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Exploration of Differences in Managers' Perception of the Industry 4.0 Advantages for Manufacturing Enterprises in the Czech Republic

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Abstract
Since the beginning of the Fourth Industrial Revolution, enterprises have been promising the main advantages and benefits of implementing the Industry 4.0 technologies. However, the perception of new Industry 4.0 technologies may vary between different types of enterprises. The paper focuses on the main advantages of Industry 4.0 technologies for manufacturing enterprises. We analyze the difference of enterprise size and technological intensity in enterprise managers' perception. The research was conducted based on a questionnaire survey that participated 217 enterprises from the Czech Republic. Statistical analysis showed that higher productivity and production volume are the main advantages of Industry 4.0. The present results show differences between enterprises according to their size. However, differences related to the technological complexity of enterprises have not been confirmed as an essential factor.

Keywords
Industry 4.0, Manufacturing enterprises, Advantages, Enterprise size, Technological intensity.

Introduction

Industry 4.0 and related technology brings advantages and benefits to industrial enterprises. Barriers to the implementation of Industry 4.0 are falling fast, and benefits are becoming more apparent (Ruppenthal, 2019). The positives of Industry 4.0 can be considered as advantages (Brozzi et al., 2020), motives (Halse and Jaeger, 2019), benefits (Masood and Sonntag, 2020), technological drivers (Muller et al., 2018) or opportunities that positively influence companies' decision to invest in new technologies.

Industry 4.0 means greater efficiency and flexibility – and even the advent of previously unattainable capabilities. However, the ability to produce economically with small-batch production methods, regardless of economies of scale, is only one of the benefits of the new order. It means an overall increase in innovation capacity. Industry 4.0 offers workers a safe workplace and better working conditions based on new technologies for production and more accessible work. Furthermore, new technology in production leads to increased production volume, overall efficiency and productivity. This area is closely related to operational management, which means better support, maintenance, monitoring and optimization of the manufacturing process. It makes it easier for enterprises to individualize production and focus more on the customer. In logistics, this facilitates closer cooperation with suppliers and customers. In addition to accelerating the physical flow, it also brings communication benefits in information flow. Savings from technology have a positive impact on both the environment and sustainability.

Currently, many authors aim to develop readiness (maturity) models of the implementation of Industry 4.0 (Pech & Vrchota, 2020). However, the present research is limited to the lack of studies concerning the differences in the managers' perception of the Industry 4.0 advantages. We extend the understanding of the nature of the benefits of Industry 4.0, which can be essential for theoretic and practitioners. Our paper analyses the difference between enterprises related to their size and technological intensity to fill this gap. The research focuses on the main advantages and benefits of Industry 4.0 to make manufacturing enterprises understandably of the coming industrial revolution for competitive advantage.

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Literature review

This part briefly reviews the body of related work available in the literature.

Industry 4.0

Industry 4.0 is a new phenomenon that will certainly affect our future, industrial production, and the quality of our lives. Industry 4.0 is often referred to as the fourth industrial revolution. Still, it is more of an evolution, i.e. it is a continuous development of computer technology that has been going on since the mid-1980s. The first three development stages of industrial production were characterized by (Schwab, 2017) innovations in mechanics (Industry 1.0), electronics (Industry 2.0) and information technology and computers (Industry 3.0).

Industry 4.0 is a term for upcoming innovations and changes in production processes. In this context, manufacturing systems are moving to a higher intellectual level related to flexible and intelligent technologies and reconfigurable processes (Shen & Norrie, 1999). It means a higher level of manufacturing based on autonomous communication and cooperation of machines to perform production functions (Muhuri et al., 2019). The four key components of Industry 4.0 are cyber-physical systems, the internet of things, services, and the smart factory (Roblek et al., 2016). Industry 4.0 integrates production methods with cyber-physical systems in manufacturing (Meyer, 2019), one of the most revolutionary changes in this millennium (Xu et al., 2018).

