co-creational business models;
- Examine the interplay among innovative business model, digitalization and boundary management;
- Adopt a future looking perspective in implementing successful BMI, considering the fundamental challenges to face on digital transformation

12.1. The new competitive contexts

The digital era is radically changing our societies and how firms do business. New competitive contexts, network dynamics and digitization present a continuous stimulus to renew the sources of competitive advantage (Kortmann *et al.*, 2014; Liu & Liang, 2015; Zhang, 2011; Fosso Wamba & Misha, 2017; Chen, 2019; Haseeb *et al.*, 2019; Veiga *et al.*, 2021).

As a consequence, there has been great hype that has led organisations to make considerable investments to explore how they can use digital technologies for innovation (Chesbrough, 2010; Foss & Saebi, 2018; Zott & Amit, 2007). Questions about the innovation process (Perez *et al.*, 2019), the success factors of innovation (Dewangan & Godse, 2014) and business model innovation (Fjeldstad & Snow, 2018) are increasingly relevant. Then, policy makers, executives and managers need clarification on the role of digitalization and its importance as a driver of innovativeness.

In this context, since digitalization affects several aspects of business, pushing firms toward the use of new paths of corporate growth (Holweg & Helo, 2014; Roden *et al.*, 2017), scholars have introduced the role of boundary management in rethinking the business model (Teece, 2018) and the shift from the boundaries of management to the management of boundaries (Caputo *et al.*, 2019). Digitization has accelerated the already rapid increase of activities that were traditionally within firms being realized by outsourcing processes (McIvor, 2009; Kwak *et al.*, 2018; Abeysekara *et al.*, 2019; Patrucco *et al.*, 2020).

The search for success pushes frequently towards partnerships and strategic alliances (Boddy *et al.*, 2000; Li *et al.*, 2017; Aggarwal & Kapoor, 2019; Reuer *et al.*, 2016). At the same time, firms have an increasing amount of information on environmental dynamics (Gupta & Kohli, 2006; Karmarkar, *et al.*, 2015; Trantopoulos *et al.*, 2017; Vrontis *et al.*, 2017) and the digital technologies push to new forms of interactions among firms and external stakeholders (Rosenzweig, 2009; Mikalef *et al.*, 2020; Zerbino *et al.*, 2018; Fosso Wamba & Mishra, 2017).

In view of the above, the analysis of the current competitive contexts is developed with reference to two main issues: the new business opportunities opened up by the digitalization and the growing importance assumed by the firm boundaries.

12.1.1. The digitalization process

Current markets are witnessing a rapid increase in digital infrastructures and network dynamics (Karmarkar, *et al*., 2015). Digital technologies refer to all those objects and devices that enable corporate actors to make rapid yet accurate decisions in response to the changing environment (Pan *et al*., 2018; Lee, 2012). Digital technologies include a wide range of automated systems equipped with automatic data exchange and technology capabilities characterised by "self-monitoring, analysis and reporting technology (SMART)" (Mashhadi *et al*., 2018 p. 1). They pervade every business operation and characterise most of the organisations and are widely used in a number of sectors. Studies (Schaltegger *et al*., 2016; Yang *et al*., 2017) point out that novel business models are achieved through digital technologies, whose models and technologies should be embedded in the organisation strategy (Schuelke-Leech, 2018). Lanzolla & Giudici (2017) argue that digitization can drive radical organisational transformation; however, organisations need to develop a set of core capabilities for directors to maximise the effects of digitalization.

The digitalization is touching several aspects of businesses, including supply chains and operations, pushing firms towards new "sharing economy" business models (BCG, 2015; Cohen & Kietzmann, 2014; Holweg & Helo, 2014; Sundararajan, 2013; WEF, 2016). These trends can improve the supply chain's flexibility, aiming to increase the quality level of production and minimize supply times to customers to meet variations in product demand faster, reducing crossing times and ensuring the necessary stocks by partnering with flexible suppliers.

At the same, digitalization should increase production efficiency, with the aim of reducing production costs and optimizing immobilized capital; in this way, plants can be used properly through systems that can streamline information flows.

Moreover, the affirmation of the digitalization develops new interactions among firms and among firms and customers (Rosenzweig, 2009). Indeed, firms can reduce risks by tending to share processes and activities in order to reduce the risk of interruption of flows along the supply chain, minimizing operational risk and contingent on operating costs (Fiorentino, 2016). This requires greater integration across an increasingly complex network of multiple partners (D'Aveni, 2015).

The current wave of this digital transformation has created new business opportunities and represent an important driver of novel – and often disruptive – innovation and value creation (Rachinger *et al*. 2019; Apostolov & Coco, 2020). The digitalisation process creates – and consequently changes – market offerings, business processes and models that result from the use of new technology (Caputo *et al*., 2019; Caputo *et al*., 2016). Digital technologies have radically changed the nature and structure of new products and services, shaped novel value creation and value appropriation pathways, enabled innovation collectives that involve dynamic sets of actors with diverse goals and capabilities and produced a new breed of innovation processes (Porter & Heppelmann 2015; Yoo *et al*., 2012). In this sense, the digital technologies are identified as powerful forces to pushing firms toward new business models (Cohen and Kietzmann 2014; Fjeldstad & Snow, 2018), making the firms' capability to innovate increasingly relevant (Chesbrough 2010; Foss & Saebi 2018; Zott & Amit 2007).

While it is clear that digital technologies will transform business processes, there are a number of challenges that firms should face; these challenges need to be addressed by managers and executives.

Specifically, the rise of new ways of doing business based on digital technologies has led scholars and operators to link new forms of strategic development to the concept of firm boundaries (Brouthers & Hennart 2007; Fiorentino 2016; Nambisan et al. 2017; Schotter et al. 2017).

Indeed, the digital transformations are creating new competitive contexts, and such contexts are having a major impact on firms and business processes, making the boundaries of firms fluid, dynamically expanding and more blurred than in the past (Garzella, 2000; Caputo *et al*., 2019); the new competitive context and digital convergence are able to develop intra and inter-organisational boundaries (Schotter *et al*., 2017; Yang *et al*., 2010).

The relevance of network models and the development of digital society put the emphasis on business process management at the firm's boundaries (Fiorentino, 2016; Borbély & Caputo, 2017).

In summary, the diffusion of ever new digital technologies makes the capability to innovate increasingly relevant for firms (Chesbrough 2010; Foss & Saebi 2018; Zott & Amit 2007) and emphasizes the importance of firm boundaries. Starting from the call for more innovative business process management, the study investigates the role of boundaries in the new digital and technological landscape pushing to shift the focus from the boundaries of the management to the management of the boundaries (Caputo *et al.*, 2019).

12.1.2. The firm boundaries

The environmental dynamics calls for new perspectives in business process management. The corporate growth strategies should be properly developed to create innovative paths and competitive advantage (Kortmann *et al.*, 2014; Liu & Liang, 2015; Von Hippel, 1988; Zhang, 2011; Llanes, 2019).

In a global environment where the speed of competition has substantially increased, the literature agrees that cooperation strategies should often lead to relevant benefits when firms, because of the lack of know-how or funds, hardly can self-generate the innovation needed to effectively respond to market needs (Aggarwal & Kapoor, 2019; Bouncken *et al.*, 2020; Ritala *et al.*, 2015).

In this scenario, the traditional distinction between "internal growth" and "external growth" strategies are becoming less useful to analyse the new strategic business practices that firms could embrace to create innovative paths and growth (Kortmann *et al.*, 2014; Liu & Liang, 2015; Zhang, 2011; Capurro *et al.*, 2021a).

Indeed, the traditional theories, such as "transaction cost economics" and "resource-based views", generally investigated corporate growth strategies by a "make or buy" lens (Barney, 1991; Coase, 1937; Williamson, 1975).

The transaction cost economics focused on the benefits and costs of managing activities inside or outside the firms. The resource-based view suggested, instead, that the analyses should encompass the traditional dichotomy between benefits and costs to focus on the analysis of resources and capabilities development.

These theories have been recently developed based on the evolutions in competitive and technological landscape pushing towards collaborative decisions in resource, knowledge and business processes management (Foss, 1996; Milgrom & Roberts, 1990; Parmigiani & Mitchell, 2009; Santos & Heisenhardt, 2005; Tortoriello & Krackhardt, 2010; Costa *et al.*, 2016; Enderwick & Buckley, 2019).

In this way, the management of boundaries becomes a key variable in the new competitive contexts (Foss *et al.*, 2013; Swink *et al.*, 2007; Caputo *et al.*, 2019; Garzella *et al.*, 2021). Studies increasingly focus on the firm's boundaries as a third alternative, over integration and market, emphasizing the joint use of skills and knowledge between firms (Alexander, 1997; Breschi and Malerba, 1997). In this way, boundary management should be the way to integrate benefits of internal and external growth strategies (Hargadon, 2002; McEvily & Zaheer, 1999; Steensma & Corley, 2001; Takeishi, 2001; Garzella 2000).

Specifically, the topic of boundaries was analysed by scholars from economics, management and organizational behaviour (Garzella, 2000, Villalonga & McGahan, 2005; Roy & Sarkar, 2016; Caputo *et al.*, 2019; Kim & Jin 2017). These studies have referred to the boundary concept to analyse resources, activities and processes that can be jointly controlled and influenced by many organizations (Yang *et al.*, 2010; Nason *et al.*, 2019).

Therefore, it is increasingly necessary to consider the autonomy of the concept of boundaries as having intrinsic characteristics, such as the size of these boundaries, namely how much the continuum area is extended, the resources that are positioned in the boundaries, and their management (Garzella *et al.*, 2021).

In this sense, scholars have found that the "control" should be the most useful criterion to define where firm boundaries should be placed: *''the organization ends where its discretion ends and another begins''* (Pfeffer & Salancik, 1978, p. 32). As such, boundaries are defined as transitional areas between the inside and the outside of an organisation, circumscribing resources and capabilities over which governance and control are extended (Fiorentino, 2016).

More in depth, boundaries should be viewed as a continuum area that represents an intermediate form of hybrid governance in network dynamics, digital innovations and sharing economy perspectives (Normann & Ramirez, 1993; Hakansson & Snehota, 2006). This continuum constitutes a "border area" in which it is not easy to distinguish the firms from the external environment. Consequently, it is increasingly necessary to use the concept of boundaries and the "boundary zone" as a central element in the business process management (Garzella *et al*., 2021; Nambisan *et al*., 2017).

The management of resource, knowledge and activities on the firm boundary should be a new paradigm to obtain and sustain competitive advantage (Dyer & Singh, 1998; Garzella, 2000; Wagner, 2003). This process is designed to create value by focusing on business processes and activities that occur at a firm's boundaries (Fiorentino 2016). In a context in which new communication tools and new ways of governing relationships are established, bringing the boundaries to the centre of the strategy could promote creativity and innovation (Foss & Saebi, 2018; Phelps, 2007). Managing boundaries involves a set of capabilities that guarantees balance and harmony between various elements and activities combined with internal and external forces (Parmigiani & Mitchell, 2009). To manage effectively, it is necessary to invest in management personnel attitudes, a fact that highlights the importance of governing relational, organisational and technological factors.

The "boundary" decisions are generally the answer to the pressure to extend and complement internal resources and the need for risk control (Yang *et al*., 2010).

In this sense, scholars suggest advantages from boundary management (Cao and Zhang, 2011; Cassiman and Veugelers, 2006; Parmigiani and Mitchell, 2009; Caputo *et al*., 2019). Studies find that boundary management favour the integration of coordination and flexibility benefits by jointly developing both (Park *et al*. 2004; Lavie, 2006; Swink *et al*., 2007). Specifically, scholars suggest advantages from managing business processes in hedging against demand uncertainty and in learning and developing new capabilities from partners (Cao & Zhang, 2011; Cassiman & Veugelers, 2006; Parmigiani & Mitchell, 2009). Other studies find that boundary management favour the integration of coordination and flexibility benefits by jointly developing both (Park et al., 2004; Lavie, 2006). Another literature stream focus on the chance of facing relevant risks of current contexts such as the full outsourcing of key activities by enhancing to outsource partially, thereby increasing the resource and knowledge portfolio from the relationship with external actors.

These findings lead managers to overcome the traditional trade-offs among internal and external growth strategies (Blocker *et al*., 2012; Fiorentino, 2016; Troilo *et al*., 2009).

12.2. The business model innovation

Business model literature has successfully developed frameworks and practices to capture the complex interrelationship between the creation and appropriation of value and to understand the logic of an organisation for value creation (Massa *et al*., 2017; Zott *et al*., 2011). Currently, it is now clear that innovating the business model has become a fundamental capability to survive the competition.

Stemming from prior accounts of business models, we use a comprehensive definition which sees business models as a modelling and representation tool: *"a business model describes an architecture for how a firm creates and delivers value to customers and the mechanisms employed to capture a share of that value"* (Teece, 2018, p. 40). It allows businesses to mediate technological and other resources in several ways: controlling, communicating and innovating; classifying, disclosing, focusing managerial attention, helping idea exploration, and supporting and coordinating the knowledge flow (Zott *et al*., 2011).

A business model can be made both of an internal value chain and external value chain. Specifically, with reference to the internal value chain, the business model could affect – for instance – the products and services, the activities, the resources and so on.

On the other hand, with reference to the external value chain, the business model could affect, *inter alia*, on the relationship with customers, suppliers, partners and competitors.

Once we have drawn a picture of a firm's business model, we could also make the important steps towards business model improvement and innovation. The conclusions of a business model assessment, including strengths, weaknesses, opportunities and threats are the basics for business model innovation.

Business models help innovation since they turn market opportunities into profits, delivering the value of a service or product through commercialisation (Zott & Amit 2012). Firms commercialise new ideas and technologies through their business models; but while firms have extensive investments and processes for exploring new ideas and technologies, they often have little ability to innovate their business models (Chesbrough 2010; Spieth *et al.*, 2016).

In line with these assumptions, more firms now are turning toward Business Model Innovation (BMI) as an alternative or complement to product or process innovation and because it can translate to a sustainable advantage (Brehmer *et al.*, 2018). In this sense, *Table 1* shows some famous examples of business model innovation.

Table 12.1. Famous examples of business model innovation

Companies	Business models	Sector
Amazon	On-line distribution of books, music, etc.	Retail
Apple	New digital music players and online songs selling	Music players
Canon	Photocopiers for medium and small users	Photocopiers
Dell Computers	On-line direct distribution of computers	Computers
First Direct	Direct banking	Banks
IKEA	Direct distribution of global ready-to-assemble (RTA) furniture.	Furniture
McDonald	Managerialization of a traditional individual activity	Food catering/restaurants
Procter&Gamble	Production of disposable diapers	Retail
Southwest Airlines	Low-cost air transport	Air transport
Starbucks coffee	Creating a coffee-related drinking experience	Food catering/restaurants
Swatch	Production of fashionable plastic watches	Watches
Unilever	New concept of "experiential" and new distribution channel	Frozen food products
3M	Selling paper memo	Retail

Source: Our elaboration

The rapid development of digital technologies has radically modified the nature and structure of new products and services, shaped novel value creation and value appropriation pathways and produced a new breed of innovation processes (Caputo *et al.*, 2019). Indeed, the digital era and the Industry 4.0 paradigm, combining different technologies, offer the potential not only to create radically new products and services and to share knowledge between different actors of the technology ecosystem (Lombardi, 2019) but also to generate proactively BMI (Caputo *et al*, 2016; Spieth *et al.*, 2016). The *Table 2* lists some critical success factors which can promote an evolution in BMI.

Specifically, the BMI refers to a new activity system of a firm (Foss & Saebi 2018) and innovative structures for value creation and value capture (Chesbrough 2010). Markides (1997) clearly distinguishes the business model innovation which is a radical rethinking of the elements and the relationships existing between the elements of the business model. As Gary Hamel (1998) argues: "we have only just begun to think about innovation at the level of business model. There are very few people in firms today that can think holistically about entirely new business models as opposed to seeing innovation as a technology or product issue". We need to overcome this traditional view. We need to focus on business model innovation. Thinking in terms of business models rather than products or processes significantly extends the potential scope of innovation. The possibility of crystallizing innovations in an overall innovative business model seems to increase the shelters against imitation, the sustainability of the competitive advantage and the period of time in which to benefit from a Schumpeterian yield (Teece *et al.*, 1997).

Table 12.2. Critical success factors evolution in business model innovation

Industry	Performance attributes emphasized by established firms	Performance attributes emphasized by business model innovators
Banking	Extensive, nationwide branch network and personal service	24-hour access, convenience, price
Insurance	Personal, face-to-face advice through an extensive agent network	Convenience and low commission rates
Airlines	Hub-and-spoke system, premium service, meals, baggage checking	Price, no frills
Brokerage	Research and advice	Speed of execution and price
Photocopying	Speed of copying	Price, size and quality
Watches	Accuracy and functionality	Design
Steel	Quality	Price
Motorcycles	Speed and power	Size and price
Bookstores	Chain of superstores offering nice environment and service	Wide selection, speed, price, convenience
Car rental	Location (airports) and quality of cars	Location (downtown) and price
Computer	Speed, memory capacity, power	Design and user-friendliness

Source: (Markides, 2013).

