



The Impact of Digitalization of Marketing on the Efficiency of the Agricultural Sector

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Abstract

The authors study the influence of digital marketing on the efficiency of the agricultural sector of the economy. The authors chose the systemic approach as the leading approach to study the problem. The chosen approach allows the authors to scientifically substantiate and solve the problems of studying the agricultural sector as a voluminous and complex functioning system. The research revealed that agriculture in Russia is characterized by a lower level of digitalization compared to European countries and other sectors of the national economy of Russia. Currently, the picture is being smoothed by the active development of digital technologies, including digital marketing. Using variance analysis, the authors revealed the relationship between the costs of innovative activities in the field of marketing and the indicators of revenue, profit, and profitability of product sales in the agricultural sector. As a result, the authors developed recommendations for implementing digital marketing. The developed recommendations will reduce unproductive costs and increase the efficiency of the agricultural sector.

Keywords

Digital marketing · Agricultural sector · Innovative technologies · Digitalization · Costs · Statistical analysis

JEL Classification

L79 · M31 · M38

1 Introduction

Digitalization of the Russian economy is one of the main trends in the sustainable development of society. The active inclusion of advanced technologies is typical for all sectors of the national economy, including the agricultural sector, which acts as one of the country's main productive forces. One of the innovative tools to increase the industry's attractiveness for all participants in market processes is digital marketing. Assessing the impact of digital marketing on industry performance is recognized as one of the key and complex tasks at the level of an individual organization and as a whole. These facts determined the relevance of this research.

The research aims to analyze the impact of digitalization of marketing on the efficiency of the agricultural sector in Russia. In accordance with the research objective, the authors analyzed the development indicators of the country's agricultural sector. The authors also studied the development of digital technologies, including marketing, in the agricultural sector. Moreover, the authors carried out a variance analysis. This analysis confirmed the hypothesis of a significant impact of digital marketing costs on revenue, profit, and profitability indicators in the agricultural sector.

The research results are of scientific significance in terms of studying trends in the development of digital marketing and factors determining the efficiency of the agricultural sector in the digital economy. The results can also be used when making management decisions to choose digital marketing tools in the agricultural sector.

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2 Research Methodology

During the research, the authors applied general scientific (comparison, analysis, synthesis, method of logical reasoning, generalization, formalization, and analogy) and specific (document research, static analysis, and graphical method) methods of scientific knowledge.

The variance analysis was carried out in Excel with a default significance indicator of $p=0.05$, corresponding to an error of 5%. The indicators “Costs on innovation activities in the agricultural sector in the section ‘Marketing and brand creation’” and “Costs on digital marketing in the agricultural sector” were selected as categorical predictors. The dependent variables were indicators of revenue, profit, and profitability of sales of agricultural products. The significance of categorical predictors was found based on $p<0.05$ and Fisher’s test $F_{act}>F_{crit}$. The correspondence of the results to the indicated values showed the acceptance of the hypothesis about the influence of the independent factor on the dependent variable.

3 Results

The leading role of the agricultural sector in the economic and social development of society is confirmed by many Russian and international scientists (Bose and Kiran 2021; de Gennaro and Forleo 2019; Ferreira et al. 2022; Gritsenko et al. 2022; Malorgio and Marangon 2021; Sharipov 2012). The active introduction of digital technologies into the country’s economy has aroused a keen interest of science and the public in the issues of digital transformation of the agro-industrial complex (Dobrovlyanin and Antineskul 2022; Germaniuk 2021; Karieva et al. 2021; Popkova and Sozinova 2022; Savelyeva et al. 2022; Serdobintsev and Aleshina 2022; Srivastava 2022). It is noted that digital technologies are one of the key parameters for developing the agricultural cluster of the economy. Innovations in digital marketing are a strategic direction for increasing the efficiency of the agro-industrial complex in Russia and other countries (Beksultanova et al. 2021; Karaeva et al. 2021; Lionboui et al. 2022; MacPherson et al. 2022; Nechaev et al. 2022; Saparova et al. 2022). The analysis of the works from neighboring countries also showed the relationship between the introduction of digital marketing and

the development of the agricultural industry (Government of the Russian Federation 2021; Krautsou et al. 2023; Saparova et al. 2022). The analysis of thematic publications revealed insufficient coverage of the issues of digitalization of marketing in agriculture, where the issue of assessing the effectiveness of digital marketing transformation of agricultural organizations and its impact on the efficiency of the industry remains practically unstudied, which requires additional research of these aspects.

