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The Green Competitiveness of Enterprises: Justifying the Quality Criteria of Digital Marketing Communication Channels

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Abstract: The omnichannel approach to forming marketing strategies for the development of the green competitiveness of enterprises is seen as a process for the inseparable interaction of marketing-mix elements that are aimed at promoting green competitiveness. This approach integrates traditional and digital marketing communication channels and provides consideration for stakeholder interests. The effectiveness of applying the omnichannel approach to the formation of marketing strategies to develop the green competitiveness of enterprises depends on a set of marketing communication channels, which, in various combinations, can increase or decrease the level of companies' green competitiveness. For that purpose, this paper proposes a scientific approach to identifying the quality parameters of marketing communication channels, which involves testing the hypothesis that statistically significant relationships exist between their quality parameters and the levels of green competitiveness. The objects analyzed in the paper comprise large Ukrainian production companies that are part of the agro-industrial, mechanical engineering, and food industries, and that work in both the local and international markets. According to the results of the calculations, four relevant parameters were identified for determining the quality of the marketing communication channels: the speed of loading pages, the failure rate, image, and remarketing activities.

Keywords: green competitiveness; quality criteria; Ukrainian companies; digital marketing channels marketing

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1. Introduction

Modern marketing strategies are characterized by an omnichannel approach that ensures the opportunity for consumers of goods and services to use the full set of marketing channels of communication to obtain a continuous inflow of information and engage in decision-making about companies and purchases [1]. In this case, the relevant marketing strategies should be provided exclusively by a combination of online and offline tools, which necessitates the digitalization of commercial processes. According to a Netsertive report, "The State of Digital Advertising for Multi-Location Businesses", and other analytical reports [2], the COVID-19 pandemic is accelerating the snowballing of e-commerce development. Therefore, digital instruments have become strategic imperatives for brands.

The 2030 Sustainable Development Goals, approved in 2015 by the UNDP, require the transformation of the business sector to the principles of a green economy [3–8]. Harmonization of the basic postulates for the sustainable and competitive development of enterprises should be ensured by enterprises developing green competitiveness, which is characterized by the ability to create and effectively use green competitive advantages (the greening of business processes, green marketing and environmental management, a regulatory framework, inclusion of stakeholders, and green infrastructure) [9–14]. These key determinants will provide convergent and complementary effects for the sustainable development of enterprises, the expansion of their competitive positions in the market, an

increase in investment attractiveness and capitalization, and the formation of the green brand [15,16].

At the same time, the development of Ukraine's national economy is characterized by an intensification of the European integration processes (an association agreement was signed in 2014, and an application for EU membership is to be prepared in 2024 with the aim of joining the EU in 2030). These processes require companies to implement modern sustainable development models, transform and modernize production and management approaches, implement green processes and technologies, and produce green goods and services [17–20]. Ecologically oriented transformation processes will provide competitive advantages for Ukrainian companies and ensure their green competitiveness [21–27]. Therefore, the positioning of domestic enterprises in the European market actualizes their use of digital channels of communication with stakeholders and the promotion of goods and services in new segments of the European market, especially in these COVID-19 pandemic conditions [28,29]. Therefore, it is important to assess the level of companies' green competitiveness, use the relevant marketing channels for communication, and justify the relevant criteria for their selection to increase the green competitiveness of enterprises. The purpose of the study is to identify the quality parameters of marketing communication channels and to determine the relevant criteria for their selection to increase the green competitiveness of enterprises.