The business model innovation involves the redefinition of "who" (who customers?), "what" (what products?) and "how" of business models developed by firms. From a strategic management perspective, the aim is to think to new customers, new products and new processes all together. The answers to these questions are based on what each firm think its business is. Business model innovation occurs when a firm identifies new sources alternately or simultaneously: e.g. in market opportunities, linked to new customer segment or neglected customer segments; in the creation of innovative products/services, linked to the development of customer needs; in rethinking the corporate structure, linked to new skills or processes.

An innovative business model can allow the firms to change the rules of the game in order to compete through a business model that is not only better than its competitors but so radically different as to acquire a privileged position in a competitive context.

Indeed, recent developments emphasise a need for a more dynamic perspective that addresses BMI itself so that any fundamental change in the relationship between the model elements can be understood as BMI (Foss & Saebi 2016). Firms often experience conditions of

resource scarcity, and they need to focus on BMI as source of future value (Amit & Zott 2012). Competitors might find it more challenging to imitate or replicate an entire novel activity system than a single new product or process (Casadesus-Masanell & Zhu 2013).

Managers must be aware of the possibility of competitors' efforts in this area because BMI can be a powerful competitive tool. Competitive pressures have pushed BMI much higher than expected on firms' priority lists. Even under conditions of resource scarcity, organisations do not need to renounce innovation as a way of enhancing their performance (Zott & Amit 2008). Instead, managers should consider the opportunity offered by BMI to complement innovation in processes and products. BMI can allow managers to resolve the apparent trade-off between innovation costs and benefits by addressing how they do business and by involving partners in new value-creating activity systems.

Digitization is profoundly reshaping the way firms think and go about business model innovation for competitive advantage (Baden-Fuller & Haefliger, 2013; Huarng *et al.*, 2015; Lanzolla and Giudici, 2017) not only in the so-called "digital world" (e.g. Alberti-Alhtaybat *et al.*, 2019) but also in the "physical" world (i.e. "real-traditional world," Chen & Zhang, 2014; Hartmann *et al.*, 2016; Tian, 2017). For example, digitization increasingly opens up opportunities for firms to conceive and create innovative business models in two-sided markets (Caputo *et al.*, 2019; Rochet & Tirole, 2006; Garzella *et al.*, 2021) with interconnections between two or more customers that might or might not make monetary payments (i.e. "users," see Baden-Fuller *et al.*, 2018; Erevelles *et al.*, 2016; Tiago & Verıssimo, 2014).

Traditionally, the innovation development model has been structured according to a "technology-push" logic in the literature. This process, developed in the 1950s and dominant until the early 1960s, considers innovation to be the result of a more or less linear process that starts with scientific discovery, continues with R&D, and ends with the creation of industrial technological developments that become new innovative processes and products to affirm in the market (Freeman, 1974). The "technology-push" model therefore recognizes the supremacy of technological progress as the main driver of the evolutionary phenomenon (Rosenberg, 1982). The innovation process arises from the availability of new technologies, and only in the later stages do firms analyze how to meet market needs with these technologies (Mowery and Rosenberg, 1979). It is therefore the firm that promotes innovation through the development of its offer, realized with the support of major direct and indirect investments in research and development that aim to make innovations consistent with the firm's strategic goals. Only later and in the background is there a need to investigate the possible relationship between these innovations and market needs.

In contrast, since the mid-1960s, a different "demand-pull" approach has been developed (Schmookler, 1966). This perspective argues that market demand plays a key role in innovative processes, while technology remains in the background (Myers & Marquis, 1969). Technology knowledge alone is not sufficient to stimulate innovation. The innovative process, understood as the result of market stimuli, reverses the sequence of phases in the "technology-push" model. The primary input of the "demand-pull" process is the identification of market needs. Subsequently, there are attempts to satisfy those needs

through technological innovations that place new products on the market (Eggers *et al.*, 2017).

Therefore, firm innovations are driven by the need to satisfy market demand, looking to grasp – at best anticipate – market trends to direct and speed the innovation process and acquire new positions of competitive advantage (Chaffey & Ellis-Chadwick, 2016).

The juxtaposition between "technology-push" and "demand-pull" is useful for identifying where the stimuli for innovation arises and for understanding the importance, on the one hand, of focusing on scientific research and technological development activities while, on the other, analyzing the external environment to identify opportunities linked to latent needs (Taylor, 2008; Di Stefano *et al.*, 2012).

To date, digitization is shifting focus to consider ways to integrate these perspectives to fully understand the sources of innovation processes. Digital transformation push firms to

change their innovation processes based on a logic in which the traditional boundaries between technology-driven and market-driven approaches disappear. The potential of digital technologies is often able to facilitate the development of innovation and the redefinition of firm-customer relationships: digitalization can redefine the relationships between firms and customers, dematerializing a part of the supply chain; web is the platform that enabled sales models to be redefined by "shops" and "new locations," sometimes called "virtual" but more properly defined as "digital," where supply meets demand by using technology as a tool for meeting, conversation and bargaining. Indeed, the firm–customer relationship is changing; this relationship, as conducted over product sales processes, is becoming the starting point for product and manufacturing innovation. The traditional approach oriented toward understanding customers' needs and behaviors, including hidden ones, has also considered the potential of big data analytics. Moreover, the increasing competition and globalization of strategic processes are requiring a search for new positions of competitive advantage (Capurro *et al*., 2021b).

In current contexts, given the complexity of innovative phenomena, it is increasingly difficult, in fact, to frame innovative processes along a predefined linear path from a precise

point of origin to one of arrival. Market-driven and technology-driven approaches are increasingly the extremes of a single path that, over time, has adopted countless intermediate and interactive forms in which the interweaving of the increasingly available scientific and technological knowledge with market dynamics is evident (Capurro *et al*., 2021b).

This change can drive firm innovation processes to rewrite the "rules of the game" (Davenport *et al*., 2012; Leeflang *et al*., 2014). Digital technologies are witnessing the development of innovative paths aimed at interpreting and integrating the two logics in a new way, aiming, from a more typically strategic view, to relaunch the "technology-push" logic alongside the accredited "demand-pull." These two perspectives appear not antithetical but, conversely, should complement each other to increase their effectiveness. Digital transformation can drive innovation processes through the development of disrupting ideas that are able to model, convey and influence market demand, thus triggering a virtuous circular process. The speed of smart technologies can overcome the dichotomy between sources of innovation and eliminates the possibility of delineating strict boundaries between technology and market needs. New capabilities are required to close the gap between the two worlds.

Additionally, developing a BMI offer firms the opportunity to complement innovation in processes and products by involving dynamic sets of actors with different goals and capabilities in new value-creating activity systems (Bouncken *et al*., 2020). Understanding new value creation and value appropriation pathways which include external partner in firm's activities exert pressures on the management of the business processes concerning firms' boundaries (Fiorentino 2016; Caputo *et al*., 2019; Schotter *et al*. 2017).

Although prior studies have shown BMI as a core driver for a firms's survival and superior performance (Child et al. 2017), the traditional definitions of business models focused mostly on internal or external elements of the value chains (Zott & Amit 2012); the literature on topic gives less importance to the connecting elements (Caputo *et al*., 2019).

Instead, it is important to analyse the role of the boundaries – and the boundary management - for the elaboration and implementation of a more innovative business models. In fact, in contexts where new innovation paths are established, the firm's boundaries are already considered as a central element in network dynamics, digital innovations and sharing economy perspectives (Garzella *et al*., 2021; Nambisan *et al*., 2017). The current challenge is to shed light on the influence of boundary management on supporting the development of BMI.

The next section delineates line of actions and solutions on how firms can develop more innovative and co-creational business models and foster boundaries capabilities management in the new digital landscape.

12.3. The role of boundary management and digital technologies in business model innovation

Boundary management requires firms to develop the capability to manage resources that are neither internal nor external, with the need to balance new technological tools (e.g. cloud technologies, sensors, big data, 3D printing) and new inter-organisational relationships (e.g. cooperation, collaboration and communication between the firms' networks) as well as new leadership styles (Caputo *et al.*, 2019).

The diffusion of digital technologies has created new business opportunities and continuous stimuli to renew the sources of competitive advantage. The pressures and opportunities driven by the rapid technological changes have made relevant the management of resources which neither internal nor external and can be physiologically placed in the boundary area.

Analysing the studies on topics, the main boundaries resources can be identified in intangible assets - such as corporate image, social capital, management relationship skills and so on - and in technological and digital assets (Garzella, 2000; Galeotti & Garzella, 2014); these resources have fundamentally a great role in reaching the competitive advantage position of the firms. The strategic importance of intangible resources depends largely on their difficult reproducibility and their incremental character. We mean to refer to the ability of most immaterial elements to simultaneously produce inputs and outputs of the production process. Most resources are consumed during the production process, while intangible resources instead of diminishing as a result of their use, if well used, increase or at least retain their potential.

Likewise, the establishment of "boundary" strategic processes draws attention to the deepening of the role played by information and, in particular, information technology as factor that allow the integration of elements that carry out the important task of resource linking and development, and allowing continuous isomorphisms of the firms and the environment, by means of strategic boundary management, in the search for the best competitive positioning.

Indeed, the success of a strategy based on boundary management, in fact, is often powered by the greater autonomy that characterises boundary elements and resources. In this sense, the boundary management individuates - in a sort of contradiction - boundaries as the centre of the firms' system of strategies.

Managing boundaries, together with the push of digitalisation, could support firms to implement innovative actions to create and expand markets rather than just reacting to customer demand, and to redirect resources from profitable but dwindling business to support emerging ones that are potentially more profitable.

It is the choice to focus on resources that, on the verge of controlling, cannot be considered internal (but not even external) that favours strategic pushes.

Strategic creativity comes from the contributions of subjects with a relative individuality and a strategic freedom capable of "joint fertilization" and to prefigure as a consequence, a higher ability to organize innovative activity, primary source of competitive asset over other competitors. (Arcari, 1996; Fronterre, 1991).

In this sense, the decision and the awareness of being oriented towards a strategic development path that sets its own success in the ability to strategically manage boundaries has led, firstly, to understand the opportunities of this development model and then to impose considerations regarding its effective, efficient and correct implementation.

Actually, as seen, the decision to share the growth with other subjects of strategic autonomy and to put the pivot of the strategies on the firm's periphery requires the need of a special attention to the management of the boundaries.

The boundary management commitment is to create balance and harmony between the various elements and activities that lie in the boundary zone, combining them effectively and efficiently with the mix of internal and external forces, in order to reach positions of excellence with respect to competition (Cassiman & Veugelers, 2006; Parmigiani & Mitchell, 2009).

As seen, a successful boundary strategy requires the involvement and participation of a plurality of autonomous subjects. The firms thus realize an organization framework capable of ensuring creativity, flexibility and responsiveness (Park et al., 2004; Lavie, 2006).

The management of boundaries includes the decisions about “how” to define the activities integrating and interfacing the firm and the external environment. This approach implies the involvement of many subjects each one with strategic autonomy and, in fact, generally affects business processes that cannot be considered neither fully internal nor fully external. The management should design and manage business processes in a wider perspective to identify new integration and coordination opportunities among the value chains of the firm and the value chains of external “partners” (Boddy *et al*., 2000; Pil & Holweg, 2006; Porter, 1987).

Indeed, recent studies emphasize the link between the management of firm’s boundaries with the most modern paths of growth such as the open innovation processes (Capurro *et al*., 2021). Implementing open innovation modes (Chesbrourg 2003a; 2003b), firms change activities process transforming innovation management model, business model (Zhu *et al*., 2019; Garzella *et al*., 2020; Saebi & Foss, 2015; Abdulkader *et al*., 2020) and sharing knowledge with producers, providers, users, research centres, universities and other network actors (Lombardi *et al*., 2016; Secundo *et al*., 2019). The involvement of several external resources becomes a focal issue in governing firm through strategic boundary management (Giannopoulou *et al*., 2010; West *et al*., 2014; Fiorentino, 2016).

By grasping the link between new forms of innovation and boundaries management, the studies push to shift the focus of open innovation implementation towards the management of the boundaries, where boundaries capabilities and activities play a key role in order to maximize potentiality and reduce risks in implementing open innovation. The link between boundaries strategies and resources and innovative capabilities can also be useful in identifying the best ways of managing and organizing the network and the various partners involved or to be involved in the innovation implementation process (Capurro *et al*., 2021).

However, typical management and organizational issues of boundary strategies are represented, above all, by the difficulty of "controlling" over time organizations and individuals who are gravitating in the boundary area and that represent in the strategies, by definition, strategically relevant resources.

In order to reduce the risk of dangerous centrifugal pushes - with boundaries variables and resources becoming external and competing with the firms - there is a need to constantly seek ways and arrangements to give relative cohesion to resources and boundaries organizations, often exercising on the ability to reach a strategic convergence of interests, although starting from dissimilar, and sometimes even apparently conflicting, positions. In this sense, firms should implement “linking” and “bearing” strategies for managing relationships with suppliers and customers (Scott, 2003; Garzella, 2000).

Boundary strategies lead to a win-win approach for organizations in a supply chain where each actor collaborates to compete with other chains.

The “linking strategies” seek to internalize the resources and skills of the partners. Firms, pursuing the information sharing and the alignment of internal and external business processes, should allow redesigning the entire supply chain innovatively to satisfy the customer more effectively and improve the overall operating efficiency.

At the same time, however, firms need to supervise business processes by developing "bearing" strategies that allow protecting from the risk that external actors of the supply chain should acquire key information by the relationship with the firm. Competitive expectations should lead other parties of boundary operations to promote their own interests at the expenses of firm interests.

Boundaries strategies – with linking and bearing approaches – can be the way to quickly catch the signals of strategic change in business contexts, on one hand, and to defend the strategic resources and capabilities, on the other hand.

The main advantages and disadvantages related to the implementation of boundary strategies are summarized in *Table 3*.

Specifically, boundary strategies strongly propose the importance of governing relational, organizational and technological factors. The skills and professionalism required by management become complex and articulated. In the implementation of boundary, the critical

issues are first managing relationships between processes, activities and people. The developments of information technology and digital infrastructures make it possible to share a big amount of data and information that, on the one hand, offer huge opportunities but, on the other, pose problems with their organization and their correct use (Capgemini, 2011). There is a need to ensure and develop the sense of belonging to a kind of over-organization to reduce the risks of dangerous opportunistic behaviors.

Such physiological autonomy and flexibility of boundary relations emphasizes the need for forms of cultural, strategic and operational coordination more advanced than traditional ones, otherwise bankruptcy risks become high and the severity of the effects on the firms is correlated proportionally to the importance of the tangible and intangible assets concerned.

Table 12.3. Advantages and disadvantages of boundary strategies

Advantages	Disadvantages
Access to resources/capabilities that are difficult to replicate	Difficulties of integration among the actors
Increased creativity and flexibility to the corporate system	Difficulty of "controlling" the corporate processes
Fast operational processes and low costs	Slow operational processes and waste of resources
Elimination of potential competitors	Facilitation of a potential competitor

Source: Our elaboration

First, it's important the implementation of a negotiation process (Caputo *et al.*, 2019). The negotiation, commonly defined, in the relevant literature, as a process through which two or more parties reach a needed joint decision, while having different preferences (Zartman 1977; Fisher et al. 1981; Pruitt 1981; Lax & Sebenius 1986; Raiffa et al. 2002; Lewicki et al. 2014), is thus both essential and fundamental for business.

Due to the interdependence which reigns over and inside multi-actor decision processes (Thompson, 1967; 2001), negotiation outcomes are affected by all decisions made by all the parties involved. In this sense, improving the ability to negotiate effectively is crucial in managerial, political, and business contexts.

Therefore, the ability of the firm to consistently negotiate within and beyond its boundaries is an important strategic driver to achieve and sustain competitive advantages (Brown, 1998).

In this sense, the analysis identifies in the ability to capture weak signs, anticipate the future, generate innovation, and govern change, the key elements in order to implement more innovative and co-creational BMI. Management must be able to manage a system of increasingly complex and varied factors, giving rise to a harmonious combination capable of interpreting the environment and competitive dynamics. Thus, the concept of BMI comes to strictly linked with the boundary management, finding support in the diffusion of new digital technologies.

In line with the current concept of BMI - which include a "border area" - boundary management has to take care of expressing the need to organize an innovative relational system, extending beyond the classical business boundaries and interpreting a new way of managing both the processes that move resources from the inside to the boundaries (think, for example, of issues related to the development of telework), as well as those that approach resources from the outside (e.g. creation of inter-companies networks). In this sense, the BMI should give autonomous relevance to the boundary management and to boundaries strategies; firms need to pay attention to internal resources and capabilities, to external resources and capabilities and to resources and capabilities that are collocated on the boundaries (Caputo *et al.*, 2019; Nason *et al*., 2019).

Boundary strategies – in a competition based on intangible resources, relationships and digital assets – can be considered a cornerstone to create BMI, in order to reach new situations of bigger and more solid competitive advantages and sustainable positions.