The concept of Industry 4.0 is intended to emphasize the linking of products, machines and people, not just to individual industrial processes but to all the economic activities of an enterprise. Industry 4.0 is related to manufacturing enterprises and services, such as banks, insurance enterprises, repair shops, healthcare, education and other areas. It is also crucial that it concerns enterprises of all sizes. However, most small and medium-sized enterprises are just-introduced Industry 4.0 technologies (Pech & Vrchota, 2020).

Industry 4.0 is based on three pillars: digitization of production, automation and robotics, and automatic data interchange (Schlechtendahl et al., 2015). A new concept of smart factories is born from digitization, automation, and large data sets from production, machines or products. Industry 4.0 is based on state-of-the-art information and communication technology and digital transformation of industry into smart factories. However, this transformation of traditional factories takes a long time and requires many resources (Rafael et al., 2020).

Advantages and benefits of Industry 4.0

The literature review pays special attention to the advantages and benefits of Industry 4.0. Industry 4.0 brings an increase in the quality of human life through increased productivity and the disappearance of monotonous and physically demanding professions. Other benefits are short development periods, individualization on demand, flexibility in product development and production, resource efficiency (Lasi et al., 2014). Some authors refer to these benefits as technological drivers. According to Muller et al. (2018), these drivers are considered opportunities to influence Industry 4.0 implementation positively. They can be divided into technical, economic, regulatory, and social drivers (Obiso et al., 2019). The driving forces of Industry 4.0 are related to human resources (reducing human work, increasing shortages), financial resources (profitability, operating costs, inventories), market conditions (competitiveness, new business models), management (performance monitoring, greater control), productivity and efficiency (improving lead times, shorting downtimes, efficiency) (Horváth & Szabó, 2019).

The emergence of differences in perceptions of the positives of Industry 4.0 according to the enterprise size is based on the findings in studies explicitly targeting small and medium-sized enterprises (Masood & Sonntag, 2020; Muller et al., 2018; Prause, 2019). They highlight the differences between large enterprises (LE) and small and medium-sized enterprises (SMEs). Masood & Sonntag (2020) show that SME enterprise size affects only the benefits and manufacturing complexity (such as industry, production method or product mix), and only challenges of implementing an Industry 4.0 technology. Industry 4.0 technology benefits for small and medium-sized enterprises in Masood & Sonntag, (2020) are operational costs, operational efficiency, flexibility, quality and competitive advantage. Interestingly, according to Horváth & Szabó (2019), large enterprises have higher motives power and lower barriers perception than SMEs. Similarly, surveys are carried out that focus on selected sectors (Jimeno-Morenilla et al., 2021; (Kamble et al., 2018). These sectors may differ in the intensity with which the introduction of new technologies is required. According to the enterprise size and industry sector, Muller et al. (2018) find differences in perceiving opportunities and challenges impacts Industry 4.0 implementation. We, therefore, distinguish between more or less technologically intensive sectors.

Further, we will look at the benefits and advantages of Industry 4.0, which were the subject of our research.

Higher productivity is the strategic objective of enterprises in implementing the ideas of the fourth industrial revolution. They aim to accelerate and streamline the production process, including logistics and sales. Increased productivity is based on automation and optimization. For example, autonomous mobile robots obtain feasible solutions in increasing the productivity of the production systems (Fragapane et al., 2022).

Increasing the volume of production is another advantage and sometimes a reason for introducing new technologies. New and more modern technologies enable faster execution of production processes and, thanks to these capacities, are released for larger production volumes.

The increased safety of workers is based on the idea that automatic risk prevention systems can be used in factories. This system can be, for example, the use of virtual reality to create a risk-free virtual learning and training environment (King Chun et al., 2012). The use of virtual reality can be helpful in construction, healthcare, etc.

Similarly, modern technologies can be used to create risk maps and routes for avoiding work accidents (Vahdatikhaki & Hammad, 2015). The worker can then see all the necessary information in glasses.

Better working conditions in factories mean eliminating manual work and introducing new ergonomically adapted tools and machines. Some enterprises use learning factories to develop future workers' autonomous learning skills and improve logistics management courses' learning outcomes (Fu, 2017). Modern technologies of Industry 4.0, through the processes of virtualization using digital twins and virtual reality in an industrial context, create virtual ergonomics, through which it is possible to offer valuable decision support as part of the process of designing new assembly lines (Laudante, 2017).

