

INDUSTRY 4.0 CHALLENGES FOR THE BUSINESS MODEL

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Abstract: Increasingly, in the environment of academia and business, new challenges for industry are being discussed in connection with the fourth industrial revolution. Industry 4.0 is the result of the development of cyber-physical manufacturing systems as part of the fourth industrial revolution. Researchers, politicians and entrepreneurs are discussing the directions of changes in industry. Industry 4.0 marks new areas of change in the sphere of production and management. The development of the Industry 4.0 concept forces modern enterprises to adapt quickly and flexibly to changing demand conditions. This is reflected in the creation of new business models that allow for the introduction of innovation, rapid reorganization of processes and very flexible adaptation of the functioning of enterprises to the conditions of the changing competitive and widespread environment.

The aim of the article is to present the concept of a business model assuming high flexibility in the Industry 4.0 era.

Keywords: business model, business process, Industry 4.0

1. Introduction

Rapidly changing business environment, development of new technologies, the increasing intensity of competition and increasing globalization pose a confrontation of businesses against increasingly difficult requirements (Grabowska, & Furman, 2015).

Technological changes have gained strategic importance in the thinking and actions of many market players, penetrating, at the same time, into all links of the value chain and the ways of their connections. This has changed the range of competition and the way in which the needs of buyers are met (Saniuk, Witkowski et al., 2013; Gajdzik, 2008). The technical revolution has broadened the boundaries of what businesses can deliver to customers in the form of value. In today's highly competitive production environment, enterprises face the challenge of dealing with large amounts of data, the need to make quick decisions and to make the production processes flexible (in terms of a personalized product). The contemporary nature of production

is shaped by the paradigm shift from mass production to production at the customer's request (Gajdzik, 2018; Szczanowicz, & Saniuk, 2016, p. 97).

Industry 4.0 marks the fourth industrial revolution in that it is assumed that this is a vision of intelligent factories built of intelligent cyber-physical systems. As part of the proposed Industry 4.0 concept, there is a close connection between physical objects and the information network. Sophisticated corporate networks are created, connected by intelligent resources, communicating over the Internet. The functioning of small and medium enterprises in production networks today gives many additional development opportunities, but at the same time raises some concerns and requires solving many problems. In the case of enterprises from the SME sector, this means the possibility of offering customers a wide variety of products. The effectiveness and efficiency of such functioning requires enterprises to create a cooperation network and apply appropriate business models, as well as making (often) significant changes in them.

Almost all existing business systems are built as a way to archive and manage large numbers of transactions related to the company's operations - from sales, through purchases and employee benefits, to industrial processing. However, in the "modern world", and especially in the Industry 4.0 concept, the task of creating unique personalized experiences requires that systems capture the essence of interaction, not the transactions themselves (Grabowska, 2018, p. 1985).

The aim of the article is to present the concept of a business model assuming high flexibility in the Industry 4.0 era. The article attempts to present a business model that allows for the introduction of innovations, rapid reorganization of processes and a very flexible adaptation of the functioning of enterprises to the conditions of the changing competitive and widespread environment.

2. Industry 4.0

The term 'Industry 4.0' was widely adopted in Europe in the second half of the 21st century. It found its source during the work initiated by the German government in 2010 regarding the recognition and analysis of upcoming groundbreaking changes of strategic importance for the German economy. In 2011, at the Hanover Fair, this term was used for the first time (in the original it reads *Industrie 4.0*), with presentations about the future of the industry. As a result of the work of the working group of representatives of German business, industry and science, a document was published in 2013, presenting recommendations for the putting into place of the program called "Strategic initiative *INDUSTRIE 4.0*", which presents the image of a new cyber-physical reality shaped by revolutionary changes in industry. The term Industry 4.0 was also used in the draft strategy for the development of the "High-Tech Strategy 2020" technology

of the German government. One of the key areas of this strategy is defined as: "Digital economy and society" (Iwański, & Gracel, 2016).

