

# **Digitalization in Industry 4.0, Knowledge Management**

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## **Abstract**

“Czech companies can not sufficiently exploit the potential of the digitalization in combination with Industry 4.0. In this respect, foreign companies are a great inspiration because they are much more strategically and comprehensively involved in digitization.” This is the conclusion of a study performed by the consultancy company EY in a cooperation with the Czech Chamber of Commerce in the summer of 2018.

To increase the competitiveness of companies in general, there is a need to improve their access to the digitization. One of the areas where an emphasis is needed to place is a knowledge management in conjunction with digitalization. The knowledge Management is a discipline dealing with the storage, development and transfer of knowledge, experiences and information among other members of company. Companies with a perfectly developed process of digitization and knowledge transfer have undeniable advantages over others.

The aim of this paper is to introduce and facilitate understanding of knowledge management issues in conjunction with Industry 4.0. The importance of adaptation to the progress made by this concept is shown and explained not only by examples from the practice.

## **Keywords**

Industry 4.0, Knowledge Management, Digitalization

## **1. Industry 4.0**

Industry 4.0 was first mentioned in 2011. Since then, this concept has spread to almost the entire industry sector. Industry 4.0 aims to digitize, robotize and automate the human activities to ensure greater speed and efficiency of the production. Some of the visions of the initiative is to replace manual human labor by robotizing, entering production data and procedures by electronically conveying information or introducing automated component and material transport within production.

Industry 4.0 is officially a German Government project that aims to create intelligent factories with automated production systems linked to the Industrial Internet of Things. The 4th Industrial Revolution, as Industry 4.0 is called, respects the interconnection of the virtual and physical worlds, rests in cybernetics, intelligent machines and their interconnection, and intelligent processing and storage of data.

Industry 4.0 has spread not only to neighboring countries, but also to the US or China, but in a slightly different form. Although foreign initiatives to automate production are almost identical to Industry 4.0, they are called differently. The US government actively supports the Advanced Manufacturing Partnership 2.0, which is dedicated to manufacturing automation projects. The Made-in-China 2025 Initiative was created in China, with a large share of the German companies, while the Japanese Stakeholders established the Industrial Value Chain Initiative without government interference (Edurobot 2019).

The Czech Republic is not left behind. On the order of the Czech Ministry of Industry and Trade, a document entitled National Industry Initiative 4.0 was prepared. According to the consulting company BDO, half of Czech companies plan to invest up to one tenth of their investments in modernization. According to Jiří Kabelka, director of DEL, a company specializing in the digitization and automation of production processes, the use of virtual reality in the form of digital twins, virtual 3D copies to find the best solution without costly prototyping will be crucial.

Another interesting aspect that needs to be realized in connection with the development of Industry 4.0 is the need to restructure of the education. An estimated 60% of the jobs, that today's schoolchildren will do in the future, do not yet exist. Therefore, it will depend on the synergy of education, the state and the companies themselves.

This will cause changes in the required professions in the future, changes in the labor market, a change in understanding of individual production and business processes. Above all, however, this must be a training system that should always be one step ahead. And because the relevant education is crucial for Industry 4.0, the education system needs to be restructured, especially in secondary schools and universities.

In addition to restructuring education and science, the state's role will also be to strengthen cybersecurity, provide data communication infrastructure, apply a subsidy policy to support new technologies.

The Czech Republic has one of the highest shares of industry in GDP compared to other EU countries, reaching 45%. In order to keep pace with foreign companies in the long term, it will be necessary to join the mainstream of innovation. This is increasingly signaling digitization and production automation (Technický Týdeník 2018).

There is a need to realize the potential that Industry 4.0 creates. For Czech companies, it is a chance to step out of the subcontractor category and join the mainstream of change.

## **2. Industry 4.0 in the Czech Republic**

Based on a survey by EY, a consultancy company among a hundred major Czech manufacturing companies, it is clear that Czech companies perceive Industry 4.0 as a potential to increase productivity, increase work efficiency, and provide data for production management. Importantly, 76% of the companies surveyed see Industry 4.0 as an opportunity to develop their business. Therefore, there is no motivation.

