

THE IMPORTANCE AND BENEFITS OF APPLYING SMART TECHNOLOGIES IN THE SUPPLY CHAIN: THE CASE OF AB 'ROKIŠKIO SŪRIS'

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Abstract. *This scientific article explores the benefits of implementing smart technologies in supply chain management, focusing on the case of AB "Rokiškio sūris". It emphasizes the importance of adapting research knowledge to smart technologies within supply chains and their application benefits. The study aims to assess potential benefits and challenges, including obstacles related to integrating smart technologies into the supply chain of a dairy sector company. Through a methodology developed by the author for researching smart technology application in companies, areas for improvement and assumptions for innovative technology implementations are revealed. It reviews the most potentially beneficial smart technologies for enhancing a company's supply chain.*

According to Strandhagen et al. (2017), the use of smart technologies in corporate practices reduces unnecessary operations, makes processes smarter and clearer, decreases labor demand, minimizes paperwork, boosts productivity, changes the methods of information access and processing, improves analysis and control mechanisms, increases profit, and is a key factor in rapid growth and development. The implementation of smart technologies is an ongoing process in logistics, contributing not only to operational efficiency but also to ecological sustainability and CO2 reduction.

The study focuses on the application of smart technologies in supply chains as companies seek more efficient and sustainable operational solutions. Using scientific literature analysis and synthesis, case analysis, and expert surveys, significant conclusions are drawn from the data collected. The results indicate that smart technologies reduce unnecessary operations, make processes clearer, decrease labor demand, minimize paperwork, enhance productivity, and contribute to rapid growth and sustainability.

Based on the findings, recommendations are provided for companies to efficiently select smart technologies for their supply chains. For companies addressing efficiency improvements through smart technologies, it's crucial to correctly identify problems and establish criteria for selecting potential solutions. If a company is large enough and has significant experience in implementing various smart technologies, its specialists can serve as experts in selecting the most significant criteria and participating in further innovation selection and implementation processes.

Keywords: *logistics, supply chain, smart technologies, Industry 4.0, digitalization, artificial intelligence.*

Introduction

In the last ten years, the logistics sector has experienced remarkable growth, further accelerated by recent global occurrences. The introduction of technological innovations has revolutionized logistics operations, promoting the widespread adoption of smart technologies in multiple areas. This shift is largely attributed to the fourth industrial revolution, which has played a pivotal role in advancing the concept of Logistics 4.0. This initiative aims to address individual customer needs through the integration of smart technologies and artificial intelligence, all while maintaining cost-effectiveness.

The investment in smart technologies offers a pathway to achieving efficient operational solutions, cost savings, and enhanced sustainability. Take smart warehouses as an example: they reduce the need for manual labor by automating tasks, coordinating robotic systems for

various operations such as restocking and order fulfillment, optimizing storage methods, planning the routes of autonomous machines, and automating the generation of documents. Furthermore, advanced AI-driven surveillance systems are employed to gather data and monitor warehouse activity. The deployment of these cutting-edge technologies not only elevates the quality of logistics services but also provides a competitive edge (Akkaya and Kaya, 2019). By leveraging modern information and communication technologies, these innovative, digitized networks facilitate direct interactions among individuals, devices, manufacturing units, logistics operations, and products, thereby enhancing the efficiency of the entire supply chain (Winkelhaus and Grosse, 2020).

The possibilities become virtually limitless. As labor costs rise and workforce shortages become more pronounced, businesses are increasingly evaluating the feasibility of investing in smart technologies, the returns on such investments, and the overall value and incremental benefits brought about by these innovations.

This research highlights how smart technologies can transform logistics processes and provide companies with a competitive edge and efficiency in the supply chain.