The activation of the fourth industrial revolution should allow the development of intelligent production systems that, in addition to the mentioned autonomy, will have self-configuration, self-control or repair properties (Wittbrodt, 2018). The Industry 4.0 concept incorporates areas that include numerous technologies and associated paradigms. The main elements that are closely related to the idea of Industry 4.0 include: industrial internet of things, production based on the cloud, intelligent factories, cyber-physical systems or social product development (Hermann et al., 2015).

In this concept, the production process will continue to be an orderly series of actions thanks to which the customer (user) has the opportunity to obtain a product. Moreover, it must be designed and organized for set purposes (which may change). It also has a dynamic character, which is conditioned by the volatility of quantitative and qualitative characteristics, material, energy and information subsidies. Finally, it should be used to maximize corporate profit and customer satisfaction (Kagermann, 2014).

In the situation of the development of the Industry 4.0 concept, each company is perceived as offering an intelligent module for use in the entire logistics chain, and the size of the enterprise ceases to be meaningful. Meanwhile, the business model of a particular enterprise takes on the significance of the technology used, the level of highly qualified staff employed and the degree of openness to unlimited communication using increasingly common technologies, including cloud computing, big data and Internet of Things (Lasi, et al., 2014).

3. Business Model concept Industry 4.0

Strong competition and the growing expectations of customers in the modern market ensure that product development occurs along side the increase in production efficiency. In industry 4.0, personalized production (suction - pull model) is carried out by fully automated and robotic production processes (automatons, robots, regulators, servos, etc.) for automatic control, regulation and execution of processes and operations. Robotization and automation eliminates the direct participation of employees in the production process, reducing their presence to the role of general supervision. Fully automated production lines and / or lines fully serviced by robots are an Industry 4.0 solution, and come about by connection with the IT world and the Internet of Things, i.e. ubiquitous access to data and information, remote communication, distance ordering, remote control of devices, etc.

The effect of these changes in production should include, among others: lower production costs (however, at first, enterprises need to invest in innovation solutions to later obtain lower production costs), reliability of production systems (self-learning devices), resource efficiency

and reducing the share of shortages (production exactly on time and according to the customer's order).

The progressively increasing complexity of modern technologies, the onrush of information and communication technologies, networking, globalization, social innovations, as well as the accretion in the requirements of customers, who step by step, expect the most personalized product, pose new challenges for managers. This means the necessity for the today's enterprise to abandon the models in force in the past, and transition from the old rules of operation envisaged for a resource-centered enterprise to the formula of a Smart Enterprise/Smart Factory. Businesses should build their capacity to use global resource networks, and create collaborative networks themselves to co-create unique customer experiences. In a turbulent and changing environment, enterprises are forced to look for the most effective methods of monitoring and detecting changes in the environment to undertake effective adaptation activities resulting from the Industry 4.0 concept.

The colloquial model is a pattern. Business models arise as a reaction of companies to the diverse demands placed on their environment. Individual models may be more or less stable over the period considered. They can be a form of passive reaction (after time, so-called reactive models) or active (so-called anticipation models). They can be more or less creative in crafting a company's success. Therefore, the business model is a description of the company's activities that give it profits. In the business model – the goal of the company is to offer a unique value for the customer in the most profitable way for the company. Each company has a business model (or several), most often in the entire industry it is similar. Companies rarely act solely on the basis of one type of model (Gajdzik, & Grabowska, 2018).

The fundamental transformation of business is just taking place. Industry 4.0 will absolutely force enterprises to change their models of operation. One of the most important models of business management enabling flexible, effective and competitive functioning of the company on the market is a process-based model.

In order to create the concept of the business model of enterprises operating in the era of Industry 4.0, it is necessary to start with a few assumptions:

- the value is determined by experience created at a given time in cooperation with a single customer,
- the company cannot be vertically integrated,
- no company is so great in terms of coverage and size to satisfy the experience of a single customer at a given time,
- attention is focused on access to resources and not on ownership of resources,
- resources are derived from various suppliers, and access to them is global,
- it is crucial that the supply of products, services and competences is multi-institutional.

Using the concept of the "new era of innovation" for the research needs of the work, it was assumed that the business model is a configuration of business processes that combine and develop resources, shaped in the form of social and technical architecture of the enterprise (Prahalad and Krishnan 2010). The business model is one of the most important elements of the structure of the competitive and innovative potential of the company, serving its transformation to the requirements of Industry 4.0.

