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THE USE OF DIGITAL MARKETING FOR OPTIMIZING THE LOGISTICS SUPPLY CHAIN AND COST CONTROL

ABSTRACT

The aim of the research is to analyse the relationship between digital marketing and delivery failures and identify opportunities for optimization.

The research employed the methods of statistical analysis, correlation analysis, comparative analysis, and analysis of metrics.

The conducted research determined that one of the main challenges of the supply chain is failures caused by various reasons (lack of skills, diseases, transport failures, adverse weather conditions, cyber attacks, etc.). Disruptions often lead to delivery failures. The reasons for this often do not depend on the companies and bring significant negative consequences, in particular, in the form of losses, loss of reputation, and decreased customer loyalty. The study revealed that digital marketing indicators are positively correlated with non-delivery indicators. In particular, Social media interactions and Failures to deliver (0.75), Social media likes and Failures to deliver (0.74), Social media interactions and Biweekly Failures to deliver volume (0.78), Social media likes and Biweekly Failures to deliver volume (0.78). It was assumed that this state of affairs may be determined by increased demand due to digital marketing, for which companies may not always be ready. Insufficient preparedness can lead to disruptions because of supply chain congestion.

The results can be useful for e-commerce companies to evaluate and minimize the number of failed deliveries.

Keywords: digital marketing, logistics supply chain, user loyalty, number of interactions, social networks, delivery failure, preferences

JEL Classification: D24, L86, M31

INTRODUCTION

Digital marketing has become an integral element of the activities of modern companies, which determines their competitiveness in the context of digital transformation (Bhosale et al., 2020; Daud et al., 2022). The introduction of digital marketing has radically changed traditional methods of advertising and forced marketers to refocus on using the Internet to interact with users and promote products and services (Poorani and Vidhiya, 2021). The broad concept of digital marketing includes e-commerce, smart products, mobile devices, artificial intelligence (AI), Internet of Things (IoT) and others (Herhausen et al., 2020; Nikonenko et al., 2022). These and other digital marketing tools allow companies to obtain a number of benefits, including increasing sales, strengthening the brand, improving customer interaction, reducing costs, adding value, etc. (Redjeki and Affandi, 2021; Setkute and Dibb, 2022).

In addition, digital marketing can be used to optimize the logistics supply chain and control costs. Supply chain management involves demand forecasting and planning (Aamer et al., 2020; Seyedan and Mafakheri, 2020), inventory management, distribution of goods, interaction with counterparties, performance analysis, and quality control (Zhou and Li, 2020; Kurdi et al., 2022). Digital marketing can play a significant role in the implementation of these types of activities. In the academic literature, there are approaches to identifying the impact of digital marketing on the efficiency of the logistics

supply chain, which testify to the positive effects of such an impact (Adam et al., 2020; Salhab et al., 2023). At the same time, optimization primarily requires the identification of what exactly needs to be optimized, i.e., supply chain problems. As practice shows, one of the main problems of the supply chain is delivery failures caused by various obstacles (Jafarzadeh et al., 2021; Rai et al., 2021). Therefore, the aim of this study is to analyse the relationship between digital marketing and delivery failures and identify opportunities for optimization.

LITERATURE REVIEW

A number of studies confirm the role of digital marketing in optimizing companies' activities (Nasiopoulos et al., 2021). Its advantages include increased interactivity, overcoming geographical and time constraints, the possibility of flexible and quick responses to consumer needs, measurability of results, personalization, etc. (Veleva and Tsvetanova, 2020).

Particular attention is paid to the role of digital marketing and its individual tools, such as the Industrial Internet of Things (IIoT) for supply chain optimization (Zhang, 2024). Digital marketing is seen as a tool capable of optimizing the supply chain, which can result in increased customer loyalty and satisfaction (Adam et al., 2020). In interaction, digital marketing and supply chain management are able to optimize the companies' activities and increase their operational efficiency (Djaja and Yuan, 2023).

