

## IMPROVING THE ORGANIZATIONAL AND ECONOMIC MECHANISM OF DIGITIZATION OF PRODUCTION ACTIVITIES

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### ABSTRACT

*This article summarizes the findings and preliminary research findings on the consequences of the consistent use of digital technologies in industrial work. In particular, the barriers to digitalization of production, problems, their causes, as well as Internet of Things (IoT) cyber physical systems were studied. The article develops a definition of the possibility of digitization, which allows the digitization ability of the enterprise to interact with its business model, which allows the growth of data, digitization, and as a result promising ways of future research will be able to highlight.*

**Keywords:** Digital Economy, Industry 4.0, IoT, Expert Evaluation, 5G Internet, Digitization.

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### INTRODUCTION

The term production generally encompasses a transformation process in which resources (input factors) are used to generate products and added value (output). Production takes up the value-creating part of the product life cycle, which is preceded by a planning and development phase and followed by distribution and end consumption [Moritz 2016]. Production development has been technologically oriented for some time. Automated task design, lean production and the just-in-time principle have been the main concepts of industrial work for a long time. Through these concepts and increasing mass production, in which production is more strongly adapted to the needs of customers and mass effects can be used, lead times in production processes have already been reduced and inventory management improved. The trend is towards more and more automation and the use of intelligent communication and information technology, as is envisaged in the context of Industry 4.0. The digitization of production, which is supposed to be the subject of this thesis, has long been underway, which is why one should critically examine the question of whether the further digitization sought, which will be discussed in the next section, is really another industrial one Represents revolution.

When you talk about the digitization of production you come across a wide range of definitions. As early as the 1980s, the Computer Integrated Manufacturing (CIM) concept pursued the goal of holistically monitoring, planning and controlling the process of value creation through the use of integrated IT systems [Thomas Richter et al 2017]. From today's perspective and against the backdrop of Industry 4.0, the digitization of production goes one step further. In addition to the support of the production processes by IT systems, all areas and levels of the production process are now to be networked with one another and controlled centrally. With the help of intelligent devices and systems, communication within a company but also along the entire supply chain should be significantly improved. The intelligent processing and use of large amounts of data collected with the help of digitized production processes play an important role. In this context, there is also repeated talk of the "Internet of Things" and cyber-physical systems. These cyber-physical systems mean precisely these intelligent devices, However, here again the question arises whether these potentials, which will be presented in the further course of the work, really exist and, if so, whether they can really be tapped.

The digitization of production processes opens up new design options for industrial companies in various acronyms

for business operations. For example, the increase in digitalization contributes to the ability of new business models to automate production processes and meet customer demand for individual products. This development is preferred, among other things, by the availability of large amounts of sensory data. In research and practice, digitization in industrial enterprises is usually described by the phrase "Industry 4.0". The purpose of the professorial research for applied systems and e-business is to demonstrate the possibilities of digitization of production processes and to study new software systems and architectures. To this end, the use of computers in the industrial sector (e.g., data glasses and smart watches) on the one hand, and the interface between machines or smart factories and users (cyber-physical systems) on the other hand are analyzed.

Since digitalization is a major trend that affects many aspects of business-to-business marketing, a number of researchers explain these problems with a variety of research questions, methods, and theories. For example, industrial marketing management has published more than 100 articles on digitization and digitization in the last five years. Nevertheless, the directions of future research on this topic are unclear due to conceptual uncertainty and lack of general perspective. For example, [Ross 2017] Digitalization and digitization are two different organizational phenomena, the first of which deals with digital value propositions in the market, the second regulates the transition from analog processes to digital data, and the other uses terms interchangeably. Moreover, current research efforts appear to be scattered and unrelated because topics are diverse and connections are not established. Some studies business, adopting a business-model perspective on different conceptualizations it will be clear that the model will deal with the simplification and digitization of opportunities in different parts of the model, while others will deal with value propositions (digital / digitization) [Ritter, (2014)]. Thus, applying the business model framework to discuss different conceptualizations of basic constructions helps to identify meanings and differences.

