

# Automation of logistics processes in direct trade between producers and the restaurant sector

Rovshan Rasulov<sup>1</sup>

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**Abstract.** This article examines the process of automating supply chain management systems and the deployment of digital platforms to facilitate direct trade between restaurants and manufacturing enterprises. The research is aimed at simplifying and optimising processes through integrated systems. A mixed-methods approach was employed, consisting of a systematic literature review and collecting primary data via a survey. Specifically, the authors distributed structured questionnaires to senior business logistics managers from various companies, selecting 50 managers with diverse managerial qualifications using purposive sampling. The study revealed that integrating inventory management systems into the supply chain network reduces supply chain costs by 20%, while order fulfilment accuracy improves by over 30%. It also showed that processes such as queuing could be reduced by approximately 40% without incurring additional costs when digital systems, such as EDI, are used in conjunction, which proves particularly beneficial in the restaurant industry. SEM analysis confirmed that service automation enhances service speed ( $\beta = 0.45$ ) and service satisfaction ( $\beta = 0.40$ ). The findings underscore the need to justify the shift to digital solutions to increase market competitiveness. Further research should focus on evaluating the sustainability of automation and the institutional characteristics of the studied countries, which goes beyond the scope of this study.

**Keywords:** business logistics, digital platforms, integrated systems, process optimisation, supply chain management.

## INTRODUCTION

Increasing competition among food manufacturers and service providers is reshaping the importance of technology and innovation for transforming internal processes and external market relations. The rapid pace and efficiency of food delivery, takeaway, and other food ordering services compel companies to employ modern mechanisms and enhance operational processes. According to statistical data, approximately 75% of companies operating in the logistics sector have implemented supply chain management systems (Carone, 2018; Moriya et al., 2019). This trend enables management to reduce costs, but more importantly, it improves service quality, which is

crucial in contemporary society, particularly in the case of restaurants.

Automation encompasses a range of technologies, including artificial intelligence, the Internet of Things, robotics, and others, enabling restaurants and manufacturers to interact efficiently. Their combination addresses issues such as order accuracy, effective inventory control, and delivery times (Dashko & Mykhailichenko, 2021; Kota, 2019). One example is an automated restaurant inventory management system, which can predict future sales of different menu items by analysing past sales performance on various days and occasions. This helps restaurants maintain

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<sup>1</sup> Rovshan Rasulov

Founder & CEO of Rgand, Founder of Direct Trade Foundation, Baku State University, Baku, Azerbaijan, <https://orcid.org/0009-0001-8720-4895>

inventory control, avoiding shortages or dead stock, thus preventing losses. It has also been found to enhance customer service, as popular dishes can be guaranteed (Kumar et al., 2021; Müller et al., 2020; Taigel & Meller, 2018).

The implementation of automated logistics processes also comes with specific challenges. These include high initial implementation costs, employee acceptance of such changes, and the ongoing need for technological support (Accorsi et al., 2017; Jagtap et al., 2020). Despite these challenges, the benefits of automation are likely to outweigh the drawbacks. Logistics companies that automate their operations can improve them by over 20–30%, thereby gaining a competitive edge (Dolati Neghabadi et al., 2021; Granlund & Wiktorsson, 2014; Nascimento & Silva, 2017).

Changing trends in the restaurant industry are forcing companies to move beyond operational efficiency and re-engineer their logistics systems to adapt to new consumer habits. There is a growing call for synchronising automation strategies with organisational strategies. Organisations integrating automated logistics systems into their overall business strategy are better positioned to respond to market challenges, increasing their competitiveness and market resilience (Bał-Sokolowska, 2018; Zota & Ciofica, 2015).

This study assesses how logistics changes, driven by automation, impact direct trade between manufacturers and restaurant establishments. It focuses on automation technologies used, barriers to their implementation, and product quality and customer satisfaction outcomes. The goal is to provide recommendations for organisations seeking to optimise their logistics processes through automation.

### ***Research Problem***

Direct suppliers' provision of logistics services in the restaurant trade has undoubtedly driven the evolution of processes within the system. In this scenario, exploring how automated processes can enhance operational efficiency and product quality has become more than necessary. However, while the number of companies adopting automated systems is increasing, many remain unaware of how to leverage them to improve logistics activities. The growing availability of automation tools on the

market brings advantages and disadvantages, making it essential to adapt to the ever-increasing market demands continuously.

Nevertheless, most previous studies have explored aspects of automation, such as its cost and efficiency, but have rarely focused on the hospitality sector. There is a significant lack of literature explaining these automated logistics systems' theoretical foundations and understanding and how corporations can effectively utilise them in business competition. Moreover, much of the existing literature focuses on simplifying and disseminating technologies, overlooking some of the inhibitors of technological progress, such as reluctance to change and the cost of technology, which can become barriers to any advancement.

The primary aim of this study is to fill such gaps by closely examining the impact of automation in logistics on product quality, customer satisfaction, and competitive advantage. By analysing these aspects, the work will contribute to the body of knowledge for academics and practitioners, promoting the practical application of logistics automation technologies in the restaurant industry.

### ***Research Focus***

This study explores the opportunities for improving efficiency and competitiveness in restaurant supply chains through logistics automation. Additionally, the research evaluates specific technologies at the forefront of the automation process, the challenges in implementing the process, and the contribution to product quality and customer satisfaction.

### ***Research Aim and Research Questions***

The main aim remains to assess the impact of logistics automation on trade interactions between suppliers and food business operators. The specific questions this research will address are as follows:

1. What critical systems support logistics automation processes in the restaurant industry?
2. How do these automated systems for executing food preparation and service processes impact product quality and customer satisfaction?
3. What barriers do companies face in automating their logistics operations, and how can these barriers be overcome?

## LITERATURE REVIEW

Due to technological advancements and growing competition, the need for automating logistical processes to facilitate direct distribution of goods—specifically from manufacturers to food service establishments—has become increasingly apparent. Over the past few years, numerous scholars have examined the benefits of business process automation, focusing on reduced operational costs and enhanced customer service quality. For instance, companies implementing automation technologies can reduce operational costs by 20–30% and accelerate order processing by 50% (Donald, 2020; Marcondes e Santos, 2014).

Key technologies that enable increased automation include inventory management systems, integration with marketplaces, and artificial intelligence for demand forecasting. For example, platforms like FoodServiceDirect connect manufacturers with restaurants, shortening supply chains and eliminating intermediaries. Implementing such platforms can reduce the time from order placement to delivery by 40% (Carone, 2018; Moriya et al., 2019). This order fulfilment time is critical in the restaurant industry, where the quality of services determines customer satisfaction levels.