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13. DIGITAL BUSINESS PLAN AND STARTUPS

Learning objectives

Students learn in this chapter:

- Basics of business plans
- The need for digital business plans
- How to write a business plan
- Basics on start-ups
- Financing possibilities for start-ups
- Life-cycle of start-ups

13.1. Business plan in general

From an internal perspective, a systematically prepared and regularly updated business plan is a valuable tool for the management. To serve as a management tool the business plan need to provide deep insights into all business issues, serves the management to efficiently plan the development of the company and to prepare the necessary adjustment measures in a structured manner. Such a business plan can thereby contribute on the one hand as a guideline for the daily decision-making and on the other hand as a control instrument in the control of the current business. In addition, the joint implementation of the business plan by the management team leads to the assurance of a general commitment to the company's goals and controls. If a company has several branches, business plans can make a significant contribution to the development of the company, as they enable top management to ensure location-based corporate planning on the one hand and to continuously monitor performance and the achievement of overall corporate goals on the other (Fry & Stoner, 1985; Schwetje & Vaseghi, 2007).

On the other side on an external view, the business plan represents the most important financing instrument of a company. Further, it also serves to secure existing or planned business relationships between the company and its stakeholders. Depending on the type of financing and stakeholder relationships, different aspects are weighed in a business plan and treated in different ways. Most investors, especially venture-capital and private-equity investors only consider an investment when the business case is well prepared in a business plan. In particular, investors are most interested in the how and in which period of time a return on investment will be realized. Further, when banks are considering applications for credits they are interested in a business plan that shows in particular how the loan and the interest can be paid back. Similar to investors, statements about the company strategy, growth, market success, the current and future financial situation as well as the qualifications and experience of the founders are particularly important (Fry & Stoner, 1985; Schwetje & Vaseghi, 2007).

Moreover, a business plan is relevant when a company wants to enter into a strategic partnership or wants to buy a company, because the business plan provides information about all important and relevant information. Many companies consider the generation of a major customer or an agreement with a wholesaler to be an extremely important step for success. Since many large companies are cautious and reluctant to negotiate with unknown small businesses, a convincing business plan can help eliminate doubts and build confidence. In this context, a business plan can serve as an effective door opener to new markets, suppliers or customers (Schwetje & Vaseghi, 2007).

In summary, it can be stated that a business plan is used to record the current or planned activities of a company, the feasibility of the venture is documented and an implementation plan is drawn up. In addition, goals are defined and shown how and in what time-frame they can be achieved. Essential parts of a regular business plan are: the description of the company and its products, the definition of the customers, an analysis of the market and the competitors, the process planning, the financial planning and the marketing planning. In the financial plan, projections of liquidity, sales and profits as well as financial requirements should be presented. This traditional business plan can be used as a selling tool in negotiations with e.g. investors or banks as well as to solicit base to gain feedback from e.g. a potential customer or business mentor (Schwetje & Vaseghi, 2007).

The structure or the degree of detail of a business plan depends on the purpose for which it was created (e.g. for internal use or for external use) and must therefore always be adapted to the framework conditions (Schwetje & Vaseghi, 2007). However, the formal structure of a business plans is now largely standardized in order to give the interested reader a targeted overview of the essential elements of the planned company (company concept). In terms of content, a business plan can basically be divided into three sections (Schinnerl, 2018):

- the (verbal) presentation of the business idea (business purpose) and the founder(s) (competencies) and the planned implementation of the project (measures),
- the financial planning calculations (funds required for implementation)
- and attachments.

Digital Business plan

Since market-conditions are rapidly changing due to technological advancements, a business plan has to be updated according to the market data and assumptions at least annually. Lately, the expectations about strategies have changed due to new market conditions: organizations need to include technologies and develop a digital strategy with e.g. mobile technology to remain competitive. For that reason, a Digital Business Plan is needed. In comparison to the regular business plan, a digital business plan is an extension of the former, which is used to detail the contribution of the digital initiatives to the success of the vision, the goals and opportunities.

Development of a digital business plan

After describing what a business plan is, why it is necessary and which components should be included this chapter gives a detailed overview on the development of a digital business plan. In particular, the three essential elements mentioned above will be presented in detail.

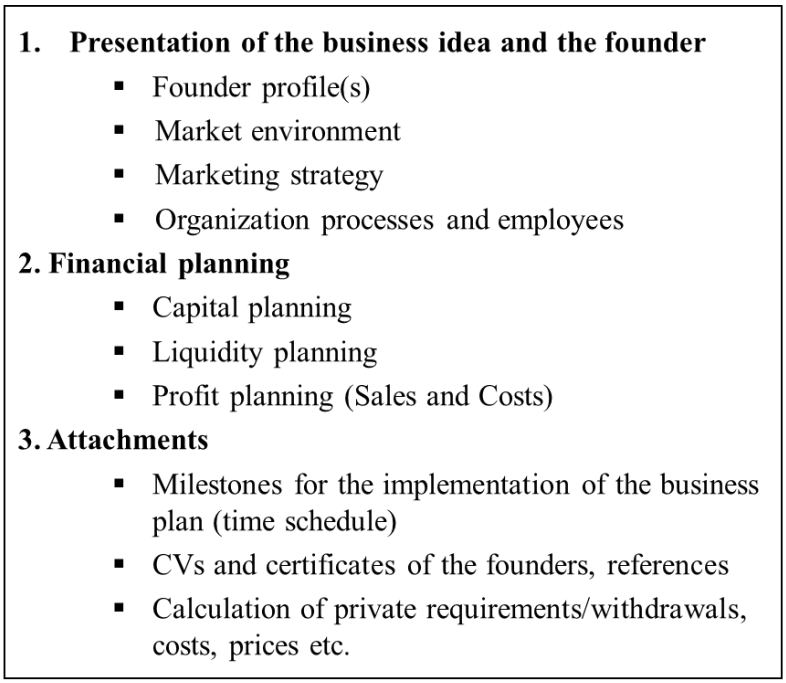

Figure 13.1. Overview Business Plan

The written preparation of a business plan (company concept) - as well as its visually supported presentation - regularly starts with a title/cover page. This title page should include information of the project, name of the company, address location, the reason for the preparation and the founder/team name. After this front-page the business plan includes a one-page content overview or a summary of the subsequent content. This summary should be conducted like a management summary, including all relevant information (Heupel, 2020; McKeever, 2016; Schinnerl, 2018).

When describing the corporate concept it is necessary to keep in mind that it should be formulated as concisely as possible and as detailed as necessary without overtaxing or boring the reader. So for example do not use technical terms or self-praise etc. Overall the final business plan (prepared in the initial phase) should not exceed 30 pages. Informative graphics (with a few illustrative colors) also visually loosen up the explanations and reinforce the message; however, more extensive elements like CVs, samples, tables or flow charts should be included as an attachment. Overall, the structure of the business plan should follow a storyboard that has a clear structure and a certain dynamic, so that the reader follows the explanations with interest until the end (Lämmle, 2020; Schinnerl, 2018).

Presentation of the business idea: Here, the planned product/service should be presented in a comprehensible and understandable way (even for someone outside the business). The individual considerations, analyses and measures already presented in advance are not repeated here. In this part of the business plan you describe your offer (product, service) exactly, thereby it is very important to describe your offer clearly, so that everybody could understand it. Therefore, you should give information about the characteristic and in particular on the features of the product, characteristics of the product or focus of activities in the case of services. Avoid technical terms as much as possible and explain complex issues in more detail. After the description of the product it is important to make clear why exactly do you offer this product. In this section, the unique selling proposition (USP) that distinguishes, your offering from competing products (in the foreseen market segment) must be specified (Schinnerl, 2018).

A USP in this sense might be for example: novel/innovative, low cost, high quality, regional, healthy, environmentally friendly, visually/tactile appealing, size/weight consumer friendly, packaging/presentation enticing, longer useful life, additional service/guarantee; can this be easily imitated/substituted by competitors. Further, the benefits of the offer for the potential

customers and the customer problems which the product /service solve need to be described. Specifically, it should be noted which customer needs (possibly new, i.e. created by the product/service in the first place) are satisfied by it. Thus, the current development status of the offering as well as existing hurdles exist/could arise until completion (technical, legal, financial, etc.) should be mentioned (Großklaus & Großklaus, 2006). Moreover, you should provide information about the possibility to apply for property rights. Possibly you can already present/describe a prototype of your product (Schinnerl, 2018).

Founder profile: While competent founders can usually lead even a mediocre business idea to success, incompetent founders on the other side can fail even with an excellent business idea. Therefore, it is important to impressively present the applicable characteristics and competencies of the founder(s) in the business plan. For this reason, it is important to describe the professional qualifications of the various founding members (individual founders) or members of the start-up team, the commercial qualification/knowledge of the founder/start-up team as well as the personal characteristics/qualifications of the founder(s). Among other things, this section of the business plan should include for example information about work experience, degrees, continuing education, basic knowledge of organization/planning, business management and accounting, and information about performance or language skills (McKeever, 2016; Schinnerl, 2018).

Marketing strategy: Based on the above (analysis) steps and the factors listed above, the marketing instruments used to realize the planned (marketing) strategy or marketing policy are presented here (marketing mix) used to realize the planned (marketing) strategy or marketing policy. These include in particular: customer, product, price, distribution and communication policy, distribution and communication policy (McKeever, 2016).

In the area of the target group, it is defined which customers this should include, how the support of the customers should look like, how the sales relevance of these customers is designed, how the price sensitivity of the customers is designed and which needs the customers have. The product policy describes the design of the specific offer or assortment. In particular, the breadth and depth of the product range and the additional services are to be presented here. When setting prices, several factors have to be taken into account, such as the market or the customers and their willingness to pay the required price for the customer benefits of the product. The competition, which also determines the price (the upper price limit) for comparable products/services and, last but not least, the cost price, which determines the (longer-term) lower limit of the selling price (Baker, 2014; Lämmle, 2020).

When choosing a distribution channel, the decisive factor is the area in which the company operates. In this section of the business plan, however, the following aspects should be addressed, among others: Is a delivery service offered? What resources are available/required? How will customers receive the product/service? How long do the different delivery routes take? Since the founders are usually completely unknown on the market, they have to draw their potential customers about themselves/the company and the product/service. It is important to determine how potential customers are to be reached, what the advertising budget and the advertising concept look like, and which advertising campaigns are planned via which advertising channels (Baker, 2014; Schinnerl, 2018).

Market environment: Key factors influencing the future success of a company are the market situation and development, the location (advantage) and the intensity of competition. Their determination and analysis have already been described in principle. In the business plan, therefore, only the various factors and their characteristics/analysis results are presented and, if necessary, supported by the relevant statistics and graphics (including references). Since these are very industry-specific in nature and relevance, only general aspects can be listed below and supported with examples (Klandt, 2010).

In this part of the business plan, you should describe the market potential for the product/service in the selected market segment. Thereby the number of interested parties or potential customers and their purchasing power as well as the price for the product/service needs to be considered. In particular, you should make assumptions of a realistic market share,

on sales, costs and profit planning in concrete terms. Further, the selected location for your business must be described and justified. This part of the business plan, which is not standardized but depending on the particular industry you operate it, deals with the selected catchment area, the closeness to the customers, the competitors, access to production facilities, requirements, laws, taxes and the price for the property (Abrams, 2003; Schinnerl, 2018).

Concerning the competitors, the (most important) competitors in the industry and the specific location need to be find out and listed in this section. A distinction is to be made between competitors and competing products. On the one hand, it will be shown in detail which competitors serve the same market, how the competitor products are designed and, on the other hand, the strengths and weaknesses of the competitors as well as possible scenarios of how competitors will react to the introduction of the product (Klandt, 2010).

Organization processes and employees: In this section of the business plan, in addition to the chosen legal form of the company, the required premises should also be presented, and the corresponding costs for them should be presented in the next section "Financial plan". In addition, this section shows which employees are required in which function and with which qualifications. Statements about employee requirements (constant/fluctuating) as well as the salary structure are also to be included (Schinnerl, 2018).

Financial Planning: The values determined or forecast for the various periods need to shown visibly in this section of the business plan. Therefore, totals, balances as well as surpluses or deficits are to be calculated for specific purposes. The individual values are to be justified or substantiated (with sources) in a comprehensible manner (for an external interested party/potential investor) in a written commentary on the various plans and the results are to be interpreted from the company's point of view and evaluated with regard to the above-mentioned market research analyses/results. The consideration of the developments over time (especially with start-ups usually increasing) as well as comparisons with other companies in the industry increase the informative value of the analyses. The results ultimately provide information about the visibility of the business model and thus the creditworthiness of the planned company. Last but not least, the measures planned in each case should be mentioned. All calculation concepts (plans) presented at this point should be presented and calculated in programs such as MS-Excel in order to be able to modify them easily. As discussed above, due to the digitalization era the business plan should be updated at least once a year, however in some cases an monthly or quarterly update of the values may be necessary. To increase the informative value the informant may use key graphics, figures and comparisons. However at this point, it should be noted that most or many of the figures and data presented here are based only on estimates and forecasts. For this reason, the accuracy, reliability and meaningfulness of the results presented may be impaired (Abrams, 2003; Schinnerl, 2018).

Liquidity planning: The calculation of liquidity should be prepared on a revolving basis, which means that the respective months that have already passed are to be removed and replaced or supplemented by the new subsequent values. This procedure enables an unlimited planning horizon. The payments of the due dates are also to be listed in the liquidity plan, these can be current, recurring, one-time, periodic or irregular due dates. Moreover, as already mentioned, some assumptions have to be made here concerning the payment habits and payment morale of the customers. In particular, for example it should be considered when the customers may pay the invoices (e.g. partial, in advance) or if there are defaults expected? However, due to the uncertainty of the individual assumptions, these assumptions must be estimated with extreme caution (McKeever, 2016; Pinson, 2008).

Capital planning: In the capital planning section of the business plan, information on expenditures for planned investments as well as operating costs should be compiled in order to determine the capital requirements. The founders often have to make assumptions here and provide a plausible presentation. The specific positions of the capital plan are different according the businesses and organizations, therefore the list below only serves as an exemplary representation of positions that could be relevant: (Schinnerl, 2018)

- Long-term investments (e.g. land, buildings, operating and business equipment, tools, machines, vehicles, IT equipment)
- Working capital / short-term investments (e.g. start-up costs, rental costs, personnel costs, stock of goods and materials (opening stock), reserves, etc.).

Profit planning (Sales and Cost): In the Profit Planning section, the expected costs are to be indicated in addition to the expected sales. These can be presented or broken down by region, customer (group) or product (or product group), for example. In order to achieve a clear presentation, amounts for less than one year are normally extrapolated to annual values. It is important that the sales forecasts are presented in a comprehensible manner and that the underlying calculations (and the data used for these calculations) contain realistic assumptions. The determination and calculation of meaningful key performance indicators (KPIs) is indispensable for corporate management as well as for capital procurement. These ratios should include a mix of financial and profitability ratios. Examples of key figures that are extremely relevant are: cash flow, contribution margins of the individual products/services and the break-even point. Related to these key figures, a graphical representation of these key figures can be very useful when it comes to a comparison with other companies (Abrams, 2003; Schinnerl, 2018).

Attachments: The last part of a business plan is usually the attachment part, where data or information used in the sections above is presented in detail. In this section you can give everything that may be useful for getting deeper knowledge on the founder, the founders team and more important the business planed. Below is a list of possible attachments: (Schinnerl, 2018):

- Milestones for the implementation of the business(-plan).
- CV of the founder(s).
- Testimonials of the founder(s).
- References of the founder(s), evaluations of the product, etc.
- Other (e.g.: list of assets/inventory list, more extensive calculations, detailed and intra-year sales/revenue projections).

13.2. Startups in general

This part of the chapter is concerned with startups, starting with a definition of them: As mentioned above, many industries are experiencing rapid (digital) change due to new technologies and are therefore forced to deal with innovations in order to remain competitive. Established companies are often very large and relatively rigid in their organization, making it difficult for them to react quickly to these innovations. In comparison, new companies, so-called startups are much more agile and can therefore act more quickly on the market. A startup in this sense is a young new company that is at the beginning of its development. Since there are many different definitions of startups and other authors have also used this term to describe established companies which offer innovative solutions for the sector in which they operate, in this textbook we restrict to all those companies which were founded less than 10 years ago (Lowrey, 2009; Skala, 2019).

Many industries are experiencing rapid change due to new technologies and are therefore forced to deal with innovations in order to remain competitive. Established companies are often very large and relatively rigid in their organization, making it difficult for them to react quickly to these innovations. Startups are much more agile in comparison and can therefore act more quickly on the market and offer their innovations there or adapt them more quickly. But these innovations are not just limited to technologies. Established companies also have to keep an eye on the business models of startups. Therefore, it is of interest for long-established companies to cooperate with startups. In doing so, this company can offer the startup financial resources as well as experience. In return, the latter learns more about the innovative business model or technology of the young company. Due to their characteristics and the rapid development of all kinds of industries, startups can be found in a wide variety of sectors.

Startup characteristics

In this section, characteristics that can be used to distinguish startups, what form of innovation they may apply, and what types of funding are eligible for them are described. However, it need to be noted that the establishment of a new company alone is not enough to automatically be called a startup; a startup must also have one of the following characteristics. The first characteristic is a form of innovation - be it an innovative problem-solving approach, an innovative business model or an innovative technology. The second possible characteristic is the striving for growth, whereby sales growth or employee growth can be striven for. Above all, this growth should not take place slowly, but significantly quickly compared to other companies. Due to their characteristics and the rapid development of all kinds of industries, startups can be found in a wide variety of sectors, e.g. logistics, real estate, grocery shopping(Dempwolf, Auer, & D'Ippolito, 2014; Skala, Skala, & Barlow, 2019). To get deeper knowledge on the term start-ups the next part of this chapter deals with distinct characteristics of them.