At present, it is not difficult to know which industry or network is one step ahead as a result of the effect of digital technologies. It has become clear that by 2050, the countries that have slowed down the integration of digital technologies into the economy will be among the most backward countries. The digitization of sales, employment, money circulation systems, search engines, analytics, calculations and reports has provided absolutely innovative systems, algorithms and cost-effective technologies for a new generation. The new generation does not spend much time on economic analysis, forecasts, models and calculations. They just deal with creating innovation. Because their ancestors solved such issues today. The results of the World Bank's Digital Dividends study show how relevant and important the digital economy is in the development of countries' economies. In particular, a 10% increase in internet speed will lead to an increase in the country's GDP. In developed countries, the figure is 1.21 percent, while in developing countries it is 1.38 percent. This means that if the speed of the Internet doubles, the GDP can also increase by about 15 percent. [Kambarov et al.].

## METHODOLOGY

The following evidence, particularly IT-related issues, did not exclude possible changes in industrial operations. Specifically, there are two topics at the center of the debate on the digitization of industrial work: The first is the question of the possible quantitative effects on employment, and the second is the structural change and skills of professional activity. The analysis provides a broad understanding of industrial work. To sufficiently understand the importation of this modification process. In general, the concept encompasses all direct and indirect value creation in industrial operations, from the operational and executive levels of the organization to the strategic levels of planning, regulation and monitoring, to the lower and middle levels. activities [Hartmut 2016].

The following evidence is of a research nature and is relevant to the introduction of new technologies, more

specifically to its own, review of the existing literature in the field of socio-scientific industrial and labor research and based on a systematic resume. Research in the social sciences in industrial engineering, occupational psychology, occupational sociology, and innovation is a clear example of this. In particular, the results of a number of social science studies dealing with the development of information technology and their impact on labor in recent years are used. In particular, we can cite the results of several studies on occupational psychology, particularly recent reports on occupational sociology and industrial sociology. Since there is a heated debate about the prospects of Industry 4.0 in Germany, these sources are often original research in German. In general, the research focuses on social and macro-structural changes in the labor process, as well as possible conversion processes at the micro level of individual companies and workplaces [Hartmut 2016].

The job losses that can occur as a result of digitalization research are largely due to the well-known debate about technological unemployment. As John Maynard Keynes said, increasing technical efficiency happens faster than we do with the problem of labor absorption (Keynes 1963). As for this question, the frequently said “traditional wisdom” of labor market research goes back to Ricardo, who argued that the short-term negative effects of technological change on employment are always offset by increased productivity [Aghion and Howitt 1994]. Thus, based on a detailed study of the literature, expecting the adoption of digital technologies will not have a clear impact on employment. In particular, they point out that it is very difficult to make a causal impact on employment with this technology. This is due to their potentially wide application in many areas. Although significant empirical research is lacking, an optimistic view of the long-term employment impact of digital technologies is predominant in the literature. Because it is necessary to see a direct negative and an indirect positive effect on employment as a result of increasing efficiency and lowering prices, opening new markets [Evangelista et al. 2014].

The use of smart information and communication technologies and the network of people and machines associated with it brings many advantages within the company in the field of manufacturing. During the entire production process of the workpiece, data is collected in real time, then recorded at a central control point, stored in production databases and analyzed. In addition, the aforementioned cyber-physical systems are used, which are aimed at linking computational performance to physical devices. At the device level, the coordination function is assigned to the devices in the manufacturing process, which ensures that the production is more efficient in use. Using this data, a company is able to measure important parameters of the production process, such as current production development, production speed, or the relationship between desired and achieved quality in real time, and draw the necessary conclusions. By constantly and accurately monitoring each individual product in the production process, the whole process will have a great deal of transparency, which means that decision-making in production planning can be made much faster and more efficiently. But then, we point out that data processing and protection is an important issue.