Inventory management systems, specifically Enterprise Resource Planning (ERP) systems, help organisations better manage their stock. Seventy per cent of food companies already use analytics for demand forecasting, avoiding overstocking or stockouts (López-Gómez et al., 2020; Romanenko, 2017; Sharma et al., 2021). This also leads to cost reductions and increased profitability. Accurate demand forecasting allows manufacturers to organise production processes efficiently, reducing storage times and transport costs.

Successful management of logistical activities largely depends on data analysis. Modern analytical tools go beyond simple demand forecasting and aim to optimise all aspects of the production and supply processes. Recent studies have shown that more efficient data analytics implementation can improve supply chain performance by 20–30% (Mani Sekhar et al., 2020; Rahimi et al., 2020). All these aspects combine to provide a comprehensive understanding of the market, enabling informed decision-making.

Analytics also ensures product quality control. For example, restaurants that have implemented automated quality control systems reduce the number of defective products by 30% (Berezhnytska, 2018; Kravets & Zenkin, 2016; Polinkevych & Zenkin, 2016). This enhances brand image and builds consumer trust. Since data analysis oversees most elements, issues are detected early before they escalate, significantly reducing potential losses.

Despite these numerous benefits, many organisations face substantial challenges in integrating automation. Fifty per cent of business organisations cite structural rigidity as the main obstacle to technological advancement (Danneels et al., 2017; Palomino-Tamayo & Timaná, 2021; Rinta-Kahila et al., 2016). This is often due to inadequate staff training and the need to invest in new systems and solutions. Without practical training, employees may struggle with new systems, undermining the goals of automation.

Organisational culture is critical to the success of any automated processes. Companies with modern, adaptable cultures are over 30% more likely to successfully implement new technologies (Abdul Hadi & Wajih Zarzis, 2017; Jivan et al., 2020; Lakhwani et al., 2020). For example, Starbucks, with its innovation-oriented culture, successfully implemented a mobile ordering system, resulting in a 15% revenue increase (Rodriguez, 2020).

Moreover, automation directly impacts product quality. Yu et al. (2020) argue that adding an automated quality control system can reduce product defects by up to 30%. This improves brand image and builds consumer trust. Restaurants implementing automated quality control systems received 25% more positive customer reviews, suggesting that automation reduces costs and improves customer satisfaction.

Employee training is fundamental to the success of automation. Organisations that allocate resources to training are 40% more likely to succeed in implementing new systems (Dolati Neghabadi et al., 2021; Granlund & Wiktorsson, 2014; Nascimento & Silva, 2017). In addition to providing technical courses, organisations must also focus on enhancing communication and team dynamics, as these are crucial for fostering

a comfortable working environment with the new systems and improving overall productivity.

Market data indicates that businesses that implement automation tend to have higher performance metrics. For instance, Starbucks reduced customer service times and increased sales by 15% thanks to its automated ordering and delivery systems (Rodriguez, 2020). Some restaurants have adopted mobile apps for order placement, improving order management efficiency and reducing the likelihood of processing errors.

Automation has also increased business flexibility. Automation enhances supply chain resilience, enabling quicker responses to market changes (Dolati Neghabadi et al., 2021; Granlund & Wiktorsson, 2014; Nascimento & Silva, 2017). This capability is crucial during extreme events, such as the COVID-19 pandemic, which disrupted many supply chains. Companies that have implemented automation can maintain operations during lockdowns, reducing risks and increasing productivity.

## RESEARCH METHODOLOGY

### *Research Design*

This study employed a mixed-method approach comprising a systematic literature review and primary data collection through surveys. This allowed for exploring theoretical aspects and the practical application of automation in logistics processes in direct trade between manufacturing companies and the restaurant sector. The study began with an extensive literature review to classify and analyse fundamental concepts, existing trends, and research gaps related to logistics process automation, supply chain operational efficiency, and integration technologies.

### *Sample and Participants*

Data were obtained from a survey conducted across 50 food logistics companies, providing a representative sample of firms of varying sizes and operational types. Among the respondents were large, automated distribution centres and smaller companies that are sufficiently creative and resourceful to remain competitive.

The sampling procedure followed a stratified random sampling approach, enabling the inclusion of active companies from different categories and ensuring fair representation

In light of the above, our research focuses on identifying potential automation strategies affecting logistical processes in direct trade. Determining the most effective technologies and methods to improve the interaction between suppliers and restaurants today is essential. This involves exploring the challenges that hinder companies from using certain technologies and offering suggestions on addressing these issues.

Thus, it can be assumed that implementing automation systems in direct trade logistics can significantly enhance efficiency and service quality. Organisations must focus on training, data analysis, and technology to optimise the impact and enable all active participants to work seamlessly together. The most significant opportunities for transforming the restaurant logistics sector include inventory management systems, data management systems, and automated quality control systems. Implementing these new technologies will improve business processes and strengthen customer loyalty, which is crucial in today's market.

across target groups (i.e., large, medium, and small enterprises). This approach facilitated a comprehensive perspective on the impact of automation on food logistics regarding the range of stakeholders involved.

### *Survey Design*

A structured questionnaire was developed to gather comprehensive data from all organisations involved in food supply operations for the restaurant industry. The survey included closed-ended questions (yielding numerical data) and open-ended questions (yielding descriptive information). Nearly all closed-ended questions focused on specific automation solutions, such as inventory management systems, logistics support tools, etc. Meanwhile, open-ended questions explored participants' views on the impact of such technologies and the challenges they faced in their implementation.

A pilot study with select stakeholders was conducted to gain insights, enabling adjustments to the survey instrument. This ensured that the clarity and relevance of the questions were optimised, helping to improve the instrument and provide a thorough report on the various logistics practices.

### ***Data Collection***

The study involved 50 establishments actively engaged in the food supply chain, from production and distribution to logistics adequacy, as they implement automation in their restaurant supply processes. Potential respondents were invited to participate in the study, explaining the research's purpose and assuring their responses' confidentiality.

Data was collected using structured, closed-ended and open-ended questionnaires completed by respondents between September 1st and 21st, 2024. A follow-up reminder was sent to those who did not return their completed surveys on time, helping increase the number of responses and contributing a wealth of data for analysis.

### ***Data Analysis***

The data were analysed using the Structural Equation Modelling (SEM) method, which is particularly effective in detecting correlations between observed and latent variables associated with automating inherently complex logistics processes. This approach is helpful in cases involving multiple outcome variables.

A theoretical model was initially developed based on the existing literature review and primary data. This model established relationships and causal links between automation processes, such as automated inventory management systems, electronic order processing, and supply chain analytics, and outcomes, such as efficiency and agility.

Factor analysis was employed to assess the consistency and validity of the constructs, enabling the examination of whether the observed measures were aligned with the latent measurement factors developed. Additionally, a path analysis was conducted to evaluate the statistical significance of the relationships between variables, which allowed for measuring the strength and direction of these relationships, thus enhancing the understanding of the impact

## **RESULTS**

### ***Structural Equation Modelling (SEM) Analysis***

The SEM analysis of the survey results revealed various components of how and to what extent automation influences the efficiency and competitive advantages of supply chains in the restaurant industry. The study involved 50

of automation on logistics processes.