Despite many different definitions, most explanatory approaches show similar core information, namely that a start-up always refers to a new company. "New" in this sense means that the founded company is in the first phase of its activities. However, since this definition does not have a time limit, some authors set precise age restrictions for start-ups. Thus, companies that are younger than three to ten years and participate in greening competitions can (Göpfert & Seeßle, 2019). However, a time limit is not sufficient to differentiate start-ups from other companies. Other differentiating characteristics that serve to distinguish start-ups from other companies are innovative business models and new problem-solving approaches with which start-ups work. A start-up is a company that deals with a problem for which the solution is not clear and success is not yet guaranteed. Thus, start-ups mostly deal with gaps in the offer and niches that have not yet been served by established companies. Established companies can often make good use of fresh impulses from outside in order to advance new developments. The striving for significant growth is a further differentiating characteristic that distinguishes start-ups. In addition to sales growth, general growth figures such as employee growth are also among the characterization features. Overall we can see that start-ups are companies that fullfile the following three characteristics: (Göpfert & Seeßle, 2019)

- (1) Start-ups are younger than 10 years,
- (2) Start-ups are innovative with their technology and/or business model,
- (3) start-ups strive for significant employee and/or sales growth.

Further, to get a better understanding of the term, a definition from (Skala, 2019) is used here, which suggests a spiral instead of a linear definition. In the first phase, startups are defined as an organization that works with limited resources, has identified a problem and has found a possible solution for it. In the second phase, rapid growth is noted, while in the last phase, the startup is in a state where it can achieve extreme growth by scaling. The following graphic illustrates this process.

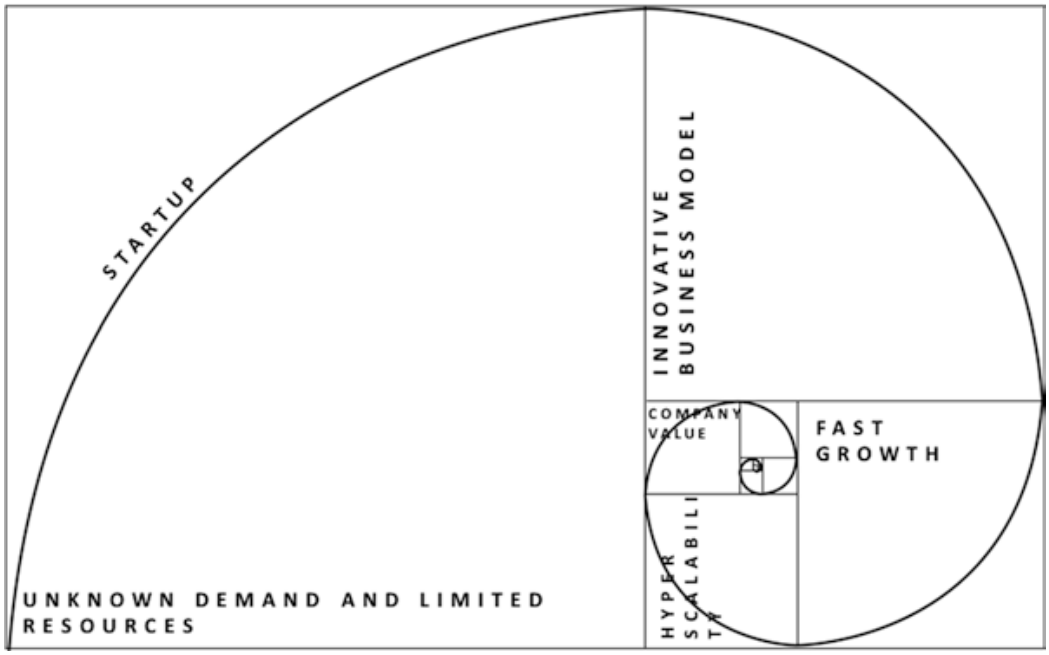

Figure 13.2. Start-ups spiral

Source: (Skala, 2019).

The most relevant implications, which are taken from this definition for this work, are the finding of a solution for a problem, as well as the high scalability of the startup. Another advantage of startups that is relevant in this work is the already digital birth of the company. Thus, digitization can be dispensed with and resources can be used elsewhere. In most cases, the business models of startups are based exclusively on digital technology. This characteristic usually circumvents the entry barrier of high investment costs.

Funding types for startups

To classify the wide variety of startups the type of funding they receive can be used. Depending on the type of funding, a startup also has different hurdles to overcome. Common types of financing are for example: *bootstrapping*, *crowdfunding*, *corporate venture capital or angel investments*. In the following these types of financing are explained below.

(1) Bootstrapping: In this type of financing, startups try to raise as many resources as possible themselves and thus avoid financing through external capital as far as possible. In this case, founders often fall back on their own savings or are supported by close people ("family and friends"). Bootstrapping thus counts as internal or self-financing. One of the biggest advantages of bootstrapping are the cost savings that result from this type of financing. In addition, the people involved in the startup can begin operations immediately without being influenced by external capital providers. However, bootstrapping also comes with disadvantages. Since a startup that has chosen bootstrapping as a funding method often focuses too much on cost savings, it often prevents itself from making investments that can be of great importance for the startup's future. In addition, bootstrapping is very time-consuming, so one of the risks is that opportunities and challenges are not discovered and subsequently not exploited. However, these can often be crucial for the future growth of the company. Another aspect that should not be neglected is the quite high physical and psychological burden that weighs on the founder at the beginning, since a positive cash flow must be achieved as soon as possible. (Vanacker, Manigart, Meuleman, & Sels, 2011; Ye, 2017).

(2) Crowdfunding: Crowdfunding is a type of financing by a relatively large number of smaller investors. The shares in the company are usually ownership or equity capital. To find such investors, startups usually use crowdfunding platforms, which connect investors and

startups. thus, crowdfunding platforms serve a two-sided market. Crowdfunding can be divided into four different segments: donation-based crowdfunding, reward-based crowdfunding, crowdinvesting and crowdlending. Crowdlending represents the most relevant segment for us, as this is the most successful of the four. Here, the company is lent a loan by its lenders, the crowd. The company repays this to its lender step by step (Paschen, 2017; Schramm & Carstens, 2014).

(3) Corporate Venture Capital: This is an option in which a company co-finances a startup, which usually also enables it to collaborate. In doing so, the supporting company often forms and sponsors its own corporate venture unit. The subsidiary of the parent company is now supposed to contribute to the development of the group by strategically investing in it. By creating this own entity, the startup has more flexibility, can act faster and has more freedom to implement its ideas. In addition, the company provides not only financial but also strategic guidance and support. Startups that are positioned to make the best use of corporate resources are more likely to go public and less likely to be undervalued. But corporate venture capital funding can also have drawbacks. For example, the funding company may pursue other strategic goals without sharing them with the startup. Another disadvantage would be the refusal to cooperate with other companies, due to an exclusive business relationship between the startup and its venture capital provider. There is also the risk that corporate venture capitalists will try to imitate the innovation. This risk of imitation is particularly present in industries with two potential competitors and in industries with weak intellectual property protection systems (Drover et al., 2017; Hahn, 2018).

(4) Angel Investment: An angel investor or business angel is usually a wealthy individual or group of individuals who makes an investment in a startup. This type of financing plays an increasingly important role for young companies with high growth potential. Angel investment is basically very similar to a corporate venture capital investment. Through the investment of the business angel, a person participates in the startup mostly through ownership or equity. Thus, the business angel becomes a shareholder in the startup. It is important to emphasize that this person invests his own capital and for this reason is personally interested in the success and positive development of the company. But there is also the possibility to receive a kind of credit from the angel investor, which can later be converted into ownership shares. Another important aspect of angel investment is the intangible capital that the business angel provides. This can be relationships or contacts, which contribute significantly to further financing by investors and to the success of the startup (Hahn, 2018; Prowse, 1998).

13.3. Startup phases

1. Early Stage / Pre-Seed (Year 1-2)

In the early stage or pre-seed phase, the idea, a detailed concept of the business model and a business plan, is developed by the founders. (also see the section “digital business plan” above). At this stage the founders usually either finance themselves out of their own pockets or already with initial "outside help”, e.g. from family or friends. The idea generation stage, which is one of the most important parts before starting a business begins even before registration with the trade office. It is mainly a matter of sounding out and finding out whether the formal establishment of the trade is worthwhile at all. The startup team and the founders are usually extraordinarily motivated in this phase. Usually it takes about a year from the idea to implementation. During this year, in addition to a business plan and a concept, a name, a logo and a website must be created. The most important thing is to communicate the idea or product or service correctly, understandable and effectively in order to find investors. Employees experienced in networking and marketing are especially important at this stage. Investors often want to the actual founders, but the employee can do valuable groundwork and help the can do valuable groundwork and help the founders communicate effectively. The earlier an employee is involved in a startup, the better he understands the founders and their idea. In

addition, the employee has better chances of helping to shape the idea than if he or she merely joins later (Crowd, 2021; Davila & Foster, 2007).

Start-up life in this sense is more than just a job. The team gives a lot of their energy and time to an idea that, at the end of the day, is supposed to be of benefit or it fails. This special drive sets founders and their team from companies. The motivation to bring something into the world something into the world, to work on something that may not have a place in the market, and thus to are elementary criteria of the inner attitude that everyone in the team must bring along. that everyone in the team must bring with them. Particularly in the phase in which many processes have not yet been processes have not yet been consolidated, you have to be able to deal with pressure and uncertainties and bring along a very strong motivation (Bogott, Rippler, & Woischwill, 2017; Crowd, 2021).

2. Seed Stage (Year 2-3)

In the second stage, the seed phase, the startup company is formally registered. Ideas that were matured in phase one are now implemented. At the same time, ways are found to monetize them. Startups with innovative business models and a convincing founding team no longer find it as difficult to raise fresh money, because they are able to attract e.g. Business angels, venture capitals or government funding programs that provide opportunities for early-stage financing.

In the second phase, all team members must contribute to publicizing the product or the service. In addition, networking, especially for recruiting and sales, is now becoming particularly important. Further, the customer contact is and the feedback received needs to be implemented wisely. Once the product is live and the company has slowly built up and established itself, networking really makes sense for employees. In the age of digitalization social media channels (e.g. Instagram or Tik Tok) are also increasingly used strategically to promote the company and increase the awareness of customers in order to increase the range of the company (Bogott et al., 2017).

In phase two, as in phase one, employees must also be very flexible and capable of learning. Everything the startup does must be constantly adapted. Since the founders cannot yet afford experts, the team has to be developed constantly. Therefore, the team needs to be creative and willing to learn, and have the openness to develop or trying out new ways of doing things. The second phase, is also often characterized by the first formal round of financing, often seeding or seed financing. It is used to raise capital to mature the idea, e.g. to build a prototype, to prepare the production, marketing, and sales. Usually venture capitalists and private investors (business angels) invest here, often buying company shares in exchange for capital. However, despite the initial funding, employee salaries are often still very low at this stage. For this reason, it is even more important for employees to stay motivated. The founder cannot afford to have demotivated employees on the team at this early stage who do not move the company not move the company forward (Bogott et al., 2017).

3. Growth Stage (Year 3-4)

If the startup does well and manages to get investments from outside the third stage, the growth stages follows. At this stage more capital is needed and, of course, more employees. The goal is market maturity and subsequent market penetration. Again it is about raising outside capital, for example through venture capitalists, business angels or through an IPO (initial public offering), which in turn will require bridge financing. In this case, investment banks or issuing companies provide capital that is repaid once the IPO has been completed. It is somewhat more difficult to acquire funds in the growth phase: For international investors, investments of less than ten million euros are simply far too small. But, the willingness to take risks and the pressure to invest is increasing among investors, and with it the hope that this could (Freiling & Harima, 2019).

In general, working hours are slowly becoming more regulated, as a second management level often moves in. It is not uncommon for an exchange of employees to take place in this

third phase of growth. If you have been in a startup from the beginning, you should ask yourself at this point, how you envision your future in the meantime. Structures have formed and are steadily solidifying. At this point specialists are in demand in the first place, since it is then always more about the professional than the personal network. Furthermore, the corporate culture is already quite concrete at this stage and smaller (sub-) groups are already emerging. At this stage of the startup life cycle may be the last chance to change the culture in the startup: Employees also need to understand that there are significant changes for the founder in the third phase. It is often the first time that the founder can afford to pay himself a salary after about two years. Before that, there is not much money to pay others either, unless the startup has venture capital funding(Bogott et al., 2017).

4. Later Stage (Year 4-6)

The sale of the startup is often more of a new beginning than an end and therefore naturally also has an impact on the employees. After three to four years, it is often the case that another managing director is needed. In the rarest of cases, the person who initially had the vision and strived for greatness, is the one who can and wants to successfully manage the day-to-day business of the company in a later phase. In the final phases of startups (later stages), it is usually either about an exit, i.e. selling the startup on the market, a management buyout or similar. This is usually associated with restructuring or diversification and thus with further capital requirements (Bogott et al., 2017; Freiling & Harima, 2019).

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14. DIGITAL ENTREPRENEURSHIP: BEST PRACTICES FOR SUCCESS

Learning objectives

After reading this chapter, you will able to:

- Explore some salient traits of the Digital Entrepreneurship
- Clarify the infusion of Digital Technologies in Entrepreneurship research fields
- Describe the Digital Entrepreneurship along the firm's life cycle
- Give some details regarding the most common managerial approaches followed in both a startup and a mature firm
- Defining the cultural changes with respect to the digital context
- Successfully handle an entrepreneurial ecosystem
- Identify the most relevant issues in the definition of an open governance path
- Implement a successful business idea in a digitized world

CHAPTER OUTLINE

14.1. Digital entrepreneurship: an overview

Considered nowadays as a pillar of entrepreneurship, digital entrepreneurship can be defined as the ability to create new ventures or transform existing ones by leveraging the development of digital technologies or the innovative employment of such technologies (European Commission, 2015). Doing business digital deals with innovation: however, being innovation is a necessary but not sufficient condition to define a successful digital entrepreneurship initiative. Digitalization, via innovative behaviors (e.g. the introduction of a new technology), should be integrated in the long-term strategy avoiding the trap of the lack of clear vision or of the spot-reaction to a temporary market exigencies or to customer expectations (Saarikko et al., 2020).

Digitalization has two impactful consequences on entrepreneurial initiatives (broadly considered as entrepreneurial processes and outcomes). First, digitalization implicates a less bounded entrepreneurial action: in fact, boundaries appear more porous and less stable (Nambisan, 2017). From the entrepreneurial outcome perspective, digital entrepreneurship is "intentionally incomplete" (Garud et al., 2008), in the sense that the product continues to incrementally evolve even after its introduction or implementation on the markets. Second, digitalization shifts the structure of entrepreneurial agencies (the places, not only in the physical sense, where entrepreneurial ideas are born and rise) from a predefined type to a less predefined one (Nambisan, 2017) making the pursuing of entrepreneurial objectives more collaborative due to dynamic agents involved in the process (Aldrich, 2014). Hence, digitalization facilitates entrepreneurial process that rests in incremental and nonlinear paths (Sahut et al., 2021). Not a minor issue resides in the ability of digital technologies to increase human capacities to acquire, process, and consume information and this is crucial since the value creation process of digital entrepreneurship roots in the production of digital information, regardless of whether this value is physically linked or not to products (Bryniolfsson & McAfee, 2014). The above-mentioned ability spurs three key dimensions of digital entrepreneurship that make it unique (Sahut et al., 2021). First, it expands the understanding of customers' needs moving from demographic data to intrinsic motivations that revealed by the same users (product/service offer is smart and personalized for each user) (Pariser, 2011). Second, it allows a shift from a physically-based value chain to a network-oriented chain that is based on a web of relationship. Third, it fosters a democratization process of entrepreneurship permitting a collaborative way of goal pursuing by lowering information barriers, reducing entry cost (Leong et al., 2021). As result, digital technologies stand as a driver for entrepreneurial opportunities pursuit since they facilitate experiential knowledge acquisition and thus reduce liability of newness (Song & Wu, 2021). Prior researches on this point have highlighted that social networking platforms help digital entrepreneurs to increase foreign market knowledge (Sigfusson & Chetty, 2013) moving from a classic firm-level business network to an entrepreneur's personal social network. Within this research stream, Stuart and Ding (2006) state that entrepreneur's position in social networks is able to influence entrepreneurial success.