Agriculture in Russia is currently at an active development stage (Federal State Statistics Service of the Russian Federation 2018). Regarding the amount of added value produced in the agricultural sector, Russia ranked fifth in the global ranking at the beginning of 2022. In 2021, sales volumes in the industry increased to 7572.3 billion rubles (+ 30.5% compared to 2019), return on assets increased by 1.9%, and the share in GDP increased from 3.4 to 4.5% (Delovoy Profil 2022). The growth in production volumes in 2022 was 14.8% compared to 2021 and 1.84 times compared to 2015 (Federal State Statistics Service of the Russian Federation 2023).

However, despite the stimulation of import substitution processes and active support from the government, many Russian experts talk about extensive development and the need for a radical transformation of the agricultural sector of the economy based on digital technologies. The departmental project “Digital agriculture” was developed in 2018. It is the starting point for forming an integrated management system in the digital transformation of the industry. According to the document, “... by 2024, 100% of agricultural land should be included in the digital platform ‘Digital agriculture,’ 100% of Russian regions will introduce digital sectoral planning of agricultural production, and the share of investments for the purchase and implementation of digital technologies will be 25% of the total investment of agricultural enterprises” (Ministry of Agriculture of the Russian Federation 2019b).

Efforts on the part of the state and entrepreneurship to transform agriculture have led to the active development of digital technologies and digital marketing in the agricultural sector (Table 1).

In 2021, the sector showed rapid growth in all segments. The most actively developing technologies were big data, electronic document management systems, financial payments in electronic form, digital electronic signature tools,

Table 1 Indicators of the development of digital technologies in Russia and the agricultural sector

Indicator (percentage of total organizations)	Russia/agricultural sector		
	2020	2021	2021 to 2020, ±
<i>Internet use</i>			
Fixed broadband Internet access	73.0/ 57.8	73.8/ 65.8	+0.8/+ 8.0
<i>Use of digital technologies</i>			
Cloud services	25.7/ 17.8	27.1/ 21.5	+1.4/+ 3.7
Technologies for collecting, processing, and analyzing big data	22.4/ 17.2	25.8/ 23.3	+3.4/+ 6.1
Digital platforms	17.2/ 10.2	14.7/ 9.8	-2.5/- 0.4
Internet of things	13.0/ 11.6	13.7/ 14.4	+0.7/+ 2.8
Geographic information systems	13.0/ 14.1	12.6/ 16.1	-0.4/+ 2.0
RFID (radio frequency) technologies	10.8/ 8.1	11.8/ 10.1	+1.0/+ 2.0
Artificial Intelligence technologies	5.4/ 2.2	5.7/ 2.9	+0.3/+ 0.7
Industrial robots/automated lines	4.3/ 4.1	4.4/ 5.3	+0.1/+ 1.2
<i>Using software</i>			
Electronic document management systems	53.8/ 40.1	55.7/ 49.7	+1.9/+ 9.6
Financial payments in electronic form	41.8/ 31.6	42.3/ 39.1	+0.5/+ 7.5
Providing access to databases through global information networks	22.1/ 12.8	21.8/ 17.0	-0.3/+ 4.2
Training programs	15.3/ 6.3	16.1/ 8.9	+0.8/+ 2.6
<i>Use of information security tools</i>			
Digital electronic signature tools	68.6/ 58.0	70.1/ 67.5	+1.5/+ 9.5
Regularly updated antivirus programs	63.6/ 48.7	64.5/ 56.7	+0.9/+ 8.0
Software hardware that prevents malware from accessing	44.7/ 27.2	45.9/ 32.8	+1.2/+ 5.6
Spam filter	40.4/ 23.7	41.6/ 29.0	+1.2/+ 5.3
Encryption tools	38.5/ 22.0	39.5/ 26.9	+1.0/+ 4.9
Computer or network intrusion detection systems	32.0/ 18.5	33.0/ 22.6	+1.0/+ 4.1
Software tools for automating analysis and control of system security	27.2/ 16.5	28.0/ 19.7	+0.8/+ 3.2

Source Compiled by the authors based on Abdrakhmanova et al. (2023a), pp. 47–61

and antivirus programs. These changes led to an increase in the digitalization index of agriculture from 9.7 to 11.6 (Vasilkovsky et al. 2022).