The proposed business model of the enterprises of Industry 4.0 will be based on the configuration of social architecture and technical architecture of business processes connected with each other. In this model, the role of business processes is clearly emphasized. In practice, elements of such a business model are / will be:

- social architecture (knowledge resources, management systems, competencies, employee development, motivation).
- technical architecture (IT and telecommunications devices, computers, ICT systems, machines, etc.),
- business processes that combine these databases (essentially infrastructural) and, at the same time, derive from them the resources necessary for the implementation of appropriate products that create value for the client.

With regard to the social architecture of the Industry 4.0 company, in its scope, companies expect to make work time more flexible. An interesting area of research is in assessing the potential working conditions in the intelligent factory of Industry 4.0. The focus is on problems related to the disappearance of organizational boundaries, flexibility of working time and work at a distance. The progressing computerization of industry makes it possible to create work structures that have so far been used only in innovative industries. It is pointed out that in the industry, the issues of work time flexibility and work at a distance will become more and more important. Forms of project work in which individuals from and outside the organization will take part, will become more popular than ever before.

It is forecasted that two work models will be in force – one is based on structures with a variable composition that support learning processes at the workplace and provide individuals with far-reaching autonomy and flexibility of operation. The second will be based on the polarization of qualifications, as this provides for a far-reaching division of labor. On analyzing the impact of technology on the shaping of social reality within socio-technical systems, it is pointed out that the technique should be adapted to the requirements of organizational structures and work quality criteria such as: individual development, competence and knowledge of employees.

A company's technical architecture embraces a set of distributed, intelligent components of automation, components equipped with their own data processing systems and software. Distributed, intelligent drives only need a command from the control system to perform a specific motion or sequence of movements. Intelligence dispersed in Industry 4.0 requires open standards in the areas of communication and software. Industry 4.0 means the twilight of

standards owned by individual producers. Therefore, many companies support open technologies, as exemplified by the Open Core Engineering of Bosch Rexroth, and Ethernet, which is the basic communication technology not only in the IT and business world, but also between them and the layer of machines and industrial automation.

Schematically, such a model is shown in Figure 1.