For most (57%) surveyed companies, the biggest problem in digitization-based development and automation is the lack of qualified staff who can work with new technologies and exploit their potential. Other barriers are, according to the survey, the total amount of implementation spending, outdated technology, and lack of industry 4.0 awareness. Experts from the consulting company EY see another obstacle for Czech companies. Businesses lack a comprehensive or strategic approach to capitalize on the full potential of digitization and automation. In addition, companies are little considering how new solutions will affect organization and corporate culture. The lack of qualified personnel also attaches weight. According to Petr Knap of EY Business Consultancy, Czech companies are solving and testing in most of them partial topics and do not use the potential of new technologies for fundamental transformation and development. "Czech entrepreneurs have great potential for inspiration abroad, where companies are approaching digitization more comprehensively and strategically," says Jan Burian from EY (Ernst & Young Global Limited 2017)

In order for Czech industry to thrive and keep pace with the world's economies, it must not overshadow and must keep pace with the development of Industry 4.0, especially in sub-areas such as automation and digitization. After several surveys, it turned out that companies, in their opinion, lacked trained staff and that more state support is needed. According to experts, there is another and bigger problem. Czech companies cannot comprehensively and strategically approach digitization. If the basic principles of the modern functioning of the company were instilled to all, not only managers, it could start a trend that will keep Czech companies at least just behind the world's largest economies. We must still be vigilant about what would happen if we left the new industrial revolution outside of us. We would lose competitiveness. Production would eventually move away from us.

## **2.1. Digitalizace**

Much has been written about the fact that digitization goes hand in hand with Industry 4.0. The basic pillars of digitization are the so-called Buzzword, or the removal of the paper form of communication, thus opening the possibility of automating routine internal processes. Digital twin is another pillar of digitization. It is a digital product, a production process, a product life cycle. Digitizing documents allows us to store and disseminate any knowledge, experience or know-how to a defined range of people. The discipline that deals with this is called knowledge management. This is another piece of the puzzle called Smart Factory.

## **2.2. Knowledge Management**

The main goal of knowledge management is to identify and grasp the specific knowledge, know-how, experience or skill and to enable them to be transferred to a wider circle that will use them. Using knowledge increases the quality, efficiency and productivity of work. The grasp and transfer in this concept can be called digitization. The knowledge of the worker's head is essentially continuous. Once migrated to digital, it can be shared with a wider audience. Thus, in this concept, digitization serves as a medium, a means that allows us to define, store and share knowledge with corresponding people.

On the one hand, there are specialists with specific knowledge who must be able to express and describe the knowledge explicitly, and on the other hand, a user who wants to use and trust the digitized knowledge.

These include information technologies that enable the digitization process to take place (System Online 2006).

The benefit of knowledge management can be seen in the following practical example. The development department of one company has a shared database where not only documents such as specifications or drawings are stored, but also selected procedures for developing certain project systems. An induction loop has been installed in the past for a train set, which is a tool for people with partial deafness. To install an induction loop, you need to correctly define the location of the induction loop cable. The development engineer at that time found out at what heights the cable must be routed to, what equipment and materials he must avoid, what type of cable is appropriate for what solution, what shape the cable loop has in certain cases and much more. The development engineer at that time managed the design excellently, the induction loop works on the trainset. Unfortunately, none of the documents, such as drawing, process, specification, etc., were put into a shared database by the technician, and the technician no longer works in the company. Some time has passed and a new project was signed, which also required the installation of an induction loop. A development engineer working on the implementation of the current loop induction loop knew that there was a project in which the induction loop was already implemented. However, the entire design and implementation process had to go through a lengthy discovery and learning process, which cost the development engineer several hours, a full-day meeting with the vendor and the company for the time spent searching and finding out the design and implementation process.

For this reason, it is important to train staff to automatically digitize newly selected and discovered workflows. The company needs to put in place the appropriate processes and systems to digitize the newly discovered knowledge and transfer it to a wider circle of society.

## **2.3. How to Implement Industry 4.0**

If any company wants to keep up with the more advanced ones, it is necessary to devise a strategy to improve.

Likewise, there is a need to define an Industry 4.0 improvement plan and strategy for the company to use the most

advanced technologies, such as mobile internet, cloud computing, the Internet of Things, 3D printing and much more, as effectively as possible.

It is important to combine business models with a direct link to the end customer. The principle is to adapt to customer needs, produce error-free, accurately and efficiently. Technology must allow the entire chain of machines, production lines, warehouses, but also supply and business companies to be interconnected.

Based on the already mentioned aspects, which are the most threatening companies in their development towards the industry 4.0, it is necessary to define the procedure for improvement.