### ***Measurement Model***

In its simplest form, the model examined the relationships between latent and observed variables responsible for operational efficiency and responsiveness in the restaurant business. In this case, latent variables included factors like the automation of inventory management systems, digital ordering systems, and data collection services for supply chains. Observing variables, such as respondents' answers to survey questions, were required to evaluate these latent variables.

The model incorporates SEM to analyse causal relationships and assess how automation processes in the food industry contribute to overall operational and production efficiency. Thus, the proposed model captures all aspects of modern technologies impacting business operations in this sector.

### ***Tools and Procedures***

A structured questionnaire was used for data collection to gather comprehensive information on the logistics automation strategies of the firms involved in the study. The questions were designed to collect quantitative data (such as the total costs of automation technologies) and qualitative data (such as how the technology was utilised).

Through closed-ended questions, respondents were able to provide specific answers, the accuracy of which allowed for the statistical analysis of particular figures and trends. The open-ended questions went further by offering a deeper understanding of the trends reflecting the state of the companies and challenging their reliability. A printed version of the questionnaire was reviewed by practitioners in the relevant field to ensure that it appropriately met the study's objectives.

By employing this method, the study seeks to understand how logistics automation affects supply chains in the restaurant industry.

establishments, 30 owned by medium and large enterprises, allowing us to collect reliable data on the use of automation equipment. In addition, key factors driving business processes were identified, as were the main obstacles organisations face when transitioning to technological solutions.

In logistics, automation incorporates various technologies, including inventory management systems, artificial intelligence (AI) for demand forecasting, and market connectivity. The study highlights that supply costs can be reduced by twenty per cent through AI-based demand forecasting systems, which is a significant relief for restaurants that typically experience fluctuations in product demand. This underscores the necessity of adopting modern technologies to enhance business adaptability to market changes.

Thus, the study's findings suggest that automation not only improves business processes but also offers new competitive strategies for firms operating in the restaurant industry. With ever-changing consumer tastes and market forces, any modern organisation must implement automation to remain competitive and successful. The subsequent conclusions reflect these interconnections through tables measuring their impact on supply chain efficiency, operational performance, and competitive advantages.

***Impact of Automation on Supply Chain Efficiency***

The survey results on the automation of logistics processes indicate a positive impact on

improving the supply chain within the restaurant business. Implementing inventory management systems with demand forecasting algorithms can help reduce storage costs. For example, restaurant managers who utilised these systems reduced their expenses by 15-20%. As a result, this enables organisations to cut costs while ensuring customers always have the necessary ingredients in stock.

AI-driven demand forecasts show that companies can increase order accuracy by up to 30%. This is crucial as order accuracy improves customer satisfaction levels. Given that speed of service is paramount in the fast food industry, businesses that incorporate automated systems tend to have a competitive edge over their rivals. Furthermore, online resources will likely help restaurants attract and retain more customers, thus increasing revenue.

For these reasons, implementing automated systems should be associated with cost reduction and, more importantly, enhancing service quality and business operations. The dynamics of key automation processes and their role in improving supply chain efficiency are presented in the table below (Table 1, Figure 1).

Table 1. Automation Technologies and Their Impact on Supply Chain Management Efficiency

Technology	Impact on efficiency	Impact on quality
Inventory management systems	High	Moderate
AI-based prediction	Very high	High
Integration with marketplaces	Moderate	Moderate

Source: Developed by the author.

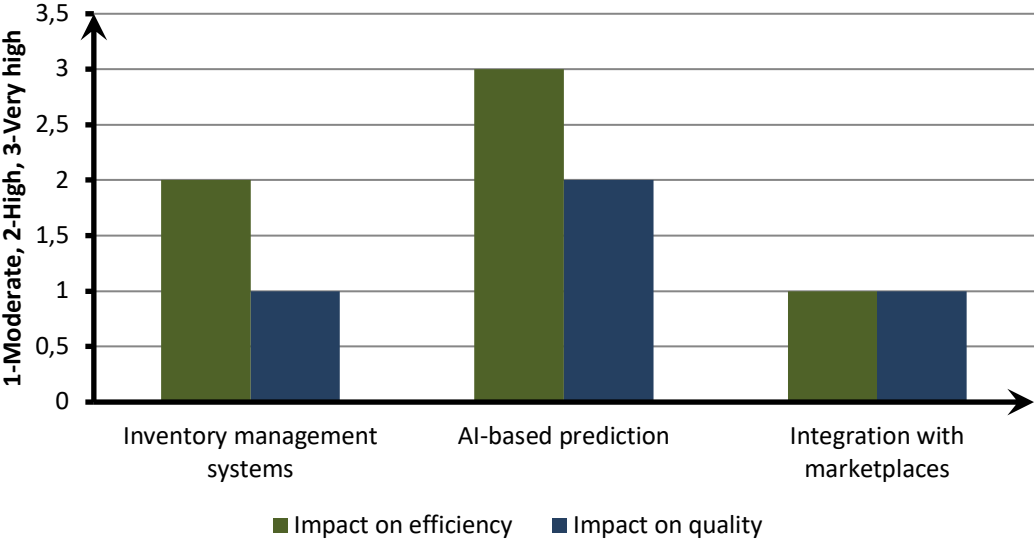


Fig. 1. Dynamics of Automation Technologies and Their Impact on Supply Chain Management Efficiency

Source: Developed by the author.

The research analysis indicates that demand forecasting through artificial intelligence positively impacts supply chain efficiency. This is attributed to its capability to process significant volumes of information in response to market dynamics. For instance, restaurant chains employing AI-based demand forecasting systems to manage demand seek and manage supplies with reduced costs—sometimes by as much as 20%. This reduces excess inventory held within the system, thereby decreasing storage costs.

Although inventory management systems have a very high impact, certain drawbacks or limitations exist regarding the quality of input data. Erroneous data entry can lead to shortages or surpluses of goods in stock. This scenario illustrates a typical situation where a restaurant, failing to monitor inventory data, frequently runs out of certain essential menu items, leading to customer dissatisfaction.

Collaboration with marketplaces allows businesses to reach a broader audience and open new sales channels. While the impact of this technology on business may be modest, it assists restaurants in retaining customers, which is critical in a competitive environment. For example, studies show that restaurants using third-party delivery services extensively increase their revenues by 15-25%. This underscores the importance of a comprehensive approach to all business processes and supports automation.