The objective of the study is to substantiate the benefits of applying smart technologies in the supply chain and to evaluate their impact on the efficiency and sustainability of the supply chain, using AB "Rokiškio sūris" as an example. To fulfill this objective, the research undertook several *key tasks*:

- Conduct a comprehensive literature review on smart technologies in the supply chain to assess current trends and potential future development directions.
- Provide a concept of smart technologies, describe the most commonly mentioned and popular smart technologies in the supply chain in scientific articles, including their respective benefits and drawbacks.
- Conduct an empirical study on the applicable smart technologies in the supply chain of AB "Rokiškio sūris", based on a research methodology developed for applying smart technologies, and conduct an in-depth analysis of the findings.
- Propose targeted strategies and practical interventions for the adoption of smart technologies in AB "Rokiškio sūris" supply chain, aiming to improve the company's operations and strengthen its competitive advantage.

The research method selected for achieving the study's objective was literature analysis and synthesis, including the analysis of scientific articles about smart technologies in the supply chain and their application benefits, as well as good practice examples. Additionally, a company case analysis and an expert survey were conducted. The literature review, an important stage of the study, allowed for a systematic analysis of scientific works on smart technologies in the supply chain and their application benefits. Articles registered in international scientific journals over the last ten years were analyzed, with a systematic analysis including 25 of the most suitable scientific articles selected from 22,100 references.

Besides the literature analysis, an empirical study encompassing a company case analysis was conducted. The research methodology was developed based on the latest practices in implementing smart technologies in the supply chain. An expert survey was chosen to achieve the study's objective, where experts with specific knowledge and experience evaluated the applicability of proposed smart technologies in the supply chain through the quality of provided logistics services and the anticipated benefits of solutions. The analysis of survey results was performed using descriptive statistics methods, diagrams, and calculated characteristics, considering the measurement scales of variables. The survey was conducted in March-April 2023, and the obtained results were included in the research analysis.

The Importance of Applying Smart Technologies

The integration of smart technologies within the logistics sector has emerged as a pivotal factor in the face of evolving challenges and burgeoning opportunities. Highlighting this paradigm shift, the study by Wang, Asian, Wood, and Wang (2019) emphasizes the critical influence of logistics innovation capabilities on reducing supply chain risks in the Industry 4.0 era. New technologies, market entrants, shifts in customer expectations, and innovations in business models necessitate new development directions for the sector to overcome these challenges. According to A. Barczak and others (2019), smart technologies can be employed to improve and facilitate work across all logistics areas: transportation, warehousing, production, and supply chain management. Production is increasingly tailored to individual needs, benefiting customers but putting pressure on supply chains. Overall, the sector faces significant pressure to provide better services at lower costs.

Consumers have rapidly shifted to purchasing goods online and using services like "Omniva", "DPD", or other parcel lockers, and "Bolt food" or "Barbora" for food delivery. Expectations for all these services focus on simplicity, speed, and convenience. The same is true for logistics processes. In many modern companies, orders are formed automatically, and the customer receives an automatic order acceptance confirmation. The warehouse management system automatically processes the order, selects the most appropriate goods, and the methods and means to execute the order. Often, the ordered product is automatically delivered to packing or checking areas, generating a dispatch document with a two-dimensional barcode (QR) or radio-frequency identification (RFID) for easy and automatic further distribution in the logistics chain until it reaches the final recipient. Customer order information is collected and used for data analytics.

In today's business environment, business innovations must be adapted for widespread use. The broader the scope of innovation, the lower its implementation cost for individual businesses, hence the expanding system integration, with specific tasks being transferred to individual platforms centrally used by many customers. For instance, as stated by Huang and others (2022), and Klapita (2022), the Electronic Data Interchange (EDI) standard encompasses the entire supply chain - the customer pays only a subscription fee or a small fee for each document, while the EDI provider, covering a large market share, invests in further system adaptability and improvement. The study by Patil and Jadhav (2021) emphasizes the significance of the Electronic Data Interchange (EDI) systems, illustrating its pivotal role in streamlining data communication processes.

Analyzing recent years might suggest that businesses have already digitized the majority of their processes. However, the emergence and rapid spread of Artificial Intelligence (AI) indicate that we have only made modest progress in digitization. In the future, significantly more processes will undoubtedly be digitized. Organizations aiming for success must focus on the future, carefully examining and evaluating signals revealing innovation opportunities. Those capable of identifying and correctly assessing future trends and signals, and possessing a long-term strategic vision, can expect better financial results, develop stronger competitive advantages, and achieve faster growth rates.

