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IMPACT OF INDUSTRY 4.0 TO
CONTROLLING PROCESSES

Theses of Doctoral (Ph.D.) dissertation

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Research content

The aim of dissertation is to introduce phenomenon of Industry 4.0 and its impact to controlling processes.

The authors first describe formation of controlling, definition, appear in Hungary and its basic processes. After that introduce definition of Industry 4.0, development, connected technologies, phases and difficulties of implementation and its situation in Hungary. At the end Industry 4.0 is combined with controlling by presentation of Industry 4.0 impact on controlling processes. The author describes in detailed its impact on development of planning and reporting processes, how changes the role and required competencies of controllers.

The aim of primary research is to find out whether there is a connection between size and owner structure of the company and existence of Industry 4.0 strategy and level of controlling process automatization.

After that the author research the difficulties of implementation of Industry 4.0 at the examined companies and reasons of automation of controlling processes.

Industry 4.0 has impact not just on controlling processes, but on controller as well, because the changes associated with Industry 4.0 requires new competencies from controllers. The aim of research is the investigation of these new required competencies.

At the end the aim of the author is to develop a model basis the results of research, what helps companies in creation and implementation of Industry 4.0 strategy especially to development of controlling processes.

Methodology

The research methodology contains secondary elements, what is analysis of national and international literature, as well as primer elements, what is qualitative and quantitative collection and processing of information.

The introduction of theoretical background is a result of library and online research by processing, analysing and comparison of national and international literature. In this part the author compares different definitions of controlling in literature and from that derive her own definition. She describes basis the secondary literatures the different development of German and Anglo-Saxon controlling schools as well as the various controlling techniques and methods. The author describes basis the literatures the definition of Industry 4.0 and its development and derive from that her own view. Basis the secondary research she introduces technologies concern Industry 4.0, phases and difficulties of implementation, its impact on employment, situation in Hungary and its impact on controlling processes.

The primary research contains quantitative and qualitative methods. Qualitative method was used at analysis of a questionnaire expert sample and qualitative method was applied at the deep interviews. The author research with such a mixed method the hypothesis and determine the new and novel result of the research.

The questionnaire, what consist 26 questions, was filled in in second half of 2019 and beginning of 2020 and was processed and analysed in second half of 2020 and beginning of 2021. Because of specialities of the research topic and its novelty content the author decided to research

an expert sample, what mean, that she included just such companies to research, what have Industry 4.0 strategy and high-level controlling activity. The statistical analysis was conducted with SPSS (version 22) program.

The selection of interviewees based on personal acquaintances and professional recommendations. The candidate conducted 7 deep interviews during the research. Her aim was to involve representatives of big manufacturing companies to the interviews, as she thought, that such companies have Industry 4.0 strategy and high-level controlling activities, and such can deliver relevant information to the research.

The novelty of the topic

The doctoral dissertation is of special relevance in several respects. Just only controlling, the planning and reporting process of it, as well as the role of controller are interesting and well researchable topics. This merge with todays changes, the broader automation and Industry 4.0 serve even more interesting challenge to the author when writing the dissertation.

The digitalisation develops rapidly, what allows more disruptive solutions and possibilities. The digitalisation entered also to corporate sector, where production machines sends data about their production, stock keeper scans pallets when moving them between stock locations, prototypes of products can be printed with digital 3D printer, employees of the companies organises online meetings and already with virtual glasses can be seen how

new packaging of products look like on the shelves of the stores.

Controllers and controlling try to follow this development, but because of novelty of the topic there is no beaten path or commonly used method how to do that.

Questions and hypotheses of the research

The candidate formulated five research questions and along each a hypothesis when stated the research.

The development of the hypotheses was based on the domestic and international literature, as well as the experiences gained during her work. Please see hypothesis below:

H1: The owner's structure of the company has an impact on whether it has Industry 4.0 strategy and how automated its controlling processes are.

H1a: Majority foreign-owned companies have a greater Industry 4.0 strategy.

H1b: Majority of foreign-owned companies have a higher degree of automation of controlling processes

H2: The size of the company has an impact on whether it has an Industry 4.0 strategy and how automated its controlling processes are.

H2a: Big companies have a greater Industry 4.0 strategy.

H2b: Big companies have a higher degree of automation of controlling processes.

H3: The main obstacle to implementing the Industry 4.0 strategy is seen by businesses as a lack of know-how.

H4: The primary reason for the digitization of controlling processes is not cost savings, but the provision of shorter response times (quick decisions) and the reduction of errors through automation.

H5: Industry 4.0 is changing the requirements for controllers. Controllers need to have higher IT knowledge.

Results

T1: The ownership structure has a significant impact on whether the company has an Industry 4.0 strategy. Most foreign-owned companies have an Industry 4.0 strategy to a greater extent and their controlling processes are more automated. This is especially true for companies whose parent company is in the German-speaking world.

T2: The size of the company also has an impact on whether it has an Industry 4.0 strategy and whether its controlling processes are automated, but the ownership structure has a more significant impact on it.

T3: Based on the candidate's research, it can be stated that the main obstacle to the introduction of Industry 4.0 is the lack of resources. Companies primarily make investments where the benefits of automation are easy to retain, such as automation primarily on production capacities. Other service related or administrative automation efforts, including controlling, follow only after that. Although the

lack of know-how is a hindrance to the introduction of Industry 4.0, the main obstacle is the lack of resources.