2. Literature Review

Modern trends in the promotion policies of companies y characterized the necessity of providing relevant communication channels to promote green competitiveness. Competitive marketing strategies must become increasingly complicated in how they combine traditional offline and online communications [30–32]. Simultaneously, the mainstream of modern marketing involves the total digitalization of communication processes, and the significant domination of online channels for promoting goods and services and for disseminating other information about the activities of companies [33]. The prevailing evidence suggests that the integrated digitalization and virtualization in the era of Industry 4.0 adjust the nature of the companies' interactive processes: managerial, financial, marketing, educational, etc. [34–36]. In the paper Bilan et al. [37] justified their hypothesis about how the amount of financial resources attracted through digital platforms is dependent on the quantitative characteristics of the relevant determinants. The digitalization of marketing policy includes many approaches and methods: strategic communication with influencers [38,39], the aspect of branches [40–42], SMM marketing [43–45], and behavioral aspects [46,47]. In the article Kim et al. [48] demonstrated through bibliometric studies that digital marketing is leading the way in offering new methods to reach, promote, involve, supply, and propose goods and services to customers. At the same time, Oncioiu, I. et al. [49] provided the theoretical background for identifying the correlations between the capabilities of social media and the features of relationships with online consumers. Moreover, Oncioiu, I. et al. [49] justified the importance of companies assessing their interactive communications and how they dialogue with online consumers and other stakeholders. Several studies have recognized that social media is a new medium for marketing promotion. It gives the opportunity for companies to communicate with their customers while constantly monitoring the content, timing, and frequency of social media conversations [50]. In that context, it is also important to determine the benefits of social media marketing, to understand and apply best practices, and to use an experimental design [51]. The COVID-19 pandemic has only highlighted the importance of these actions. Some scientists investigated digital mental health and emphasize an active role in creating digital mental-health marketing communications [52]. The author Syhyda L. [53] justified the necessity to use hybrid tools for marketing communications that allow taking advantage of the benefits of advanced communication tools and innovative solutions. On the other hand, Fischer et al. [54] reported that communication plays an important role in promoting sustainable consumption. They generalized the key approaches and behavioral

aspects in the communication process, and revealed the challenges of integration in this field [55,56]. In the parer Tkachuk V. et al. [57] examined digital marketing strategies for running a green-based business and for developing a policy for communicating with consumers. The findings of Vorontsova et al. [58] highlighted the tendencies apparent in developing educational processes.

The formation of competitive advantages for enterprises in the modern market environment is characterised by the greening of all business processes and the appearance of clusters of green consumers [59,60]. In the paper Ziabina et al. [61] distinguished the social, economic, and ecological indicators of energy efficiency at the country level. Moreover, Pavlyk V. [62,63] estimated the energy efficiency of the national economy using the interdependence of green investment and energy efficiency gaps. The authors Bilan et al. [64] confirmed the linkage between pollution of the environment and the shadow economy. At the same time, Keliuotytė-Staniulėnienė G. and Daunaravičiūtė K. [65] reported that the development of the green-bonds market provides a relevant scientific area for researchers to study the tendencies of the COVID-19 pandemic. Using bibliometric analysis, Ziabina Ye. and Kovalenko Ye. proposed using theoretical and methodological backgrounds for analyzing the trends in energy efficiency theory [66]. The scientists Vasylieva et al. [67] developed a mechanism to increase energy efficiency by reducing energy efficiency gaps. The generalization of the scientific approaches [68–72] to estimate the interconnections between social and economic indicators and environmental responsibility concludes that effective energy policy and responsible communications support key opportunities for developing the green competitiveness of enterprises.

Consumers of green goods and services are heterogeneous, which is due to differentiated socio-demographic structures, values, behavioral determinants, levels of education, and degrees of environmental literacy [73–76]. Therefore, it is important to define the category that characterizes a consumer in the digital age and outline the key characteristics of the digital portrait of the green consumer. The portrait of the green consumer includes the following structural elements [77–79]: socio-demographic characteristics (gender, age, education, profession, professional and family status, and income level); psychological characteristics (concerns, interests, beliefs, behaviors, habits, lifestyles, attitudes, values, and cognitive biases); behavioral characteristics (loyalty, events, frequency of use, attitude to the brand, attitude to the product, consumer status, and level of conversion); and geographical determinants (geographical location and living conditions).

The causality and uncertainty of the processes of promoting green competitiveness are significantly determined by the dynamic and behavioral nature of the consumers of green goods and services. Therefore, marketing strategies for developing green competitiveness should use an omnichannel approach and continuous communication with the personalized consumer of green goods and services. In comparison with other marketing strategies, omnichannels take into account the heterogeneity of consumers of green goods and services by personalizing them; building integrated communications; maintaining the continuity of the purchasing process, consumer information, and experience; using multimedia routing; and interacting with consumers via all communication channels [80,81]. To determine the role and place of marketing tools for communicating with stakeholders and to form and increase green competitiveness, it is important to establish the strength and direction of the appropriate tools' impact on the level of green competitiveness and identify channels that inhibit sales growth [82,83].