According to Feng and Ye (2021), AI is increasingly used in business processes, becoming an assistant and advisor, entrusted with more complex tasks. Business needs are gradually shifting from Excel calculations to those performed with AI assistance. The application possibilities of AI are indeed vast, ranging from customer service robots, warehouse management systems, to autonomous loaders performing independent operations. It's likely that human involvement in business processes will become increasingly rare. Phone calls will less

frequently be answered by a human voice, and the sight of humans operating mechanisms or performing routine tasks will become rarer. These trends will bring their own challenges for companies, which should be thoughtfully considered and prepared for in advance.

Smart Technologies in Supply Chain Management

Following the analysis of scientific literature sources and aiming to formulate the problems more precisely, below are presented definitions of smart technologies by various authors, highlighting the key features (Table 1).

Table 1. Definitions of Smart Technologies (compiled by the author)





Author & Year	Definition	Key Features
Casciati (2018)	Smart technologies are devices that integrate sensing, processing, and communication capabilities to collect and share information and respond to user needs.	Smart devices, information sharing, responding to needs.
Wang (2019)	Smart technologies are a combination of sensor, communication, and decision-making capabilities that allow for autonomous, proactive, and adaptive behavior	Integration of sensor, communication, and decision-making capabilities enabling behavior.
Gunasekaran et al. (2017),	Smart technologies are a set of technologies that are interconnected and work together to process data, generate insights, and automate processes.	Technology union, a set with a common goal/task, working towards generating insights and automating processes.
Chen et al. (2019))	Smart technologies are systems that utilize advanced data analytics and algorithms to improve efficiency, accuracy, and decision-making in various fields.	systems that process data intelligently to enhance efficiency, accuracy, and decision-making
Yilmaz et al. (2020)	Smart technologies are systems that use advanced sensors, data analytics, and artificial intelligence to enable decision-making in real-time, automating and optimizing processes	Systems employing advanced sensors, data analytics, and AI to make decisions, automate processes

In summary, based on the analyzed scientific articles, smart technologies in the supply chain are described as innovative digital solutions aimed at optimizing processes, efficiency, and resilience. The importance of building resilient supply chains to mitigate disruptions has been extensively discussed in recent literature (Katsaliaki, Galetsi, and Kumar, 2022). These solutions enable organizations to track and analyze data in real time, forecast trends, automate workflows, and ensure high customer satisfaction. Proper integration and interaction of smart technologies are crucial, emphasizing not only the innovations themselves but a comprehensive approach to their implementation. Authors Shcherbakov and Silkina (2021) argue that increasingly complex logistics processes demand more management resources and create a greater need for integration. According to Cimini et al. (2020), Logistics 4.0 has ushered in a transformative view on human labor, positioning employees as "Operators 4.0" through enhanced interactions with smart devices. The research by Edirisinghe and Tadesse (2020) emphasizes the importance of a meticulous evaluation process when integrating smart technologies. This process should encompass a comprehensive assessment of financial viability, maintenance demands, and the adaptability of the technologies to ensure the most suitable solutions are adopted. Their work underscores the critical need for strategic decision-

making in the implementation of smart technologies to achieve optimal outcomes in finance, maintenance, and adaptability.





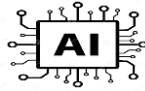


Smart technologies in the supply chain can be divided into countless new and still developing technologies. For efficiency, it is important to integrate smart technologies and adapt them to existing systems. Smart technologies in ongoing logistical processes encompass a vast amount of digital information, facilitating the execution of processes. These technologies are used in all stages of the supply chain.