A number of studies noted certain positive consequences of the integration of digital marketing and supply chain management for companies (Khurdei et al., 2023). Using digital marketing as a promotion strategy can allow a company to increase revenue and drive consumers to make a purchase (Hartono et al., 2020; Hutsaliuk et al., 2020). Supply chain companies can significantly improve their financial performance by investing in digital marketing (Sakas et al., 2023).

Some authors emphasize the impact of applying digital marketing together with supply chain management on productivity. Salhab et al. (2023) studied the relationship between the intensity of digital marketing and other dimensions of the company's activity on the supply chain quality. The researchers are convinced that digital marketing can have a significant impact on productivity. Kerdpitak (2022) found that the application of digital marketing and supply chain management together with high service quality and innovation significantly increases productivity using the example of the tourism industry.

In addition to the evidence on the positive impact of digital marketing on supply chain efficiency, researchers provide recommendations for the integration of these areas of companies' activity. Vichit (2020) emphasizes the need to synthesize the theory and practice of digital marketing management from a supply chain perspective. According to Alkahtani et al. (2021), digital marketing through web design elements is able to persuade customers to purchase a product in a global supply chain.

The conducted review gives grounds to note that the majority of authors seek to demonstrate the positive consequences of using digital marketing together with supply chain management. At the same time, in order to identify opportunities for optimization of the logistics supply chain, it is first of all necessary to identify existing problems. After that, it is worth investigating whether digital marketing affects the identified problems and how it can solve them, which reveals a new research prospect in this area.

AIMS AND OBJECTIVES

The aim involves the fulfilment of the following research objectives:

- justify the main problems of the global logistics chain that require optimization;
- explore the state of the digital marketing market and its relationship with supply chain management;
- identify and describe the relationship between digital marketing metrics and failed deliveries.

METHODS

Research Design

The research design included three stages. The first stage is aimed at identifying the main problems of the global logistics chain. Identification of problems made it possible to determine the main aspects that require optimization, namely, the

number of unfulfilled deliveries and their volume in monetary terms. The second stage is designed to explain the relationship between digital marketing and supply chain management. This stage gives grounds to thoroughly talk about the likelihood of the impact of digital marketing on the global logistics chain. The third stage is aimed at identifying the relationship between digital marketing indicators and backlogs using the example of large e-commerce companies.

Sample

The sample of indicators in the first and second stages of the research is formed by secondary data, which are global indicators of challenges for the global supply chain, the main causes of disruptions in the supply chain, and the size of the global digital marketing market. The LPI score and the UNCTAD B2C E-commerce Index were used for correlation analysis in the second stage of the research. LPI score contained data for 139 regions, UNCTAD B2C E-commerce Index – for 152.

The sample for the third stage of the study was made by such large e-commerce companies as Amazon, eBay, Alibaba, Walmart, Etsy, Newegg, and Best Buy. These companies are global players in the e-commerce industry, and their performance provides ample scope for research. As industry leaders, these companies are trendsetters for smaller companies, so their trends may reflect the state of the industry as a whole. The sample of indicators for the analysis of companies is formed by indicators characterizing digital marketing, as well as indicators related to delivery failures. The group of indicators characterizing digital marketing includes Mentions, Social media mentions, Non-social Mentions, Number of Positives, Number of Negatives, Estimated Social Media Reach, Social media interactions, Social media likes, Non-Social Reach, Advertising Value Equivalency (AVE), User Generated Content. Failures to deliver and Biweekly Failures to deliver volume in USD (amount for the studied period) belong to the group of indicators related to delivery failures. Table 1 contains the values of the observed indicators for the studied companies for May- June 2024.