***Enhancing Operational Efficiency***

The survey results revealed that investments in automation technologies enable companies to significantly enhance their operations. In particular, 75% of respondents indicated that automation has reduced order fulfilment times, increasing customer satisfaction. Respondents also noted that delivery times had decreased by 25%, which is a crucial aspect of fast service.

As demonstrated by experience, the benefits of mechanisation extended beyond merely reducing order fulfilment times; they also encompassed improvements in accuracy. Implementing technologies has resulted in a 30% increase in order placement accuracy, vital for avoiding errors during delivery. For example, automated management systems allow for adjustments to demand within very short timeframes, thus minimising the likelihood of unnecessary losses due to incorrectly ordered items.

Consequently, the data obtained from the surveys corroborate the position that automation enhances the internal processes of restaurant enterprises. Such changes not only improve efficiency but also open additional channels for expansion. The subsequent table presents the operational improvements achieved through automation (Table 2).

Table 2. Operational Improvements Following Automation

Improvement rate	Percentage increase/decrease
Order Accuracy	+30%
Delivery time	-25%
Inventory turnover	+20%

Source: Developed by the author.

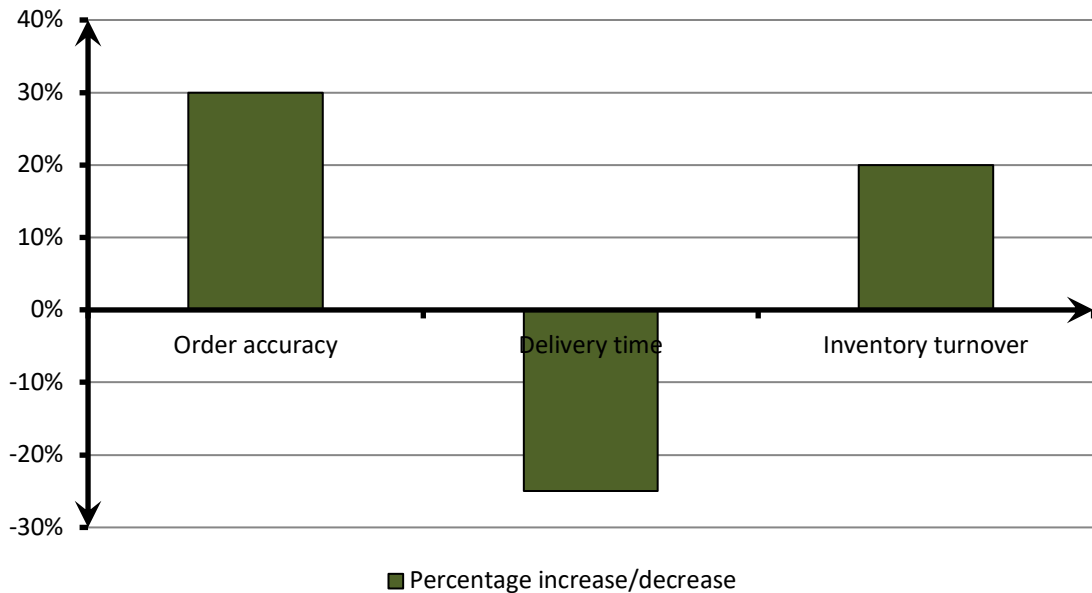


Fig. 2. Dynamics of Operational Improvements Post-Automation  
Source: Developed by the author.

The graph illustrates (Figure 2) that significant shifts in operational metrics have occurred due to the automation processes applied in business. An example is the 30% increase in order accuracy, demonstrating how automated restaurant systems assist in planning and fulfilling orders within specified timeframes to avoid errors. This is particularly crucial in the fast-food segment, where a single mistake can result in a complete loss of clientele.

Furthermore, another noteworthy factor is the reduction in delivery times by 25%. The customer experience is enhanced as orders are received promptly, leading to a decrease in delivery duration. Research indicates that the speed of delivery services directly impacts customer satisfaction, and companies providing delivery services are more likely to survive in a competitive market.

Another key performance indicator is inventory turnover, which has increased by 20%. Automation enables companies to adapt more swiftly to consumer demand, incurring lower warehousing costs while ensuring product availability when needed. Thus, this enhances

the overall competitive advantage of the company within the industry.

### *Impact of Automation on Competitiveness*

The research demonstrates that supply chain automation systems not only improve system efficiency but also foster competition among companies. The market share post-automation has increased for 70% of respondents. This indicates that companies interested in adopting new technologies are more likely to expand their customer base.

The study shows that customer experience and retention during this challenging era largely depend on automation. Respondents also noted that service quality has improved, as customers can receive responses significantly faster than before, positively affecting the company's overall image.

Thus, the data suggest that automation is an effective means of enhancing competitiveness within the restaurant sector. The following table illustrates the impact of automation on several key competitiveness indicators (Table 3).

Table 3. Impact of Automation on Competitiveness

Indicator	Changes after automation
Market share	+15%
Customer satisfaction	+25%
Response speed to requests	+20%

Source: Developed by the author.

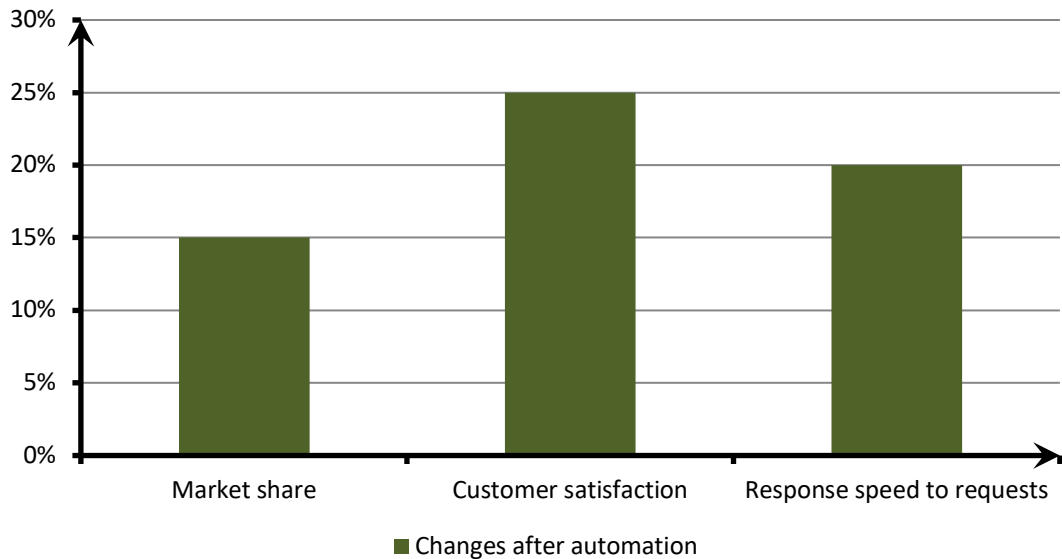


Fig. 3. Dynamics of the Impact of Automation on Competitiveness  
Source: Developed by the author.