Table 2. Smart technologies in supply chain, advantages and disadvantages (compiled by the author)

Technology:	Description:	Advantages:	Disadvantages:
Robotization and Automation Marchuk et al. (2020) 	Robots used in warehousing include sorters, pallet-loading robots, wrapping robots, etc., to help automate warehouse operations.	Reduces the number of errors and the risk of human injuries. Increases the efficiency of warehousing operations. Enhances productivity and reduces costs. Decreases the workforce and improves delivery and warehousing efficiency;	Problems with navigation Insufficiently developed, unified technologies. Complex interaction with humans in the same space.
Big Data Ivanov, Dolgui (2020) Hopkins, Hawking, (2018) 	Efficient processing of large volumes of structured and unstructured analytical data from various sources using software tools for their further efficient use.	Reduces human involvement in the decision-making process. Continues self-learning to optimize warehouse processes. Analyzes obtained results and implements necessary changes (forecasting demand fluctuations, detecting seasonality, optimizing warehouse processes, etc.).	The full potential of the technology is not fully utilized. Obstacles encountered in collecting and processing data.
Blockchain Dobrovnik, et al. (2018) Edirisinghe, Tadesse, (2020) 	Data and document exchange management system based on a decentralized blockchain.	Transparent, decentralized, and secure data exchange between parties. High security and traceability. Elimination of manual document entry, reducing errors. Simple document verification and speed. Encoding, sending, decoding, receiving, and even money transfers can occur automatically	Developing technology. Lack of unified standards. Minimal legal regulation. Requires deep IT knowledge and extensive coding. Complicated integration with existing programs. Uncertain whether one or two dominant solutions will emerge or several competing solutions.
EDI Huang et al. (2022) 	The formation, filling, and transmission of structured document data according to respective standards, allowing for the automated sending, receiving, creation, and processing of various electronic documents by integrating them with the used information systems.	Significantly streamlines the document management process. Increases sales. Reduces the number of human errors. Lowers inventory levels. Enables an automated data processing process. Reduces workplace expenses. Decreases pollution by eliminating paper	Low level of data security. Underutilized technology. High cost. High degree of integration required. Requires allocation of IT infrastructure and labor time for implementations and adjustments.

Following is a table compiled by the author, listing the smart technologies most commonly mentioned in scientific articles as used in supply chains, revealing their advantages and disadvantages (Table 2).

Table 2 (continued) Smart technologies in supply chain, advantages and disadvantages
(compiled by the author)

Technology:	Description:	Advantages:	Disadvantages:
RFID Vukićević et al. (2021) 	Utilizes radio frequencies to read and record information stored on tags, widely used in warehousing and rapidly advancing in technology.	Faster and more comprehensive inventory management. Simplifies inventory and accounting. Reduces the likelihood of theft. Decreases errors and improves control over goods movement. Reduces stock storage time.	Higher costs compared to paper labels. Radio wave interference can reduce effective scanning distance. Low data security.
Internet of Things (IoT) Tu (2018) 	Devices that interact over the internet, including industrial devices for measuring and collecting data or controlling remote devices. Real-time business process management.	Increases supply chain speed. Provides data availability and possible feedback. Allows for communication between various devices and managing warehouse energy costs, productivity, tracking inventories, and monitoring workplace safety	Requires integration with warehouse management and business management systems, which should be cloud-based. High demand for IT work. Security issues.
3D Printing Akkaya and Kaya, (2019) 	allows the creation of required products and components from plastic, metal, and even human tissues based on computer 3D modeling.	Accelerates production speed and reduces costs. Customer-oriented - the product can be individually customized. Reduces negative environmental impact. Shortens the supply chain, reducing the need to store and keep goods	Limited size of products. High prices for raw materials for production. High energy consumption. Relatively limited selection of raw materials. The technology is still in the early stages of development
Cross-docking Marchuk et al. (2020) 	A service for receiving and distributing goods without placing them into long-term storage.	Reduces goods processing costs. Decreases warehouse storage time for goods. Increases warehouse turnover. Lowers storage costs. Reduces negative environmental impact	Incoming goods must be suitable for further distribution (without requiring additional operations such as repackaging, labeling, etc.). sufficiently large quantities are required
AI Feng and Ye (2021) Pandian (2019) 	Smart devices capable of performing tasks that typically require human intelligence.	Ensures data security, reliability, traceability, and authenticity. Reduces errors (eliminates the need for paper documentation). Increased efficiency..	Significant IT resources required. Clear, separate, and unified processes must be defined for AI to undertake.
Drones Akkaya and Kaya, (2019) 	Automated autonomous vehicles used in warehouses to reach goods from hard-to-reach places and manage inventory.	Flexibility in storing goods at various heights. Reduced time to retrieve goods. Reduction in labor force. Efficient inventory accounting.	Limited safety in motion. Low power and insufficient autonomy. Inability to use GPS indoors. Lack of a legal framework.
Autonomous Transport Marchuk et al. (2020), Hsia et al (2018) 	Autonomous vehicles designed to reduce manual human labor in warehouses for storing goods.	Reduction in labor force. Efficient inventory management. Reduction of human errors. The technology can operate 24/7. Reduces workplace expenses. Decreases thefts and damages.	Expensive and complex implementation. Often requires separation from human traffic. Requires previously installed advanced warehousing systems and their integration