Table 1. Values of indicators characterizing digital marketing and indicators related to non-fulfilment of deliveries for the studied leading retail trade companies. (*Source: summarized by the author based on Companiesmarketcap, 2024; Brand24, 2024*)

|	Amazon	eBay	Alibaba	Walmart	Etsy	Newegg	Best Buy
Mentions	38675	26204	14995	37032	35063	1619	12289
Social media mentions	918	7735	9232	13898	26837	808	5135
Non-social Mentions	37757	18469	5776	23134	8226	811	7154
Number of Positives	3065	1768	739	2878	4795	103	1262
Number of Negatives	405	741	538	1414	1432	19	291
Estimated Social Media Reach	2734569	13106462	34730033	63441409	43941484	5409672	12420996
Social media interactions	110365	737028	988819	4995694	2578819	335189	292052
Social media likes	106088	658281	1157868	4427409	2299940	290053	263173
Non-Social Reach	2,11E+09	1,75E+08	43936535	2,37E+08	1,67E+08	5734551	69259034
AVE	1,83E+08	7033882	15835130	29512910	20756059	1262061	7425396
User Generated Content	5610	10093	10180	18423	29600	1062	5928
Failures to deliver	8970	120000	5900	260686	2430	35476	26170
Biweekly Failures to deliver volume in USD	1690000	6580000	2650000	15910000	390000	80000	1980000

Methods

Statistical analysis was the main method used in the first two stages of the research. This method enabled the analysis of secondary data from a survey on global supply chain challenges and causes of disruption (Simmons, 2023), as well as forecast data on the size of the global digital marketing market (Market Research Report, 2024). The method of correlation analysis was used in the second and third stages of the research. In the second stage, this method made it possible to confirm the connection between digital marketing and the supply chain through the LPI score and the UNCTAD B2C E-commerce Index. In the third stage, the method made it possible to determine which digital marketing indicators are most closely related to non-delivery indicators. This gave grounds for assumptions about the reasons for such a relationship and to provide propositions and recommendations. Additional methods of analysis were the analysis of digital marketing metrics as the basis for drawing the key conclusions of the study, and a comparative analysis between the companies included in the sample.

RESULTS

The Main Problems of the Global Logistics Chain that Require Optimization

Supply chain optimization involves, first of all, identifying the main problems in the supply chain and their causes. This makes it possible to identify appropriate optimization approaches based on specific needs.

According to statistics, the main problems in the global supply chain are related to factors such as the shortage of talented labour resources and relevant skills, human diseases, as well as problems with the transportation network. The top five challenges for the global supply chain according to supply industry specialists are presented in Figure 1.
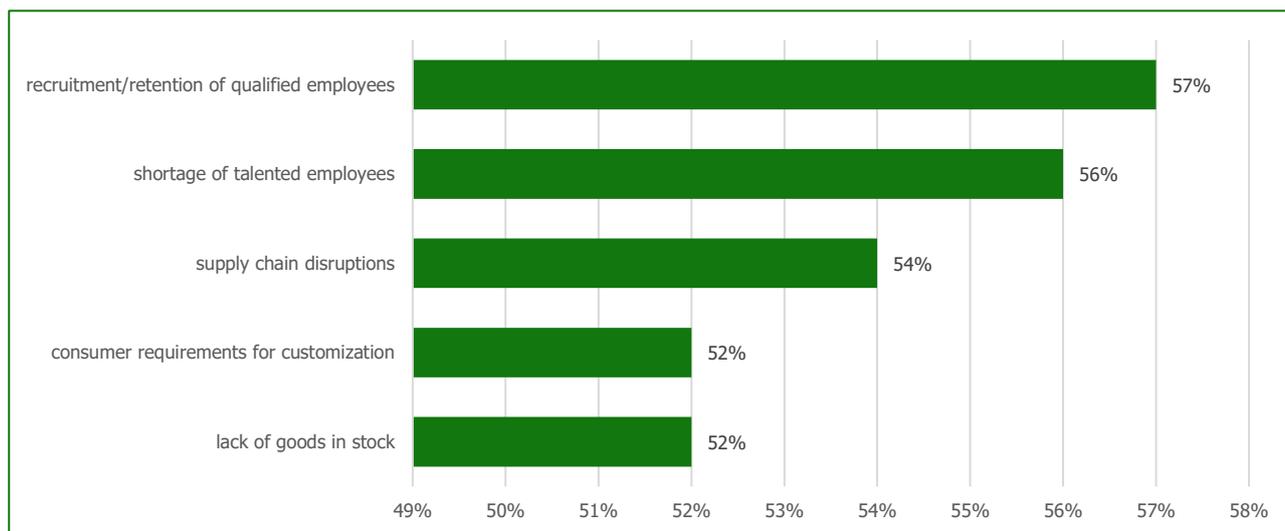
Figure 1. The most serious challenges for the global supply chain. *(Source: built by the author based on Simmons (2023)*