The graph (Figure 3) clearly demonstrates that mechanisation has a positive impact on enterprises' competitive positions. The 15% increase in market share indicates that companies employing modern tools and processes are more adaptable to changes in their environment and consumer preferences. This may be a critical factor in profit growth.

Customer satisfaction has risen by 25%, and statistical data indicate that the degree of automation is directly proportional to the speed and quality of service. Such firms can enhance the quality of services offered to their customers by utilising contemporary technologies. This is particularly significant given the prevailing competition in the market. For instance, restaurants that are capable of serving their customers in the shortest possible time tend to receive better customer ratings, which considerably strengthens their client base.

An increase in response speed to queries by 20% is another example of how automation affects the effectiveness of customer interactions. This suggests that companies employing automated systems can respond to customers' needs and desires much more swiftly, thereby assisting them in retaining existing clients and attracting new ones. Thus, while internal processes become more efficient, this also leads to an enhancement in the competitiveness of the companies.

**Structural Equation Modelling (SEM)**

The SEM assessment revealed that automation approaches are associated with both operational efficiency and competitiveness. Confirmatory Factor Analysis (CFA) and path analysis were conducted to validate the model and establish its significance (see Table 4).

Table 4. Impact of Automation on Competitiveness

Path	Coefficient ( $\beta$ )	Standard error (SE)	p-value
AI prediction → Operational efficiency	0.50	0.09	<0.001
Inventory management → Operational efficiency	0.30	0.08	<0.01
Operational efficiency → Competitiveness	0.45	0.10	<0.001

Source: Developed by the author.

The purpose of this table is to present the results of the Structural Equation Modelling (SEM) and the corresponding relationships identified between the studied variables. The influence of AI-based forecasting methods on operational efficiency is the strongest among the

correlation indicators ( $\beta = 0.50$ ), indicating that the utilisation of such technologies positively integrates with the activities of restaurants. This implies that organisations implementing artificial intelligence technologies into their business

processes are likely to outpace competitors who do not.

As evidenced by the second significant relationship ( $\beta = 0.30$ ), operational efficiency positively correlates with inventory control, highlighting the budgetary aspects of process automation systems. This becomes particularly relevant for restaurants aiming to reduce costs and enhance efficiency. Hence, it can be inferred that a greater emphasis should be placed on automating inventory replenishment mechanisms.

The final relationship ( $\beta = 0.45$ ), focusing on the connection between operational efficiency and competitiveness, underscores the importance of adopting technologies for practical survival and competition. In a fiercely competitive environment, where demand is less than supply, the need for restaurants to operate efficiently becomes paramount for survival. Therefore, systems are automated not only to improve the organisation's internal processes but also to cultivate brand awareness among customers, which essentially enhances the market potential of the company (Figure 4).

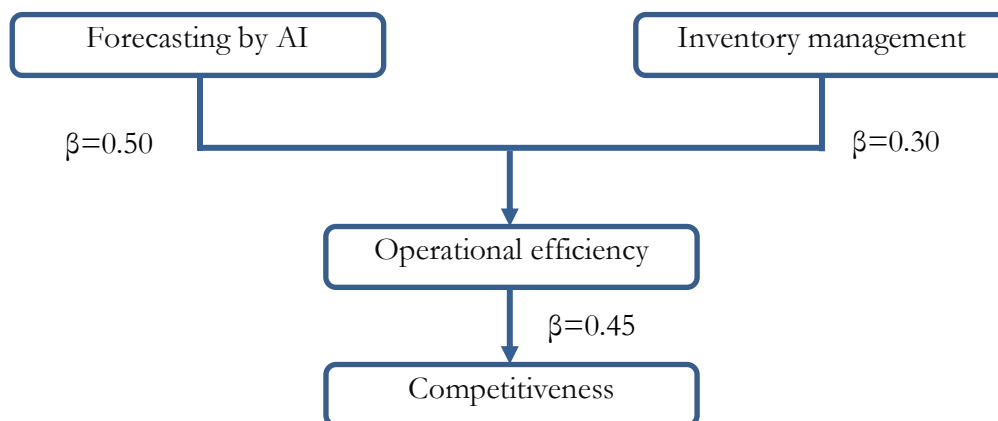


Fig. 4. Dynamics of the Impact of Automation on Competitiveness  
Source: Developed by the author.

### Conclusions from the Literature Review

The literature review confirmed the obtained results by developing a theory regarding the induced relationships. Significant

findings corroborated the impact of automation on the efficiency and competitiveness of the supply chain within the restaurant sector (see Table 5).

Table 5. Conclusions from the Literature Review

Authors	Key findings	Integration into the SEM model
Dashko and Mykhailichenko (2021), Kota (2019)	Importance of AI in supply efficiency	The rationale for including AI in the model
Accorsi et al. (2017), Jagtap et al. (2020)	Challenges of implementing new technologies	Support for identified challenges
Herashchenko and Shmadchenko (2015)	Data-driven solutions improve quality	Confirming the link between efficiency and competitiveness

Source: Developed by the author.

In the table provided, the key findings obtained during the literature review are summarised, along with evidence supporting the importance of automation in the restaurant business. The contribution of artificial intelligence to the efficiency of the supply chain plays a central role in the modern business landscape, where every company strives to enhance its performance (Dashko & Mykhailichenko, 2021; Kota, 2019). This suggests that the adoption of new technologies

is imperative to remain competitive.

The literature outlines barriers to automation, such as employees' reluctance to adapt to new systems (Accorsi et al., 2017; Jagtap et al., 2020). These issues are inevitable, as successful automation can only be achieved through effective change management and staff training. According to research, firms that take a proactive approach to training their employees encounter 30% less resistance.

Research conducted by Herashchenko

and Shmadchenko (2015) indicates that the quality of data-driven decisions positively correlates with increased competitiveness. The findings underscore the relevance of data utilisation for strategic decision-making, which

## DISCUSSION

This study aims to understand the impact of logistics automation on the relationships between suppliers and food business operators. In the modern restaurant industry, logistics is a crucial element that determines an establishment's overall productivity. When integrated into the food business, automated systems for ordering, inventory control, and communication between suppliers provide highly cost-effective solutions and high-quality service that meets customer expectations.

Technologies are rapidly evolving, resulting in the automation of most processes, such as how restaurants manage food and beverage inventory and logistics changes. In addition to in-house inventory management systems (IMS) and electronic data interchange (EDI) for gastro corporations, some large companies have begun to utilise big data technologies in logistics to enhance demand forecasting capabilities. Liu (2022) and Swart (2019) demonstrated that proprietary analytical programmes can predict demand with an accuracy of nearly 90%, thereby eliminating the consequences of excess inventory or shortages.

