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Cutting-Edge Digital Tools in the Area of Marketing Communication and Sales Used by SMEs versus Economic Results- Evidence from Poland

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Abstract:

Purpose. *The purpose of this research is to assess the degree of use of digital marketing tools by Polish SMEs in the context of economic effects. The focus was on communication and sales tools.*
Design/Methodology/Approach. *A quantitative approach was used. A survey was conducted on a sample of 574 Polish SMEs from the industrial sector. Statistical methods such as difference significance tests (Mann-Whitney U test, ANOVA Kruskal-Wallis test and Dunn's post-hoc tests), Kendall's rank correlation coefficient and Multivariate Adaptive Regression Splines (MARSplines) were used to analyses the data obtained.*
Findings. *The result of the research proves the positive impact of the use of modern digital technologies for communication and sales on the economic performance of enterprises. They also indicate the importance of barriers on the side of enterprises that inhibit the implementation of the digital instruments presented. Polish SMEs mostly rely on traditional communication channels and customer service methods and make limited use of modern digital marketing tools.*
Practical Implications*. Practical implications refer to pointing out to SME managers the need for, as well as ways to implement and finance digital technologies within the framework of various EU programs on digital transformation of member states.*
Originality/Value. *This is the first research into the impact of the level of digitalization of the marketing area of Polish SMEs on their economic performance, taking into account the level of digital competence of customers.*

Keywords: *Digital transformation, digital marketing, small and medium-sized enterprises, economic results, quantitative methods.*

JEL codes: *M31,M21, O32.*

Paper type: *Research article.*

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1. Introduction

Cutting-edge digital technology and Industry 4.0 tools have been employed increasingly in companies operating in all economic sectors. The digital transformation takes place the fastest and most broadly in large companies which have much higher investment, financial and HR opportunities (Obschonka and Audretsch, 2020). Companies implement new solutions and obtain significant benefits primarily in the area of production and logistics (Reddy and Reinatz, 2017; Dalenogare *et al*., 2018), but also in the area of marketing activities, customer communication and service (Sisko Maarit Lipiäinen *et al.*, 2014; Sun *et al*., 2020).

New technology and digital tools constitute significant development potential for SMEs as well (Ulas, 2019; Li *et al*., 2017; Matt and Rauch, 2020) as they offer a chance of increased innovation and improved operating effectiveness (Cesaroni and Consoli, 2015; Cenamor *et al.*, 2019; Masouras *et al*., 2021; Hassan, Meisner, and Krause, 2023). This is particularly important for the Polish economy based primarily on small and medium-sized enterprises. The SME sector accounts for 99.8% of all enterprises, of which, 97.2% are micro-enterprises (2.3 million), 2.1% are small enterprises (48.7 thousand), 0.6% are medium-sized companies (14.6 thousand) (Report on the state of small and medium-sized enterprises in Poland, 2023).

The share of the SME structure in the EU is similar According to the Annual Report on European SMEs 2022/2023, SMEs number 24.281.159, which is more than 99.8% of enterprises in the European Union, of which 93.5% (22.744.173) are micro enterprises, 5.5% (1.332.200) are small enterprises and 0.8% (204.786) are medium-sized enterprises (Di Bella *et al.*, 2023).

Digital transformation has taken place not only for supply, but also for demand, changing the consumers' purchasing methods and habits, their ways of thinking, their mindset and lifestyle. A new type of digital customer is being created with different requirements and preferences concerning the company offering. The digital customer is conscious of their needs and rights, is more critical and demanding, looks for convenience and comfort, but primarily for a customized offer (Smith, 2017; Jain *et al*., 2021).

To satisfy the digital customer's needs and expectations, appropriate marketing activities are required. Today's marketing requires the application of new strategies based on close and ongoing cooperation between the consumer and the manufacturer or service provider at all stages of offer development, from design, through production and product assessment, to sale and after-sale services. This outcome can be achieved by building digital ecosystems, developing digital business capabilities and using modern tools focused on creating value for digital customers (Kopalle *et al.*, 2020; Wielgos *et al*., 2021; Grabowska and Saniuk, 2021a).

Given the importance of SMEs to the Polish economy and the potential of digitization and technology 4.0 to improve the efficiency and competitiveness of companies, the main purpose of this article is to assess the use of digital marketing

tools of communication and sales by Polish SMEs in the context of economic performance.