Deliver failure is one of the most unfavourable business consequences of the noted challenges. This reduces customer loyalty, causes losses to suppliers, damages their reputation, and causes additional costs. The main disruptions in the supply chain that can lead to delivery failures are presented in Figure 2.
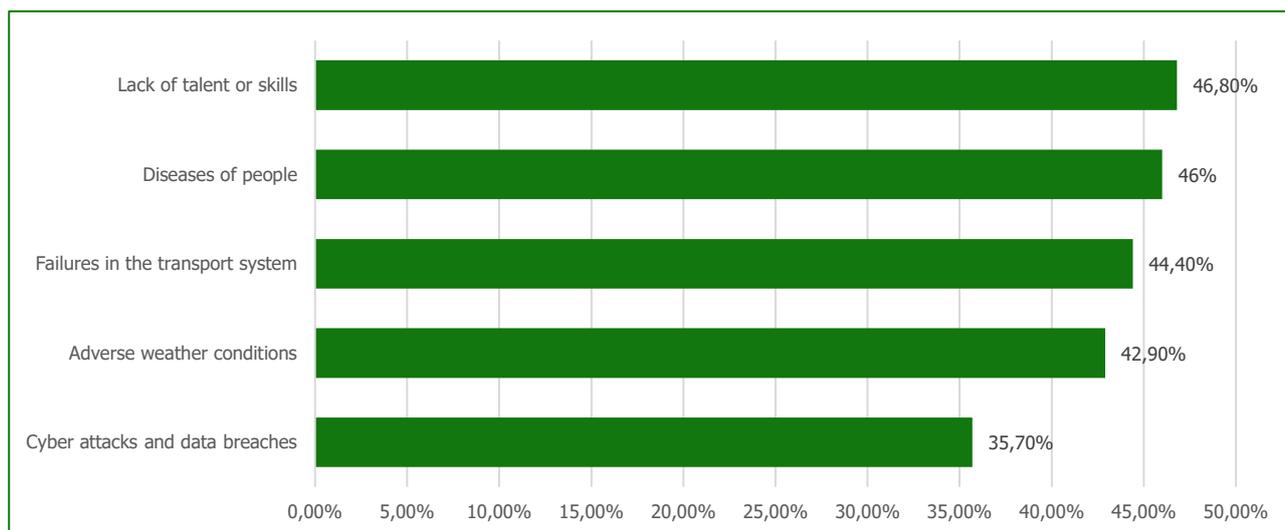

Figure 2. The main causes of failures in the supply chain. *(Source: built by the author based on Simmons (2023)*

It is impossible to eliminate completely all causes without excluding the cause of possible failures in the supply chain. For example, there is always the possibility of human error, a sudden change in weather conditions, a natural disaster, various disturbances caused by political, etc. reasons etc. The probability of failures caused by these and other reasons can be minimized by qualitative forecasting, data analysis, and modern tools. However, it must be recognized that a certain percentage of unfulfilled deliveries will remain a problem for the supply chain in the context of uncertainty and the impact

of many influencing factors. So, companies face a challenge: how to maintain customer loyalty, and reputation, and minimize losses and costs even in the event of non-delivery. Digital marketing can be a suitable tool that can solve this dilemma.