Cooperation with suppliers and customers is based on integrating the Internet of Things in supply chains (Haddud et al., 2017). Integrating intelligent IT into CT can provide a variety of methods and tools to manage supply chain dynamics (Ivanov et al., 2018). Effective supply chain management allows responding flexibly to real-time demand fulfilment.

Sustainability and the environment are other areas affected by Industry 4.0 technologies. It was found that the motivating factor for the implementation of Industry 4.0 can be sustainability for 32% of enterprises (Basl, 2017). It will grow in the future due to the further deepening of supply chain integration and the growing number of interconnections of enterprises. In the context of Industry 4.0, green processes bring environmental, economic and social sustainability outcomes (Vrchota et al., 2020). The advantages relating to the economic dimensions of sustainability prevail over social considerations of sustainability (Brozzi et al., 2020).

A higher innovation rate is an essential effect of digital transformation (Gubert, 2019). Industry 4.0 elements have a significant operational impact for increasing efficiency, improvement of resources utilization and reduction of costs (Zielinski, 2019). However, new capabilities are needed to close the gap between current thinking on value innovation and the requirements for Industry 4.0 (Matthyssens, 2019).

Better operations management includes the maintenance, support, monitoring, and improvement of other production functions. Optimizing internal operations in real-time is based on virtualization of the production process and supply chain (Brettel et al., 2014). Machines in modern factories react to the failure of the device to avoid high costs loss. Production and capacity planning, scheduling, monitoring, maintenance and support is performed by information and technologies (Szalavetz, 2019).

Production customizing in Industry 4.0 means a fundamental focus on the customer. The current focus on the customer is realized via incorporating customer needs in real-time (Pereira et al., 2017) and developing new business models for higher customer involvement (Kagermann et al., 2013). It enables the real-time capability to link the factory with the customer for better adaptation to demand changes (Carvalho et al., 2018).

Communication advantages of Industry 4.0 technology lie in information transparency and virtualization. These systems are based on cloud computing which is the platform for file-sharing, collaboration, distributing, creating documents in real-time. With the cyber-physical systems and Internet of Things, connected objects and people increase (Carvalho et al., 2018). Electronic devices, machines and production assets collect and process data from production for faster decision-making, performance monitoring etc. (Intezari & Gressel, 2017).

Materials and methods

The paper aims to discover the main advantages of Industry 4.0 technologies for manufacturing enterprises. The partial aim is to analyze differences between managers' perceptions and enterprises related

to their size and technological intensity. The following working hypotheses were formulated within the research:

- H_1: The advantages of Industry 4.0 differ in managers' preferences according to the enterprise size.
- H_2: The advantages of Industry 4.0 differ in managers' preferences according to the technological intensity of enterprise production.

Data

The data collection was carried out in 2019–2020 in the Czech republic. There were 180,193 enterprises in the manufacturing industry in the Czech Republic (Czech Statistical Office, 2018). We sent a request to fulfil questionnaires to 1,500 manufacturing enterprises. We obtained a total of 225 questionnaires with a response rate of 15%. From these, we eliminated eight questionnaires due to incomplete answers. Thus, the research sample consists of 217 completed questionnaires. The overall margin of error is 6.65% on 95% confidence level condition. We used a stratified random sampling method to obtain a representative research sample based on enterprise size and technological intensity criteria. The main characteristics of enterprises are shown in Table 1.

Table 1
Data sample characteristics

Group	Category of Group	Total	%
Enterprise Size	Small Enterprises	83	38.3
	Medium-sized Enterprises	65	30.0
	Large Enterprises	69	31.3
Technological Intensity	High-Tech Intensity (HTI)	125	57.6
	Low-Tech Intensity (LTI)	92	42.4

The categories of enterprises divided by size come from the European Commission's (2003) definition. We divided enterprises into small and micro enterprises (0–49 employees, annual turnover or balance sheet total $\leq$ EUR 10 million), medium-sized enterprises (50–249 employees, annual turnover $\leq$ EUR 50 million or balance sheet total $\leq$ EUR 43 million) and large enterprises (criteria for small and medium-sized enterprises not met). Table 1 shows that the sample consists of 38.3% small (including 21 micro-enterprises), 30.0% medium-sized, and 31.3% large enterprises. The numbers of enterprises in each group are almost similar.