To achieve this goal, the degree of use of traditional and modern communication and sales tools by Polish SMEs was first analyzed. Then the impact of the tools used on the economic performance of enterprises was evaluated. The following statistical methods were used: difference significance tests (Mann-Whitney U test, ANOVA Kruskal-Wallis test and Dunn's tests post-hoc), Kendall's rank correlation coefficient and Multivariate Adaptive Regression Splines (MARSplines).

The survey results were used for statistical studies. The survey was carried out based on a sample of 574 small and medium-sized enterprises in the industrial sector. The respondents were top managers.

2. Literature Review

2.1 Development of New Technology in Marketing and Customer Service

New digital technology related to the fourth industrial revolution brings about changes in the operations of business entities across all industries and sectors. The pending digital transformation covers all areas of social and economic life. The digital transformation means a change of the way of thinking and approach to management, development of new business models to provide anticipated values to contemporary customers and meet the challenge of new competition dimensions for all companies, including SMEs (Hebbert, 2017; Bouwman *et al*., 2018; Grabowska and Saniuk, 2021b).

Digital transformation takes place by using the Internet and by implementing cutting-edge technology and Industry 4.0 tools, including cloud computing, big data, artificial intelligence, Internet of things, 3D printing, virtual reality, blockchain, mobile devices, robotics systems etc. to the processes of designing, production, logistics, marketing and sale (Moreiro *et al.*, 2018; Grube *et al*., 2019).

However, it should be emphasized that although digital transformation has taken place by using the above technology, success does not result from the implementation of more modern or more innovative solutions (Andriole, 2017; Fabrizi *et al*., 2019; Vial, 2019).

In order to succeed, a company should skillfully use the right tools to better know and understand the needs and growing demands of digital customers. This knowledge will allow us to prepare a satisfactory offer and deliver it in a fast, efficient and convenient way. The drivers behind the digital transformation are technology and Industry 4.0 tools used in marketing and customer-oriented (Peter *et al*., 2020).

The digital transformation in marketing has taken place for many years (Lamberton and Stephen, 2016; Kannan and Li, 2017; Kim *et al*., 2021). The Internet, digital

communication channels and social media have offered new opportunities to carry out marketing activities and to develop and implement integrated market strategies (Berthon *et al*., 2012; Hendrix, 2014; Charlesworth, 2018; Valenti *et al*., 2023).

Digital technologies and tools are used primarily in areas such as: customer communication, product promotion and advertising, sales process and broadly taken customer service. This is where modern communication tools which have been improved continuously in line with technical and technological progress have been used for years.

Fraccastoro *et al.* (2021) enumerated sale communication tools based on their digitization extent: (1) "traditional" sale communication tools, using face-to-face contact, phone calling and postal services; (2) "digital" sale communication tools, involving emails, websites, search engine optimization, online meeting and chatting platform (e.g., Skype, WhatsApp, Google Hangouts); (3) "social media" sale communication tools, such as social networking sites (e.g., Facebook, Twitter, Instagram, LinkedIn etc.), online blogs (e.g., Quora and Capterra), and content communities (e.g., YouTube).

For more than a dozen years, SMEs have been using second and third digitization degree tools for their customer contacts. Recently, those trends and company digitization process have been accelerated by the pandemic (Amankwah-Amoah *et al*., 2021).

SMEs have been using websites, SMS, emails and social media a lot in their marketing activities (Cacciolatti and Fearne, 2013; Omar *et al.*, 2019; Odoom *et al*., 2017). Developing their own websites, SMEs may present their offer to many recipients at the same time, share more detailed information concerning their operations (e.g., CSR, charitable or sponsoring activities) or organize advertising campaigns online. SMS or email sending allows them to reach individual customers, fulfill their requirements and develop closer relationships.

Even more opportunities are offered by social media, including Facebook, Twitter, Instagram, LinkedIn, Pinterest, Massenger and YouTube (Hanna *et al*., 2011; Salo, 2017). Social media not only ensure ongoing, close contacts with customers, but also enable communication between the company customers, feedback exchange and product recommendations which contributes to building consumers' trust and loyalty.

Many advantages of social media make them a major marketing and sale tool as social media are widely used by salespeople (Bill *et al*., 2020; Lamberton and Stephen, 2016; Mülleret *et al.*, 2018; Tlapana and Dike, 2020).

