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Changes in the social architecture of business model in the perspective of the Industry 4.0 concept

"Our hard skills are responsible for business success, but the ability to establish relationships with other people".

Dale Carnegie

1. Introduction

The rapidly changing business environment, the development of new technologies, the growing intensity of competition and the progressing globalization are putting companies facing increasingly difficult requirements (Nogalski and Niewiadomski, 2019).

The use of the most modern technological solutions on an increasing scale, networking of the economy, which affects the development of various forms of communication, global competitiveness, the increasing and more popular employee mobility are trends and phenomena that affect the lifestyle and work of a person - often strongly modifying it. These regularities, combined with a rapidly changing professional environment, mean new opportunities, but also challenges for organizations, their staff and, above all, people management leaders (Gracel 2017).

Industry 4.0 is the final end of Taylor's concept of hierarchical management. In the factory of the future, the most important

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values are: autonomy, teamwork, low-level decision-making and innovation (Broniatowski, 2016).

The current approach to the business ecosystem is a consequence of a change in the conditions of business organizations and the modern business landscape. It requires understanding of the enterprise management strategy in relation to the current market conditions. Consequently, classic strategy levels (corporate, business and functional) need to be expanded to include inter-organizational links. Traditional thinking perceives enterprises as rivals in dispute over clients and profits (Saniuk et all. 2020)).

Today, organizations operate in more complex conditions. Rapid changes taking place in modern markets make it difficult to forecast the future of the company and ensure its long-term presence and success on the market. Competition and cooperation are being integrated. All these changes require the reorganization of business models or even the search for their new forms (Bauernhansl et al., 2014).

The analysis of model building concepts is an important aspect of the theoretical approach to process management. The review of domestic and foreign literature shows a clear research gap concerning the components of competitive business models, especially business models that absorb the megatrends of Industry 4.0 and models that can meet the challenges posed by modern customers.

The aim of the article is to identify the changes taking place in the area of social architecture of the business model in the era of Industry 4.0.

2. Industry 4.0 in the context of changes in the working environment and the employment structure

The Fourth Industrial Revolution called Industry 4.0 takes production to another dimension of performance, flexibility and mobility (Saniuk and Saniuk, 2018; Saniuk et al., 2019).

The Idea of Industry 4.0 emphasizes the role of integration of complex physical machines and devices with sensors and network software used for controlling, planning and forecasting, ensuring better business and social results - which in turn leads to the creation of so-called Intelligent Factory (Hermann et al. 2015).

Industry 4.0 is the Fourth Industrial Revolution in which it is assumed that it is a vision of intelligent factories built from intelligent cyberphysical systems. The implementation of this idea should allow the development of intelligent production systems, which, in addition to the above-mentioned autonomy, will have the properties of self-configuration, self-control or self-repair (Grabowska, 2018).

The Fourth Industrial Revolution refers mainly to factories. However, this is a much broader concept, also referring to other areas of the organization's activities, e.g. global supply chain management. Integration is not only horizontal, but also vertical, having an effect that goes beyond the company's internal zone, reaching out to suppliers and customers, embracing all the most important partners in the value chain, using technologies enabling real-time tracking and planning and implementation of tasks (Kubera, 2017).

Industry 4.0 can be considered at the level of process, technology or management throughout the entire supply chain, it is defined as the sum of all breakthrough innovations derived and implemented in the value chain to take into account trends of digitization, autonomy, transparency, mobility, modularization, networking and socialization of products and processes (Lee et al., 2015).

It should be noted that, taking into account the results of previous studies, it is impossible to clearly determine the impact of the implementation of Industry 4.0 on future production work. One forecast indicates an increase in employment due to reindustrialisation processes, while other forecasts point to the progressive and inevitable process of replacing human work with automation tools (Lorenz, 2015).

The positive development perspective assumes that the industry revolution will create better and safer work environments in which man will be in the first place. Human work will be partly replaced by robots and artificial intelligence, but one should not forget about the key role of man in the success and proper functioning of the manufacturing company 4.0 (McKinsey, 2019; Pawłowicz, 2017, Berger, 2016).

A perspective arousing antagonistic emotions is the image of an industrial work environment dominated by technology, algorithm-based software, statistics, performing their calculations based on probability theory. The knowledge and experience of manual workers will play a marginal role in the environment of a dehumanized intelligent factory, where people will only become cogs. Moreover, the potential for rationalization in modern technologies may result in increased requirements for employees and, consequently, the liquidation of jobs for people without complex qualifications (Schwab, 2016).