The classification of the enterprises by technological intensity (High-Tech and Low-Tech) is based on prevailing industry focus of production, as defined by the methodology of Eurostat (2020). This classification defined groups of High-Tech enterprises (HTI) as enterprises focused on manufacturing pharmaceutical products, computer, electronic and optical products, chemicals and chemical products, electrical equipment, machinery and equipment, motor vehicles, trailers and semi-trailers, and other transport equipment. The Low-Tech enterprises (LTI) are focused on producing coke, refined petroleum products, rubber and plastic products, non-metallic mineral products, basic metals, food products, beverages, tobacco, textile, wearing apparel, leather, wood, paper, furniture and other manufacturing. Table 1 shows that about 57.6% of enterprises are focused on High-Tech industries and 42.4% on Low-Tech industries. It means that the sample consists mainly of more High-Technologically demanding enterprises.

Methods

An important component of the research was a questionnaire survey focused on the advantages and benefits of Industry 4.0. Enterprises' managers had to fill out a questionnaire to participate in the study. We asked them to answer the question: "In which areas do you consider the advantages of Industry 4.0 for your enterprise?", followed with ten different possibilities (higher productivity, higher production volume, workers' safety, better working conditions, cooperation with suppliers, sustainability and environment, higher innovation rate, better operations management, production customizing, and communication advantages). Each of these advantages was graded by a 5-point Likert scale from 1 (the least important) to 5 (the most important).

The proposed hypotheses were verified by statistical analysis in Statistica software. We used ANOVA statistics for multiple comparisons of samples to evaluate the effect of enterprise size. First, Levine's tests for homogeneity of variances were performed. We used ANOVA when homogeneity of variances (i.e., the null hypothesis of homogeneity of variances) could not be rejected via Levine's test (Howell, 2012). Otherwise, when samples showed variance heterogeneity, we used the nonparametric statistic Kruskal–Wallis ANOVA. Any differences found between categories in ANOVA were further subjected to pairwise comparison using the LSD (Least Significant Difference) test. To assess the effect of technological intensity, we used the t-test methodology for independent samples (Witte & Witte, 2017). In all cases, the calculated *p-value*s were tested at an alpha level of 0.05. In tables are presented results of criteria values and given *p-value*.

Results and discussion

This part provides an evaluation of the main results of the questionnaire survey. Each advantage of Industry 4.0 included in the questionnaire is accompanied by a table summarizing the percentage of responses to each option. We divided the results of the survey into three parts: overall Industry 4.0 advantages overview, their relation to enterprise size and their relation to technological intensity. The hypotheses verification is shown in tables followed by a brief commentary.

Industry 4.0 advantages overview

Managers' views on the benefits of Industry 4.0 are similar, and the differences in terms of the breakdown used are relatively small. These results vary between average mean values of 3.92 and 3.09. Table 2 presents the structure and rating frequencies of responses on a scale of 1–5 and mean values.

Table 2
Evaluation of Industry 4.0 advantages

Industry 4.0 advantage	Rating frequency					Mean
	1	2	3	4	5	
Higher productivity	21	12	25	65	94	3.92
Higher production volume	22	20	41	65	69	3.64
Workers' safety	22	28	55	62	50	3.41
Better working conditions	21	20	48	68	60	3.58
Cooperation with suppliers	33	29	61	63	31	3.14
Sustainability and environment	34	34	61	54	34	3.09
Higher innovation rate	18	16	49	67	67	3.69
Better operations management	20	20	54	67	56	3.55
Production customizing	36	36	50	61	34	3.10
Communication advantages	24	30	66	57	40	3.27