Scientific achievements, the existing practice of using omnichannel strategies for promoting goods and services, and the development of environmentally friendly competitive positions indicate that there is a strong system of indicators for assessing the quality and effectiveness of digital marketing strategies. The Global Retail Omnichannel Index [84], which was established in 2015 by Global Consulting Company Strategy& includes the following groups of indicators: web promotion indicators, mobile web system adaptations, indicators that characterize traditional channels of communication and sales, and indicators that characterize the use of marketing strategies and consumer service. The growing

level of the digitalization of communications between producers and consumers leads to the constant implementation of new tools and indicators for assessing the quality of the interaction channels in marketing strategies, which include indicators for the web system and for the traditional offline promotion channels.

However, it is important to create a scientific basis for improving the reliability and accuracy of the selection of marketing communication channels, and of the patterns for improving and expanding their effectiveness in the context of establishing sustainable development and the green competitiveness of enterprises.

The aim of this paper is to analyze the impact of digital marketing instruments on a company's green competitiveness.

3. Materials and Methods

3.1. Assessing Green Competitiveness

The methodology for assessing green competitiveness is based on the entropy approach proposed by X. Cheng and V. Charles [85–87]. The components that characterize green competitiveness are structurally divided into five subgroups:

Economic (Ec_i): output (Ec_1), profit (Ec_2), attracted green investments (Ec_3), energy intensity (Ec_4), and resource intensity of production (Ec_5);

Ecologic (Env_i): the share of renewable energy sources in total energy consumption (Env_1), the amount of air pollution (Env_2), the amount of water resources (Env_3), the amount of waste (Env_4), the level of wastewater treatment (Env_5), and the percentage of waste recycling (Env_6);

Social (S_i): the number of staff members (S_1), the gender structure of the staff (S_2), the monetary assessment of staff training and development costs (S_3), social infrastructure costs (S_4), and the morbidity rate and number of accidents at work (S_5);

Corporate (C_i): transparency of reporting (C_1), ownership structures (C_2), efficiency of the board of directors (C_3), level of environmental culture (C_4), and availability of environmental policy (C_5).

Such components reflect the processes and activities that form the green competitiveness of enterprises.

The assessment includes the following steps:

(1) Normalization of indicators:

- For stimulators:

$$H_{ij} = \frac{Z_{ij} - Z_{min}}{Z_{max} - Z_{min}} \quad (1)$$

- For de-stimulators:

$$H_{ij} = \frac{Z_{max} - Z_{ij}}{Z_{max} - Z_{min}} \quad (2)$$

where Z_{max}, Z_{min}, Z_{ij} are the maximum, minimum, and actual value of the ith indicator ($i = 1, \ldots, n$) of the jth subgroup ($j = 1, \ldots, m$) of the green competitiveness of enterprises, respectively; and H_{ij} is the normalized value.

(2) Determining the share of the indicators of the green competitiveness of enterprises using the entropy method:

- Calculation of the share of the ith indicator of green competitiveness of the j the subgroup (I_{ij})

$$I_{ij} = \left(1 + H_{ij}\right) \div \sum_{i=1}^{m} (1 + H_{ij}) \quad (3)$$

- Calculation of the entropy of ith indicators of green competitiveness (e_i)

$$e_i = -\frac{1}{\ln(n)} \sum_{j=1}^{m} I_{ij} \times \ln\left(I_{ij}\right) \quad (4)$$

- Calculation of the weighting factor of the ith indicator of green competitiveness (ω_j)

$$\omega_i = (1 - e_i) \div \sum_{i=1}^{n} (1 - e_i) \quad (5)$$

(3) Integral evaluation of the green competitiveness of enterprises using the taxonomic method:

$$GC_i = GC_{Ec} + GC_{Env} + GC_S + GC_C = \sum_{i=1}^{n} \omega_i \times Ec_i + \sum_{i=1}^{n} \omega_i \times Env_i + \sum_{i=1}^{n} \omega_i \times S_i + \sum_{i=1}^{n} \omega_i \times C_i \quad (6)$$

where GC_i is an integrated index of green competitiveness of the ith enterprise; Ec, Env, S, and C are normalized indicators of the relevant components of the green competitiveness of enterprises; and GC_{Ec}, GC_{Env}, GC_S, and GC_C are the economic, ecologic, social, and corporate components of green competitiveness, respectively.