Digitalization is a transformation process that can be systematized by accounting for three horizons of growth (Hinterhuber & Nilles, 2021) that refer to the *McKinsey's Three Horizons Model* (Baghai et al., 2000). At its core, this model states that are three overarching pathways to achieve company growth: optimize the core business (*horizon 1*); nurture emerging business (*horizon 2*); create genuinely new businesses (*horizon 3*). In the first horizon, there is great pressure to generate cash flows to sustain entrepreneurial activities. This would imply to leverage on digitalization to go further than classic market exploration or the customers' needs analysis. However, this horizon is also critical because of rapid technological changes may undermine firm survivability over long-term: that it, digital entrepreneurs must be able to anticipate such changes and support multiple platforms, both digital and physical, simultaneously (Srinivasan & Venkatraman, 2018). To do this, digital platforms and digital communities poses as crucial. On the one hand, digital platforms foster organizational learning and knowledge sharing that increase revenues and stimulate entrepreneurial success (Ben Arfi & Hikkerova, 2021), such platforms have also the merit to help the development of complementary products and services (Gawer, 2009). On the other hand, digital communities possess the power to attract new funds from institutional investors (venture capital and business angel) that lead to digital scaleups (Cavallo et al., 2019) but also to expand customer base by allowing a deeper and intimate understanding of their needs. Finally, digital communities increase user base that stands as a factor even more important for rapid scaling (Huang et al., 2017). Therefore, in the first horizon digitalization helps to maximize the untapped growth penetrate the existing markets. In the second horizon, entrepreneurs must deal with uncertainty by exploiting emerging businesses and entrepreneurial ventures. In doing this, an imperative is to challenge conventional industry norms. To achieve growth within this horizon

three mechanisms are useful (Huang et al., 2017), namely: data-driven operation, instant release, and swift transformation. The first mechanism is the way thanks to which digital entrepreneurial initiatives explore, monitor, and frame innovation opportunities by analyzing huge amounts of data. The second mechanism regards the affordance of digital in decreasing the time-span between service idea and development. The latter mechanism refers on how digitalization is contextualized into the value creation process of new entrepreneurial opportunities. In the third horizon, the imperative is the creation of new capabilities and new business as a response to disruptive opportunities. To this end, digital entrepreneurs might find important to incorporate into business growth two characteristics of digital technologies: re-programmability and re-combinability. The first opens new possibilities, since it is able to implement new functionalities by changing the logical structure that governs the object. The second considers that digitalization allows products to perform a wide range of functions by separating the semiotic functional logic from the physical embodiment of the product (Yoo et al., 2010). As result, "*these characteristics on their own may give rise to new functionalities and help generate new entrepreneurial opportunities*" (Nambisan, 2017: 1038).

14.2. Digital entrepreneurship and firm's life cycle

Entrepreneurship has been transformed by the predominance of innovations in technology, digital platforms and infrastructures. Digital transformation is a process involving several aspects of the business and generating significant changes not only in technology, but also in culture, operations and value creation (Nambisan et al., 2019). Such process represents a current challenge for firms, which must be able to exploit digital technology to generate organizational and strategic solutions through which they can gain a competitive advantage (Saarikko et al., 2020).

One of the most relevant issues pertains the difficulty of defining a set of *best practices* and/or business models that are adaptable to different types of enterprises, without considering the life cycle (Ghezzi & Cavallo, 2020). Considering the early stages of its development, startup frequently undergoes changes (McDougall & Oviatt, 1996), in response to resource scarcity and the need to coordinate internal resources with external circumstances (Katila & Shane, 2005; Hanlon & Saunders, 2007). This is more apparent in dynamic digital contexts, where digital technologies dictate the rules of change, by leading to transformations of various sectors (Ghezzi et al., 2015). Digital startups, therefore, face an uncertain and dynamic environment in which they operate that cannot be compared to that of mature companies. By contrast, mature firms due to increased uncertainty in the surrounding environment need to implement a plan for core business model transformation, driven by a digital business transformation (DBT) process, to be competitive in the target market (Gupta & Bose, 2019). Therefore, the success key for mature companies is the strategic business transformation for survival in an adverse environment. Mature firms need to change their organizational set-up to support innovations in business model and make the most of the new digital skills available.

When technological innovations are not radical, they offer learning challenges to the users of the system, and technology is not seen as a threat. However, when digital technologies bring about disruptive changes, such as radical changes in the structure of work processes, users may resist (Orlikowski et al., 1994). Empirical investigations show that organizations implementing information systems to improve efficiency, reduce errors, increase productivity, improve communication, accelerate innovation processes, achieve such benefits only to the extent that the users of the technological system adapt by changing themselves, their work routines and the information system to leverage its strategic capability (Venkatesh et al., 2003). It is important to move from the paradigm of centralized change management to that of widespread organizational agility. Organizational agility is a firm's attitude to reshape rapidly and adapt itself to dynamic changes in the markets (Zain et al., 2005).

However, the differentiation along firm's cycle allows to deem different theoretical insights reshape to startups and mature firms. More fitting with respect to startup, Lean Startup

and Agile Development approaches will be considered. Digital Inertia and Culture Changes will be used in the analysis of best practices in managing mature firms. Lean Startup Approaches (LSAs) are a set of methods based on lean and agile principles; they provide support to companies facing Business Model Innovation (BMI). Startups operating in this digital era can exploit a set of approaches that fall within the domain of agile methods. Among them, Agile Development (AD) refers to software development based on the centrality of individuals and interactions, collaborations with customers and responses to change (Senapathi et al., 2013). Despite huge spread, LSA is still deemed with skepticism among scholars. Consequently, there is still no solid theoretical basis for these approaches in the literature, although it would be of great help to accumulate knowledge. A growing number of scholars and practitioners agree that established companies and startups should look beyond isolated product, service or process innovation and focus instead on innovating the entire business model (Chesbrough, 2007).

Lean Startup Approaches

The principles of the "lean philosophy" focus on customer and value. This significant rethinking of production systems towards customer value is summarized in the following five lean principles (Womack & Jones, 1996):

- *Creating value for the customer*. Value is created when internal wastes and costs are reduced by offering new services and/or functions appreciated by the customer.
- *Identify the value stream*. Costs must be transparent to all partners in the supply chain.
- *Create flow*. Creating flow is used to avoid any interruption in the value stream by preventing the main causes of such stoppages (e.g., production changes, breakdowns, incorrect batches, in terms of quantity or timing, lack of necessary information, etc.).
- *Produce only what is pulled by the customer*. This principle implies a high level of responsiveness to produce the highest quality products in an efficient and valuable way.
- *Pursue perfection by continuously identifying and eliminating wastes*.

Therefore, LSA is defined as the attempt to reduce wastes which represent the activities and processes that the target customer does not want or require (Ries, 2011). LSAs consist of a hypothesis-driven scientific approach to entrepreneurship, in which entrepreneurs translate their vision - i.e., *business idea* - into falsifiable hypotheses that are incorporated into an initial version of a business model. These hypotheses are then tested through a series of minimum viable products (MVPs), which are "the smallest set of activities required to disprove a hypothesis". The process is repeated until all key assumptions are confirmed or validated through MVP test. When this condition is reached, the startup has achieved its product market fit (Eisenmann et al., 2012).

Agile Development

Similar to lean, agile methods are associated with a common "philosophy", where the main values and principles are: (i) individuals and interactions; (ii) working software; (iii) collaboration with the customer; and (iv) responding to change (Campanelli & Parreiras, 2015). Indeed, Agile Development (AD) is one of the approaches conducive to bring product, service and innovation in the value proposition. In particular, it pertains the practices focused on software development into which a key role is played by the centrality and interaction of human capital, the collaboration with customers and the reaction to reshape (Senapathi & Srinivasan, 2012; Rigby et al., 2016; Cram & Newell, 2016).

Despite agile and lean deemed different concepts (Hallgren & Olhager, 2009), in both supply chain and software development fields. Their combination has led to the proposal of an integrated practice, named "leagile" (Mason-Jones et al., 2000). Therefore, Lean Startup Approaches stand between Business Model Innovation and AD. They are a kind of the agile methods that can be applied to product, service, value proposition and business model. In addition to the widespread adoption of agile methods and practices, some scholars also highlighted their possible weaknesses. A recent study by Conboy and Fitzgerald (2010) showed

that organizations need to customize AD methods to find their own version. In other words, the latter is the best one, in terms of challenges and goals, and able to make the adoption the simplest possible.

Digital Inertia

Digital Inertia emerges when mature firms need to implement an organizational change and analyze the best practices to be followed. Organizational change is complex, mostly for mature companies, even when they recognize the need to evolve in response to changes in their external environment. A firm's reaction to external change is constrained by existing capabilities, resources, behavioral routines, and cognitive concepts (Tushman & Anderson, 1986), so when organizations undertake a major digital transformation, it is hampered by inertia. Indeed, inertia resides not only in individuals, but also in routines, resources and technology. According to Hannan and Freeman (1984), inertia occurs when the quickness of reorganization is lesser than the speed at which the environment changes mental conditions.

Technological change often has implications going beyond the technology itself. New customer segments with different preferences may emerge (Abernathy & Clark, 1985), and new business models may be needed (Chesbrough & Rosenbloom, 2002). Therefore, firm should develop a new corporate identity where both human capital and stakeholders contribute to a strong rethinking of values and guiding beliefs.

Cultural changes

Business model transformation and operating model transformation represent two crucial elements for corporate digital entrepreneurship along with the cultural change. Therefore, to promote digital transformation, cultural changes are needed, and they could be implemented by the following approaches: AD and Open Innovation. In a perspective based on an efficient cultural change, companies should also provide learning and develop opportunities for their employees, so as to become key digital people (Lee et al., 2017). It is relevant to develop the competences to implement clear digital strategies, with the aim to expand digital cultures within the organizational structure (Kane et al., 2015). Companies should pay greater attention to several challenges for developing new products and services, such as: (a) attracting and maintaining talents for recognizing, catching opportunities (Teece, 2007) and creating a digital workforce; (b) building a digital leadership team to enable large scale changes, not restricted to a single business function. The top management team should work as "catalytic agent" for digital corporate entrepreneurship. Indeed, the top management's entrepreneurial and leadership skills might support the firm's cultural change (Teece, 2010); (c) moving towards a risk-taking entrepreneurial approach to test innovative and bolder ideas, in order to bring changes and explore new areas of business (Kane et al., 2015).

Building on the prior considerations, digital technologies are requiring mature firms to change their corporate culture and develop a more agile entrepreneurship-focused organization (Porter & Heppelmann, 2015). Therefore, the predominance of innovations in technology, digital platforms and infrastructures is influencing firm's cultural transformation and promoting corporate digital entrepreneurship.

14.3. eing successful in digital entrepreneurship

Digital entrepreneurship, as outlined earlier, stems from the infusion, at different stages, of digital technologies in the entrepreneurial processes (Fig. 14.1).

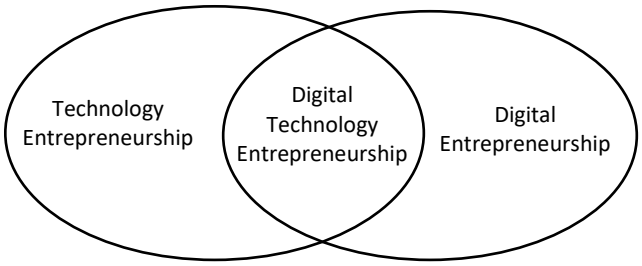

Figure *14.1.* The different stages regarding the infusion of digital technologies in the entrepreneurial processes

Source: Giones & Brem, 2017, p. 47.

According to Recker and von Briel (2019), digital entrepreneurship might be investigated by a framework consisting of the following three analysis units: the digital enablers (i.e. the activities inherent to the development, scaling, exploitation, etc.); the digital outcomes (i.e. the product/service system offered by the new company); and, the digital context (i.e. the "place" where the processes are implemented) (Fig. 14.2).

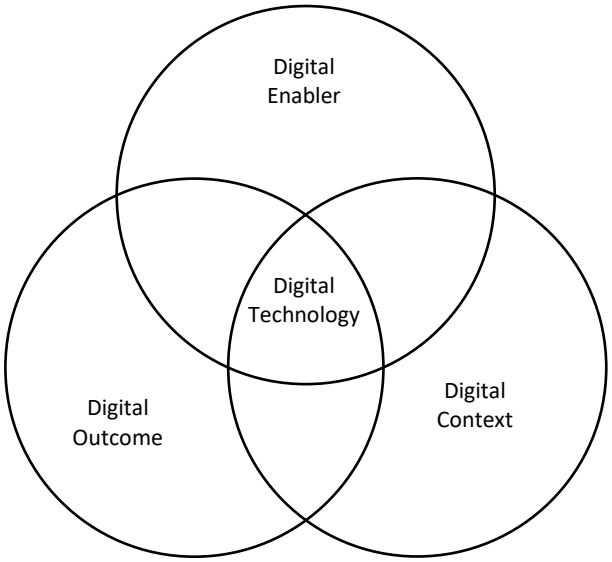

Figure 14.2. A framework for the examination of digital entrepreneurship

Source: Recker & von Briel, 2019, p. 2.

One the main determinants of the success reside in the creation of a digital context or, better, an entrepreneurial ecosystem which often gives rise to the decomposition of spatial value chains. Such ecosystem, leveraging on specific features (Autio et al., 2017), represents a further development of the well known industrial districts (Becattini, 2004), the value net (Parolini, 2021) and the mere new venture team (Zaheer et al., 2019).

Among the foregoing specific features, it is worthwhile mentioning both a different endowment of knowledge (Nambisan & Baron, 2013) and a peculiar governance path (Sussan & Acs, 2017).

The former requires spare competences and skills in the venture team (Giones & Brem, 2017), given that the entrepreneurial processes are increasingly less bounded (Zaheer et al., 2019). On closer inspection, the founder or the new venture team should roll out particular capabilities, in managing several relationships with different stakeholders, such as investors, consultants, ecosystem managers, public institutions (Tranfield et al., 2003) and so on.

To this end, the institutional context might play a crucial role in fostering, for instance, the cooperation between policy makers and universities, with the aim to test innovative educational activities able to develop novel tools and methods for better assessing the outcomes pertinent to digital entrepreneurship (Zaheer et al., 2019). In other words, the real challenge pertains the preparation and definition of fitting standards (Brem et al., 2016), in order to better tackle the complexity related to entrepreneurs's decision making process (Giones & Brem, 2017).

Similarly, the social context might reveal a prominent scope to be considered, as the diversity or the inclusion and the sustainability policies exert a remarkable influence over the firm's success, in a digitized world (Zaheer et al., 2019).

The latter specific feature, namely a peculiar governance path, rests on an "architecture of partecipation" (Nambisan, 2017) where the entrepreneurs can share and shape their respective abilities, expertises and experiences (Srinivasan & Venkatraman, 2013). In this regard, some previous studies, in a detailed manner, depicted the nature and the distinctive traits of the corporate governance model, in a digital platform (Brenahan & Greenstein, 2014; Tiwana et al., 2010). More broadly, an open governance structure should encourage the development of competences, at different levels, namely either for the single entrepreneur or the whole ecosystem (Nambisan, 2017).

A relevant issue, often conditioning the success in a digital entrepreneurship context, concerns the position held by the entrepreneurial agent. Drawing upon earlier studies (Grégoire & Shepherd, 2012; Wood & Williams, 2014), such role requires an enrichment of the knowledge and the setting up of a "distributed entrepreneurial agency" (Nambisan, 2017).

In an ongoing changing of the competitive dynamics, the success of a business idea, in a digitized world, is often associated with the founder's attitude to innovate the business model (Westerlund et al., 2014). Contrarily to the past (Brinckmann et al., 2010; Gruber, 2007), in similar circumstances, the value propositions are subject to ever changing and challenging development leaps much to undermine the managerial support given by the business plan (Nambisan, 2017).

Furthermore, the salient characteristics of the industry (i.e. revenue model, delivery path, etc.) (Zaheer et al., 2019) and the influence of regulation (Gurses & Ozcan, 2015) might ease the success of a new venture, in a digital entrepreneurship context.

At last, compared to recent years, the creation and the cooperation in an entrepreneurial ecosystem enable the single founder or the venture team to gain a better understanding of both the future uncertainities and the fitting ways to tackle the coming challenges (Nambisan, 2017).

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15. SOCIOMATERIALITY AND DIGITALIZATION

Learning objectives

After reading this chapter, you will be able to:

- Explain how technology can impact business practices on organizational practices.
- Understand how digital artifacts can be perceived by entrepreneurs.
- Identify how digital technology interact with human factor.

15.1. Introduction

The aim of this chapter is to describe how digitalization impacts work behavior and changes the organizational work environment. This chapter focuses of interactions of digital artifacts and their users. We discuss how digital technology used in organizations influences workers and how workers influence technology. Also we show links between digitalization and organizational results and explain how digital artifacts interact with human agency in terms of entrepreneurial activity (Nambisan, 2017).

Sociomateriality and sociomaterial routines can help to understand why boundaries of entrepreneurial process where digitalization appear are shifting (Nambisan, 2017). As Nambisan points out the explanation why some undertaking entrepreneurial actions take place in spite of perceived uncertainty can be a result of sociomaterial routines. Thanks to these routines knowledge about using digital tools is created and the barriers to initiate activity with new technology are reduced.

15.2. What is sociomateriality?

We adopt sociomateriality perspective which treats phenomena as entanglement of human (social) and non-human (materiality – here: digital technology) agency. The term sociomateriality was proposed by W. Orlikowski (2007) to overcome human- and technology-centered perspective in analyzing interaction between these two usually separately studied worlds. Sociomateriality informs us that business practices are constantly changing due to interaction between technology's user and technology providing new ways of doing things. It constitutes a nature of organizational practices as dynamic and subjected to influence of agencies bounded together by particular situation while usually independently operating.