Moreover, the global reach of the Internet and social media offer SMEs a chance of internationalization and foreign expansion (Arnone and Deprince, 2016; Omar *et al*., 2019; Fraccastoro *et al*., 2021).

Modern technology and Industry 4.0 tools offer immense potential for marketing activities. The Internet of things, big data, cloud computing etc., ensures fast collection, processing and analysis of large quantities of data concerning buyers, demand forecasting, preparation/development of customized products (Varadarajan *et al*., 2021).

3D printing, sensor technologies and visualization enable us to develop the offer together with the customer, to test the products, to improve them and to generate marketing innovations.

Artificial intelligence revolutionizes the development of marketing campaign content and customer relation management, thus reducing marketing costs significantly (van Esch and Black, 2021; Saura *et al*., 2021).

Finally, mobile tools and digital applications offer multiple alternative payment methods which are convenient for customers, including the Internet banking, mobile payments using a phone, smartphone or a watch (Blik, FNC, HCE), mobile wallets, digital currencies (such as Bitcoin), virtual card etc. (Ulas, 2019; Chmielarz, 2020; Szumski, 2020).

Although modern digital technologies and mobile tools used in marketing can provide tangible benefits, SMEs are not realizing their full potential. The pace and scope of the digital transformation of SMEs are constrained by many obstacles and barriers, both internal and external (Sharma *et al.*, 2023).

The most frequently cited barriers to the implementation and use of modern tools in marketing activities by SMEs (including communication and sales tools), regardless of country or industry, are financial constraints, too much risk of new investment, insufficient expertise and low competence of employees (Sisko Maarit Lipiäinen *et al.*, 2014; Styvén and Wallström, 2019).

It is worth mentioning that cutting-edge digital tools allowed many small and medium-sized enterprises to survive the pandemic thanks to the remote communication and customer service. This was proved e.g., by studies carried out following the Covid-19 crisis in 518 Chinese SMEs (Guo *et al*., 2020).

The study authors proved as well that digitization contributes to improved SME economic results. The pandemic accelerated the digital transformation in SMEs. More than one third of Polish SMEs increased their digital platform use, 18% of companies invested in cutting-edge digital tools (purchase of new hardware and software) and 20% of companies made their product and service offer more modern and changed thanks to digitization (Szwajca and Rydzewska, 2022).

The above considerations gave rise to the following research hypothesis:

H1: Small and medium-sized enterprises are increasingly using cutting-edge marketing communication and sales

2.2 Measurable Benefits of Cutting-Edge Digital Tools Implementation

Small and medium-sized enterprises have been implementing new technology and digital marketing tools to a growing extent as well as using their potential and opportunities in response to the growing pressure of the competitive environment and prospective benefits. The studies carried out by many authors recently show that SMEs using e-marketing tools and digital technology achieve the following positive outcomes:

- attracting and gaining more new customers (Taiminen and Karjaluoto, 2015; de Vries *et al*., 2017),
- improved building of brand awareness and loyalty (Kumar *et al.,* 2017; Ismail, 2017; Bill *et al*., 2020),
- improved customer service level, customer satisfaction and trust (Kumar *et al*., 2016; Hochstein *et al*., 2023).

Social media and other digital tools allowing multi-channel, international communication offer SMEs a chance of easier expansion to foreign markets, acquisition of customers in different countries globally (Jin and Hurd, 2018; Karjaluoto *et al.,* 2015). and international brand development (Okazaki and Taylor, 2013). For example, using the digital platform called Alibaba by SMEs in New Zealand allowed those companies to enter the Chinese market successfully (Jin and Hurd, 2018).

The said marketing effects translated into measurable benefits, including:

- increased sale volumes (Karjaluoto *et al*., 2015; Wang *et al*., 2016; Kumar *et al*., 2017),
- reduced marketing costs and expenses (Mokhar, 2015; Odoom *et al*., 2017),

improved economic and financial results ((Johnston *et al*., 2007; Cenamor *et al*., 2019; Styvén and Wallström, 2019; Hwang, W.S. and Kim, H. S.; 2022).

Consequently, this results in improved competitiveness and strategic advantage building (Nobre and Silva, 2014; Cepel *et al*., 2018, Rydzewska, 2023).
In view of the above considerations, a research hypothesis was established:
H 2: The use of the digital marketing tools of communication and sales by SMEs is reflected in their economic results

3. Methodology

To achieve the purpose of the study and verify the research hypotheses, a research procedure consisting of two stages was used. It is presented in Table 1.