3.2. Assessing the Quality Criteria of Marketing Communication Channels

The quality criteria for marketing communication channels in the process of forming the green competitiveness of enterprises were substantiated by using a t-test approach and a two-stage approach. The objects of the study comprise enterprises selected from three sectors of the national economy of Ukraine: mechanical engineering, the food industry, and the agro-industrial sector.

The first stage was intended to form a research information base for two groups of communication channels: online and offline.

Offline communication channels are characterized by the presence of a trademark and brand, promotional materials, a brand book, media promotions, self-conducted promotional and image activities, and remarketing events.

In the second stage, the hypothesis of a statistically significant difference between the levels of green competitiveness and the use of varying combinations of communication channels was tested. The indicator of comparison is the green competitiveness of fifteen Ukrainian companies in mechanical engineering, the food industry, and the agro-industrial sector.

The corresponding calculations were performed using Stata 14.0/SE software.

Checking the nature of the data distribution was undertaken using the Shapiro–Wilk test [88]:

$$W = \frac{\left(\sum_{i=1}^{n} a_i \times x_{(i)}\right)^2}{\sum_{i=1}^{n} (x_i - \overline{x})^2} \quad (7)$$

where a_i is a coefficient, $x_{(i)}$ is the minimum value of the sample, $\overline{x}$ is the average value of the sample, and n is the number of indicators in the sample.

The next step was to check the equality of the samples' variances using the Leuven test [89]:

$$W = \frac{(N - k)}{(k - 1)} \times \frac{\sum_{i=1}^{k} N_i (Z_{i.} - Z_{..})^2}{\sum_{i=1}^{k} \sum_{j=1}^{N_i} (Z_{ij} - Z_{i.})^2} \quad (8)$$

where N is the total number of observations, k is the number of different groups to which the samples belong, and Z_i is the number of cases in the ith group.

For comparison of the average of two independent samples, we used the parametric Student's t-test:

$$t = \frac{|M_1 - M_2|}{\left(\sigma_1^2 / N_1 + \sigma_2^2 / N_2\right)^{1/2}} \quad (9)$$

where M_1 and M_2 are the arithmetical mean, σ_1 and σ_2 are standard deviations, and N_1 and N_2 are sample sizes.

3.3. The Quality Indicators of Marketing Communication Web Channels

The analysis focuses on the enterprises of three branches of the economy (mechanical engineering, the food industry, and the agro-industrial sector), which are leaders in terms of financial and economic development, the level of implementation of green technologies, and a strong corporate culture.

All indicators from the economic, environmental, social, and corporate blocks were obtained from the analytical financial and economic statements located on the companies' websites, the Ukrainian Stock Market Infrastructure Development Agency information portal, the National Industrial Portal, and the information portal of the Centre for Environmental Initiatives (Ecodia).

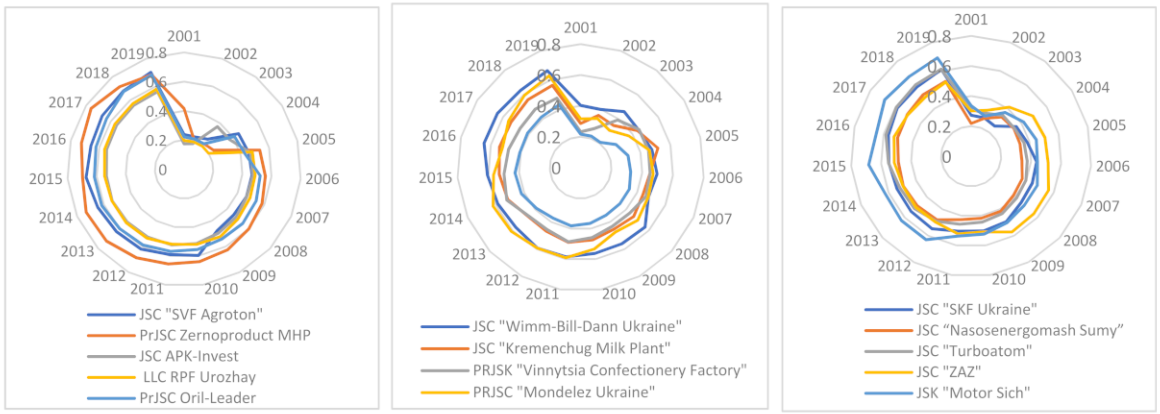
The indicators and their sources on the web systems are systematized in Table 1.