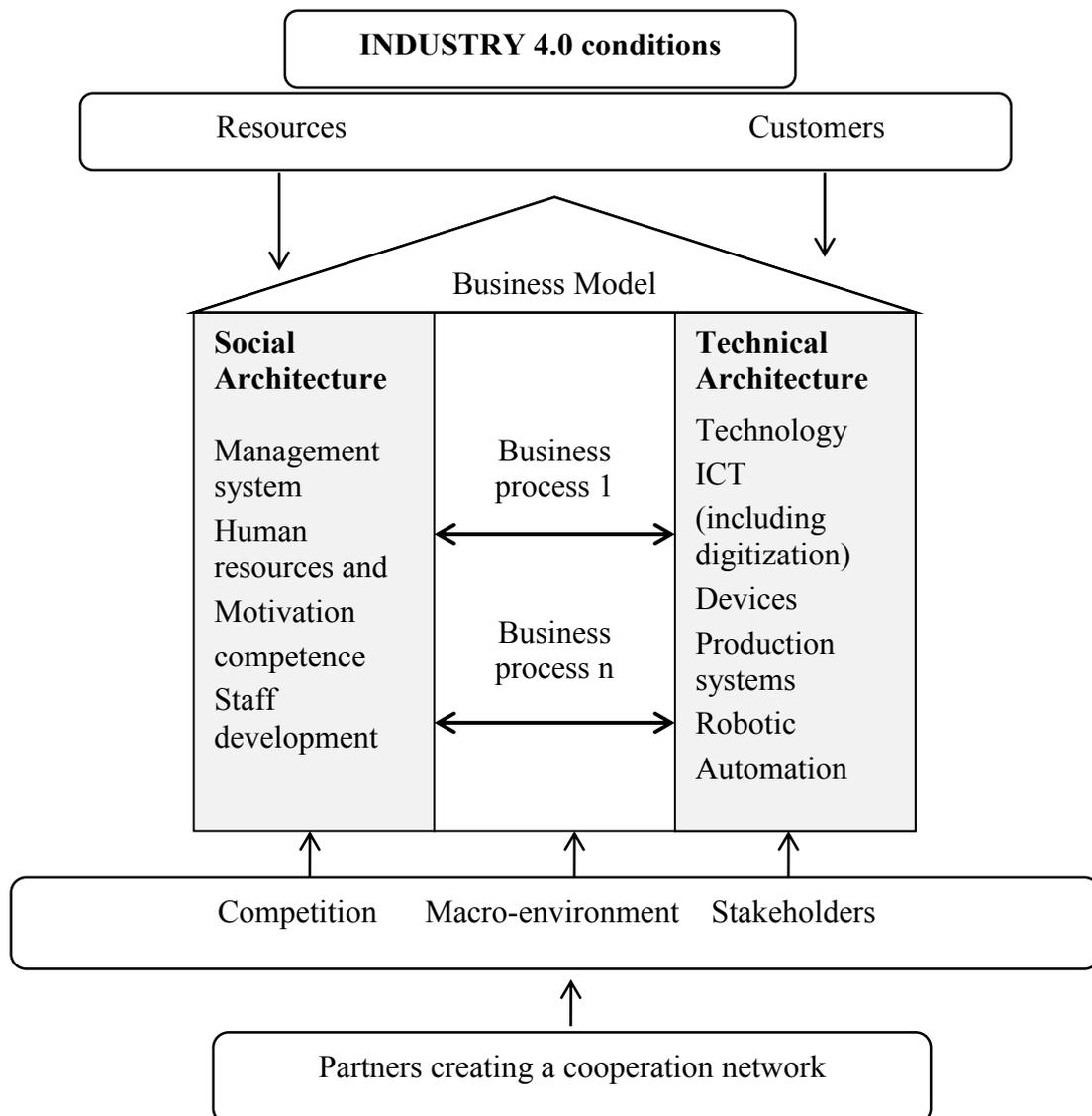


Figure 1. Business model concept Industry 4.0 (own study).

When analyzing Figure 1, it is worth noting that the transformation potential is highly dependent on human resources and the ability to put in place modern ICT systems. In particular, this applies to the competencies and opportunities for the development of employees, as well as the advancement of the processes of digitization and robotization and effective communication systems. It is worth noting that in this approach, the results of business operations are conditioned by the transparency of the developed strategy and the configuration of business model elements.

As can be seen in Figure 1, in the business model, business processes must be associated with the relevant qualifications, attitudes and orientations of managers. Social architecture – organizational structure, measurement methods, training, qualifications and organizational values – must reflect new competitive imperatives resulting from the concept of Industry 4.0. The same must be required from the technical architecture of the company – the spine of its information technology, automation and robotization of production processes.

It can, therefore, be said that an important advantage of the presented concept is the treatment of the model as the overriding values: innovation and efficiency, which are achieved through appropriately selected and combined elements of the model. The use of innovations that radically change the company's strategy enables the creation of a new market space – the formula of success.

4. Conclusion

Summing up the directions of development changes in the concept of Industry 4.0, it should be noted that it is difficult to predict now how the concept of industry 4.0 will evolve, and with it the ongoing industrial revolution. The future reality will may or may not coincide with the current expectations. With the development of 4.0 industry, new opportunities and threats to enterprises arise. Building a new industry is not easy because it requires new resources for enterprises.

It can be predicted that changes in business models and business processes will play an important role in the area of management systems. New business concepts will translate into a concrete model that constitutes a strategic and operational basis for changing the configuration of products and processes in the company, enabling competition on the market determined by the industry 4.0 concept.

The emerging transformation of business from the concept of Industry 4.0 is based on trends that cannot be reversed. Customer activism, ubiquitous communication, convergence of technologies and industries, globalization of markets and global search for resources and global access to them are trends that are not subject to the control of any single company – hence the creation of cooperation networks is so important. They lead inevitably to the world – the business world that follows the development of Industry 4.0.

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