To determine a higher degree of assurance in managers' perceptions of the Industry 4.0 advantages, we analyzed responses with a rating of 5 points (5 – the most important). The main advantages are considered by 17.67% of respondents to increase productivity. Productivity is an economic indicator that refers to the efficiency of resources, in this case, factors of production – new technologies. Managers in Industry 4.0 see opportunities for improving the use of corporate resources. A relatively high rating of 12.97% was given to the increase in production volume since newer technologies usually allow work to be done faster or on a larger scale. A substantial rating of 12.5% was achieved by the higher innovation rate, which is related to the improved ability of enterprises to innovate products or processes. Managers rated better operational management as the most essential advantage in 10.53%. These benefits are mostly based on the business's day-to-day operations to be perceived more positively by managers. It may be similar for working conditions (9.40%) and employee safety (10.71%). Little impact is expected in improving cooperation with suppliers (5.83%) or in impacts on sustainability (6.39%), communication advantages (7.52%) and customization of production (6.39%). In these cases, the main reason can be unfamiliarity with the possibilities of applying new technologies in these areas or, on the contrary, their high initial investment. (Fig. 1).

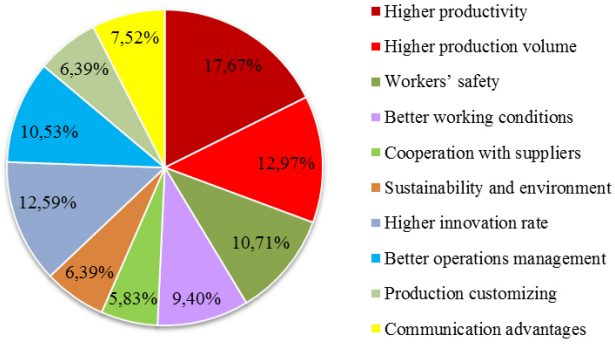

Fig. 1. Industry 4.0 Advantages (in %)

Advantages of Industry 4.0 concerning size of enterprise

According to the size of the enterprises, more significant differences in managers' opinions were found in higher productivity, increased production volume, higher innovation rate and improved operations management (Table 3). Here, the impacts of Industry 4.0 are felt or only expected by managers of medium-sized or large enterprises. Large enterprises' little expectation (compared to other enterprises) means that their occupational safety will improve. This problem has been probably thoroughly resolved in previous years.

We conclude that managers in large enterprises emphasize Industry 4.0 advantages as higher productivity and production volume. In small and medium-sized enterprises, these benefits are equally important, but there is a higher preference for factors focused on the work environment, conditions, and safety.

To determine working hypothesis H_1, we assumed that "*the advantages of Industry 4.0 differ in managers' preferences according to the enterprise size*". First, we verified via Levine's F-test that the samples come from a distribution with equal variance. The difference in variances was only significant for

Table 3
Industry 4.0 advantages according to the enterprises' size (mean values)

Industry 4.0 advantage	Size of Enterprise		
	Small	Medium	Large
Higher productivity	3.46	4.02	4.38
Increased production volume	3.14	3.78	4.10
Workers' safety	3.11	3.54	3.67
Better working conditions	3.37	3.68	3.74
Cooperation with suppliers	2.89	3.14	3.43
Sustainability and environment	2.82	3.17	3.35
Higher innovation rate	3.29	3.85	4.01
Better operations management	3.14	3.68	3.91
Production customizing	2.88	3.12	3.33
Communication advantages	3.11	3.09	3.64

the advantages higher productivity ($F = 6.7858$, $p\text{-value} = 0.0014$) and increased production volume ($F = 5.0993$, $p\text{-value} = 0.0069$). For these cases, we further used Kruskal–Wallis ANOVA to assess differences in means. The results showed (Table 4) that the hypotheses were confirmed for:

- Higher productivity ($p\text{-value} < 0.0001$). The deeper analysis show differences between small and large enterprises ($p\text{-value} < 0.0001$), small and medium-sized enterprises ($p\text{-value} = 0.0181$).
- Increased production volume ($p\text{-value} < 0.0001$). In this case are differences significant between small and large enterprises ($p\text{-value} < 0.0001$), small and medium-sized enterprises ($p\text{-value} = 0.0275$).

In both cases, we can conclude that small enterprises seem to have a different approach in assessing the importance of productivity and the possibilities of increased production volume. For large and medium-sized enterprises, these benefits are generally the main reasons for technology deployment.

