Study of the level of digitalization of logistics activities in small and medium-sized enterprises in the North-East Region

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Abstract. The digitization of logistics activities in small and medium-sized enterprises is part of the changes brought about by the Fourth Industrial Revolution. Rapid technical progress in technology and its impact on production will put increasing pressure on both its structure and process distinctiveness. In addition to the positive aspects of this revolution, there are also negative ones, leading to a dramatic change in the functioning of individual units in any organization. In order to keep up with the changes, the company must demonstrate a capacity for digitization of its economic activity. This predetermines the purpose of the article, namely to examine the level of digitization of logistics activities in small and medium-sized enterprises in the North-East Region.

1 Introduction

The twenty-first century will be a century of technical development, built on the basis of fundamentally new industrial technologies, electronic control, computer-integrated production activities and the drive to minimize or replace human labor in production and other activities through artificial intelligence. Borders will increasingly blur, and the structure of production will change significantly. The pursuit of complex improvement of technological, auxiliary and informational activities will increasingly be imposed as a main factor for the development of modern production. And this means that on the basis of new communication and computer achievements, nanotechnology and other technical solutions, the structure of production will change globally. In the future, production will be considered as a whole, including both the technique, technological and information processes, as well as functionally integrated production components, including the logistic ones.

The fourth industrial revolution leads to the integration of systems through digitalization between devices using IoT and Cyber-Physical Systems (CPS) [1], called Industry 4.0 [2, 3]. [4] defines Industry 4.0 as “the comprehensive introduction of information and communication technologies (ICT) and their connection to the Internet of Things, Services and Data, enabling real-time production”.
2 Research the level of introduction of digitization of logistics activities in small and medium-sized enterprises in the North-Eastern Region (NER)

The study was carried out through an online survey platform, and 75 respondents from 59 small and medium-sized enterprises in the territory of NER were included in the study. The main sectors in which the research was carried out are transport, tourism and logistics. The survey was conducted in the period 09.01.2023 until 10.03.2023 with surveys completed by low and middle management employees.

According to him, 78% of the surveyed enterprises are familiar with the concept of "digitalization" and only 22% of them indicate that they are not yet (Fig.1). The main reason for this 22% is that the enterprises are managed by managers over the age of 60, who face the following barriers: fear of the unknown, anxiety about lack of knowledge, skills and experience, lack of information about the benefits and effects of digitalization and anxiety about the ability to meet new requirements, insufficient funds to invest in digitization, lack of a long-term strategy, insufficient qualification of employees.

![Fig. 1. Relative Share of Enterprises, Familiar with the Concept of "Digitalization".](image)

When asked "Are you digitizing your supplier relationships?" 45% of small enterprises confirm this, while the results for medium ones show 75% digitization, fig.2. This is due to...
companies' understanding that the company-supplier relationship is one of the most important components of their operation. The successful relationship between the two parties contributes to building the company's image, competitive and market positions (national or international) and last but not least - an opportunity for differentiation.

Fig. 2. Supplier Relationship Management.

To the question "Are you digitizing the management of material resource needs?" 35% of small businesses confirm this, while the results for medium ones show 60% digitization, fig.3. The results are positive, as all the enterprises that participated in the survey have introduced varieties of the MRP-system. The larger percentage of enterprises have introduced this system because it allows them to do preliminary program planning, to plan the quantities of required output products, to plan the capacity and deadlines for production or delivery, and finally - to make an accurate estimate of the deadlines, which would also guarantee the fulfillment of the orders.

Fig. 3. Management of Material Resource Needs.

To the question "Are you digitizing your inventory management?" 36% of small enterprises confirm this, while the results for medium ones show 75% digitization, fig.4. The lower percentage for small businesses is due to the fact that the warehouse space they have is not that large and this is the reason why they do not invest in different software for maintenance and optimization of warehouse stocks. Medium-sized enterprises prefer to use various warehouse management systems because it helps them manage the movement and storage of goods in the warehouse more efficiently, as well as facilitates the activities related to the daily planning, organization and control of goods in the warehouse. According to the surveyed managers, the benefits of implementing warehouse management software are: minimizing errors, no gaps, easy order processing, real-time stock tracking, reduction of overstocking costs, optimal supply chain, etc.
18% of small businesses confirm digitalize the management of the packaging and shipping process against 44% in medium-sized enterprises, fig. 5. The comment from small business managers is that packaging equipment is too expensive and businesses can still be flexible. Managers of medium-sized companies share that with the help of automated packaging solutions, businesses can promptly adapt to dynamic changes in market demand, offer new cuts of existing items and reduce the duration of packaging processes. Among the most interesting and innovative developments for automated packaging equipment are complete robotic palletizing and depalletizing lines, which, with the help of software with intelligent functions, can fully autonomously process different packages and containers with different stacking schemes and place them directly on a system of modular conveyor belts to move them to the next station on the packaging line. Another innovation is mobile HMI terminals with the possibility of remote control. They can feature advanced features such as voice and speech recognition, motion sensors, virtual simulation platforms and augmented reality (according to https://www.engineering-review.bg).