The State of the Digital Marketing Market and its Relationship to Supply Chain Management

Digital marketing can determine the success of a business today, and this trend will only increase in the future. The digital marketing market size including forecast values is presented in Figure 3.
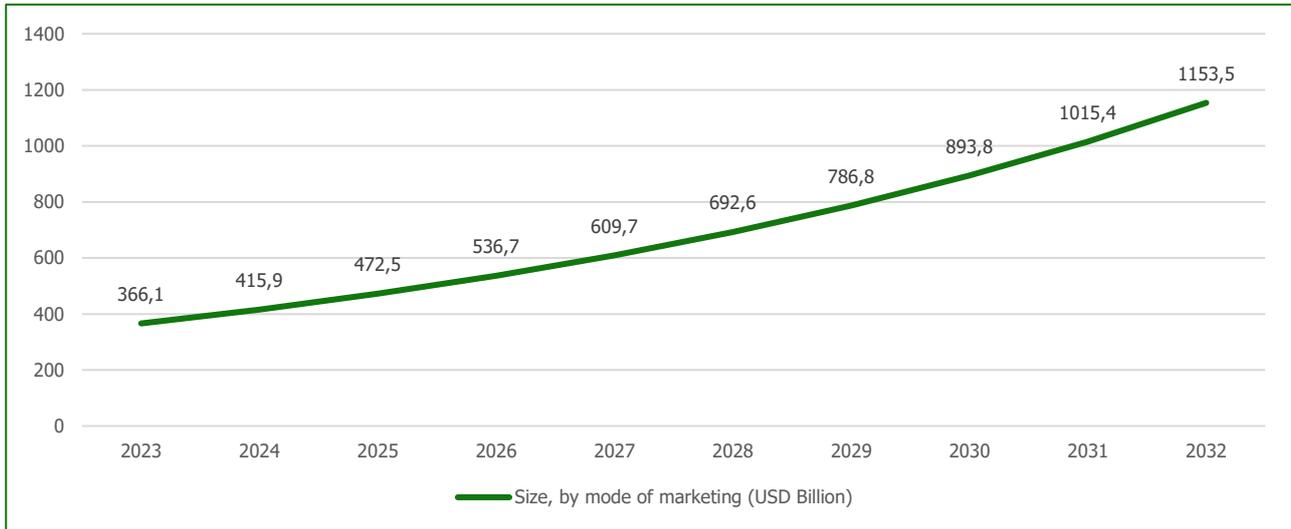
Figure 3. Global digital marketing market size. (*Source: Market Research Report, 2024*)

Consequently, within 10 years, the global digital marketing market is projected to grow more than three times (in 2032 compared to 2023). Digital marketing has a wide potential to improve customer communication, product customization, market analysis and trend forecasting, product forecasting strategies, etc. Digital marketing is also closely related to logistics and supply chains, which can be confirmed through the correlation analysis between the LPI score (including its component sub-indices) and the UNCTAD B2C E-commerce Index (Table 2). The first of these indicators describes the efficiency of logistics processes in different countries of the world, the second characterizes the degree of infrastructure development and the available technological capabilities that ensure the proper development of e-commerce.

Table 2. Results of correlation analysis between LPI score (including sub-indices) and UNCTAD B2C E-commerce Index. (*Source: calculated by the author based on Connecting to Compete (2023), The World Bank (2020)*)

	UNCTAD B2C E-commerce Index
LPI score	0.816832
Customs score	0.809317
Infrastructure score	0.811377
International shipments score	0.731803
Logistics competence and quality score	0.780535
Timeliness score	0.765751
Tracking and tracing score	0.796984

So, the results of the correlation analysis between the LPI score indicators (including sub-indices) and the UNCTAD B2C E-commerce Index indicate a close and statistically significant correlation. The relationship is positive, and therefore the growth of the LPI score is most likely to be accompanied by an increase in the UNCTAD B2C E-commerce Index. This shows a significant relationship between the supply chain and e-commerce, where digital marketing can be an important strategy or component.