Debating on the prospects of the place of man among machines occupies a leading position in the discussion on the effects of industrial transformation.

The key to success is the integration and simplification of introducing as well as maintaining change. It is therefore necessary to facilitate the implementation of modern 4.0 technologies in existing contexts and to make them available as quickly and intuitively as possible. To make the industrial revolution as

effective as possible, improving relationships between people and machines is fundamental. It will be wise to use machines where they are much more efficient, e.g. during simple, repetitive and monotonous operations. In intelligent automated factories, the importance of simple human production activities will decrease. Most forecasts predict that routine activities will be replaced by modern technical solutions (Grabowska, 2018), which doesn't mean total unmanned jobs. This change will force the acquisition of new competencies among production line employees or maintenance workers. Delegating repetitive tasks to robots will require proper programming of the device's controllers and their constant monitoring.

It is a mistake to assume complete maintenance-free stand and that in the case of fully robotic production sockets, no people are required to operate it. This is contrary to reality, because modern robots are not perfect and supervision over their work and the operation of machines still remains the role of the engineer. Transferring repetitive tasks to robots is associated with the need to properly program device controllers, continuous monitoring and control of work at every stage of production, for which an employee on the line or from maintenance is responsible, a person who should have the appropriate competence. Robotization is therefore an opportunity to develop the skills of workers. Investments in machinery must accompany investments in staff training, which will result in synergistic effects (Lee, 2015).

Employees should emphasize the development of skills such as the ability to act flexibly, effective learning in the workplace, and solving complex problems (Gracel et al. 2017).

3. Social architecture of business models of the Industry 4.0 era

The dynamic increase in competition, largely associated with the globalization of the economy, makes it necessary to create the concept of running a business (and not only to create strategies and formulate goals). Concepts of business models are their theoretical detail and also an application option(Grabowska and Furman 2015).

A business model is a concept that has no uniform defi nition (Nikiel, 2019). Business models developed and implemented by enterprises largely determine the profitability and competitiveness of these organizations. The competitiveness and flexibility of an enterprise is determined by the combined impact of sector and company-specific factors. The model is to generate income, so it depends on these factors (Brzóska 2009).

Business model according to the so-called a new era of innovation is based on the configuration of social and technical architecture connected by business processes. In such a model the role of business processes is clearly exposed. In practice, the elements of such a business model are (Grabowska et all. 2020):

- social architecture (knowledge resources, management systems, competences, employee development, motivation),
- technical architecture (IT and telecommunications equipment, computers, ICT systems, machines, etc.),
- business processes constituting a combination of these (essentially infrastructural) bases and at the same time deriving from them the resources necessary to implement appropriate products creating value for the client.

Schematically such a model is shown in figure 1.