**Companies Benefit from Accurate Data Collection as Follows:** Precise localization and tracking of used production facilities serve as the basis for more efficient inventory management. A more accurate, more efficient organization of the described real-time tracking order quantity planning allows important decisions to be made in a cost-effective implementation. Information systems have evolved to such an extent that the ordering of new materials and the recording of resources currently available in the warehouse are done completely automatically on the basis of the data, with the person having only a control function. Thus, it will be very easy to determine the material requirements and the optimal amount of the ordered quantity early, as smart systems can easily monitor and analyze consumption and then require data to make appropriate decisions. This, for example, minimizes inventory and prevents obstacles in inventory in advance. As a result, capacity may be reduced or otherwise used and material handling may be reduced. This significantly eases people's

responsibilities and significantly reduces the likelihood of mistakes.

The use of the machine in the actual production process can be optimized using digital production systems, which reduces or prevents production downtime. Another important factor is to avoid off-stock situations through intelligent production planning, which can lead to greater customer satisfaction. In addition, the connection of different production areas to the network leads to a reduction in the production cycle time and production time by minimizing or eliminating corrosion processes. In terms of any sustainable and resource-efficient production, low material losses and improved waste management should be noted as great potential. In addition, there should be an opportunity to increase the energy efficiency of machines and possibly improve safety, and thus add less hazardous work steps to production processes, as people are increasingly free from manual labor and monitoring, and become familiar with control functions. In the next direction, it becomes clear that most companies underestimate the benefits of this potential or consider themselves well positioned [Reyes et al. 2016]. In addition to inventory and production planning potential, there are also great opportunities in supply planning.

## DISCUSSION

In the context of Industry 4.0, the digitization of industry and thus the digitization of production is at the heart of what is called the Fourth Industrial Revolution. The evolving numbering and branching of production processes should lead to a continuous change in industrial structures in the future. The introduction of network and independent production systems in small and large companies has the potential to restructure the whole world and give higher priority to industrial work. On the other hand, this is not a short-term and simple change, but a digitization process that takes very little time and can only be mastered by overcoming a few challenges.

If you don't look forward or backward, but rather look at the current state of digital development, today's production systems, with all their trends and rapid change, may not meet the demands of a rapidly evolving society in most areas. This has led to a lot of research and studies to make the transition to digital production as effective as possible. One of the main problems is that companies do not want to make their processes transparent and disclose information. But in recent years, that wish has already come true. This has been accompanied by an increase in the use of Cyber Physical systems in recent years, which is one of the key technologies of Industry 4.0. Therefore, the creation and rapid development of intelligent production systems and broadband infrastructure within the company is important to meet the requirements of a dynamic society, industry, not to lose competitiveness.

In subsequent work, it is created first by briefly defining the terms production and digitization (in relation to the production process) and then by further explaining them. The main part then explains in more detail the important potentials and problems of digitization. Different aspects of potential are divided into three parts. First, the possibility of improving production planning and inventory management will be considered. Trade and cost potentials are then discussed. As for the impending problems of digitization of the production process, first of all, the possible problems for the company in the introduction of network and smart production systems are listed. It also considers working with an abundance of information that can be useful to any company, but should be handled with care. The main focus is on data collection, processing and data protection.

The aim of the work is to present the potential and problems of production digitization from a business and logistics perspective and to critically examine it. On the one hand, it should be clear that the digitization of the production process will affect all areas of the company. At the division level, this includes not only production planning, but also inventory

management, service, and for those involved, not only the management level, but also the staff and supply chain partners. does not bypass. At the same time, on the other hand, it is also important to ask a serious critical question about the development of digitalization in the background of Industry 4.0 and explain once and for all whether this development is actually a disruptive change or an industrial revolution. Then, everyone should be able to form an opinion about the existence of the fourth industrial revolution and compare the potential and challenges to get an idea of the economic scope of the digitization of production.

In many manufacturing companies, digitization is the job of management (almost 40% of the companies surveyed). This is because the digital transformation should help companies achieve important business goals. A total of 45% of companies want to use digital channels to improve customer communication and share experiences. Another 35 percent is focused on optimizing production management through process digitization and automation. Eighteen percent of respondents said they primarily use the digital business model to create new sources of revenue.