Examples from global companies such as McDonald's and Domino's indicate that business processes can be improved by combining IMS with other business metasystems (Bottani et al., 2014; Foster & Rhoden, 2020; Schmidt & Godwin Schmidt, 2019). For instance, in the case of Domino's, the order management system is linked to a mobile application that allows customers to place orders with minimal effort. Consequently, it has been reported that the company achieves annual sales growth of over 30% due to a system that ensures fast and accurate ordering and delivery.

The largest and most successful fast-food chains, such as Starbucks and KFC, have also integrated automation technologies into their supply chains worldwide. For example, Starbucks uses analytical models to assess demand for specific products in particular regions, enabling it to reduce costs related to storage and product movement. In turn, this helps them maintain reasonable pricing while

can significantly enhance the operational effectiveness of restaurant establishments. Thus, all these studies provide a cohesive understanding of the impact of automation implementation in the restaurant sector.

ensuring very high-quality standards for their products, which is one of the reasons why this business thrives in such a competitive market.

The emergence of automated inventory and order management systems positively affects service delivery and customer satisfaction with the services provided. Automation has been implemented to minimise the number of errors that may occur during the order processing stage, leading to improved service (Handfield & Linton, 2019; Mejjouli & Babiceanu, 2018). For example, the EDI system installed at Chipotle has reduced order processing time by 40%, significantly impacting food delivery times and customer satisfaction levels.

In addition to the speed with which orders can be processed due to automation systems, this innovation facilitates effective inventory-level management. This, in turn, minimises the likelihood of shortages or surpluses of specific goods intended for restaurants. This risk is particularly pronounced during specific peak cycles, such as holidays or promotional events, when demand for particular items is high, resulting in significant fluctuations in order. These analytical systems enable businesses to adjust their orders in response to changes in demand. Accordingly, this mitigates the repercussions of customer dissatisfaction and the retention of unnecessary or insufficient inventory (Bottani et al., 2014; Foster & Rhoden, 2020; Schmidt & Godwin Schmidt, 2019). Specifically, for instance, a restaurant holding company managed to increase orders for specific menu items by more than 50% during the autumn holidays in December 2023, effectively addressing the issue of shortages.

Company efficiency is enhanced as they can respond swiftly to changes in the environment due to another aspect—supply chain process automation. For example, Sysco implemented integrated inventory management and electronic order processing systems, reducing operational costs and improving logistical ordering and delivery accuracy. As a result, the firm was able to enhance customer

service levels and strengthen its competitive position.

High costs associated with such technologies represent organisations' key challenges when deploying automated systems (Fernandez & Aman, 2021; Więcek et al., 2019). For example, the estimated cost of deploying IMS and other related systems can reach USD 200,000, making such systems inaccessible to most small and medium-sized enterprises. Furthermore, high-tech solutions incur additional costs due to acquiring new equipment and software, training personnel, and even ongoing maintenance of new systems. While these expenses may be justifiable for large companies, they can be prohibitive for smaller enterprises, depriving them of new solutions that could enhance productivity.

Another significant barrier is training employees to use these systems effectively. Inadequate staff training can lead to low productivity or errors during order processing. When organisations neglect training their personnel, they risk losing up to twenty per cent of potential productivity due to errors arising from incorrect data entry or misuse of modern tools.

Additionally, some employees may resist the inductive implementation of new technologies, which can diminish the level of automation. Many workers fear that with the introduction of the latest systems, they may lose their jobs, leading them to oppose new systems. This is exacerbated in cases where certain employees realise that automation processes will render them less necessary. For instance, Domino's Pizza has leveraged many new systems and mobile applications for ordering instead of employing a large workforce, reducing operational costs despite the implications for employee welfare (Schmidt & Godwin Schmidt, 2019).

By examining the results of this study and contextualising them with other research, it is evident that the effects of implementing automation in restaurant business processes yield results comparable to those in many different sectors. In their study, Bottani et al. (2014) assert that logistics automation can reduce operational costs by 15-20%, a statistic supported by evidence from the hospitality sector. Similarly, Schmidt and Godwin Schmidt (2019) claim that ordering and delivery processes

can be automated, reducing wait times and enhancing customer satisfaction.

Evidence shows that organisations can improve their resource management and adaptation to market dynamics by integrating analytical software with automated systems and other products. The significance of this issue is underscored by the example of the fast-food restaurant McDonald's, which has implemented such automation across all operational segments, thereby increasing operational efficiency and, conversely, reducing supply chain management costs (Cherchata et al., 2020; DeJonge et al., 2021; Kanagavalli & Azeez, 2019). This also highlights the need for food distribution automation worldwide, as networks like McDonald's, Starbucks, and Domino's Pizza have successfully implemented such systems to oversee their overseas operations.

### ***Limitations of the Study***

This study has certain limitations that may affect the generalizability of the findings. For instance, the sample is more representative of the restaurant business, which has unique characteristics. For example, Manufacturing or logistics would encounter different challenges related to implementing automation. Therefore, the results of this study cannot be easily generalised to other sectors.

Furthermore, the study does not consider the potential long-term effects of automation on employees. It can be agreed that increased efficiency and reduced overhead costs are outcomes of process automation; however, the overall workforce reduction may not benefit society. The work of Więcek et al. (2019) is also important for understanding that implementing automation still requires considerable time and resources for retraining people and altering the working environment, which can pose challenges for some organisations.

It is clear that limitations exist, but automating logistics in the restaurant sector demonstrates substantial benefits for enhancing the efficiency and competitiveness of such enterprises. Future research could focus on exploring the long-term effects of automation and its implications for various sectors and addressing issues aimed at facilitating interventions for small and medium-sized enterprises.

## CONCLUSIONS

The optimisation of logistical processes in direct trade between producers and establishments within the restaurant industry is a crucial factor in enhancing efficiency, reducing costs, and improving competitiveness. The study demonstrates that modern inventory management, electronic data interchange (EDI), and data analytics significantly contribute to streamlining internal processes and increasing customer retention by creating value propositions. This enables businesses to stay one step ahead; competition becomes less of an issue when market conditions change radically and swiftly.

The implementation of automated systems facilitates genuine interaction with consumers—an element critical for developing trust and loyalty in business. For instance, some companies utilise inventory management systems (IMS) alongside EDI, enabling them to convey timely and accurate information regarding product status and availability, easing restaurant interactions. In practice, such real-time communication with customers enhances customer satisfaction and reduces risks associated with order processing.

The optimisation of logistical operations generates substantial amounts of information for formulating strategies. The data gathered through analysis allows organisations to manage product demand precisely and to adjust organisational tactics in response to dynamic market and consumer trends. This yields additional advantages for the organisation by preventing the accumulation of inventory while ensuring the availability of necessary products.