## **2.4. To qualify the employees**

The first aspect of the company's braking development towards Industry 4.0 is the need for more skilled personnel. Every third company has already implemented or plans to implement measures to develop employee skills (34%). According to Czech companies (38%), the lack of qualified personnel would help to solve state support in the development of new fields of study focused on interdisciplinary issues. "The limited number of experts in the technology of connection with the Industry 4.0 on the labor market is, among other things, a result of a lack of relevant courses in technical secondary schools and universities, while the Industry 4.0 technology represents an effective tool for increasing productivity in the current Czech economy and lack of skilled labor production and work efficiency," says Jan Burian of EY.

Industry 4.0 will have a major impact on the labor market. According to the results of the study, the number of jobs in traditional fields will be reduced. At the same time, an overwhelming increase in jobs is expected, especially in services and IT. Manufacturing methods and ways of working will be fundamentally different from the existing ones in the future. The result will be a change in business models and the emergence of new professions. European companies will need enough qualified staff to handle the demanding digitization process. "As a result, this will lead to a positive balance when Industry 4.0 compensates for job losses," adds Thomas Rinn.

## **2.5. How to approach Industry 4.0 more effectively and strategically**

Another of the most frequently mentioned aspects hampering the development of companies towards Industry 4.0 is that companies are unable to approach digitization much more comprehensively. The problem with the companies is that they want to be smart, fix on a few training sessions, digitize in some areas, but as a whole it doesn't make sense. Employee IT training cannot be performed when the current status is not analyzed, goals are not defined, and a strategy to achieve goals is not invented.

Companies need to be able to imagine a vision, imagine how they could function as Smart Factory, as a functioning Industry 4.0-based company. Only by defined goals to train staff, identify risks and opportunities. There is a need to ensure an active approach from all levels of the business, a comprehensive approach to reassessing and transforming current financial, business and operational models.

A company that decides to transform towards Industry 4.0 needs to align its current strategy with the needs of new tools, prepare people, infrastructure, technology, and set up processes. It is necessary to devote the necessary amount of time to the definition of the strategy, it is a long-term strategy and continuous changes of priorities do not go anywhere. It is a process in which key people need to be involved and a regular feedback process set up. Another need is to educate employees to accountability and leadership (Strategie v době digitální a komplexní 2018).

## **2.6. Support from the state**

The third aspect related to the development of companies to Industry 4.0 is the need for society to support the state. Inspiration can come from Germany. In Germany, digitization of production is one of the priorities of the political agenda. Thanks to the steady support of Industry 4.0, Germany is the only country in the world where the ROCE indicator has grown over the past 15 years. Without changing its asset turnover rate, ROCE increased from 12% in 2000 to over 30% in 2014.

The possibilities to support the company include, for example, tax support for development and innovation activities, digital communication of the state administration or financially inexpensive access to the results of scientific and research activities.

In 2015, the Czech Republic presented its own initiative in the field of industry 4.0, currently an action plan for its implementation is being finalized. The aforementioned shortage of skilled labor remains the Achilles heel of the Czech environment. Companies agree on the need to promote dual education and a clear vision of the education system in general.

"Some businesses have already responded to the need for a new qualification by educating professionals in their own training courses. New study fields are also being prepared in the Czech Republic," adds Philip Staehelin, Managing Partner of Roland Berger's Prague office.

### **3. Summary**

As for the aspects described above related to the development of companies towards Industry 4.0, they are all connected with the need to educate and develop the existing competencies of employees. In this area, the state must play a major role in initiating education reform and starting to prepare students for a world where machines can be done by machines and automatically. The world will move forward and we will get used to the fully-developed digital automated operation of the world as well as we have become accustomed to the industrial revolution of the previous industrial revolution, without which we can hardly imagine life and industry today. On the foundations of Industry 4.0, the germs of another, much more sophisticated technology, which we cannot even imagine today, can arise.

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### **Biography**

**Jiří Mouček** is a student of doctoral studies at the department of Technologies and Measurement of Faculty of Electrical Engineering at the University of West Bohemia in Pilsen. He earned a master's and bachelor's degree at this faculty. Work experiences he gained mainly in the rail industry. He initially worked as a project manager junior and now works in an international company in the newly established department for the development and implementation of rolling stock information systems. In the dissertation thesis he deals with risk aspects of processes.