Table 1. Sources and explanations of indicators of companies' web systems.

Indicator	Description	Source
MegaIndex Trust Rank	Degree of trust in the company's website	MegaIndex
MegaIndex Domain Rank	Domain quality (number of external links to the web resource)	MegaIndex
Number of pages in Google search	Number of website pages in search engine rankings as a source of visitors' engagement in commercial web resources	Google Analytics
Page Speed Insights	Number of website pages in search engine rankings as a source of visitors' engagement in commercial web resources	Serpstat
Average time on web page	The time that a user spends on a site	Serpstat
Failure rate	The percentage of web users who view only one page of the enterprise site and leave it without continuing to view others	Serpstat

4. Results

The results of the green competitiveness assessment are presented in Figure 1.



(**a**) (**b**) (**c**)

Figure 1. The result of the green competitiveness assessment in (**a**) mechanical engineering, (**b**) the food industry, and (**c**) the agro-industrial sector.

According to the 2001–2019 calculations, the leading enterprises in terms of the level of LCP were: in the agro-industrial sector, PJSC "SVF Agroton" and PJSC "Oril-Leader" (0.7 and 0.68, respectively); in mechanical engineering, PJSC "Motor Sich" (0.69); and in the food industry, PJSC "Wimm-Bill-Dann Ukraine" (0.66).

The results of the Shapiro–Wilk test hypothesis of the existence of a statistical significance between communication channels and the level of green competitiveness of enterprises are presented in Table 2.

Table 2. Results of the Shapiro–Wilk test to verify the nature of the distribution.

W	V	z	Prob > z
0.95	1.062	0.119	0.45

Note: W—test statistics, V—deviation from normal, z—statistics, and Prob. > z—level of statistical significance.

The results of the Levene test to verify the equality of the samples' variances are presented in Table 3.

Table 3. Results of the Levene test to check the equality of sample variances.

W (0)	W (50)	W (10)
0.144	0.143	0.144

Note: W (0), W (50), and W (10)—test statistics by mean, median, and 10% truncation of mean, respectively.

The use of the Shapiro–Wilk test and the Levene test allowed the conclusion that the sample has a normal distribution and equality of sample variances.

Table 4 presents the results of comparing the average of two independent samples by the parametric Student's *t*-test.

Table 4. The results of comparing the average of two independent samples according to the parametric Student's *t*-test.

Indicators of the Quality of Marketing Communication Channels	Prob.	Interconnection
The degree of trust in the company's website	0.23	Absent
Domain quality	0.53	Absent
The number of website pages in search engine rankings as a source of visitors' engagement in commercial web resources	0.87	Absent
The number of website pages in search engine rankings as a source of visitors' engagement in commercial web resources	0.23	Absent
The time a user spends on the site	0.008	Available
The percentage of web users who view only one page of the enterprise site and leave it without continuing to view others	0.07	Available

Note: Prob.—level of statistical significance.

According to the results of the calculations, four relevant quality parameters of marketing communication channels were identified: page speed insights, failure rate, conducting image, and remarketing events. In addition, the relevance of these marketing channels of communication for enterprises of different economic activities (the agro-industrial sector, the machine-building industry, and the food industry) was studied. The results of the corresponding study are presented in Table 5.

Improving the quality of digital communication channels in combination with offline channels should be a priority in adopting marketing measures to increase the green competitiveness of enterprises. Increasing the page speed insight will expand the audience in the web environment and the number of consumer conversions, and reduce the failure rate. This, in turn, will raise the position of the company's web pages in search engines and marketplaces.

The results of the calculations showed that the analyzed industries have different combinations of criteria for the quality of marketing communication channels in the context of increasing the green competitiveness of enterprises. Thus, in general, for the enterprises of the agro-industrial sector, the most significant are failure rate, conducting image, and remarketing events. The machine-building industry is characterized by the diversity of these characteristics. For PJSC Wimm-Bill-Dann Ukraine, failure rate, conducting image, and remarketing events are relevant; and for PRJSC Kremenchuk City Dairy Plant, these quality criteria of the marketing communication channels are not significant. Therefore, most enterprises of the machine-building industry experience a trend similar to that of the

agro-industrial sector, where three criteria of the marketing communication channels are significant. For PJSC Zaporizhzhya Automobile Plant, all the parameters of the quality of the marketing communication channels will affect the level of green competitiveness of enterprises.