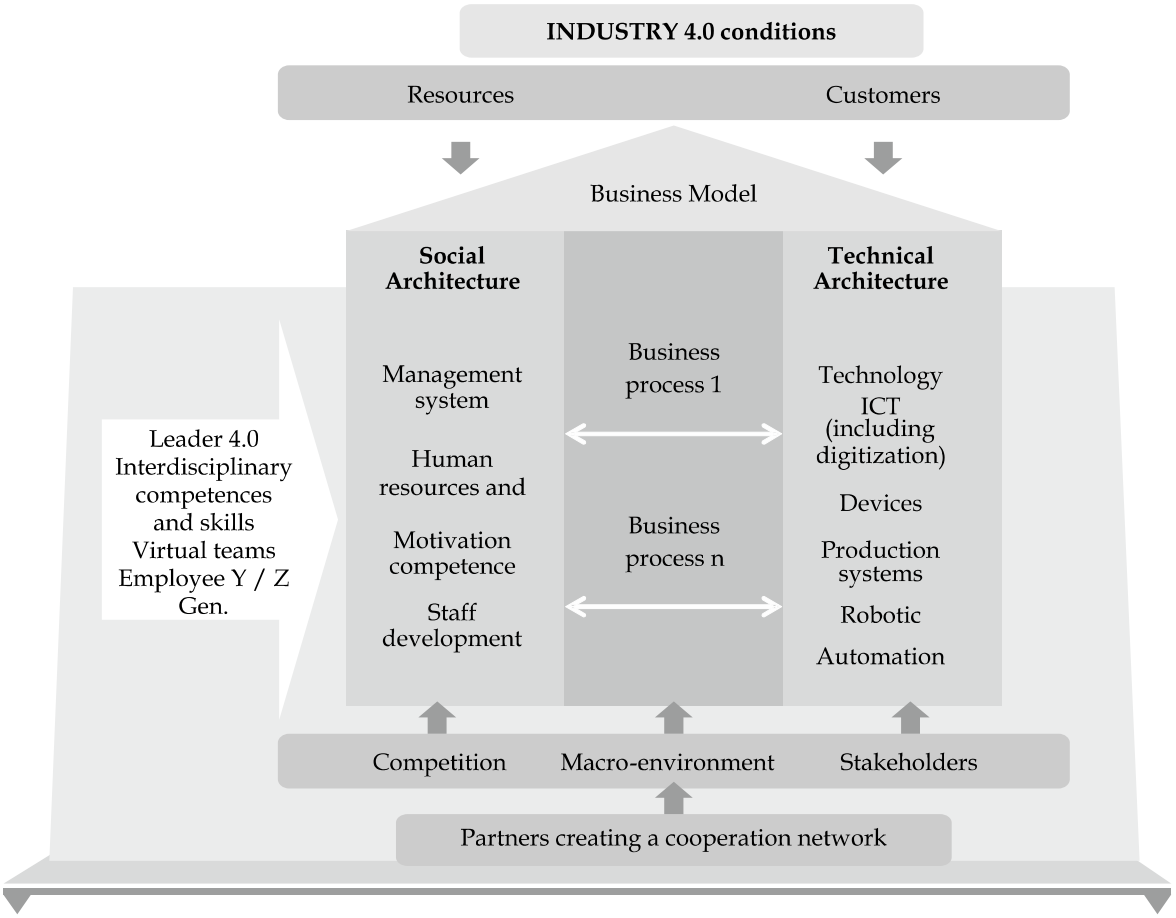

Figure 1. Business model of the Industry 4.0 concept

Source: own study

It can be seen that the business model consists of three basic components. The first two are social architecture and technical architecture. They represent specific resources. Business processes constitute the third component.

Based on the conducted studies of business modeling theory and own research for the research purposes, it was assumed that the business model is a configuration of business processes connecting and developing resources shaped in the form of social and technical architecture of the enterprise. While the Business Model 4.0 will be a configuration of business processes combining and developing resources, shaped as a social and technical architecture of the enterprise, built on flexible processes, based on a virtual network of cooperation, able to meet the demand for personalized products.

Technical architecture mainly includes information and communication technology systems, while social architecture is: human resources, organizational structure, decision-making powers and company performance management systems (Saniuk et all., 2020).

Business automation as well as the need to constantly adapt to changing company environment conditions require completely new employee competences, and thus a change / reorganization of social architecture. Therefore, for the fourth generation industry, it is not only crucial to acquire talents from the labor market, but also to develop skills among current employees - which should be the strategic goal of every enterprise. Such actions allow to notice problems in time and implement corrective actions. These include not only classic training, but also employee rotation between teams, enabling engineers to plan their own career path or including them in the process of shaping the vision of organization development. It is worth remembering about soft competences. The ability to cooperate, communicate or be responsible for one's own actions are among the most important skills that determine the success of the digital revolution (Fogliattoa et al., 2012).

In the environment of intelligent factories, employees who are able to interact with others to carry out joint tasks in the process of creating value for the enterprise are also valuable. In addition to the obvious area of specific knowledge, updated and assimilated by engineers on an ongoing basis, it is also important to create the so-called "Soft" skills of engineers, including how to implement tasks and projects, solve problems and teamwork. The combination of these elements makes it possible to distinguish specialists who can adapt to the work culture and the way they function in modern factories. Nowadays, openness to changes, effectiveness and flexibility are particularly taken into account. This is what engineers learn in the workplace, also thanks to the availability of special

development programs in the organization, it basically allows them to become "Engineer 4.0".

The trends of changes in production work in the perspective of "Industry 4.0" in the literature are analyzed in the following four dimensions (Gracel et al., 2017) :

- demand for labor,
- professional qualifications / competences,
- the role of man in an intelligent factory,
- organization and work environment.