How to manage production in the digital age? What does digitalization mean for your company? To answer these questions, we list eight areas where you can benefit from Digitization.

1. **Resource Consumption and Process Optimization:** Modern production management systems provide real-time process tracking for immediate response to unwanted events. It is estimated that this component of digitization in production alone will help increase productivity by 3-5 percent.

2. **Estimated Maintenance:** Defects that can occur due to constant remote monitoring of the machine condition can be detected more quickly, downtime or required replacement time can be significantly reduced, and ultimately, costly operating time can be avoided. Analyzes show that due to the preventive service it is possible to reduce the downtime of the machine by 30-50% and extend its service life by 20-40%.

3. **Employee Efficiency:** New technologies can make a significant contribution to increasing employee productivity. Examples include the use of cloud services, the application of the 5G network to the industry, the analysis of large amounts of data (BigData), as well as the use of 3D printing devices to speed up processes due to research and analysis.

4. **Inventory Management:** Appropriate tools to optimize the supply chain can help to avoid overproduction or limit barriers to procurement. It is estimated that automating procurement processes can reduce storage costs by about 20 to 50%.

5. **Quality Management:** Innovative applications in Industry 4.0 help to improve the quality of production by solving problems and eliminating errors in real time, as well as extensive process management. The available examples clearly show that this can save 10 to 20 percent of the cost of production due to quality defects.

6. **The Relationship Between Supply and Demand:** Today's digital economy is increasingly focused on demand because supply can be managed down to the smallest detail. Using a variety of methods to analyze and stimulate demand (e.g., systems in the field of marketing automation), the quality of demand forecasting can be improved by up to 85%.

7. **Market Time:** With the help of 3D printing or distributed simultaneously produced engineering, it is possible to create prototypes for new products and put them on the market at lightning speed. Thanks to innovative solutions in this area, the market entry time can even be reduced by 30 to 50%.

8. **Maintenance and After-sales Service:** It is estimated that remote maintenance and repair can reduce system repair

costs by 40% using augmented reality.

With the digitization of their production, many manufacturing companies are reaching new milestones that, according to the observations of Felten Group software consultants, keep the risk of mishandling. Hans-Jürgen Kopp, a senior consultant at the software company, outlined a number of important success factors that will help the digitization strategy achieve its goals:

1. **Don't Start Without a Detailed Analysis of the Initial Situation:** Digitization should always be related to the existing conditions in production. This situation requires a closer look at the error, but only the technical infrastructure is assessed in terms of digitization capabilities. Rather, it is necessary to determine the possible optimization potential in separate or multiple production processes.

2. **Accurately Assess the Benefits of Digitization:** Once the initial status is determined, the question of what benefits can be achieved by digitizing production processes needs to be answered. This requires a serious analysis based on key industry-specific key indicators and other industry performance data. This provides the company with reliable guidelines for future targeted investment planning.

3. **Make a Step-by-step Plan:** Do not do too much at once, do not dare to experiment in the first place, but rather proceed step by step within the framework of a systematic roadmap. Important criteria for evaluating the sequence of projects based on the priority matrix of measures created before the start of the first project are how quickly the ROI can be achieved, taking into account the overall improvement potential, economic value added and investment requirements. Thus, measures that produce the greatest optimization effects should be initiated first, as investments in digitization quickly finance themselves by saving funds later.

4. **Use MES as a Data Center:** In any case, the MES system is one of the key elements of the digitization strategy. As a data center, it serves as a crucial bridge for the industrial world of 4.0, as it is decentralized in real time about the use of machines for digitization, production times, human resources, material and energy consumption, and more. data must be available. Without MES infrastructure with ERP integration and digital information logistics, no model of future production management can be imagined.

5. **Understand Digitalization Primarily as a Process Problem:** It may seem that the digitization of production is largely limited to the introduction of modern digital technologies. But it's all about processes first: If you want to make the most of your improvement potential, you also need to look closely at production processes. First, the digitization process will inevitably lead to process change, and second, previous procedural efficiency barriers must also be removed during the digitization projects process.