The concept of sociomateriality is more specific comparing to general consideration like business model or business strategy. It touches the level of daily activities with digital tools, but taking into account the interaction among actors of the network, then it crosses the individual dimension.

Materiality is expressed by technology, software and apps used in companies for running business. Social represents workers and their behavior and norms. Looking at the intersection between these two issues enables to identify mutual interrelationships. As Hultin (2019) explains it: "the human and the material are not pre-formed substances and their relationship not limited to a dualistic interaction. Rather, the relationship is one of entanglement, in which the human and the material are an ensemble of continuously performed intra-relations".

Sociomateriality provides a new way of understanding "shifting assemblage" showing materiality as intrinsic in daily activities (Orlikowski & Scott, 2008). It means that materiality is not just a tool. A unique way of creating and using materiality makes the special relationship

with its user. The materiality and the user become inseparable. This approach to study interaction of social and material can be defined as follows:

- entanglement and performativity are primary mechanisms,
- the logical structure is relationality,
- key related concepts are Actor-Network Theory and Mangle of Practice,
- social and technological worlds expresses notion that "Humans/organizations and technology are assumed to exist only through their temporally emergent constitutive entanglement" (Orlikowski & Scott, 2008, p. 457).

15.3. Digital artifacts – what is it?

Digital entrepreneurship is inevitably associated with working with digital technologies which embraces digital artifacts, platforms, and infrastructure. The digital artifacts are defined as: "a digital component, application, or media content that is part of a new product (or service) and offers a specific functionality or value to the end-user" (Nambisan, 2017, p. 3). They can be a part of more complex solution like digital platform and can be used by entrepreneurs while digital infrastructure is treated more like enabler (ibid.).

Interacting with digital artifacts makes them more acquainted and recognized to perform certain actions. Knowledge gathered through the process of interaction allows to notice other possibilities of implementation digital tools in business realm. Sociomateriality help us to understand why some entrepreneurs starts new ventures with digital technology, why the rest do not perceived such options and are reluctant in using them.

However dealing with digital artifacts is no longer the feature of digital organisations but also those who wish to transform and experiment with new technologies. This issue is described in more details in Chapter 2. Such transformation declares those whose revenues decreased during COVID-19 in order to gain competitive advantage (LaBerge et al., 2020). Such change will impact organizational practice by introducing technology into daily routines. Then they experienced interaction with digital artifacts more intensively. A good example is Italy (see Figure 1) where the share of teleworking during lockdown can be perceived as reaching the limit of remote work, but what is more important from the sociomateriality point of view: this share after easing restriction is bigger than before crisis.

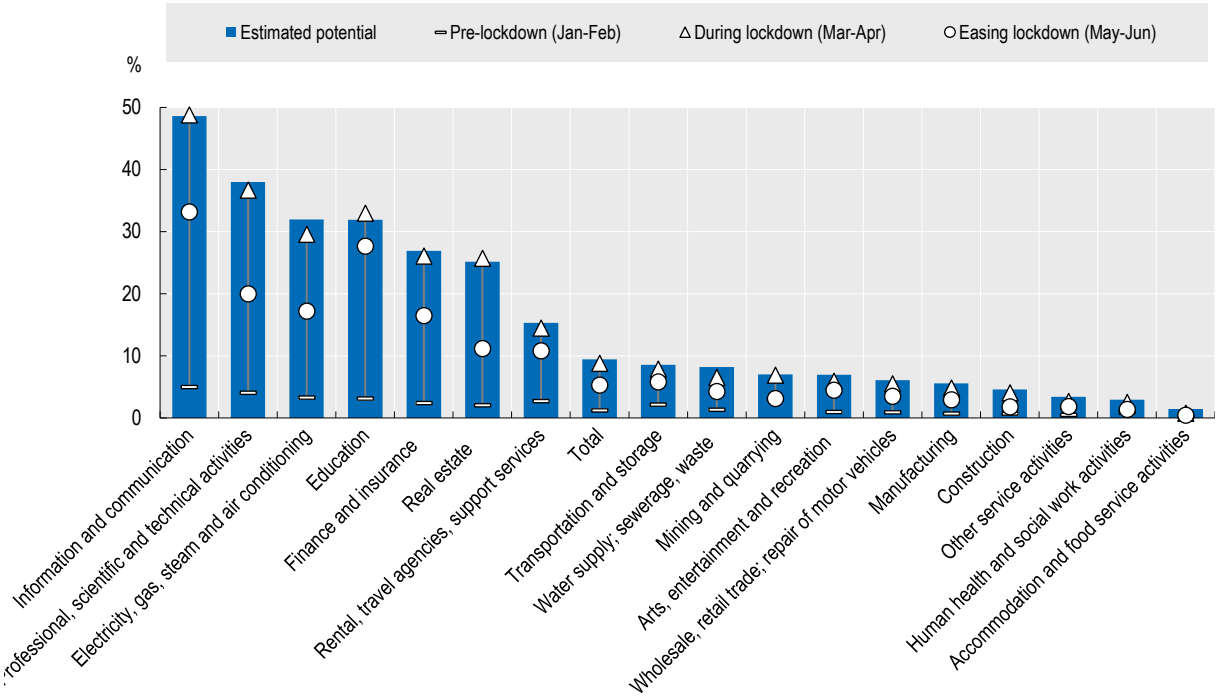

Figure 15.1. Teleworking before and during the COVID-19 crisis in Italy, by industry, 2020

Source: OECD, 2020

Estimated teleworking potential is a weighted average of the number of firms in each industry reporting that the percentage of company staff performing jobs that can be carried out in remote or smart working lies in the following bands: none or almost none (treated as 0% to 1%), less than 25%, 25% to 50%, 51% to 75%, and 75% and over. The midpoint of each band is used for the calculation.

15.4. Theories explaining impact of digitalization on organizational practices

The impact of technology on human and organizational performance has long been studied. Initially, researchers looked at how organizational structures should be changed so that specific technologies could be used. Technologies were treated as structural determinants. Groundbreaking in this context was the work of S.R Barley who, using Giddens' structuration theory, argued that the implementation of technology is an opportunity during which organizational actors can reassess the structures in which they work (Barley, 1986). He described the existence of a central paradox of structuration: "identical technologies can occasion similar dynamics and yet lead to different structural outcomes" (Barley, 1986, p. 105). He viewed technology as a "pivot between action (communication) and structure (centralization of decision-making)" (Leonardi, 2013, p. 62).

Sociomateriality is treated as the "umbrella term, that covers a wide variety of approaches to the relationship between the social and the material" (Mutch, 2013, p. 28). For explaining sociomateriality a few theories were created which we briefly described in this section (Table 15.1). Theories considered as an intellectual background for sociomateriality are: actor–network theory (ANT), practice theory, cultural–historical activity theory, complexity theory, spatial theory, organizational aesthetics, science and technology studies (STS), ANTi-History, new materialities and sociotechnical systems (Moura & Bispo, 2020). The explanations regarding human and non-human entanglements are many: all of them brings different angles of looking into epistemological and ontological aspects of sociomateriality. What they have in

common is an attention to the interactions between human and non-human elements and seeing them as outcomes of connections and actions, where everything is performed based on the existence of a "web" of relationships (Fenwick, 2014; Fenwick, 2011; Moura & Bispo, 2020).

Table 15.1. Review of sociomateriality theories

Approach	Description
Actor-network theory (ANT)	ANT is also described as "sociology of translation" by B. Latour (2005). Latour defines "translation" as "a relation that does not transport causality but induces two mediators into coexisting" (Latour, 2005, p. 108). Entity can be humans, technology, nature, etc. ANT focuses on joint effect of interaction between human and non-human. As networks are created equally by human and non-human factors their results emerge due to their participation, interactions, transforming each other; therefore, they are socially "translated". ANT explains that "reality is always a becoming process from the mutual agency of humans and non-humans in the network" (Moura & Bispo, 2020, p. 9). In order to trace the actor networks the proper research methods aligned with ANT is microsociology or follow the actor (or actant) (Michael, 2016, pp. 25–26).
Cultural–historical activity theory	Material artifacts are mediators for the actions of the system. This theory emphasizes that material artifacts are subordinate to human actions.
Complexity theory	Set of theories that are rooted in evolutionary biology and physics (such as cybernetics, general systems theory, and chaos theory). Within them reality is understood as an open system formed by human and non-human elements that interrelate. Systems are created by unpredictable patterns and often cannot be controlled.
Spatial theory	This theory emphasizes the importance of spaces that interact with social productions and activities. Elements of space can act either to stimulate or inhibit action. In this concept, space is shaped not only by people, but also by a combination of subjects and objects (Urry, 2012).
Organizational aesthetics	Material artifacts are a way of communication. Thus, on the one hand they are treated as material elements, on the other hand they are filled with symbolism. Using this approach to organizational analysis, attention is paid to the aesthetics of the elements that are used in the organization, treating them as meaningful information about the organization.
Science and technology studies (STS)	Human and technological elements are inseparable. Sociomateriality should be considered in terms of three main aspects: mutuality (day-to-day relations between human and material elements as mutually constituted); performativity (how sociomateriality is understood in relation to performance in practice); and multidimensionality (sociomaterial entanglements increase temporally and spatially).
ANTi-History	History is the result of the social interaction between heterogeneous actor-network (Durepos & Mills, 2017). The present results from previous interactions between human and non-human elements. Material elements (such as archives and documents) can determine how the actor-network is configured.
New materialities	Humans are considered part of a reality composed of networks formed by elements that are human and non-human, organic and inorganic and that together allow the world to be constituted as it is. Conceive of matter not as a passive or inert element but as possessing its own means of self-transformation, self-organization, and direction.
Practice theory	Practice as key part of social phenomena. Individuals use different objects, interacts, perform tasks.
Sociotechnical systems	Technological and human systems are interrelated. Their interaction is aimed at joint optimization, with a shared focus on achieving both excellence in technical performance and quality of work. The sociotechnical systems approach consider both factors in explaining organizational stability and change.

Source: Own elaboration based on: (Moura & Bispo, 2020).

The various theories that have been described above consider in different ways the position of material and human elements as parts that constitute the reality. Following E.O de Moura and M. de Souza Bispo, this can be illustrated on a continuum (Fig. 15.2). At the extremes of this continuum are approaches in which human and non-human elements are treated as material elements, and on the other, those in which the human is central to the analysis.

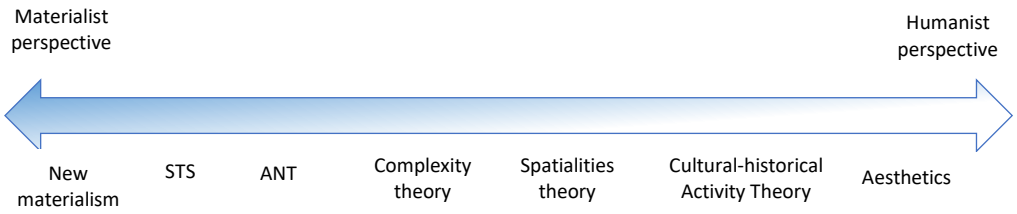

Figure 15.2. Materialist-humanist continuum of Sociomaterial approaches

Source: Moura & Bispo, 2020

With respect to sociomateriality, it is worth distinguishing two theoretical foundations: agential realism and critical realism. Upon them the study of sociomateriality are often built (Leonardi, 2013, p. 59) At the root of agential realism is an assumption that a whole is seen as sociomateriality. Within it, all elements are perceived. Sociomateriality is defined as the inherent inseparability between the material and social. Research undertaken in this area shows that organizing takes place in practice and that practice is both social and material.

An alternative approach was presented by A. Mutch (Mutch, 2013). He found that four major problems arise in analyses that adapt agential realism: lack of unique explanatory power, inability to conduct empirical studies that actually show "sociomateriality," lack of theory of temporality due to the confusion of social and material, and reliance on a thesis of "interpenetration" and a conceptualization of the social and the material as internal relations. The answer to the gaps of agential realism, according to him, is critical realism. In its framework, sociomateriality is treated as links between materiality and phenomena treated as social (these include norms, policies, communication patterns). Additionally, it is emphasized that social and material elements become sociomaterial when they are imbricated. The research undertaken in this stream focuses on explaining how the social and material becomes sociomaterial and what implications this has for organizing (e.g., communication networks, centralization, etc.). According to M. Niemimaa agential realism can be seen as a radical form of sociomaterialism, while critical realism represents its conservative form (Niemimaa, 2016). Similar conclusions can be found in the work of M. Jones, who used the term "strong" sociomateriality to refer to agential realism and "weak" sociomateriality to refer to critical realism (Jones, 2014). The differences in the perception of reality in the two approaches are shown in Figure 3. Within the approach called conservative, the attention of researchers is devoted to the interaction of social and material elements. The starting point is to note the dualism between these two. The social and the material are seen as two, ontologically independent but interacting structures (Mingers et al., 2013). The analyses undertaken within this stream are related to, among other, the ways in which technology has been used over time and how perceptions of technology change due to interactions with it (affordances). The questions raised concern how human interaction with technology occurs and how the opportunities arising from these processes are evolving (imbrications). The conservative approach considers the onto-epistemic nature of stratified reality (real, actual and empirical). In contrast, the radical approach challenges this view. The starting point of the analyses conducted within the framework of the second orientation is the recognition of entanglement (which is reflected in sociomaterial phenomenon). The role of technology is to co-create reality. Social/material temporally appear as agentic cuts (the emergence of matter boundaries in practice and the resulting consequences) and give rise to intra-activity relationships. Phenomena or boundaries are not defined from here-to-there but configured and reconfigured in each iterative intraaction (in which the unfolding event is enriched by and enriches the past).

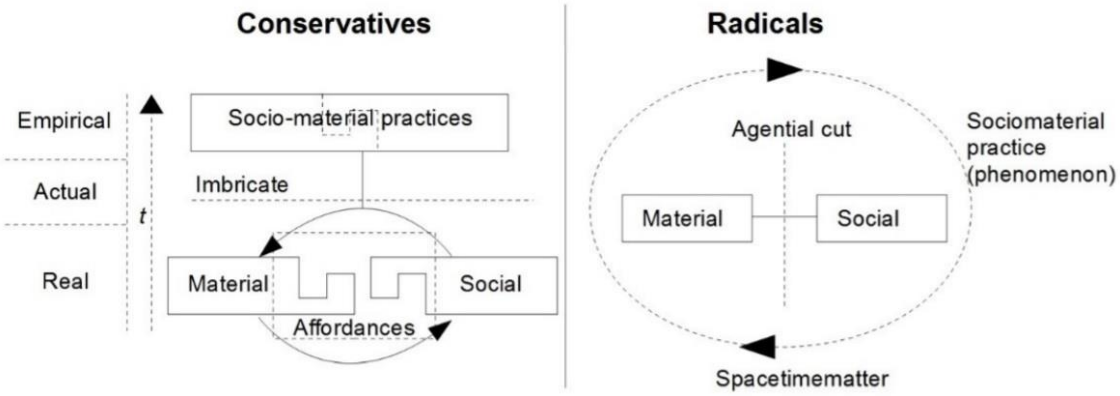

Figure 15.3. Frameworks for sociomateriality research

Source: Niemimaa, 2016, p.53

The theories and approaches presented here allow us to see how, within their frameworks, researchers unpack the meaning of sociomateriality and the connections between the elements that constitute it. The differences within them and the emphases placed on particular elements are related to the ontological and epistemological aspects of sociomateriality. In practice, researchers concerned with the interactions and connections between material and social elements must make a judgment about which way of viewing reality seems more valid to them.

15.5. Examples of interactions among human and digital technology

In this chapter we present three examples how interactions among human and digital technology creates something new. The examples presented are exemplifications of how technology affects and changes human behavior in various areas. They show sociomateriality in a broader context and will allow the reader to understand the concepts discussed by showing their practical dimension.

Pokémon GO

Let's take an example of a game app like Pokémon GO launched in 2016 which was a subject of several researches demonstrating its impact on user behavior and vice versa (Koga, 2020). Pokémon GO as a location-based augmented reality game was linked with an incentive to walk and spend time outdoors (LeBlanc & Chaput, 2017). This idea was an interesting alternative for gaming alone in the room. The game evoked organization of events for players searching for rewards but overcrowding was not desired in certain localizations due to their nature (like historical and religious sites). However searching for characters and items in PokéStops and Pokémon Gyms impacts these locations. It affected not only players appearing it these sites, but also their owners concerned about safety and privacy. Players looking at surrounding through the screen were also a subjects of injuries and involved in traffic collisions. These human activities impacted the game app as new features were added in response to noted problems.

Google search tool

For the Readers not familiar with Pokémon GO we discuss a tool probably more recognizable contemporary: Google search engine. Google Search is the most popular search engine. As Orlikowski (2007) explains its core part is PageRank algorithm which is changing due to modifications of indexed websites but also due to people's activity during searching and clicking on particular websites. Page Rank as the name implies rank website pages and measure importance of the page based on the counting numbers of links to given page. Therefore the results found via Google search are dynamically created but not by a computer but by human

actions. Its results determine current actions, however the same search keywords enter other time will produce different results. As Orlikowski states: "the performance and results of Google-based search are sociomaterial" (Orlikowski, 2007, p. 1440).