It is anticipated that Engineers 4.0 will introduce a lot of changes in the field of human resource management, cooperation or communication - thus creating a new dimension of the social architecture of business models.

In classical management theory, we have a division of labor, formal authority of the manager, unity of order and management, subordination of personal interests to the general interest, and the hierarchy and organizational structures guarantee effective management of the organization. Industry 4.0 imposes new working conditions and styles by reversing today's order by 180 degrees.

Management of the Intelligent Factory is heading towards the concept of turquoise organization, which in its assumptions assumes both the lack of a hierarchical system and a formal incentive system, because from the point of view of efficiency of operations, the functions fulfilled by turquoise organizations are greater than the positions held, and self-regulation and self-management are greater value in the process of evolution and achieving business goals.

Leader 4.0 strives to create a team that lacks not only hierarchy, but even established roles once and for all, although there are differences in the functions performed. The philosophical elements of Leader 4.0 is characterized by the following artifacts and actions:

- creates space to listen to the wisdom of employees,
- reduces the need to control people and events,
- draws constructive conclusions from the mistakes and turns them into valuable experiences.

In Industry 4.0 organizations, trust is the basis of success, employees have a real impact on the development of the company, perform functions that are adapted to their potential, and their change results not from coercion but their own motivation, which is based on competence development or the desire to "prove themselves" in new conditions. The key here is to maintain and maintain a balance between the internal motivation of employees and the appropriate work environment in which people in their approach are aware and convinced

that being members of the organization, they are responsible for it, and engaging in various tasks tailored to their individual competences, consciously use their potential, creating value in the process and this is due to their own choice. This, of course, requires creating a friendly and safe work environment in which employees feel equal and respected (Richard and Deci, 2017).

Intelligent Factories should be organizations with a flat organizational structure in which employees develop, share knowledge and experience, and support each other in the performance of specific tasks / functions. Therefore, communication and an efficient information flow system as well as creating a space in which employees can openly share knowledge, exchange acquired experience, generate ideas and submit suggestions for improvement actions, as well as are able to cooperate with robots become crucial. Such space increases the sense of sense and impact on the company's operation of each employee, thereby stimulating innovation and development (Kiełtyka, 2016).

Modifying the method and style of communication can be the biggest challenge, because it means working on changing existing habits and standards. It is also a change in the optics of perception of emerging errors consisting in focusing on the experience resulting from errors made, where the communication and feedback process is constructive, devoid of evaluation elements and focused on innovation and development, rather than implementing a disciplinary cycle. The role and expectations of managers who turn into real leaders and mentors becoming Leader 4.0 are also different.

During the research on Industry 4.0, key principles were identified in the design principles of the components / systems of Industry 4.0 (Hermann et al., 2015):

- interoperability - creating communication standards between companies, cyber-physical systems and human teams,
- virtualization - creating virtual factory models and simulation models,
- decentralization - deciding on the manufacturing method for intelligent products, with full electronic traceability at the same time (traceability),
- real-time capability - access to all key information on business and production processes automatically downloaded from machines and devices,
- service orientation - opening to the use of assets (factories, technologies, human teams) for the needs of service use for other factories, key managerial competences in the era of the Fourth Industrial Revolution
- modularity - the system's ability to flexibly adapt to changing seasonal needs, or changing specifications, substitutability or scalability of modules. Adding new modules according to the Plug & Play method.

Frederic Laloux (2015) indicates that the turquoise model of organization management is the next stage of development resulting from human consciousness and it is this model that fits perfectly with building the foundations of the social architecture of Smart Factory business models. It is hard to disagree, bearing in mind, among others new generations entering the labor market with a different work ethos, value system and mode of action (Y Gen and Z Gen). It should also be remembered that generation Y and Z treat modern technologies as a landscape of their everyday lives.

Organizations managing all processes, with a smooth (unstructured) flow of resources and a flexible approach to taking roles, which are defined by the members of the organization on an ongoing basis, depending on the current needs, taking into account the predisposition of individuals and talents of each employee can better match the expectations of work representatives of the Y and Z generation. Therefore, it is worth considering what changes a new approach to business model management will require and how the role and function of the leader should evolve, and most of the assumptions of the Laloux concept can be a very good source of inspiration to consciously initiate the change process.