Table 4
Industry 4.0 advantages according to the size of the enterprise (Kruskal–Wallis ANOVA)

Industry 4.0 advantage	Results of K–W ANOVA	
	H	$p\text{-value}$
Higher productivity	21.7497	< 0.0001
Increased production volume	21.0303	< 0.0001

In the other cases, heteroscedasticity was not proven ($p\text{-value} > 0.05$), and therefore, ANOVA could be used to compare means. Here we found differences between the perceptions of managers of different sized enterprises. We confirmed the hypotheses for the following advantages:

- Workers' safety ($p\text{-value} = 0.0148$). The LSD test results showed that the differences were mainly between small and large enterprises ($p\text{-value} < 0.0061$), small and medium-sized enterprises ($p\text{-value} = 0.0370$). Small enterprises have a different approach to using new technologies based on Industry 4.0 to ensure worker safety. They tend to use traditional training methods and traditionally manage workers. In contrast, large and medium-sized enterprises may consider using technologies such as virtual reality.
- Cooperation with suppliers and customers ($p\text{-value} = 0.0297$). Deeper analysis with paired LSD test revealed differences between small and large enterprises ($p\text{-value} = 0.0081$). This finding shows that large enterprises consider new technologies as a possible tool for integrating suppliers and customers. Integration options arise from linking the information systems of the individual elements in the supply chain networks. These systems focus on capturing customer data and mining them through various learning algorithms in distribution.
- Sustainability and environment ($p\text{-value} = 0.0347$). According to the LSD test, we found differences between small and large enterprises ($p\text{-value} = 0.0116$). Sustainability is now one of the emerging trends, and managers of large enterprises, unlike those of small enterprises, are now integrating it into their strategic priorities. Industry 4.0 offers completely new project opportunities in this context.
- Higher innovation rate ($p\text{-value} = 0.0005$). The differences were confirmed by LSD test between small and large enterprises ($p\text{-value} = 0.0002$), small and medium-sized enterprises ($p\text{-value} = 0.0048$). Industry 4.0 is synonymous with innovation through new technologies. In larger enterprises, new possibilities are perceived by managers as an opportunity well worth pursuing.
- Better operations management ($p\text{-value} = 0.0003$). The pairwise analysis of LSD test show difference among small vs. large ($p\text{-value} = 0.0001$), small vs. medium enterprises ($p\text{-value} = 0.0074$). Support, maintenance and monitoring as operational management tools are seen as drivers of greater efficiency in the fourth industrial revolution, especially for larger enterprises. In this sense, Industry 4.0 offers advanced predictive maintenance, automated support based on self-organizing

agents and mobile platform options for monitoring via SCADA systems.

- Communication advantages ($p\text{-}value = 0.0108$). The LSD test results suggested a significant difference for large vs. small enterprises ($p\text{-}value = 0.0078$), large and medium enterprises ($p\text{-}value = 0.0098$). Small businesses are less likely than large and medium-sized enterprises to perceive the advantage of intelligent communication systems that operate in real time. It may be because managers do not yet have an insight into all the possibilities of smart manufacturing.

Table 5
Industry 4.0 advantages according to the size of enterprise (ANOVA)

Industry 4.0 advantage	Results of ANOVA	
	F	*p-value*
Workers' safety	4.3000	0.0148
Better working conditions	1.8953	0.1528
Cooperation with suppliers	3.5753	0.0297
Sustainability and environment	3.4149	0.0347
Higher innovation rate	7.9518	0.0005
Better operations management	8.4277	0.0003
Production customizing	2.2802	0.1047
Communication advantages	4.6247	0.0108

Overall, the differences between the enterprises by size were statistically proved for most of the Industry 4.0 advantages. Most of the differences in the perception of the benefits of Industry 4.0 were between small and large enterprises. The generally lower assessment of the advantages among small enterprises rises from unfamiliarity with new opportunities and current trends. It is therefore clear from the results that enterprise size is a significant factor influencing the perception of the benefits of Industry 4.0.