Digital marketing technologies are being developed no less actively in agriculture, making it possible to establish contact with the buyer, build a system of loyal relationships, and increase the competitiveness of the manufacturer in the market (Fig. 1).

In 2021, software tools began to be intensively used to manage purchases and sales of goods, works, and services. Big data sources (e.g., enterprise accounting systems for resource planning, customer relationship management,

management of the flow of goods and services, etc.) are more actively used for marketing purposes. The Internet of Things gained popularity. The number of companies that organize electronic sales has increased. The Internet was more actively used to communicate with suppliers and consumers.

The influence of digital marketing on the economy of the agricultural sector is manifested in the growth of competitive advantages of enterprises. Based on the survey results, many organizations in the information and communication technology sector rated the impact of innovation on business results as high. It involves reducing time for interaction with customers or suppliers (24.6% of organizations),

expanding sales markets (28.5%), opportunities for studying, processing, and analyzing data (29.7%), maintaining sales markets (34.7%), and product-line expansion (47%) (Abdrakhmanova et al. 2023b, p. 84).

The quantitative dependence between the costs of digital marketing and the performance of agricultural enterprises was found using the variance analysis (Table 2).

The influence of “Costs on innovative activities in the agricultural sector in the section ‘Marketing and brand creation’” on the development of the industry is confirmed by the significance indicator $p < 0.05$ and the actual value of the Fisher criterion $F_{act} > F_{crit}$ for all three variables. The indicator “Costs in the agricultural sector on digital marketing” is less clear, being significant for profit and profitability and not significant for the revenue indicator ($p = 0.71 > 0.05$ and $F_{fact} = 0.15 < 7.71$). This effect can be caused by the following:

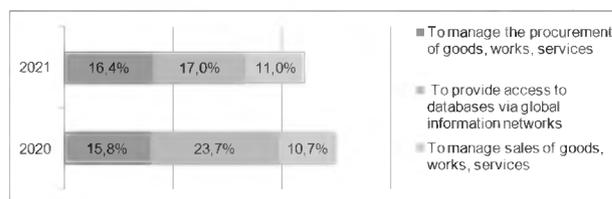
1. A certain influence is taken by the study period, which was compressed for carrying out a full statistical analysis, with the number of observations $n = 3$;

2. The influence of digital marketing on profit volumes and the level of profitability in the absence of a connection with revenue indicators gives grounds for making a conclusion about the influence of digital marketing tools on the amount of costs.

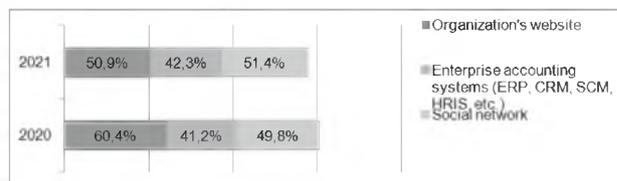
Thus, despite the growth in revenue and profit indicators associated primarily with the growth of production, we see an underestimation of the role of marketing tools, which suggests the need to intensify innovation and marketing activities in the agricultural sector. This also confirms the opinion of the Minister of Science of the Russian Federation, who claims that “...increased funding for research work in the field of agriculture does not produce results due to poor marketing” and insufficient “marketing promotion” (Information Agency “Krasnaya Vesna” 2022). The use of advanced information technologies will make it possible to implement the currently necessary areas of transformation of the marketing activities of enterprises and generally increase the potential of the agro-industrial complex.

Fig. 1 Development of digital marketing technologies in the agricultural sector of the Russian Federation (as a percentage of the total number of organizations). Source Compiled by the authors based on Abdrakhmanova et al. (2023b), pp. 226–254

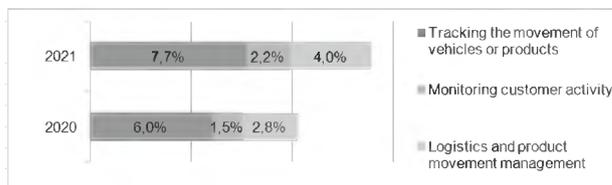
1. The use of software tools in the marketing activities of organizations