Games engineering

Another example of entanglement between digital technology and creativity comes from game industry. Analysis showed that working with a given technology (game engine) provided environment (or world) with which game developers were embedded different ideas and game features (Panourgias et al., 2014). Identified barriers to implement some theses novel solutions caused computer hardware providers to develop technology and thus offer new features also to other game studios. These technological innovations offer new option for other game developers. Therefore the changes in technology were the result of human imagination. We observe in this example how encountered limitations become the impulse to change working environment by third parties which next impacted the other game studios providing new possibilities for creating game. Similar pattern can be noticed in using digital technology in business. Observed new ways of customers' service can result in re-built and restructured current digital routines thus offering new experiences for both service provider and recipients. We believe that these examples allow to understand how in practice digital artifacts interact. In literature more situations can be found like: modification of policemen organizational routines due to introducing body worn cameras (Guzik et al., 2021), navigating the spacecraft (Mazmanian et al., 2014).

15.6. Influence of information technology on company's performance and vice versa

In this section focusing on the experience of startups, the perception of technology and its impact on business will be described. Startups are companies for which the use of technology is a natural part of business operations. Therefore, we will begin by presenting the concept of transition from sociomateriality to singularity. Next, the perception of the mutual influence of technology and the way companies operate will be presented based on the results of conducted research.

From sociomateriality to singularity

Working with digital artifacts is nothing new for so called digital-born companies or digital start-ups. Founders of such startups underline digital start-up mindset which consists of: entrepreneurial orientation, experimentation, learning, naivete, with understanding of global online marketplace, mobile technologies, and simultaneous focus on technology and business (Zaheer et al., 2019).

In fact we live in in the world where digitization processes begin to blur within the entire organizational culture. There is an era of transition from sociomateriality to singularity.

The technology singularity is a concept, in which in the near future the humanity will change radically and a new kind of being will arise to inhabit the Earth enhanced humans or artificial devices (initially created by human beings) (Vallverdú, 2017). Although some authors consider such dramatic changes as a key threat to what humanity is now (Eden et al., 2012, p. 1), it should be noted that this is an ongoing process. As Chalmers (2010, p. 9 -10) claimed "an intelligence explosion results from a self-amplifying cognitive capacity, correlations between that capacity and other important cognitive capacities, and manifestation of those capacities (conclusion). More pithily: self-amplification plus correlation plus manifestation = singularity". The development of technology, the emergence of super-intelligence, the progressive processes of identifying social spheres with technology and equating efficiency and digitization are precisely the processes that can be identified in practice with the progressing process leading to singularity. It is a natural process of technological integration into the everyday social, economic and cultural life of people. Thus, technology has moved from a tool that increases

efficiency in an organization to the everyday practice of private and business activities of a person. Now technology is started to be fused with people.

Startup founders' perceptions of sociomateriality

The evolution of socio-materiality towards singularity is particularly visible in the example of startups, especially those established by people under 30. For the purposes of this chapter were interviewed 12 founders of startups from Cracow. In order to access the narratives and individual experiences of the respondents, qualitative research was conducted using an individual in-depth interview technique (IDI) (Creswell & Creswell, 2018). The sampling was purposive. Interviewees were between the ages of 22 and 28. These are people for whom technology is, and always was, a natural element of the environment. For them the integrity of technology and business is natural. They create and improve artificial intelligence, use its possibilities and indicate the need for its improvement and expansion. The study group is a potential carrier of the signularity value. For her, socio-materiality is not a challenge, and through its behavior and business aspirations, it consciously (or not) contributes to the introduction of humanity into a new phase. They do not see new behaviors in their organizations caused by the digitization of work. In their startups, technology is the basis of business and is used in all areas of the company's operations. They use many IT tools in their work. Using technology is so natural to them that one respondent, when trying to list the tools they use in their daily routine, stated: “I don't know if we have enough time to list all the [IT] tools we use.” Technology is the basis of their activity and often the only way to run a business. During the interviews, they formulated the following statements as follows:

- “Digital business is when I turn off the plug and nothing is there.”
- “We've never even met live, no - online. We make all startup decisions through online communication tools.”
- “Our entire startup is one great technology.”

Operating in the digital world poses no challenge to their businesses. They see barriers to development related to the adaptation of the environment to technological needs. They see new up-and-coming solutions as new opportunities “we are waiting for 5G technology generally available in Poland. It will be a big milestone for us.”

It is likely that the widespread use of technology in startup operations results in a different perspective on it. As has been pointed out, these are companies that have emerged taking advantage of the opportunities that technology provides. Therefore, in the statements of the respondents there were often opinions that when they start to cooperate with someone, they pay more attention to soft skills than to technological ones. The startup`s owners statements show that technological competences are natural for them, while soft ones require special attention:

- “If someone works with new technologies, with technologies in general, he has some skills to use them. I pay attention to communicativeness among my employees - this is a challenge.”
- “Everyone can handle Google tools and launch Zoom. Not everyone knows how to talk and manage their team. It's harder to learn.”

The respondents were also asked for their opinions on digitization processes and changes in social behavior in their environment. Their statements show, first of all, that they consider their surroundings to be lagging in relation to the possibility of introducing technological processes. As one interviewee noted: “the process of digitizing the work is normal. People must be prepared for it. I mean, they have to be flexible.”

New technology into business practice is for them something natural and necessary. They believe that the labor market is subject to a natural process of digitization. For startup representatives, working with technology is not a challenge that entails adaptation, but a natural process that is necessary for growth: “the more people work in new technologies, the more this sector develops. It is a vicious circle.”

They cannot name sectors or industries in which work digitization will be impossible to introduce. Only 5 person indicated public and nonformal education as the sectors in which the advantages of non-online meetings are bigger than those of online meetings:

- "There is no profession that does not need modern technologies. I can imagine anyone who can replace machines. Well, maybe not everybody – teachers are needed ‹on live›."

This theoretical contribution to business digitization should be summed up by reading the statements of young startup founders and rhetorical question: is there a world in which other than digital processes will no longer take place? And man, along with the subsequent acceptance of the existence of advanced technological tools and forms as obvious, aims to completely change who he is and how he thinks about his environment?

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16. TALENT MANAGEMENT IN TECHNOLOGY FIRMS: MANAGING SKILLS FOR DISRUPTIVE DIGITAL BUSINESS

Learning objectives

After reading this chapter, you will able to:

- Understand the concepts of Talent and Talent Management.
- Identify the phases associated with the Talent Management process.
- Identify the Talent Management models and their relationship with the competitive strategy used by the company.
- To know how the different Talent Management models can be used in knowledge intensive companies (KIF) with disruptive digital business models, and how depending on the moment of their life cycle this type of companies will use one model or another.
- To know the capabilities and knowledge that KIF with disruptive digital business models should consider in their Talent Management processes.

16.1. Introduction

Human Resources are the most important resource of any company, and companies would be nothing without people. Within the area of Human Resources Management, the concept of Talent Management (TM) has been emerging strongly in recent times. Employee talent can be defined as the implementation of certain resources and capacities that certain people possess that allows a company to obtain above-average performance (Effron and Ort, 2010; Scaringella and Malaeb, 2014). This performance makes exceptional contributions to organizations' economic and operational results (Kim et al., 2014). TM consists of designing and executing processes that allow talent to be attracted, identified, captured, developed and retained/transferred (Macfarlane et al., 2012; Powell, 2014), i.e., management of employees' talent from an initial stage (pre-employees) to the final stage (ex-employees) in a specific organization. TM is a highly topical issue in the field of Human Resources Management (Gallardo-Gallardo & Thunnissen, 2016).

Associated with TM is the management of people's skills and knowledge, both of those who are already working in the company and of those who could work in the company in the future. In the specific case of TM in IT-based companies (Maqueira, Bruque & Uhrin, 2019), this is an issue of great importance in the new disruptive business environments. IT-based companies operate in a turbulent environment, which means that the employees of this type of company face a very intense and frenetic workload. In these environments, managing the talent of employees and detecting their capabilities and knowledge in order to develop them or generate new ones is a source of competitive advantage. In this sense, it is well known the Google TM model, where most of its employees have a PhD degree and, in addition, the company uses advanced practices in Human Resources Management, where workers have flexibility in entering and leaving work, they have relaxation and rest rooms, leisure areas (video games, pool tables, slides) or healthy food at no cost to the worker (fruit, salad, etc.). But there are several models of TM (Maqueira, Bruque and Uhrin, 2019), and each of them is particularly

interesting in its use associated with the way companies compete especially in the case of IT-based companies.

This chapter, precisely, focuses on this issue, and analyzes TM in IT-based companies, as well as the management of the skills and knowledge that are necessary in the new disruptive digital businesses. To do this, a tour is made of the concept of Talent, Talent Management and the various phases that comprise it, ranging from the initial phase of attracting talent, to the phases of identifying and capturing talent, talent development, talent retention and talent exit management. Different types of TM models are also shown: External Talent Capture model, Internal Talent Development model and Accelerated Internal Talent Development model (Fast-track Internal Talent Development model). These models are contextualized in the case of disruptive IT-based businesses. In addition, associated with the phases of TM and development models, it is related which skills and knowledge are necessary in disruptive digital businesses and the management that the TM process should perform of these skills and knowledge.

16.2. Talent and Talent Management

Talent

Different types of talent have been identified in the literature (Dries, 2013; Maqueira, Bruque and Uhrin, 2019): (1) Transferrable talent *versus* context-dependent talent; (2) inclusive talent *versus* exclusive talent, and (3) input *versus* output perspectives. Transferrable talent *versus* context-dependent talent refers to whether talent depends on circumstantial factors (interactions between individuals, talent teams, context-dependent) (Vivas-López, 2014; Groysberg, Sant and Abrahams, 2008b) or whether talented people are expected to demonstrate their abilities regardless of the environment (transferrable star employees) (Groysberg et al., 2008b). In relation to inclusive talent *versus* exclusive talent, the inclusive perspective assumes that all people are talented (talent teams) (Vivas-López, 2014) while the exclusive approach is based on the assumption that a certain number of people are inherently more talented than others (star employees) (Bish and Kabanoff, 2014). Input talent *versus* output talent refers to whether the talent depends on ability or motivation. The input perspective implies a focus on effort, motivation, ambition and career guidance in talent assessments, while the output perspective indicates an evaluation focus on production, performance, achievements, and results (Dries, 2013). In addition, at the conceptual level, individual talent exists and is related to the consideration of star employees (Bish and Kabanoff, 2014). Organizational talent also exists and, through TM, the goal is to improve the entire talent structure by attracting, developing and retaining people, thus developing the company's capacity to generate competitive advantage (Vivas-López, 2014; Groysberg et al., 2008b). Regarding the availability of talent, the decision is established whether to make or buy talent. Thus, a decision to make talent refers to the identification of internal talent and its development (Cappelli, 2008), while the acquisition of talent through economic incentives is consistent with a decision to buy talent (Cappelli, 2008; Meyers, van Woerkom and Dries, 2013).

Based on the above, talent is defined as the ability that people exploit to achieve supposed consistently exceptional results, while at the same time making contributions to the organizational performance of the company through its technical social functions and commercial or management competencies (Effron and Ort, 2010; Dries et al., 2012).

Talent Management

TM has recently been the object of greater research attention due to the assumption that is linked to companies' competitive advantages (Gallardo-Gallardo & Thunnissen, 2016; McDonnell et al., 2017). The discipline came into the crossfire of investigative interest with the emergence of the McKinsey Group (Chambers et al., 1998), who expressed concerns about the supply of talent (War for Talent) (McDonnell, 2011). In this sense, TM has enjoyed an increasing amount of scrutiny attributable to increased global mobility, which poses challenges and opportunities for Human Resources (HR) departments (Sparrow, Farndale and Scullion, 2013;

McDonnell et al., 2017) and their attraction and development of people talent (Bethke-Langenegger, Mahler & Staffelbach, 2011).

As a discipline, TM forms part of human resource strategic management (Lewis and Heckman, 2006; Höglund, 2012; Jones et al., 2012). However, among academics, there is no agreement as to a clear definition (Gallardo-Gallardo & Thunnissen, 2016). For example, at first, some authors defined TM as the search for the most suitable people for a given job at a given time (Schuler, 1990), while other authors stressed TM's focus on continuity of leadership (Rothwell, 1994). Subsequently, TM's importance was identified in the adequate management of demand, supply, capture, and flow of talent (Pascal, 2004). In addition, Redford (2005) argued that TM should ensure that everyone at all levels works to extract all the potential of employees. Lewis and Heckman (2006) revealed three principles regarding TM: (1) TM as a collection of human resource practices; in this view, TM includes the traditional activities of a human resources department, such as selection, recruitment and development (Poocharoen and Lee, 2013; Powell, 2014); (2) Talent pools, or the establishment of different categories or groups of talents in which it is possible to classify an organization's employees (Mäkelä, Björkman, and Ehrnrooth, 2010); and (3) Generic view, the concept of talent is raised above organizational boundaries and defined as a resource to be managed primarily according to performance levels (Lewis & Heckman, 2006).

In the increasingly globalized business environment, there are companies capable of managing talent on a global scale (Björkman and Smale, 2010; Stahl et al., 2012). This has led to Global Talent Management, which has been defined as all of the activities that an organization conducts to attract, develop, retain and transfer the best employees in the most strategic roles in the world (Scullion, Collings, and Caligiuri, 2010; McDonnell, Hickey, and Gunnigle, 2010; McDonnell et al., 2011).

Phases of Talent Management

The Scullion et al. (2010) definition can be used as a basis to define the five main phases of TM in companies: (1) Attraction of talent; (2) Identification and capture of talent; (3) Talent development; (4) Retention of talent and (5) Output of talent thorough outplacement (see Figure 16.1).

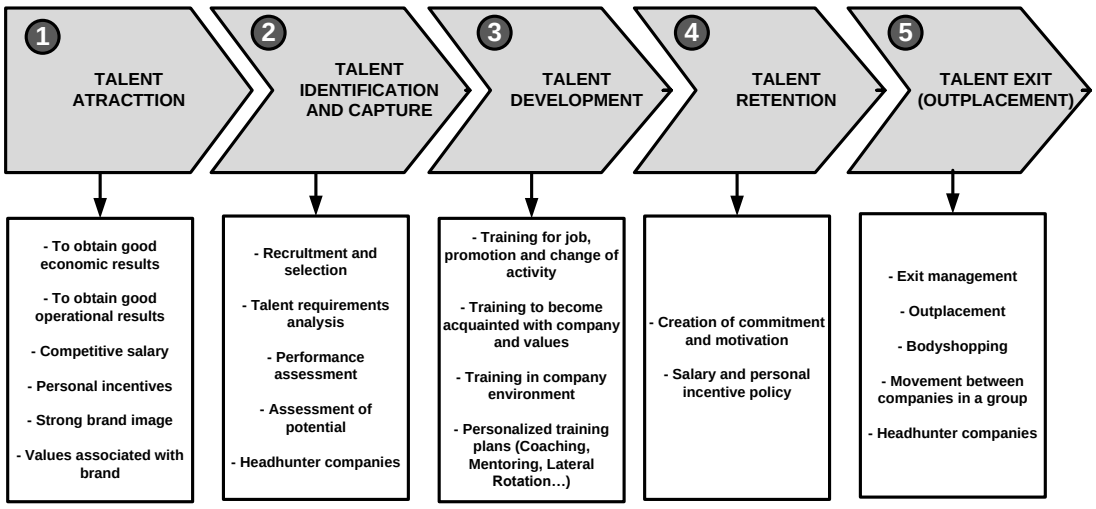

Figure 16.1. Five main phases of Talent Management in companies

Source: prepared by authors based on Scullion et al. (2010) and Maqueira, Bruque and Uhrin (2019).

Each of the phases is described below.

1. *Talent attraction*: Companies strive to represent themselves as brands that generate confidence and loyalty between their customers and employees (Sparvero & Warner, 2013). Achieving both good economic and good performance results, competitive remuneration and

personal incentives that give value to employees and a strong brand image are all major issues for attracting talent to a specific company.

2. *Talent identification and capture*: This phase is traditionally linked to recruitment and selection by the Human Resources department. The phase starts with an initial analysis of the talent required for the key jobs in the company and a study of potential supply and future demand associated with the plans for company growth (Björkman et al., 2013). Integrating potential assessment and performance assessment is a powerful tool for identifying talent (Björkman et al., 2013). There are also headhunter companies that specialize in identifying and capturing talent, a service that they offer to other companies and/or people.

3. *Talent development*: This phase is identified with the efforts that the company makes to develop its employees professionally to boost organizational performance (Den Hartog, Boselie and Paauwe 2004; Schmidt, Mansson & Dolles, 2013). This includes the training required for a more senior role or for a change of activity to make workers more knowledgeable. Therefore, personalized development plans according to the needs of the employee and the company are desirable. Talent development favors the employee's mobility and promotion, either within the same area or from one area to another, and between different department units (Schmidt et al., 2013). Practices frequently used in this phase are coaching, mentoring, lateral rotation or movement of employees through different functional areas of the company (Núñez-Cacho and Grande, 2013).