Regarding expedition - small businesses believe that digitization will eliminate the human factor, while medium-sized enterprises are of the opinion that it will not be eliminated, but will only increase its more efficient use. As a result, freight forwarders will focus on their main task, namely attracting new customers or solving problem tasks.

12% of small businesses confirm digitization of distribution and logistics versus 67% for medium-sized enterprises, fig. 6. Within Industry 4.0, and already Industry 5.0, digital solutions are a phenomenon, a driver of innovation and optimization. Thanks to digitization, logistics and distribution are taking on new dimensions, expressed in the Internet of Things (IoT), Artificial Intelligence (AI), Blockchain, wireless solutions, etc.

The surveyed small and medium-sized enterprises are united in one: digitalization has a positive role, which is expressed in increasing the added value, the growth trend, business sustainability, etc.
The main reasons that provoked the need for digitalization of customer relations are not only the large volume with which enterprises communicate, but also the desire to deliver various complex and innovative solutions in various areas of business. In the current "Era of the Customer", consumers are increasingly challenging companies to be more personally oriented. The interviewed managers shared that changes in consumer attitudes are increasingly emotionally oriented, Fig.7. This forces companies to have complete information about each of their customers to be able to use it before, during and after the purchase.

Without a perfect e-logistics supply chain, multi-channel companies cannot succeed today. This is the biggest concern for merchants in almost all parts of the E-Logistics and E-Business chain. For the near future, companies will rely on multichannel. The customer decides when, how and what they want to buy. The dealer builds a direct connection to the customer through services such as e.g. counseling. In the future, the customer, the Internet, logistics and the dealer will be united. Perhaps the definition of e-logistics should be rewritten in the practical use of e-logistics.

Achieving efficiency in supply chains requires good organization and automation of all planning and task execution activities. Digitization makes it easier to achieve high accuracy, thanks to receiving up-to-date data just in time. This also achieves transparency from the highest to the lowest level in the supply chains. The goal is to reduce their duration over time, because this guarantees the competitiveness of the company. In fig.8. it is evident that 48% of small businesses have digitized their supply chain, compared to 70% for medium-sized ones. The difference is again expressed in the scale of the companies. Small businesses are slower in the pace of digitization because, as their managers share, they do not have the amount of finance and human resources that medium-sized businesses do.
Summary figure 9 shows that small enterprises are still catching up with medium-sized enterprises in various indicators. This may be due, on the one hand, to the fact that they do not have sufficient funds to introduce digitization in their activities. On the other hand, a large percentage of small businesses are characterized by slower rates of development, as the human factor also has an impact. Looking at this factor in a positive aspect, however, it can be said that it is about to undergo a positive development, because with the introduction of new technologies, more jobs will be created for more highly qualified employees, which will lead to an increase in the competitiveness of enterprises. Of course, there are also negative consequences of the digitization of processes, such as an increase in the unemployment rate due to job cuts, significant investments for digitization that small businesses do not have, dropping out of the market due to the use of old technologies, etc.

3 Conclusion

Digitization of logistics activities in SMEs will inevitably find its place in business. Businesses that cannot keep pace with their competitors will be squeezed out of the market, which will inevitably lead to their bankruptcy. Enterprises operating in the new industry begin to depend on the pace of digitalization development, and their technological character begins to adapt to the automation nature of technological and information processes.

Based on the survey, the following conclusions can be drawn:

1. Almost all enterprises are familiar with the concept of "digitalization", which shows business literacy in a positive aspect.
2. Medium-sized enterprises are more flexible when it comes to digitization of logistics activities. They have all the necessary resources to keep up with the new requirements of process digitalization. They are ready to face multiple quests of the new era because they have the capacity to do so.
3. Small businesses are cumbersome due to the fact that they lack sufficient financial resources and trained human capital. It is a challenge for them to enter Industry 4.0, but they are still willing to meet its requirements. The management of these enterprises is ready with the idea of full digitization of logistics activities, but more time and investment will be needed for this.

4. With the proper application of digitization of logistics activities, all logistics subsystems can be integrated, including procurement logistics, in-house logistics, distribution logistics, etc., i.e., to create connecting units on which all elements of the logistics system will be built.

5. The focus of digitization of logistics activities should be directed not only to the introduction of new digital technologies, but also to people facing psychological barriers that are the reason for maintaining the status quo.

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