6. **Ensuring the Readiness of the Company for Digitization:** Digital processes change a lot of things that lead to rapid change. Therefore, the success of digitization, which can really be achieved in production, depends on how all stakeholders understand the needs and prospects. It is therefore recommended to involve them sufficiently in the initial planning phase, to involve them as advocates, and to make them active co-authors of the digital direction.

## CONCLUSIONS

In summary, the development prospects of digital manufacturing systems at present may be limited. This is because the industrial distribution of these systems, with their structural variability, faces technical, economic and social barriers that are difficult to overcome. In other words, it must be assumed that the innovations of intelligent manufacturing systems are of a very paradoxical nature [Andriopoulos 2009]. Its structural-altering effects simultaneously create resistance, constraints, and

obstacles to its implementation. This can be caused by the following factors:

1. First, there are the above-mentioned problems of data migration and integration of new systems into existing production structures and databases, the cost and complexity of which seem to be unclear at this time.
2. Second, the challenges of adopting a new concept between management and manufacturers cannot be ignored. Here, based on many years of practical and counter-experience to automation, the widespread skepticism about the efficiency promised by smart systems plays an important role. In addition, intelligent systems are confronted with the technological principles of decentralized, automated self-organization, common organizational concepts of standardization and production, which often increase the management potential of processes. In this sense, the concept contradicts the leading wisdom in building an efficient plant in several respects. In addition, backups are often available due to the fear of data security of complex databases that need to be developed in multi-band, smart manufacturing systems.
3. Third, organizational inertia must be taken into account. This is probably a specific result of the necessary restructuring of the company's level of planning and control, the division of responsibilities between IT and production technology. In general, IT competencies and tasks should be of great importance and combined with other production and technical competencies. There is concern, in particular, that technicians can use their influential position to slow or even block rapid change. Such a defensive stance against the loss of authority (or autonomy) can also be tightened by fear of the surveillance potential of digital systems.

In general, it can be assumed that the industrial sector will have a much different picture of the distribution and application of smart manufacturing systems in the medium term. First of all, such enterprises take advantage of new systems that are constantly under the pressure of innovation and rationalizers due to high flexibility requirements, and see the opportunity to achieve sustainable growth of production in new systems. These are primarily high-tech, strong medium-sized firms that have the necessary qualified personnel and skills and have made the German industrial structure popular [Hirsch-Kreinsen et al. 2015]. highly innovative firms. It should also be a user of medium-term promising smart systems due to the logistics industry, its standardized processes and rapid growth [Spath et al. 2013].

On the contrary, as large manufacturers, enterprises with highly automated production technologies and much more advanced in organization are set aside for smart systems. For them, the unique and new automation logic of smart systems could possibly jeopardize their high productivity and, at the same time, their existing competitive advantage. Examples include flexible, large manufacturers in the automotive and electrical industries. Perhaps these systems are of almost no interest to a wide range of technologically low-intensity small and medium-sized enterprises (SMEs) [FAZ 2014]. The reasons for this are primarily due to the limited resources and capabilities of many SMEs who do not want to go for technological experiments with uncertain results. On the other hand, many SMEs have achieved success in the production of standardized goods compared to the simple level of automated technology. These enterprises, for example, food products, furniture industry or metal products, are subject to low flexibility requirements. Therefore, there is no need to seriously consider expensive and dangerous automation measures for them. Thus, forms of low-skilled and ordinary industrial work should remain in the near future.

In general, it is difficult to formulate any clear and reliable assumptions about the future spread of smart manufacturing systems. The evidence presented here is highly hypothetical. At the same time, the introduction of smart production systems will create a wide field for future socio-scientific research on innovations and work related to changes in production. Such an agenda may include analytically oriented core research, as well as applied research projects, such as technology-oriented development and programming efforts. In any case, the novelty and complexity of this field further

demonstrates the need for an interdisciplinary approach between the technical and social sciences.

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