After conducting a literature analysis, the main groups of smart technologies in logistics were identified, each characterized by its unique benefits and potential drawbacks. The necessity of a thorough market and organizational analysis, coupled with an anticipation of future trends and opportunities in smart technology adoption, is paramount. Edirisinghe and Tadesse (2020) underscore the importance of a comprehensive evaluation process that considers all available alternatives to identify the most suitable smart technology solutions. This process should critically assess each option's financial implications, maintenance requirements, and overall applicability to ensure that the chosen technologies align with the organization's strategic goals and operational capabilities. Such a diligent approach is vital for leveraging smart technologies to enhance operational efficiency and adaptability effectively.

The deployment of smart technologies in the supply chain management means integrating advanced digital solutions such as IoT, artificial intelligence, blockchain, and big data analytics. In the face of escalating labor costs and workforce shortages, companies are re-evaluating the opportunities to invest in smart technologies, rethinking the return on new projects, the benefits generated by innovations, and their added value. The incorporation of smart technologies is increasingly acknowledged for its instrumental role in elevating logistics service quality and carving out competitive advantages in the industry. According to (Sokchoo et al., 2021), the integration of multi-expert systems like SFlex-warehouse management systems into logistics highlights the transformative potential of Industry 4.0 technologies in enhancing operational efficiency. As highlighted by Akkaya and Kaya (2019), such technological advancements facilitate the pursuit of excellence in logistics operations, enabling organizations to outperform their rivals. This strategic application not only optimizes service delivery but also plays a crucial role in navigating the competitive landscapes of modern business ecosystems.

The adoption of the latest cutting-edge information and communication technologies has ushered in a new era of advanced and digitized network systems. These systems enable seamless interactions between people, devices, factories, logistics operations, and products, significantly enhancing the efficiency and responsiveness of supply chains. Winkelhaus and Grosse (2020) have identified this integration as a key driver for operational excellence and innovation within the logistics sector. Concurrently, the evolving landscape of customer expectations demands that supply chains become more agile, transparent, and responsive. Shcherbakov and Silkina (2021) further emphasize the necessity for supply chains to adopt demand-based models and integrated business strategies to stay competitive. This dual approach not only addresses the immediate needs of the market but also positions businesses for long-term success by leveraging smart technology to navigate the complexities of modern supply chains effectively. Changing customer needs, increasing information requirements, evolving and accelerating supply chains, and the desire to reduce risks also drive changes. The implementation of smart technologies in the supply chain is often an appropriate way to help companies manage unexpected problems and risks. Supply chain risk management, using smart technologies and innovations, plays a critical role in developing supply chain resilience and achieving organizational sustainability.

One interesting approach suggested by experts to handle the growing complexity of processes and new technologies is the use of integrated, centralized management platforms. These platforms move operations to online spaces and bring together many companies. The main ideas behind the success of this business model are using large-scale operations to offer good services at competitive prices, combining resources for better outcomes, and making a profit. This method focuses on connecting different businesses through a single online platform to work more efficiently, improve the quality of services, and stay competitive in the market.