However, the obtained results do not provide specific information regarding the impact of digital marketing on supply chain efficiency. This necessitates additional analysis. In particular, as defined above, delivery failures can be one of the most

adverse business consequences of isolated supply chain problems. Changes in this indicator are one of the most important characteristics in the course of evaluating the efficiency of the supply chain. Therefore, the paper proposes to determine whether digital marketing indicators are related to non-delivery indicators.

The Relationship between Digital Marketing Metrics and Delivery Failures

Two groups of indicators were formed for a defined sample of companies in order to determine the relationship between digital marketing indicators and supply chain performance indicators regarding delivery performance. The first group included the main metrics that can indicate the effectiveness of digital marketing, and the second group included the number of unfulfilled deliveries and the number of unfulfilled deliveries in monetary terms. The results of the correlation analysis between these groups of indicators are presented in Table 3.

Table 3. Results of correlation analysis between digital marketing indicators and supply chain efficiency indicators regarding delivery performance. Note: the correlation between indicators marked with "*" is statistically significant at the $p < 0.05$ level; "**" - at the $p < 0.1$ level (where p is the p-value used to determine the significance of the analysis results). *(Source: calculated by the author based on (Companiesmarketcap, 2024; Brand24, 2024)*

	Failures to deliver	Biweekly Failures to deliver volume in USD
Mentions	0.343410	0.438715
Social media mentions	0.116840	0.160262
Non-social Mentions	0.300854	0.376687
Number of Positives	0.090972	0.145242
Number of Negatives	0.507885	0.565466
Estimated Social Media Reach	0.571410	0.652888
Social media interactions	0.753956**	0.783761*
Social media likes	0.737703**	0.778632*
Non-Social Reach	-0.184755	-0.115218
AVE	-0.184914	-0.100217
User Generated Content	0.196506	0.250971

Therefore, the results of the conducted correlation analysis give grounds to draw the following conclusions regarding the potential impact of various digital marketing factors on delivery performance indicators. First of all, a statistically significant and close relationship was found between both indicators regarding delivery performance (Failures to deliver and Biweekly Failures to deliver volume in USD) and indicators of Social media interactions and Social media likes. The correlation between the observed pairs of indicators is positive, so it can be assumed that the increase in the number of interactions and preferences in social networks is related to the number and monetary volume of unfulfilled deliveries. This state of affairs can be explained by the insufficient ability to satisfy all the ever-growing consumers' expectations. Growing expectations and social media coverage can also be a sign of growing demand that is difficult to meet and align with the specifics of the supply chain. The Number of Negatives and Estimated Social Media Reach indicators were also marked by fairly high positive correlations with the Failures to deliver and Biweekly Failures to deliver volume in USD. The first of the two observed indicators can quite logically reflect the buyers' dissatisfaction with incomplete delivery. The second describes the expected number of unique users that can be obtained through certain digital marketing tools — for example, advertising campaigns. In other words, these users have not yet joined the platform community, but this is expected as a result of the implementation of various measures. Correlation with this indicator can also indicate that the growing presence in the digital space can contribute to reaching an increasingly large audience, whose expectations are not always realistically met in full.

So, it can be concluded that the increased demand due to digital marketing, on the one hand, has a positive effect on the growth of the company, the expansion of its activities and the strengthening of its presence in the digital space. This can happen through improved forecasting and planning with digital marketing tools, improved customer engagement and managing consumer expectations. Digital marketing can have a positive impact on logistics as well, if it is connected with tracking systems, order management systems, etc.

On the other hand, an increased demand can cause the logistics system to become overloaded, especially during periods of high demand (such as holidays or promotions). Therefore, companies should prepare for such periods in advance by carefully planning logistics so that the supply chain is adapted to the changes.