Before undertaking the study, it was necessary to assess the reliability of the survey questionnaire and variable distribution normality. Based on the Cronbach's alpha

test, it was confirmed that the validity of the developed research tool is acceptable. The value of the standardized Cronbach's alpha coefficient for the analysed survey is 0.701876. The results of Kolmogorov-Smirnov test (with the significance level of $\alpha = 0.05$) provided basis for rejecting the hypothesis of the individual variable distribution normality. The variables were the analysed questions Q1 to Q16. Consequently, non-parametric tests were used for further analyses.

Table 1. *Research procedure*

PURPOSE OF THE RESEARCH			
RESEARCH HYPOTHESIS H 1		RESEARCH HYPOTHESIS H 2	
Verification of the statistical null hypothesis	**Results analysis tools**	**Verification of the statistical null hypothesis**	**Results analysis tools**
H_0 1.1; H_0 1.3;	Box-plots Mann-Whitney U test	*H_0 2.1*	Kendall's rank correlation coefficient/ MARSplines
H_0 1.2;	Box-plots ANOVA Kruskal-Wallis tests and Dunn's post-hoc	*H_0 2.2*	Box-plots ANOVA Kruskal-Wallis tests and Dunn's post-hoc

Source: *Own study.*

The research procedure consists of two parts. The first part involves the verification of research hypothesis *H1* in relation to Polish SMEs. For this purpose, the null statistical hypotheses *H_0 1.1*, *H_0 1.2*, *H_0 1.3* were formulated and subjected to verification. The second part of the research involves the verification of hypothesis *H 2*, which consists of the verification *H_0 2.1* and *H_0 2.2* null statistical hypotheses.

Mann-Whitney U test was used to verify *H_0 1.1* and *H_0 1.3* hypotheses. This test is suitable to test differences of 2 groups for ordinal dependent variable. *H_0 1.2* and *H_0 2.2* hypotheses were verified using ANOVA Kruskal-Wallis and post-hoc tests. This test is suitable for the number of samples exceeding 2, for ordinal dependent variable.

For the statistical analysis, questions on the use of customer communication and sales instruments, barriers to their implementation and economic effects of enterprises were used. These questions represent a fraction of the comprehensive studies devoted to Industry 4.0 aspects in small and medium-sized companies in Poland.

The survey was performed for the industrial sector companies under section C of the Polish Classification of Activities and covered 23 chapters of industrial processing PCA. The selection of manufacturing companies stemmed from the fact that Industry 4.0 solutions are employed mostly in manufacturing processes.

The survey was carried out using an anonymous questionnaire. The link to the questionnaire was sent by email to the companies. The respondents were top managers because they possess the most detailed information on the company. The survey took place from December 2019 to April 2020. It covered 900 companies, with responses returned by 613 of them. The companies were selected on a random basis. To confirm the statistic sample representativeness, the test power was analyzed. The analyzed test power for the entire group of companies (one mean, test t) was 1.0.

Data of 574 companies out of all the surveyed companies was used for these studies. The selected companies met small and medium-sized company criteria according to the EU and Polish guidelines. They employed 10 to 249 people, and their annual turnover did not exceed EUR 50 million or their balance sheet total did not exceed EUR 43 million.

The analysis was carried out based on responses to 16 questions which referred to using customer communication and sale instruments and company economic results. The list of questions is in the Appendix in Table 4. The survey questions were closed-ended ones. For answers, Likert scale was used (1 – no, 2 – rather no, 3 – difficult to say, 4 – rather yes, 5 – yes).

4. Research Results

4.1 Analysis of the Use Traditional and Cutting-Edge Marketing Communication and Sales Tools by Polish SMEs

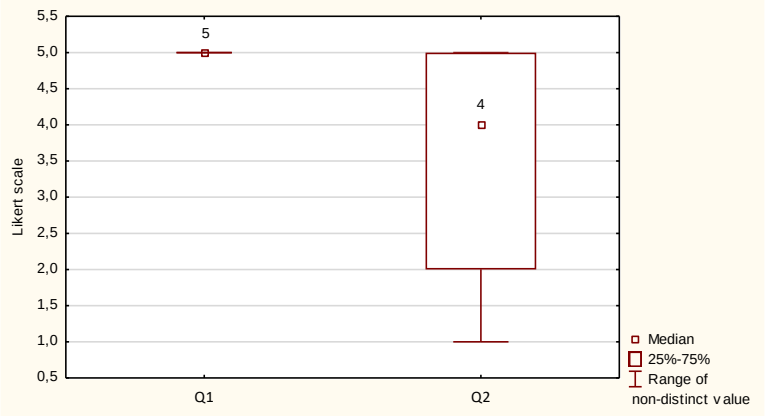
H_0 1.1 Companies use traditional and modern customer communication tools to the same extent