Results of the Expert Survey

After conducting the literature analysis and to grasp the significance and benefits of smart technology applications within a company's supply chain and its enhancement, an empirical study was deemed necessary. Expert evaluation was chosen as the methodology, selecting 10 experts—employees in leadership positions within the companies' group related to the supply chain, who possess sufficient experience and competencies. The consistency of experts' responses was verified using the Kendall concordance coefficient.

After the expert evaluation on the benefits of applying smart technologies in the supply chain of AB "Rokiškio sūris," the aim was to propose the most suitable solutions for improving the supply chain. The survey consisted of 13 closed and open questions, based on which the gathered information was summarized. When asked about the use of smart technologies in the company's logistics activities, the majority of experts responded positively, indicating their use and intention to expand the use of smart technologies in the future. This demonstrates that most experts have a positive view of smart technologies, understand their benefits to the company, and believe that expanding the use of smart technologies and introducing innovations will lead to even better performance results. Experts agree that smart technologies, in most cases, have a significant positive impact on the company's logistics results, and these solutions serve well to improve and optimize operations.

Upon querying the experts about the use of smart technology-supported technologies in their departments or the likelihood of their future implementation, most experts mentioned several currently used technologies and the aspiration to implement more in the future. Among the implemented technologies in departments, warehouse management systems, EDI data exchanges, double-decker trucks, technologies related to automation and robotization, and smart video surveillance systems were most frequently mentioned.

Using smart technologies to fix supply chain issues, the experts shared that these technologies are especially useful for reducing human mistakes and better predicting when demand goes up or down unexpectedly. They pointed out that it's becoming more common to see sudden big changes in demand. For example, if a major customer doubles their usual order, the production order might more than double, leading to too much raw material being ordered and the risk of overproduction. Experts daily face problems due to underestimated demand fluctuations and put considerable effort into effective communication with internal and external supply chain participants, aiming to make long and short-term forecasts. For several years, the company has been hiring external consultants, conducting training related to planning and inventory management. Based on the responses, a proposal for implementing an inventory management and planning system was included in the suggestions and recommendations.

Cost Analysis – Experts assessed that the most significant costs in the supply chain are attributed to employee maintenance/management, transportation/shipping, and equipment acquisition and maintenance. Based on the proposed criteria for implementing smart technologies in the supply chain, a ranking was performed to identify the most critical criteria for selecting smart technologies. According to experts, the most important criterion is "Service quality, quick response to malfunctions," followed by positive reviews about the technology-implementing company and warranty. This demonstrates experts' considerable experience in implementing various projects in supply chains. In deploying complex projects, promised short service completion times may indicate a dismissive attitude, while the lowest price and costs might suggest insufficient functionality.

According to the experts, the most critical factors influencing the implementation of smart technologies in a company are the positive attitude towards innovation and the desire to reduce

costs by the management and owners. Managers and owners view smart technologies through the lens of investment, and they are usually in favor of projects with a tangible, calculated payback period. When asked how they would like to improve the company's operations or processes by implementing smart technologies, experts indicated a strong preference for reducing operational costs in the supply chain, enhancing the efficiency of current tasks, reducing manual labor, and minimizing human errors. The experts' recommendations on what would potentially bring the most benefit include an innovative warehouse management system and order planning systems. The survey of experts and the publication/summary of the obtained results were beneficial for the company and pushed towards the adoption of the suggested smart technology implementations. It was revealed that experts have a positive view of innovations in the supply chain, as well as the company's and management's approach to implementing smart technologies in supply chains. The experts see a lot of benefits in many innovations and hope that some of them will be applied/implemented in the company.