Earlier research suggested that digital marketing could be a tool that minimizes the negative consequences of non-delivery. However, the findings indicate a relationship between increased presence in the digital space and the number of unfulfilled deliveries. At the same time, the reason for the increased number of backlogs is most likely not the use of digital marketing, but the increase in demand caused by digital marketing. The increase in demand in itself is a positive trend, but as noted above, companies must be prepared for it. In particular, along with such traditional tools as, for example, inventory management, companies can also use digital marketing tools. Such tools can be effective for planning and forecasting demand, tracking parcels, and receiving feedback from users. For example, buyers often leave complaints on social networks in the case of unfulfilled deliveries. Companies can use these complaints not only to increase their awareness of delivery success but also to contact the dissatisfied customer, find out the cause of the problem and ultimately make the delivery with the customer's consent. This can maintain customer loyalty and positively affect the likelihood of repeat visits.

DISCUSSION

As a result of the conducted research, a positive correlation was found between the growing presence in the digital space of companies and the number of unfulfilled deliveries. It was assumed that this state of affairs is most likely determined by the companies' unpreparedness for a significant increase in demand, which could cause various disruptions. To change the situation for the better and increase the adaptability and flexibility of companies, it was proposed to use traditional approaches, such as inventory management, together with digital marketing tools. These tools can be used to more accurately plan and forecast demand, track parcels, and receive feedback from consumers.

Veleva and Tsvetanova (2020) supported the results of the author's research with a thesis about the wide possibilities of optimizing companies' activities through digital marketing. However, in contrast to this study, the researchers focus mainly on digital marketing opportunities related to consumer engagement and interaction, as well as analysis and forecasting. Researchers have not directly addressed the use of digital marketing for supply chain optimization. Some researchers analyse the effectiveness of digital marketing in logistics companies but do not consider its impact on logistics and the supply chain (Sakas et al., 2023). The mentioned studies touch on related, but fundamentally different topics compared to the author's research. At the same time, it emphasizes the specifics of this study and characterizes it as able to fill a certain niche in scientific developments regarding the relationship between digital marketing and the supply chain.

A number of studies have directly analysed the relationship between digital marketing and supply chain management. Vichit (2020) emphasized the importance of managing digital marketing with consideration of supply chain aspects. The researcher proposed a model combining digital marketing with supply chain management in e-business. Al Mashalah et al. (2022) form a concept that links the stages of the supply chain with digital transformation in general. However, the noted studies are theoretical, which does not allow to support the obtained results with empirical methods. The model proposed by Nasiopoulos et al. (2021) has a stronger practical orientation. It is based on modelling the optimal ranking of a website created by digital marketing with the help of an agent system. The model is particularly useful for supply chain companies in terms of improving understanding of the optimal level of digital marketing adaptability. The model is also important for logistics companies due to the optimization of the distribution network. Kerdpitak (2022) illustrated how digital marketing combined with supply chain management, service quality and innovation affects customer satisfaction, i.e., optimizes customer service. Similar conclusions are drawn by Adam et al. (2020) who showed that the digital supply chain has a positive and significant effect on user satisfaction. Hartono et al. (2020) analysed the role of supply chain management in digital marketing strategies, in particular, the impact on new business products. In view of the mentioned models and directions of analysis, it can be noted that digital marketing has various manifestations of influence on supply chain efficiency. In particular, this is the impact on delivery failures, which was established in this study and was little studied in other works.

This research included an analysis of the relationship between digital marketing and failed deliveries as one of the main problems in the supply chain. In this context, the study has something in common with the work of Mustafa et al. (2020), who examined the impact of disruptions in digital services on consumers but did not delve into supply chain issues. The reason for studying the relationship between digital marketing and failed deliveries is that supply chain optimization should be based on identified issues. In particular, this article noted that digital marketing can cause a significant increase in demand, which, in case of imperfect planning, threatens to overload the supply chain. The author suggested using digital

marketing tools to improve planning. Zhang (2024) proposed a more specific solution to this problem using digital marketing tools. The approach proposed by the researcher implies that the update of the distribution of delivery and supplies takes place in different places, which prevents congestion.