It is imperative to emphasise that introducing automation into various logistical processes is a tactical necessity for enhancing competitiveness. Organisations that adopt innovative technologies generally exhibit superior financial performance. For example, studies indicate that most enterprises implementing automated systems can optimise their logistical chains most effectively, reducing

costs by 15-20%, which in turn increases net profit.

Such technologies are expected to have a significant impact in the future, warranting further investigation into these changes. For instance, conducting extensive and long-term observations of quality and satisfaction metrics before and after the implementation of automated systems would pragmatically assess these systems' advantages. Such studies could also aid in identifying factors and strategies for success across different regions and markets.

### *Suggestions for Future Research*

There are commendable opportunities for further research aimed at the universal implementation of automated solutions in various contexts. It could be determined which approaches prove more successful in specific types of markets, such as B2B or B2C. In this instance, results might reveal that specific B2B sectors have exhibited better performance in automation than B2C sectors.

Additionally, it would be beneficial to focus on contemporary developments in process automation and the potential implications these processes may have for logistical practices in the future. In this realm, the automation of optimisation processes is becoming increasingly feasible due to advancements in artificial intelligence and machine learning technologies. For instance, analysing customer data can assist organisations in developing sales promotion strategies that yield greater profits.

Advanced technologies offer the potential to enhance efficiency, reduce costs, and even improve customer service quality. Therefore, to thrive in the market, such companies should begin contemplating automating processes such as logistics and integrating associated technologies. This will provide them with advantages in the near future and create conditions for growth and expansion in the years to come.

## REFERENCES

Abdul Hadi, K. Z., & Wajih Zarzis, R. M. (2017). Information and communications technology and its impact on organisational culture. *Iraqi Administrative Sciences Journal*, 1(2), 438–459.

<https://doi.org/10.33013/iqasj.v1n2y2017.pp438-459>

Accorsi, R., Manzini, R., & Pini, C. (2017). How logistics decisions affect the environmental sustainability of modern food supply chains. In

- R. Bhat (Ed.), *Sustainability challenges in the agrofood sector* (pp. 175–196). John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781119072737.ch8>
- Bąk-Sokołowska, M. (2018). Sustainable logistics as a business strategy. *Prace naukowe uniwersytetu ekonomicznego we wrocławiu*, (505), 169–191. <https://doi.org/10.15611/pn.2018.505.14>
- Berezhnytska, H. (2018). Legal support for quality and safety of food products. *Herald of Lviv University of Trade and Economics. Law Sciences*, (7), 86–91. <https://doi.org/10.36477/2616-7611-2018-07-10>
- Bottani, E., Rizzi, A., & Vignali, G. (2014). Improving logistics efficiency of industrial districts: A framework and case study in the food sector. *International Journal of Logistics Research and Applications*, 18(5), 402–423. <https://doi.org/10.1080/13675567.2014.945401>
- Carone, T. E. Logistics. (2018). In *Future Automation* (pp. 123–135). World Scientific. [https://doi.org/10.1142/9789813142343\\_0007](https://doi.org/10.1142/9789813142343_0007)
- Cherchata, A., Michalski, K., & Tarasova, T. (2020). Integrated logistics solutions in the company's development strategies. *Ekonomika i Organizacja Logistyki*, 4(4), 97–105. <https://doi.org/10.22630/eiol.2019.4.4.36>
- Danneels, E., Verona, G., & Provera, B. (2017). Overcoming the inertia of organizational competence: Olivetti's transition from mechanical to electronic technology. *Industrial and Corporate Change*, 27(3), 595–618. <https://doi.org/10.1093/icc/dtx049>
- Dashko, I., & Mykhailichenko, L. (2021). The impact of artificial intelligence technologies on the efficiency of enterprises. *International Scientific Journal "Internauka". Series: "Economic Sciences"*, (6(86)). <https://doi.org/10.25313/2520-2294-2024-6-10032>
- DeJonge, M. A., Abdul Salam, M., & Ward, P. M. (2021). *Integrated logistics solutions provider project* [Conference presentation abstract]. Abu Dhabi International Petroleum Exhibition & Conference, Abu Dhabi, UAE. <https://doi.org/10.2118/207663-ms>
- Dolati Neghabadi, P., Espinouse, M.-L., & Lionet, E. (2021). Impact of operational constraints in city logistics pooling efficiency. *International Journal of Logistics Research and Applications*, 25(11), 1444–1468. <https://doi.org/10.1080/13675567.2021.1914008>
- Donald, D. C. (2020). *Hong Kong's fintech automation: Economic benefits and social risks*. SSRN. <https://doi.org/10.2139/ssrn.3544072>
- Fernandez, D., & Aman, A. (2021). The challenges of implementing robotic process automation in global business services. *International Journal of Business and Society*, 22(3), 1269–1282. <https://doi.org/10.33736/ijbs.4301.2021>
- Foster, M. N., & Rhoden, S. L. N. H. (2020). The integration of automation and artificial intelligence into the logistics sector. *Worldwide Hospitality and Tourism Themes*, 12(1), 56–68. <https://doi.org/10.1108/whatt-10-2019-0070>
- Granlund, A., & Wiktorsson, M. (2014). Automation in internal logistics: Strategic and operational challenges. *International Journal of Logistics Systems and Management*, 18(4), 538–558. <https://doi.org/10.1504/ijlsm.2014.063984>
- Handfield, R., & Linton, T. (2019). Building a culture of supply chain transparency and real-time data: Adapting to the living supply chain. *Journal of Supply Chain Management, Logistics and Procurement*, 1(4), 386–403. <https://doi.org/10.69554/hnim3077>
- Herashchenko, I. O., & Shmadchenko, O. O. (2015). Upravlinnia konkurentospromozhnistiu pidpriemstva. *The Bulletin of Transport and Industry Economics*, (50), 297–301. <https://doi.org/10.18664/338.47:338.45.v0i50.53229>
- Jagtap, S., Bader, F., Garcia-Garcia, G., Trollman, H., Fadji, T., & Salontis, K. (2020). Food logistics 4.0: Opportunities and challenges. *Logistics*, 5(1), 2. <https://doi.org/10.3390/logistics5010002>
- Jivan, K. P., Marnewick, A. L., & Joseph, N. (2020). Influence of organizational culture in the adoption of agile. In *2020 IEEE technology & engineering management conference (TEMSCON)*. IEEE. <https://doi.org/10.1109/temscon47658.2020.9140091>
- Kota, L. (2019). Artificial intelligence in logistics. *Advanced Logistic Systems—Theory and Practice*, 12(1), 47–60. <https://doi.org/10.32971/als.2019.004>
- Kanagavalli, G., & Azeez, R. Logistics and e-logistics management: Benefits and challenges. (2019). *International Journal of Recent Technology and Engineering*, 8(4), 12804–12809. <https://doi.org/10.35940/ijrte.d7179.118419>