The preliminary box-plot analysis (Figure 1) reveals differences in answers concerning methods of customer communication. The median responses to question Q1 are 1 (yes). Interestingly, the interquartile range and the typical range are 0, which means that all respondents declared that they used traditional customer communication tools, i.e., meeting in the company seat, phone, traditional mail and email.

However, when it comes to questions Q2, the response median is 4 meaning that one half of respondents use (yes) modern communication tools, and the other half do not know or do not use them. Those are tools such as Facebook, Twitter, Instagram, WhatsApp, Messenger, LifeChat and a mobile application. The interquartile range is from 2.0 to 5.0 which indicates different answers.

The results of the Mann-Whitney U test ($p = 0.0000$), with the adopted significance level ($\alpha = 0.05$) indicate rejection of the verified null hypothesis (Appendix Table 5). This means that the survey indicates that the differences in the customer communication tools used are statistically significant.

***Figure 1**. Box-plot for groups of answers to questions Q1 and Q2*



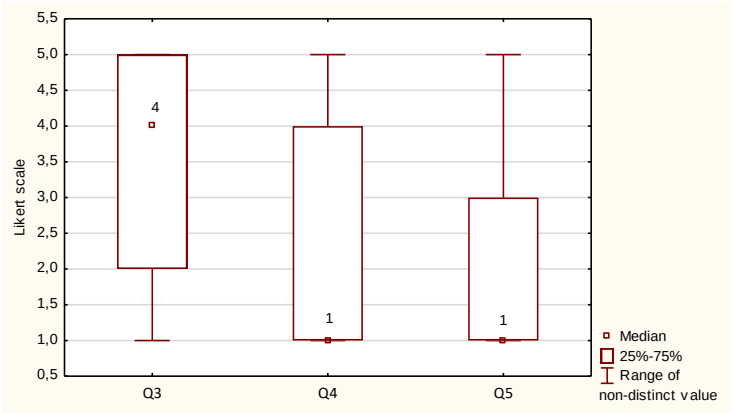
***Source:** Own study.*

Thus, null hypothesis *H_0 1.1* was rejected, and the alternative hypothesis was accepted. Consequently, companies use traditional and modern customer communication methods to a different extent.

H_0 1.2 Companies use traditional and modern sale tools to the same extent

When analyzing the methods of purchasing by the analyzed companies (Figure 2), the response median is 4 for question Q3. This means that one half of respondents said definitive "yes" to selling in the company seat. It can be seen that the interquartile range between the first and the third quantile is high, meaning diverse responses. Some respondents answered definitively "yes", but some other "rather not".

***Figure 2.** Box-plot for groups of answers to questions Q3, Q4 and Q5*



***Source:** Own study.*

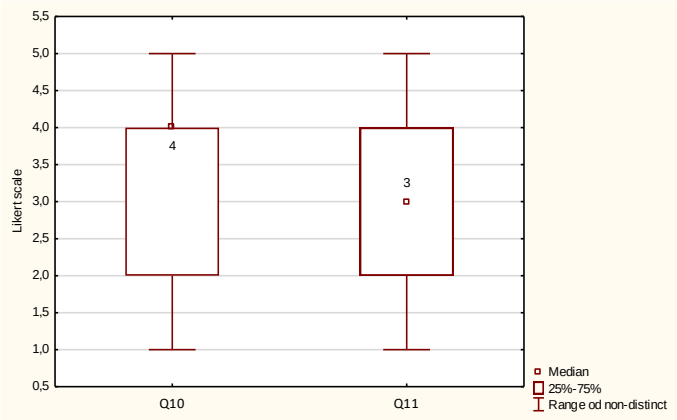
For questions Q4 and Q5, the response median is 1.0. This means that one half of respondents said definitively "no" relating to the use of modern sale tools. However, the response difference is different for individual methods. For the sale using own e-shop (question Q4), responses range from "rather yes" to "no" (the interquartile range is from 4.0 ("rather yes") to 1.0 ("no")). Referring to sale via other e-shops which offer our products, the response ranged from "difficult to say" to "no" (the interquartile range from 1 to 3). This means that if companies decide to use modern sale tools, they tend to prefer their own e-shops.