4. *Talent retention*: This phase usually relates to devising a salary and personal incentive policy to generate the commitment and motivation that forge a strong relationship between the company and the employee (Rynes, Gerhart, & Parks, 2005; Björkman et al., 2013; Schmidt et al., 2013). These initiatives could include career plans; promotions; flexibility and reconciliation of family and work life.

5. *Talent exit (outplacement)*: Although companies strive to retain talent, they sometimes need to manage their talent output. Personal or business reasons can result in talented people exiting and joining another company. This phase locates the mobility of talented employees among the companies of the same group and provides for the relocation of people who have made important contributions to the company in the past but who have ceased to be useful for the company to achieve its current or future objectives (Westaby, 2004; Gidwani and Aziz, 2012). In tech companies, bodyshopping (the ceding of people with technical knowledge to third companies for profit) and headhunting are commonplace (Majumdar, Simons & Nag, 2011).

Talent Management models

There are several very different models for TM (Maqueira, Bruque, & Uhrin, 2019): (1) External Talent Capture model; (2) Internal Talent Development model and (3) Fast-track Internal Talent Development model. Each of these models is described below.

(1) ***External Talent Capture model***: this model is characterized by its great capacity of attracting current talent, especially on account of the very high remuneration in exchange. According to this model, talent is captured on the labor market when it is already proved and tested and applied immediately in the very short term. There is no talent development, as competitive advantage is achieved through the immediate exploitation of said talent. There is only a low degree of talent retention, mainly associated with the organization's very high remuneration policy and its operational results (Maqueira, Bruque and Uhrin, 2019).

(2) *Internal Talent Development model*: This model is characterized by its great ability to attract talent, especially in cases where talent has a high potential for development. It is also distinguished by talent being captured at an early stage and subsequently identified at the internal level by excellence in performance and developed over the long term. New talent is instilled with a strong team identity with the firm and the differential characteristics that the organization acquires through teamwork. This management model is associated with a high degree of talent retention through emotional links. This model is very useful for companies that compete through differentiation (Maqueira, Bruque and Uhrin, 2019).

(3) *Fast-Track Internal Talent Development model*: This model attracts proven talent that is not yet playing at a level of maximum performance, although this can be aspired to. Talent with great potential for development is identified on a level immediately below the top-performing group but before becoming a recognized member of this group. These players quickly improve their performance during a period of intense short-term development. When talent gains recognition and its value increases by virtue of high performance, its output is managed with the organization seeking a high return on the investment that it made. This model is especially useful for companies that compete with a short-term focus.

Disruptive digital business and Talent Management models

The three models described in the previous section allow both economic and operational results to be obtained. However, their use is closely related to the competitive strategy used by the company (Maqueira, Bruque, &Uhrin, 2019).

The Internal Talent Development model would be more useful for companies whose competitive advantage is achieved through the differentiation through teamwork, such as innovation, design, etc. However, companies that do not achieve clear differentiation through teamwork but base their success on the individual contributions made by certain key employees who always perform at the same level, whatever team they are in (competitive advantage gained through personal individualisms), should opt for the External Talent Capture model. The Fast-Track Internal Talent Development model is shown to be especially applicable in companies that focus on competing in the short term. The Internal Talent Development model, however, is shown to be especially applicable in companies that compete through the competitive strategy of differentiation and do not consider the time variable to be of great relevance.

One type of company where this can clearly be applied is the knowledge-intensive firms (KIFs), such as companies with disruptive digital models (IT-based firms) (Maqueira, Bruque and Uhrin, 2019). These firms compete with very sophisticated knowledge or highly complex products, as they require the knowledge and intellectual capabilities of highly skilled employees who make up the greater part of their workforce (Alvesson, 1995, 2004). There has already been some research about TM in KIFs. Whelan et al. (2010) argue that putting talented workers into key positions in the dissemination process of external knowledge is critical and requires highly specialized personnel. In addition, an integrated approach of TM and knowledge management was emphasized by Whelan and Carcary (2011). According to Alvesson (1995, 2004), there are two ways for KIFs to achieve competitive advantages: focusing on excellent human capital or focusing on HR processes that enable differentiated work teams to be created. For KIFs that identify with the first of these two cases, this would entail contracting and retaining the best employees, with selection and remuneration being key aspects. The best results for the organization are achieved through the work of excellent individuals, and the External Talent Capture model is ideal for employing them. For KIFs of the second type, management processes seek to create an organizational climate that drives interaction and collaboration and enables excellent teams to be formed, and the best results are obtained from collective efforts rather than individual contributions. As a result, the Internal Talent Development model would be the perspective to apply. KIFs of the second type could also capture talent externally. Rather than taking on specific individuals, they could focus on teams, by purchasing successful startups, not for the value of the product that they have developed, but for the value of the whole team that has come up with the product (i.e. cluster hiring). Therefore, and in accordance with the dynamic nature of TM, KIFs of the second type could benefit to a larger extent by taking advantage of a combination of the two TM models.

The Fast-Track Internal Talent Development model is shown to be especially applicable in companies that focus on competing in the short term. The Internal Talent Development model, nevertheless, is shown to be especially applicable in companies that compete through the competitive strategy of differentiation and do not consider the time variable to be of great relevance.

In knowledge-intensive companies such as technology-based companies (Groysberg, Lee and Nanda, 2008a), when they are in a consolidated phase, these companies are usually characterized by using a competitive differentiation strategy (Alvesson, 1995, 2004). However, during a company's first years, during the startup or spinoff phase, the time variable is very important and affects TM (Whelan and Carcary, 2011; Whelan, Collings and Donnellan, 2010). Companies of this type, during their first years of existence, compete in the short term because their economic resources are very limited, which augurs uncertain viability dependent on their obtention of additional economic resources. Generally, their founders are brilliant technicians but their company management skills are often underdeveloped. The use of the Fast-Track Internal Talent Development model in this phase could allow these "brilliant technicians" to acquire the company management skills that allow them to direct and manage their young company in their quest for success. At the same time, new "brilliant technicians" must be recruited and their talent must be rapidly developed so that they lead the technical activities that are weakened when the founders' devote themselves to managing and directing the company. However, with the passage of time, successful companies of this type obtain financing and so greatly increase their economic resources and their viability, which usually allows them to grow rapidly (Alvesson, 1995, 2004). In this phase, in which the time variable begins to lose a great deal of its relevance, the Fast-Track Internal Talent Development model is no longer more efficient and a better option is to apply the Internal Talent Development model, as consolidated companies that apply this kind of differentiation will be more efficient. As there are many similarities between the two models, the change from one model to the other should not be a problem for the company.

Managing talent skills for disruptive digital business

TM must be able to identify the talent of employees, both those already in the company and those who are joining the company for the first time or, in other words, those the company hires. In both cases, companies that consider TM as a strategic issue, identify the capabilities and knowledge of their employees, and are able to inventory these capabilities and manage them, so that employees contribute more effectively and efficiently to the achievement of the company's strategic objectives. This inventory of capabilities and knowledge will also enable the development of new capabilities and knowledge in existing employees who are identified as having a high potential to contribute to the company's objectives (Internal Talent Development model). However, at a certain point in time, certain capabilities and knowledge that the company needs may not be present in its employees at that time, making it necessary to recruit new employees with these capabilities (External Talent Capture model).

This question makes it important to know what skills and knowledge should be considered by companies KIFs with disruptive digital business models. To answer this question in the scientific literature different efforts have been made to identify such capabilities (Marín-García et al., 2016; Sousa and Rocha, 2017; Charosky et al., 2021; Kipper et al., 2021). Several research papers put the focus on innovation, which stands out as one of the main criteria for grouping certain competencies (Marín-García et al., 2016; Charosky et al., 2021). This issue is of great importance in KIFs with disruptive digital businesses, where innovation is a common feature.

In the new disruptive digital businesses, Information Technologies play a fundamental role, as a supporting element of the business model. Thus, it is important to determine which IT currently predominate in disruptive digital businesses. In this sense Sousa and Rocha (2017) identify the following IT as the most used in the new disruptive digital business models: (a) Internet of Things (IoT), which is offering great opportunities in the creation of new products and services, in the creation and destruction of industrial sectors, in the definition and creation of new digital processes, new infrastructures to manage huge amounts of data and in the transformation of jobs; (b) Cloud Technologies, with great potential to change how IT services are provided to companies through new business models based on Software as a Service (SaaS) that provide flexibility and agility to companies; (c) Big-Data, which makes it possible to increase the efficiency of companies through business models based on pay-per-use services, and allows

better knowledge of customers and business partners; (d) Mobile Technologies, which can be applied to different business functions, and which are giving rise to business models based on App stores, the use of 3D products, 3D simulations for different purposes, such as military, medicine, fashion, architecture or games and entertainment; (e) Artificial Intelligence (AI) and robotics. Other authors expand this group of IT (Kipper et al., 2021) highlighting the following: IoT, sensors and wearables; Cloud Computing; Big-Data; Web Technologies (Integrating Systems, neural networks, collaborative software, Internet of Services, among others); Artificial Intelligence (AI); Robotics; Additive Manufacturing or 3D printing; Augmented Reality; Embedded Sytems and Cyber-Phisical Systems (CPS). All these IT are being used as elements that support new disruptive digital business models (Sousa and Rocha, 2017; Kipper et al., 2021), being diverse the sectors of the economy in which the use of these IT are giving rise to disruptive digital businesses. Table 1 shows these sectors and the innovative activities on which they are based.

Table 16.1. Digital business emerging due to IT

Sector	Focus
Industry	Processes monitoring Analytics Distributed manufacturing New materials
E-education	Digital learning Mobile learning eLearning
Creative industries	3D printing Wearable
Energy	Monitoring Batteries
E-tourism	New processes New technologies
E-health	Monitoring Home care
Smart city	Monitoring Security Energy consumption
Intelligent transport systems	Traffic monitoring Intelligent parking

Source: Sousa and Rocha (2017).

In companies KFIs with disruptive digital business models, TM, as shown in the previous section, will use one TM model or another, depending on the moment in time in which the company finds itself, the state of maturity of the specific business model of each company and the competitive strategy that the company uses. But it is a generality that in this type of companies, regardless of whether they use an Internal Talent Development model, a Fast-Track Internal Talent Development model or an External Talent Capture model, TM must know and manage different key skills in their employees in order to get them to contribute to meet the objectives of the disruptive digital business.

Given their important role in the development of the business and the company's strategy, the skills associated with managers will be fundamental in this type of company. In this regard, the findings of Sousa and Rocha (2017) identify 19 key skills grouped into three dimensions (innovation, leadership and management). Table 16.2 shows these skills.

Table 16.2. Skill to manage disruptive business

Category of skills	Skills
	Innovation and creativity New business opportunities Project management

Innovation skills	Risk management Efficiency and efficacy Networking
Leadership skills	High-performance teams management Talent management Motivation and satisfaction Communication Careers management Leadership of multi-cultural employees
Management skills	New models of work organization Emergent technologies Decision making tools Big-data analysis Organizational change Strategic management Social and relational knowledge

Source: Sousa & Rocha (2017)

Kipper et al., (2021), from a perspective associated with Industry 4.0 identify similar competencies that we have grouped into the same dimensions as above. Table 16.3 shows these competencies.

Table 16.3. Skills by business Industry 4.0 related

Category of skills	Skills
Innovation skills	Interdisciplinary Creativity Initiative Teamwork Collaborative work
Leadership skills	Communication Flexibility Adaptability Pro-activity Give and receive feedback
Management skills	Self-management Self-organization Strategic view of knowledge Problem solving

Source: adapted by Kipper et al. (2021)

Focusing on the innovation dimension (Marín-García, 2016; Charosky et al., 2021), Table 16.4 shows the capabilities associated with it.

Table 16.4. Innovation skills related

Category of skills	Dimension	Skills
Innovation skills	Creativity	User awareness Uncertainly management Idea generation Design Thinking
	Intra-preneurship	Initiative Networking Teamwork Communication Coordination Multidisciplinary
	Leadership & entrepreneurship	Entrepreneurship Leadership/initiative Energy Risk-propensity

	Impact	Business sense Social impact Sustainability
	Planning and managing a project	Planning Organisation Time management
	Personal & professional skills	Self-efficacy Critical Thinking Self-awareness for professional life
	Experimentation & knowledge discovery	Problem-solving Technical solution/technology Investigation & Knowledge discovery Experimentation

Source: own elaboration based on Marín-García et al. (2016) and Charosky et al. (2021)

Another question of interest is the determination of what is the specific knowledge that people associated with new digital innovation environments, such as Industry 4.0 in general and disruptive digital business in particular, should possess. This knowledge is shown in Table 16.5 (Kipper et al., 2021).

Table 16.5. Knowledge associate to digital disruptive business

Knowledge
Information and Communication Technology (ICT)
Software development and security
Sustainable development Technologies
Algorithms
Automation
Data Analysis
General Systems Theory

Source: Kipper et al. (2021)

Taking into account previous literature (Marín-García et al., 2016; Sousa and Rocha, 2017; Charosky et al., 202; Kipper et al., 2021), described above, it is possible to make an integration of these contributions, obtaining a model that shows a broad and complete view of the key skills and knowledge to be considered in people working in disruptive digital businesses, especially of people related to the management of this type of companies. We should not lose sight of the fact that in this type of companies the role of IT is relevant, so a large part of the management positions are held by people with technical backgrounds, generally associated with engineering in general or engineering related to computer science in particular. Table 16.6 shows this integrated model.

Table 16.6. Skills and knowledge model for digital disruptive business

Category of skills	Skills	
Innovation skills	Creativity	User awareness Uncertainly management Idea generation Design Thinking
	Intra-preneurship	Initiative Networking Teamwork Communication Coordination Multidisciplinary
	Entrepreneurship	Entrepreneurship Initiative Energy Risk-propensity

	Impact	Business sense Social impact Sustainability
	Planning and managing a project	Planning Organisation Time management
	Personal & professional skills	Self-efficacy Critical Thinking Self-awareness for professional life
	Experimentation & knowledge discovery	Problem-solving Technical solution/technology Investigation & Knowledge discovery Experimentation
Leadership skills	Flexibility Adaptability Pro-activity Give and receive feedback High-performance teams management Talent management Motivation and satisfaction Communication Careers management Leadership of multi-cultural employees	
Management skills	Self-management Self-organization New models of work organization Emergent technologies Decision making tools Big-data analysis Organizational change Strategic management Social and relational knowledge	
Category of knowledge	**Knowledge**	
General	Information and Communication Technology (ICT) Software development and security Sustainable development Technologies Algorithms Automation Data Analysis General Systems Theory	
Emergent Information Technology	Internet of Things (IoT), sensors and wearable Cloud Computing Big-Data Technologies Web (Integrating Systems, neural networks, collaborative software, Internet of Services, amount others) Artificial Inteligencie (IA) Robotics Additive manufacturing or 3D printing Augmented Reality Embedded Systems Cyber-Physical Systems (CPS)	

Source: Own elaboration based on: Sousa and Rocha, (2017); Kipper et al. (2021); Marín-García et al. (2016) y Charosky et al. (2021)

The model shown in Table 16.6 provides an inventory of competencies (skills and knowledge) that disruptive digital businesses must be aware of regardless of the time model and the state of maturity of their business models.

Two main groups are shown in the table: (1) Skill and (2) Knowledge. In the skills group there are three main categories: (a) Innovation skills, (b) leadership skills and (c) management skills. In the knowledge group there are two categories: (a) general knowledge and (b) specific

emerging IT knowledge. In each of the categories we detail the skills or knowledge that are of value to employees of companies with new disruptive digital models.

The category with the largest number of capabilities is innovation capabilities, which groups these capabilities into different dimensions, some more focused on the organization itself (e.g., planning, organization, problem-solving, technical solution/Technology, investigation & knowledge discovery, among others) and other capabilities more focused on the individual (e.g., initiative, experimentation, uncertainly management, idea generation, self-efficacy, critical thinking, self-awareness for professional life, among others). Innovation is a fundamental issue in new disruptive business models, where everything is really new and there are few reference points.

Leadership capabilities are also important for companies with new disruptive business models. These companies are usually set up with very flat structures where employees take on a lot of responsibility and decision making and capabilities such as communication, flexibility, adaptability, pro-activity and motivation and satisfaction will be needed in employees. In addition, the company itself must encourage the development of capabilities in its employees such as give and receive feedback, high-performance teams management, Talent Management, careers management and leadership of multi-cultural employees. In the same vein, management skills are necessary, precisely because of the adoption of very flat structures in this type of company, with the need for self-management, self-organization, new models of work organization and decision making, among others.

In terms of knowledge, employees of companies with new disruptive business models must have great general technical knowledge of Information and Communication Technology (ICT), software development and security, sustainable development technologies, algorithms, automation and Data Analysis. But they must also be proficient in emerging IT, which supports the new disruptive business models of KFIs.

These types of companies will have to apply TM, using different models, depending on the state of evolution in which they are and the competitive strategy they use. But regardless of the TM model used, they must know the key skills and knowledge that will make their employees contribute to the success of the company. It will be the TM's job to manage these competencies, detecting them in the employees to be hired, and/or developing the competencies in the existing employees. In this sense, knowing what competencies of your employees can lead to success is important information that, if properly used in your TM processes, will increase the chances of survival and success of KIFs with disruptive digital business models.

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List of figures

List of tables

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