2. Big data sources used for sales and marketing



3. Marketing goals of using the Internet of Things



4. Electronic sales

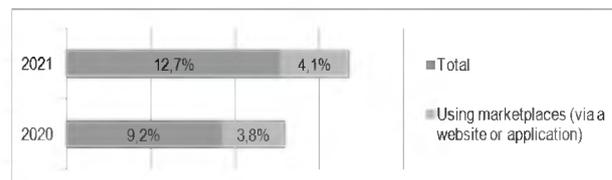
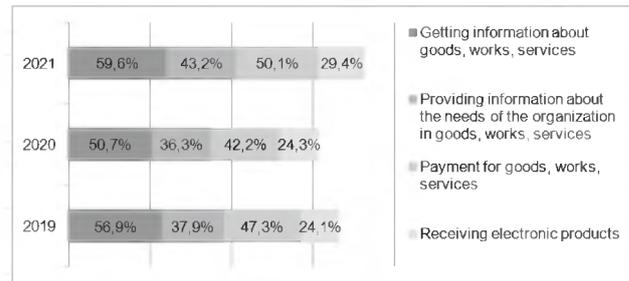
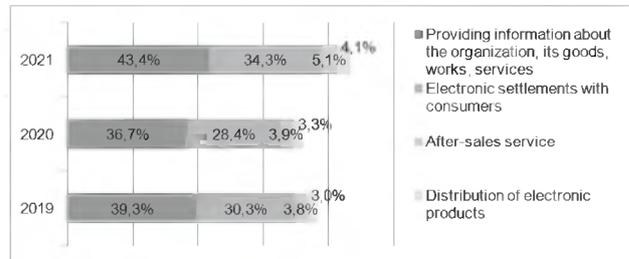


Fig. 1 (continued)

5. The purpose of using the Internet to communicate with suppliers



6. The purpose of using the Internet to communicate with consumers



7. Information posted on the website for communication with consumers

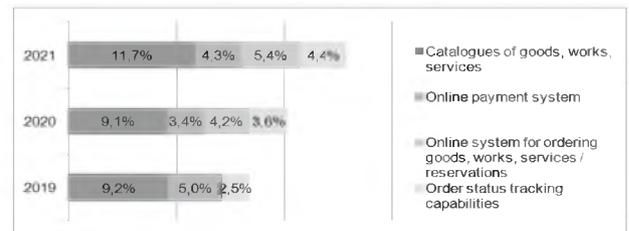


Table 2 The results of the variance analysis: the impact of digital marketing costs on revenue, profit, and profitability

Categorical predictor	Account	p-value	F-actual	F-critical
<i>Dependent variable "Revenue of the agricultural sector from the sale of goods, products, works, services in current prices"</i>				
Costs of innovation activities in the agricultural sector in the section "Marketing and brand creation"	3	0.00061	95.8511	7.7086
Agricultural sector costs for digital marketing	3	0.71220	0.1569	
<i>Dependent variable "Profit (loss) before tax"</i>				
Costs of innovation activities in the agricultural sector in the section "Marketing and brand creation"	3	0.03196	10.4349	7.7086
Agricultural sector costs for digital marketing	3	0.03337	15.2681	
<i>Dependent variable "Profitability of product sales"</i>				
Costs of innovation activities in the agricultural sector in the section "Marketing and brand creation"	3	0.03003	10.8656	7.7086
Agricultural sector costs for digital marketing	3	0.00348	38.1645	

Source Compiled by the authors based on Abdrakhmanova et al. (2021), p. 46, (2023b), pp. 38–39, Gokhberg et al. (2021), p. 62, Ministry of Agriculture of the Russian Federation (2019a), p. 21, (2022), p. 21, Vlasova et al. (2022), p. 62, (2023), p. 62

4 Conclusion

The growing strategic digitalization of the economy requires various industries to apply digital approaches aimed at meeting the market needs of society. The successful development of the agricultural sector, which largely

determines the well-being of the country's population, requires the restructuring of marketing and business processes and their transfer to advanced digital technologies. During the research, the authors confirmed the hypothesis of the impact of costs on innovation, particularly digital marketing, on the main performance indicators of the

agricultural complex. Simultaneously, the authors revealed that the impact of costs on revenue volumes is ambiguous. This necessitates monitoring the state of digital marketing and agricultural industry performance over a longer period.

However, the research results made it possible to formulate recommendations regarding directions for introducing digital marketing in the agricultural sector, reducing unproductive costs, and increasing performance.

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