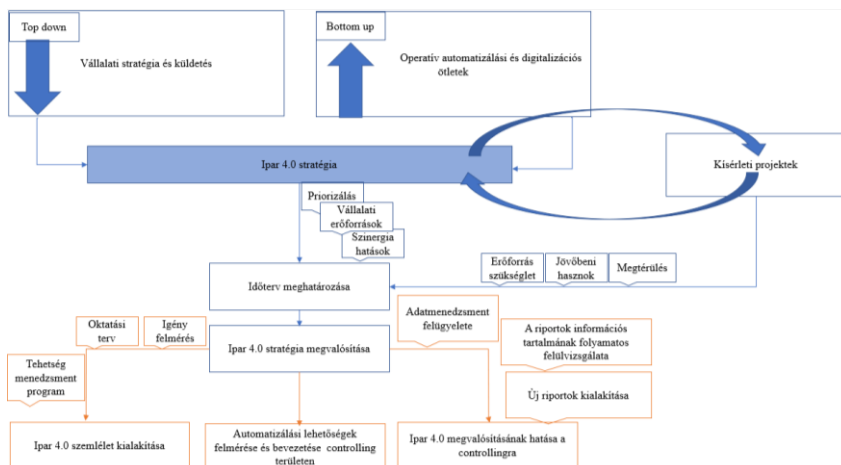
T4: Also in the field of controlling, the main reason for automation is cost savings. The goal is to produce the necessary forecasts and reports with as few human resources as possible. Just further positive benefit of this automation is to make better use of the potential of quick decisions and reduce reporting or forecasting errors.

T5: As a result of Industry 4.0, the requirements for controllers are clearly changing, as they need to have a higher level of IT knowledge, understanding of modern data management and BI tools for their evaluation. There is no picture yet in the case of the examined companies whether the business analyst function will work within or in addition to the controlling department.

Conclusions and recommendations

Based on the theoretical research and hypothesis testing examined in the dissertation, the author has compiled the model shown in Figure 1, which comprehensively illustrates the recommended steps of developing and implementing the Industry 4.0 strategy, as well as the closely related impacts on controlling area and necessary implementation steps.

Figure 1: Implementation model of Industry 4.0



Source: Own editing

The candidate suggests that companies should develop the Industry 4.0 strategy in a countercurrent approach. This means, on the one hand, taking into account the corporate strategy and mission and the long-term expectations of the owner or investors. On the other hand, the ideas of the employees must also be taken into account, as they see which automation steps would make their work easier or which processes could be optimized. Of course, the opinions of all employees of the company cannot be taken into account together, they must be evaluated and selected. The Industry 4.0 strategy must reflect a vision, a future operational framework to be achieved. The first step in the implementation is to break down this vision into sub-areas and possibly sub-projects. This is because a complete Industry 4.0 strategy cannot be fully implemented at once. There are several reasons for this, mainly lack of resources, lack of know-how and other bottlenecks in

management and human resources, and that the economic benefits of some elements of the Industry 4.0 strategy are difficult to quantify. Therefore, the author suggests companies to either distribute certain elements of Industry 4.0 among their subsidiaries in pilot projects, or to focus only on a specific area during implementation, such as production automation or customer relationship development, etc. The experience gained in this way makes it easier to assess the return on each element of the strategy, the resources needed to implement it, and to build significant know-how to prioritize the elements of the strategy, based on which the implementation schedule can be made and return can be calculated.

At the same time, within the implementation of the Industry 4.0 strategy, attention must also be paid to controlling as a sub-area. In-depth interviews and the author's personal professional experience is that one of the biggest bottlenecks in the field of controlling is the lack of know-how in the implementation of developments related to Industry 4.0. This kind of expertise cannot be acquired overnight, therefore, in her opinion, there should be a constant effort to develop the Industry 4.0 approach among the employees of the controlling department. This can be done by attending a conference, training, workshops, or reading professional journals. Her research results prove that in the future, controllers need to have a higher degree of IT knowledge. It can be a driving force to highlight a colleague or colleagues with a high IT affinity from the controlling department, then to deepen their knowledge of data management, BI tools and predictive forecasting systems relevant to controlling, and then using a kind of multiplier method in order transfer this

knowledge to other colleagues in the controlling department. These colleagues also act as a kind of filter, as they can choose from the available Industry 4.0 methods and tools to see which ones might be useful for a given company. The common task of these key colleagues and the controlling manager is to continuously monitor the new automation and digitization opportunities that are emerging in the market and to introduce those that are beneficial to the company considering the available financial resources.

At the same time, it is also important that the controlling department is kept informed and monitors what Industry 4.0 initiatives are being implemented in other areas of the company. This is necessary because more data is available to the company through ongoing initiatives. From these, it may be necessary to filter out which may be relevant in future decision-making and accordingly incorporate the newly generated data into the company's reporting and forecasting system. Only this way can the controller play the role of a business partner in the future and further support the management in information-based decision-making, which serves the long-term economic operation of the company.

The author's publications related to the topic of the dissertation

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