Choosing the best solution, a mechanism was proposed to select the best technology for implementation, applying a technology assessment questionnaire, creating an innovation implementation plan in the company, appointing responsible individuals, deadlines, funds, and control points based on Drejeris (2015). To find the best technologies, it is crucial to conduct a comprehensive market analysis to better understand the choices of technologies, their advantages and disadvantages, as well as the technologies used by competitors and their advantages. When selecting technologies, it is important to consider productivity and efficiency to determine how much time and resources will be needed for the technology to be effectively implemented and used. It's also important to consider the availability of technologies and their acquisition costs. Furthermore, evaluating the support and maintenance of technologies is crucial to ensure their longevity and operational efficiency. Literature analysis and empirical research have shown that smart technologies in the supply chain can offer numerous advantages, including cost savings, improvement in the quality of logistics services, and competitive edge. This indicates that smart technologies are a significant factor in achieving more efficient operations, higher profitability, and sustainability. The latest information technologies and advanced network systems allow companies to efficiently manage the supply chain, ensuring close connections between people, devices, factories, and products. These results emphasize the importance of smart technologies in the business logistics field and their potential to increase operational efficiency and competitive advantage.

Conclusions

In synthesizing the wealth of scholarly literature on the integration of intelligent systems within logistics frameworks, this study underscores the pivotal role of smart technologies in refining and substantiating the theoretical underpinnings of their deployment. It reveals the latest applicable smart technologies, their advantages and disadvantages, and disclosed managerial decisions for applying smart technologies. Authors of the examined scientific articles unanimously positively assess the benefits of Industry 4.0 innovations, noting the benefits provided to consumers and supply chains. Various sources' analysis of smart technologies and supply chain concepts reveals that a supply chain is a system encompassing all efforts in delivering or producing a product and supplying it to the client or end-user, including collaboration with other companies through the supply chain to benefit customers. Smart technologies can be defined as all smart technologies that allow improving, optimizing, and expanding the capabilities of applied logistics systems in the supply chain. The concepts are related in that the goal of the supply chain is operational efficiency, and smart technologies

significantly contribute to achieving these goals. Most smart technologies are compatible and complementary to each other. When applying smart technologies, proper integration of innovations, their interconnection, and proper interaction are very important. It's not just about the innovations themselves but a comprehensive approach to them.

Smart technologies can be defined as all smart technologies that allow improving, optimizing, and expanding the capabilities of applied logistics systems in the supply chain. Described most commonly encountered smart technologies in the supply chain, their advantages and disadvantages reveal that the main groups of smart technologies in logistics include Robotization, Automation, Big Data, Drones, 3D Printing, Cross-docking, Autonomous Transport, RFID, EDI, Blockchain, AI, and the Internet of Things. Many of these technologies work well together, complementing each other's functions. However, each comes with its unique set of pros and cons. Therefore, it's crucial to carefully examine the present logistics environment and consider future trends and opportunities to make the most out of these smart technologies.

The expert survey revealed that the company participates in the entire supply chain – i.e., it is a buyer, carrier, manufacturer, and seller. The company is oriented towards innovations and new technologies but does not chase them recklessly. It was found that experts positively assess innovations in the supply chain, and the company and management's attitude towards the implementation of smart technologies in supply chains. It can be stated that the expert survey and the publication/summarization of the obtained results were beneficial to the company and pushed for the proposed implementation of smart technologies. Experts see a lot of benefits in many innovations and expect that some of them will be adapted/implemented in the company.

Based on experts' responses, it was determined that a potentially most beneficial and proposed technology for near-term implementation is the order planning system, which would cover the entire company's supply chain, likely saving several jobs across the company, and would have a quick payback. The company is recommended to implement an order planning system that would help more accurately predict demand fluctuations and more efficiently allocate available resources. The system would be successfully integrated into the existing company's logistics and business management systems and create a positive impact in many departments. The selection and implementation of the order planning system are suggested to be performed using the methods described in the document, where the best solution is chosen using the proposed questionnaire, and the selected technology is applied for implementation. Successful implementation of the order planning system would achieve direct benefits such as labor savings, cost savings on premises, "extracting" working capital from inventory, increased company turnover, and improved production processes. Indirect benefits could include employee satisfaction, a higher level of work quality regardless of personnel changes, faster and simpler decision-making, more sustainable company operations, data integration, security, improvement of the company's image, and an increase in prestigious profit.

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