4. Conclusion

The concept of Industry 4.0 is the transformation of existing business models of enterprises and the digital transformation of all fixed assets and advanced integration of employees, machines, suppliers and other partners forming the value chain, creating the so-called digital business ecosystem.

As a consequence, organizations will have to reorganize their business models and change their operating rules. Certainly, industry will be more likely to rely on agile management methods known to IT today. Quantitative management and value optimization methods, such as lean management and Six Sigma methodology will still be useful, but adaptive techniques will appear next to them. This will require a change in the social architecture of business models, including management culture, in a significant part of industrial companies. A hierarchical, engineering, machine-like organization will have to give way - and with it its leaders.

Industry 4.0 contributes to creating a new type of interaction between people and machines. These interactions will significantly affect the way you do your work and the balance of power within the social and technical architecture of business models. Managers who want to cope and meet the challenges they face in the era of the Fourth Industrial Revolution - should

be open and very flexible, should share responsibility and decision-making with their employees, and these features should be systematically developed in a conscious and orderly manner. They should be able to work as a coach, mentor and mentor who can see the strengths of the employee, help him set the path to develop their own competences and permanently and actively support them in this development.

In the Intelligent Factory, employees will share experience and knowledge, using their strengths to solve problems together, and modern technology will support them in creating highly personalized products of the highest quality. Collaboration in teams (often virtual) and between teams as well as openness to new challenges will become a standard. Within teams, the roles will be divided so that their members can fulfill themselves while maintaining the highest quality of customer service and service performance. They trust each other, advise and entrust the implementation of tasks knowing that they will be carried out in the best way possible.

Summarizing the changes in the social architecture of business from the perspective of the Industry 4.0 concept, it should be noted that it is currently difficult to predict how the architecture of the Business Model 4.0 will develop. Building a new industry is not easy, as it requires building new business resources. Formulating and adapting to changes is a long-term activity, requiring large material and financial outlays. It increases the need to conduct research on the problems of creating new business models, in particular those focused on network forms of cooperation between customer-oriented enterprises operating in the era of the Industry 4.0 concept.

Summary

Changes in the social architecture of business models in the perspective of the concept of 'Industry 4.0'

After three industrial revolutions, the fourth comes, which transfers production to sophisticated networks of companies equipped with intelligent devices, machines, means of transport, communicating with each other using modern technologies. It creates new challenges for industrial enterprises, it requires redefining existing business models. The development of the concept of Industry 4.0 forces modern enterprises to quickly and flexibly adapt to the changing conditions of the technological environment. This is reflected in the changes taking place in the area of social and technical architecture of business models.

Industry 4.0 contributes to creating a new kind of interaction between people and machines. These interactions significantly affect the way work is done and the resource allocation in the social and technical architecture of business models.
The aim of the article is to identyfy the changes taking place in the area of social architecture of the business model in the era of Industry 4.0.

***Keywords*:** *business model, Leader 4.0, Industry 4.0.*

Streszczenie

Zmiany w architekturze społecznej modeli biznesu w perspektywie koncepcji „Przemysł 4.0"
Po trzech rewolucjach przemysłowych przychodzi czwarta, która przenosi produkcję do wyrafinowanych sieci firm wyposażonych w inteligentne urządzenia, maszyny, środki transportu, komunikujących się ze sobą za pomocą nowoczesnych technologii. Stwarza to nowe wyzwania dla przedsiębiorstw przemysłowych, wymaga ponownego zdefiniowania istniejących modeli biznesowych. Opracowanie koncepcji Przemysłu 4.0 zmusza nowoczesne przedsiębiorstwa do szybkiego i elastycznego dostosowywania się do zmieniających się warunków środowiska technologicznego. Znajduje to odzwierciedlenie w zmianach zachodzących w obszarze architektury społecznej i technicznej modeli biznesowych przedsiębiorstw.
Przemysł 4.0 przyczynia się do tworzenia nowego rodzaju interakcji między ludźmi i maszynami. Te interakcje znacząco wpływają na sposób wykonywania pracy i alokację zasobów w architekturze społecznej i technicznej modeli biznesowych.
Celem artykułu jest zidentyfikowanie zmian zachodzących w obszarze architektury społecznej modelu biznesowego w dobie Przemysłu 4.0.

Słowa kluczowe: *model biznesu, Lider 4.0, Przemysł 4.0.*

JEL Classification: O33, M19

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