Table 5. Quality parameters of marketing communications in terms of enterprises.

	Communication Channel	Page Speed Insights	Failure Rate	Image Actions	Remarketing
Agro-industrial sector	PJSC SVF Agroton	–	X	X	X
	PJSC Zernoproduct MHP	–	X	X	X
	PJSC APK-Invest	–	X	X	X
	LLC RPF Urozhay	X	–	X	X
	PJSC Oril-Leader	–	X	X	X
	PJSC Wimm-Bill-Dann Ukraine	–	X	X	X
Food industry	PRJSC Kremenchuk City Dairy Plant	–	–	–	–
	PJSC Vinnytsia Confectionery Factory	X	–	–	X
	PJSC Mondelis Ukraine	X	–	X	X
	PJSC Kremenchukmeat	X	–	–	–
Machine-building industry	PJSC SKF Ukraine	X	X	–	X
	JSC Sumy plant Nasosenergomash	–	X	–	X
	JSC Turboatom	–	X	X	X
	PJSC Zaporizhzhya Automobile Plant	X	X	X	X
	PJSC Motor Sich	–	X	X	X

X—the relevance of the criteria.

5. Discussion

Strengthening environmental issues and a global reorientation to green development provoke relevant changes in companies' strategies. Furthermore, new waves of the pandemic boost the development of digital marketing and its penetration into all economic sectors. In this case, considering the findings mentioned above, the companies should actively develop their digital marketing communication. It will allow them to obtain unfair green competitive advantages in the market. The results confirm that the most relevant indicators of digital marketing systems for companies' green competitiveness are page speed insights, failure rates, conducting images, and remarketing events. Compared with Tkachuk et al. (2020) [57], the findings of Taiminen H. and Karjaluoto H. [90] allow an extension of the relevant numbers of digital instruments for increasing companies' green competitiveness through identification of the relevant characteristics: page speed insights, failure rates, conducting images, and remarketing events. In contrast, the findings of Oncioiu, I. et al. (2021) [49] confirmed that it is necessary to combine the traditional and digital channels of communication. Additionally, Key et al. [90] and the authors Mato-Santiso et al. [91] proved the necessity of mixing digital and offline channels to interact with the stakeholders of non-profit organizations [92]. Moreover, the results obtained by Lesscher et al. [92] also showed the positive synergy between offline and online marketing channels for increasing consumer activity metrics.

For enterprises, the improvement in the quality characteristics of digital marketing communication channels should take place through the following optimization measures:

- Increasing the trustworthiness of companies' websites, which will ensure the presence of companies' sites in the top search queries, thus helping promote the green competitiveness of enterprises;
- Developing external links to companies' web resources;
- Raising the indicator of organic traffic, which will characterize the main source of the influx of visitors to commercial web resources;
- SEO-optimization of business sites;
- Increasing the speed of loading the pages of enterprise sites;

- Increasing the parameter of the average time on a web page due to interesting and useful content;
- Optimizing the bounce rate (the percentage of users who view only one page of the company's site and leave it without continuing to view others).

6. Conclusions

The provided assessment conclusions were achieved by implementing the methodology developed in the study. The proposed theoretical approach combines the tools for the statistical analysis of the significance of the relationships between the integrated levels of green competitiveness of enterprises and the quality parameters of marketing communication channels. We confirmed the hypothesis about the statistical significance of the relationships of the quality parameters of marketing communication channels (page speed insights, failure rates, image and remarketing activities) with the levels of the green competitiveness of enterprises.

The above-mentioned points substantiate the causal links between the relevant characteristics of the marketing channels of communication and the level of the green competitiveness of enterprises. Increasing the green competitiveness level should be ensured through the implementation of an omnichannel strategy combined with the use of different combinations of marketing communication channels and the identification of the causal relationships between relevant quality criteria. For further research, it is necessary to study the trends in the digitalization-level influence on companies' performance. Moreover, the link between marketing expenses for digital promotion and sales volumes should be analyzed.

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