Advantages of Industry 4.0 concerning Technological Intensity of Enterprise

When dividing enterprises according to technological intensity, a significant increase in the volume of production (see Table 6) is expected for enterprises with a high or increased technological intensity. These are mainly enterprises in the automotive industry and their suppliers in the Czech Republic. Enterprises must respond in their strategies to new technological trends, such as modern emission-free technologies in transport, hybrid cars, electric cars or hydrogen cars, etc.

Table 6
Industry 4.0 advantages according to the technological intensity (mean values)

Industry 4.0 advantage	Technological intensity	
	LTI	*HTI*
Higher productivity	3.99	3.86
Increased production volume	3.68	3.61
Workers' safety	3.49	3.36
Better working conditions	3.72	3.48
Cooperation with suppliers	3.08	3.18
Sustainability and environment	3.11	3.08
Higher innovation rate	3.64	3.72
Better operations management	3.62	3.50
Production customizing	3.07	3.12
Communication advantages	3.29	3.26

We statistically evaluated the question results by industry intensity. The working hypothesis H_2 was that "*the advantages of Industry 4.0 differ in managers' preferences according to the technological intensity*". First, for each of the Industry 4.0 advantages, we evaluated whether the LTI and HTI samples came from datasets with the same variances. A significant difference in variances was confirmed only for higher productivity ($F = 1.5633$, $p\text{-}value = 0.0252$). In other cases, the variances of the samples can be classified as homogeneous ($p\text{-}value > 0.05$). However, the results of the subsequent t-tests (Table 7) on the comparison of means showed no differences between LTI and HTI enterprises.

Table 7
Industry 4.0 advantages according to the technological intensity

Industry 4.0 advantage	t-test statistics	
	t	*p-value*
Higher productivity	0.7345	0.4635
Increased production volume	0.4322	0.6660
Workers' safety	0.7478	0.4554
Better working conditions	1.3827	0.1682
Cooperation with suppliers	0.6218	0.5348
Sustainability and environment	0.1619	0.8716
Higher innovation rate	0.4693	0.6393
Better operations management	0.7317	0.4651
Production customizing	0.3021	0.7629
Communication advantages	0.2213	0.8251

Overall, it was found that the results of the comparison of enterprises on the basis of their sectoral or sectoral affiliation (CZ-NACE) did not show any significant differences either.

Conclusions

In summary, this research study aims to explore the main advantages of Industry 4.0. We analyze the influence of enterprise size and technological intensity on enterprise managers' perceptions. The importance of Industry 4.0 is analyzed and evaluated in the literature, especially concerning technical, technological and organizational, including economic advantages. Our findings show that higher productivity and production volume are the main advantages of Industry 4.0 for manufacturing enterprises. Industry 4.0 advantages are less rated in terms of social. What will happen to workers when robots replace them. It is usually indicated that they will move to another job position similar to the previous one. So far, the situation is beginning to change rapidly.

The analysis leads to some valuable conclusions; the most important is that benefits and preferences of Industry 4.0 advantages differ between managers according to the size of the enterprises. In large enterprises, more emphasis is placed on the production and technological benefits of Industry 4.0. However, working conditions' advantages are also significant in small and medium-sized enterprises. Large and medium-sized enterprises generally rated the benefits of Industry 4.0 more positively than small enterprises. It suggests that Industry 4.0 and new technology projects are more likely implemented in larger enterprises. The research did not identify differences based on the technological intensity of enterprises.

The paper brings managerial implications of the results related to the implementation of new Industry 4.0 technologies. Information about what advantages prevail can lead managers to believe that implementing an Industry 4.0 strategy makes sense for their organization. Managers can use knowledge for decision making about new technology deployment. Industry 4.0 should in the future contribute to a fundamental transformation of manufacturing enterprises towards greater digitalization. All production and value chain levels will be digitally connected. Managers can see main benefits for enterprise efficiency, work environment, production and management. Some of these benefits may vary between different sizes of enterprises.

In future, Industry 4.0 will have significant social and political impacts, of which little is considered so yet. The persistence of enterprises on existing technologies will gradually lead to their exclusion from major supply chains. Executives and politicians can focus on technical and technological issues and their impact on society as a whole and prepare for the future.

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