The author's study has some limitations, in particular, its focus on supply chain performance indicators related to non-delivery only. On the other hand, this direction is important in terms of insufficient attention to the impact of digital marketing on delivery fulfilment. At the same time, the works of other authors contain other areas of analysis that can significantly expand the author's conclusions due to the use of other performance indicators. For example, Djaja and Yuan (2023) studied the impact of digital marketing and supply chain cooperation on operational efficiency by analysing such indicators as sales turnover, perfect order fulfilment, inventory forecasting accuracy, and inventory turnover. Alkahtani et al. (2021) in their work on digital supply chain management and digital marketing use a web design index and variable demand, which helps with determining selling price, supplies, advertising costs, etc. Salhab et al. (2023) examine the effects of AI usage, inventory competition, and digital marketing intensity on supply chain quality through correlation analysis.

CONCLUSIONS

Digital marketing determines the competitiveness of modern companies because it is able to increase the efficiency of many areas of company activity. One such area is the logistics supply chain, which can be optimized through improved forecasting and planning, user interaction, etc.

The research found a positive correlation between such indicators of digital marketing and supply chain efficiency as Social media interactions and Failures to deliver (0.75), Social media likes and Failures to deliver (0.74), Social media interactions and Biweekly Failures to deliver volume (0.78), Social media likes and Biweekly Failures to deliver volume (0.78). So, it was assumed that increased social media presence causes the number and monetary value of failed deliveries. At the same time, this can be explained by the companies' unpreparedness for the significant growth in demand caused by digital marketing. The solution to the problem can be supply chain optimization, which can be implemented both by traditional tools (for example, inventory management) and digital marketing tools (forecasting, planning, communication with customers, etc.). So, companies should prepare for changes in demand in advance by carefully planning logistics. In this case, the supply chain will be adaptable to changes, which will minimize the number of unfulfilled deliveries. Further research should be directed to the development of a preventive and adaptive mechanism to reduce the risks of missed deliveries for logistics companies in the event of supply chain overload using traditional and digital tools.

─── **ADDITIONAL INFORMATION** ───

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ВИКОРИСТАННЯ ЦИФРОВОГО МАРКЕТИНГУ ДЛЯ ОПТИМІЗАЦІЇ ЛОГІСТИЧНОГО ЛАНЦЮГА ПОСТАВОК ТА КОНТРОЛЮ ВИТРАТ

Метою роботи є аналіз зв'язку між цифровим маркетингом і невиконанням доставок разом із виявленням можливостей для оптимізації. У дослідженні було застосовано методи статистичного аналізу, кореляційного аналізу, порівняльного аналізу й аналізу метрик. У результаті проведеного дослідження було визначено, що одним із основних викликів ланцюга поставок є збої, зумовлені різними причинами (брак навичок, захворювання, збої у транспорті, несприятливі погодні умови, кібератаки тощо). Збої часто призводять до невиконання доставки. Причини цього найчастіше не залежать від компаній і приносять суттєві негативні наслідки, зокрема, у вигляді збитків, утрати репутації, зниження лояльності клієнтів. У роботі було виявлено, що показники цифрового маркетингу позитивно корелюють із показниками стосовно невиконання доставок. Зокрема, Social media interactions та Failures to deliver (0,75), Social media likes та Failures to deliver (0,74), Social media interactions та Biweekly Failures to deliver volume (0,78), Social media likes та Biweekly Failures to deliver volume (0,78). Зроблено припущення, що такий стан справ може бути пов'язаний із зростанням попиту завдяки цифровому маркетингу, до чого компанії не завжди підготовлені. Недостатня готовність може призводити до збоїв через перевантаженість ланцюга поставок. Результати даного дослідження можуть бути корисними для компаній, що працюють у сфері електронної комерції, у цілях оцінки та мінімізації кількості невиконаних доставок.

Ключові слова: цифровий маркетинг, логістичний ланцюг поставок, лояльність користувачів, кількість взаємодій, соціальні мережі, невиконання доставок, уподобання

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