- Kravets, O. O., & Zenkin, A. S. (2016). Metrolohichne zabezpechennia yakosti produktu [Metrological assurance of product quality]. In *Proceedings of the XV All-Ukrainian Scientific Conference of Young Researchers and Students "Scientific Developments by Youth at the Present Stage"* (pp. 144). KNUVD. <https://er.knutd.edu.ua/handle/123456789/5275>
- Kumar, A., Tatwani, S., & Choudhury, A. (2021). Real-time inventory management using hadoop. In T. P. Singh, R. Tomar, T. Choudhury, T. Perumal, & H. F. Mahdi (Eds.), *Data Driven Approach Towards Disruptive Technologies* (pp. 231–241). Singapore: Springer. [https://doi.org/10.1007/978-981-15-9873-9\\_20](https://doi.org/10.1007/978-981-15-9873-9_20)
- Lakhwani, M., Dastane, O., Satar, N. S. M., & Johari, Z. (2020). The impact of technology adoption on organizational productivity. *Journal of Industrial Distribution & Business*, 11(4), 7–18. <https://doi.org/10.13106/jidb.2020.vol11.no4.7>
- Liu, K. Y. (2022). Warehouse and inventory management. In *Supply Chain Analytics* (pp. 219–269). Cham: Palgrave Macmillan. [https://doi.org/10.1007/978-3-030-92224-5\\_7](https://doi.org/10.1007/978-3-030-92224-5_7)
- López-Gómez, J. P., Manan, M. A., & Webb, C. (2020). Solid-state fermentation of food industry wastes. In M. R. Kosseva & C. Webb (Eds.), *Food Industry Wastes* (pp. 135–161). Elsevier. <https://doi.org/10.1016/b978-0-12-817121-9.00007-3>
- Mani Sekhar, S. R., Chandrashekar, S., & Matt, S. G. (2020). Supply chain analytics technology for big data. In I. Rahimi, A. H. Gandomi, S. J. Fong, & M. A. Ülkü (Eds.), *Big Data Analytics in Supply Chain Management* (pp. 9–28). CRC Press. <https://doi.org/10.1201/9780367816384-2>
- Marcondes e Santos, R. B. (2014). Analysis of the economic and environmental benefits through the reverse logistics for retail. *American Journal of Environmental Protection*, 3(3), 138–143. <https://doi.org/10.11648/j.ajep.20140303.15>
- Mejjauoli, S., & Babiceanu, R. F. (2018). Cold supply chain logistics: System optimization for real-time rerouting transportation solutions. *Computers in Industry*, 95, 68–80. <https://doi.org/10.1016/j.compind.2017.12.006>
- Moriya, T., Kimura, N., Ara, K., & Watanabe, T. (2019). Warehouse automation towards innovation in logistics. *Journal of the Robotics Society of Japan*, 37(8), 699–702. <https://doi.org/10.7210/jrsj.37.699>
- Müller, S., Huber, J., Fleischmann, M., & Stuckenschmidt, H. (2020). *Data-driven inventory management under customer substitution*. SSRN. <https://doi.org/10.2139/ssrn.3624026>
- Nascimento, D. G. d., & Silva, G. H. d. (2017). Automation and efficiency in the operational processes: A case study in a logistics operator. *Independent Journal of Management & Production*, 8(5), 614–640. <https://doi.org/10.14807/ijmp.v8i5.599>
- Palomino-Tamayo, W., & Timaná, J. S. (2021). Creating firm value, overcoming organizational inertia through the marketing value chain. *Academia Revista Latinoamericana de Administración*, 35(1), 20–36. <https://doi.org/10.1108/arla-06-2021-0119>
- Polinkevych, O. P., & Zenkin, A. S. (2016). Prohnozuvannia yakosti produktu kharchovykh pidpriemstv [Forecasting the quality of products in food enterprises]. In *Scientific developments of youth at the current stage* (pp. 134–135). KNUVD. <https://er.knutd.edu.ua/handle/123456789/5265>
- Rahimi, I., Gandomi, A. H., Fong, S. J., Ülkü, M. A. (Eds.). (2020). *Big data analytics in supply chain management: Theory and applications*. Boca Raton: CRC Press. <https://doi.org/10.1201/9780367816384>
- Rinta-Kahila, T., Penttinen, E., & Nevalainen, A. (2016). Unfolding the types of organizational inertia in information systems adoption. In *2016 49th hawaii international conference on system sciences (HICSS)* (pp. 3908–3917). IEEE. <https://doi.org/10.1109/hicss.2016.486>
- Rodriguez, M. A. (2020, September 14). *Starbucks fell short on Q2*. CAPEX.com. <https://capex.com/en/market-news/starbucks-exceeded-revenue-expectations-but-lost-on-everything-else>
- Romanenko, O. (2017). Methodical recommendations on the use of web analytics system in food industry enterprises. *Advanced Engineering Forum*, 22, 36–40. <https://doi.org/10.4028/www.scientific.net/aef.22.36>
- Schmidt, S., & Godwin Schmidt, B. S. (2019). The role of packaging in logistics processes - impact on sustainable logistics in the food sector. *Proceedings on Engineering Sciences*, 1(2), 235–246. <https://doi.org/10.24874/pes01.02.020>

- Sharma, S., Gahlawat, V. K., Rahul, K., Mor, R. S., & Malik, M. (2021). Sustainable innovations in the food industry through artificial intelligence and big data analytics. *Logistics*, 5(4), Article 66. <https://doi.org/10.3390/logistics5040066>
- Swart, W. (2019). Restaurant management. In S. Samaddar & S. Nargundkar (Eds.), *Data Analytics* (pp. 51–67). New York: Auerbach Publications. <https://doi.org/10.1201/9781315267555-5>
- Taigel, F., & Meller, J. (2018). *Data-driven inventory management: Integrated estimation and optimization*. SSRN. <https://doi.org/10.2139/ssrn.3256643>
- Więcek, D., Więcek, D., Kuric, I., Bučková, M., & Krajčovič, M. (2019). Evaluation of the effectiveness of implementing production logistics automation systems supported by computer simulation tools. *MATEC Web of Conferences*, 299, Article 02007. <https://doi.org/10.1051/mateconf/201929902007>
- Yu, B., Zhan, P., Lei, M., Zhou, F., & Wang, P. (2020). Food quality monitoring system based on smart contracts and evaluation models. *IEEE Access*, 8, 12479–12490. <https://doi.org/10.1109/access.2020.2966020>
- Zota, R. D., & Ciovica, L. (2015). Designing software solutions using business processes. *Procedia Economics and Finance*, 20, 695–699. [https://doi.org/10.1016/s2212-5671\(15\)00125-2](https://doi.org/10.1016/s2212-5671(15)00125-2)