The result of Kruskal-Wallis test ($p = 0$) at the accepted level of significance ($\alpha = 0.05$) indicates rejection of the verified null hypothesis (Appendix Table 6). This means that responses to at least one question differ statistically from the others. The post-hoc test analysis provided grounds for the conclusion that there are statistically significant differences between all three responses to questions. This means that companies use traditional and modern sale tools to a different extent. All the same, null hypothesis *H_0 1.2* was rejected, and the alternative hypothesis was accepted.

H_0 1.3 Obstacles on the part of the company and of the customers limit modern technology implementation to the same extent

The preliminary analysis of responses (Figure 3) indicates differences in obstacles restricting the implementation of modern technology on the part of the company and of the customers. The median of responses to the question Q10 concerning the obstacles on the company's part is 4.0 ("rather yes"). This means that one half of respondents indicated limitations (yes"), including absence of funds, low employee competence, absence of expertise.

Figure 3. *Box-plot for groups of answers to questions Q10 and Q11*



Source: *Own study.*

On the other hand, the median of responses to the question Q11 relating to the obstacles on the customer's part is 3.0, i.e., "difficult to say". This refers to the reluctance to use new technology, no expertise, no trust in mobile devices and

artificial intelligence. This means that one half of respondents said "yes", and the other half said "no" to identifying the obstacles to the modern technology implementation in customer service with the buyer's limitations.

The results of the Mann-Whitney U test ($p = 0.0001$), with the adopted significance level ($\alpha = 0.05$) indicate rejection of the verified null hypothesis (Appendix Table 7). This means that there are statistically significant differences between the groups of responses to questions Q10 and Q11. Hence, the obstacles on the part of the company and of the customers limit modern technology implementation to a different extent. This means that null hypothesis *H_0 1.3* was rejected, and the alternative hypothesis was accepted.

4.2 Analysis of the Impact of the Use of Communication and Sales Tools on the Economic Performance of Polish SMEs

H_0 2.1 Using individual communication and sale tools and obstacles to their implementation influence the economic results of the company

When analyzing the Kendall's rank correlation coefficient between different responses to questions concerning the tools of customer communication and service and economic results (Table 2), the following regularities can be seen. For question Q1, there are statistically significant correlations for the first (Q14), second (Q15) and third (Q16) economic result. This means that the traditional communication tools allow the companies to carry out investments with positive ROI (Q14).

However, relating to the effects: profitability higher than competitors (Q15) and increase of revenues higher than those earned by competitors (Q16), the correlation is significant, but negative. This means that using solely traditional tools of customer communication results in lower profitability and reduced revenues when compared to the ones earned by competitors.

***Table 2**. Kendall's rank correlation coefficient*

	Kendall's tau correlation. BD removed in pairs. Marked correlation coefficients are significant with p <0.05000		
Variable	Q14	Q15	Q16
Q1	**0,081956**	**-0,067188**	**-0,100356**
Q2	**0,117383**	**0,129314**	**0,103223**
Q3	0,028331	0,016375	-0,000893
Q4	0,002843	**0,097389**	**0,126442**
Q5	0,015420	0,051675	**0,074143**
Q10	**-0,112189**	**-0,070817**	**-0,073550**
Q11	-0,024304	0,030237	0,015573
Q12	-0,006976	**0,072175**	0,052036

Q13	0,049448	**0,068068**	**0,088144**

Source: *Authors' calculations.*

It is different for modern communication tools (question Q2). A significant positive correlation with all economic results is found. New technological solutions for customer communication contribute to the effective investments (Q14), company profitability higher than that of its competitors (Q15) and revenue increase higher than earned by competitors (Q16).

When analyzing the relationship between responses to the questions concerning sale tools and economic results, the use of traditional tools (Q3) is not reflected in the financial results (there are no statistically significant correlations). For sale using own e-shop (Q4), this contributes to profitability higher than achieved by competitors (Q15) and to the revenue increase higher than earned by competitors (Q16). On the other hand, selling using other e-shops (Q5) which offer our products results solely in the revenue increase higher than earned by competitors (Q16).

When analyzing the relationship between obstacles to implementing cutting-edge solutions in customer service and the economic results, there is a statistically significant correlation when compared to ROI (Q14), profitability (Q15) and revenue increase (Q16) for obstacles on the company's part (Q10). This is a negative correlation meaning that the obstacles contribute to reducing ROI, lower profitability and decreasing revenue when compared to competitors. The obstacles on the customer's part (Q11) do not have any statistically significant impact on the company's economic results.

Considering responses to questions concerning the company website which allows us to select a product matching customers' expectations and needs (Q12), Kendall's coefficient indicates correlation with responses concerning higher company profitability than that of its competitors (Q15). This means that running a website with a product offer contributes to company profitability.

When analyzing the relationship between responses to questions connected with the level of the company preparation to serve digital customers (Q13) and economic results, it is correlated (in a statistically significant way) with responses to questions concerning the profitability (Q15) and the increase in profits higher than those earned by competitors (Q16). This means that the company preparation to serve customers who do shopping or handle any official matters using mobile devices has a favorable impact on profitability and the obtained revenues higher than those earned by the competitors.

Multivariate Adaptive Regression Splines were used to complete the verification of the null research hypothesis H_0 *2.1*. Detailed results are shown in Table 3.

Analyzing the results of MARSplines, then for the dependent variable Q14, the best predictors are Q2 and Q10. Thus, the economic effect in the form of a positive return on investment is statistically significantly influenced by the use of modern digital

tools for communication with the customer (Q2) and barriers to the implementation of modern technologies in the area of customer service occurring on the side of the company (Q10).

Table 3. *MARSplines results for dependent variables Q14, Q15, Q 16 and independent variables Q1,Q2,Q3,Q4,Q5, Q10, Q11, Q12, Q13*

Characteristics	Dependent variable		
	Q14	Q15	Q16
Model equation	Q14 = 3,98687048471834 e+000 - 1,07316216029357 e-001*max(0; Q10-1,00000000000000 e+000) + 2,72355316354401 e-001*max(0; Q2-4,00000000000000 e+000)	Q15 = 3,37263580519805 e+000 - 1,18537225996519 e-001*max(0; 4,00000000000000 e+000-Q2) - 6,01555038434376 e-002*max(0; Q10-1,00000000000000 e+000)	Q16 = 3,51939935571921e+000 - 7,21101480713554e-002*max(0; 4,00000000000000e+000-Q2) + 5,94604120550734e-002*max(0; Q4-1,00000000000000e+000) - 6,01464024944235e-002*max(0; Q10-1,00000000000000e+000) - 1,08129596432386e-001*max(0; Q1-1,00000000000000e+000
Penalty	2.000000	2.000000	2.000000
Threshold	0.000500	0.00050	0.000500
GCV error	1.128497	0.662174	0.675047

Predictors	Number of references to each predictor		
	Q14	Q15	Q16
Q1	0	0	**1**
Q2	**1**	**1**	**1**
Q3	0	0	0
Q4	0	0	**1**
Q5	0	0	0
Q10	**1**	**1**	**1**
Q11	0	0	0
Q13	0	0	0
Q13	0	0	0

Source: *Authors' calculations.*

Considering the results obtained for the independent variable Q15, for it the best predictors are also Q2 and 10. Thus, the significant statistical determinants of the company's profitability higher than its competitors are the use of modern digital tools for communication with customers (Q2) and barriers on the part of the

company regarding the implementation of modern digital technologies in the area (Q10).

Identifying the predictors using the MARSplines method for the independent variable Q 16, they are: Q1, Q2, Q4 and Q10. Thus, the factors determining the economic effect - revenue growth higher than that of competitors, in addition to the use of modern digital tools for communication with customers (Q2) and barriers to the implementation of modern technologies in the area of customer service (on the part of the company) (Q10), are also the use of traditional methods of communication with customers (Q1) and sales through its own online store (Q4).

Summing up the survey results, verification of null hypothesis *H_0 2.1* offered ambiguous results. Using Kendall's rank correlation coefficient method, the presented null hypothesis was confirmed for questions O1, Q2, Q4, Q5, Q10, Q 12 and Q13. There is a statistically significant correlation (impact) of the listed variables on the economic results. However, for questions Q3 and Q11, null hypothesis *H_0 2.1* was rejected, and the alternative hypothesis was accepted. Using solely traditional sale tools and obstacles limiting implementation of cutting-edge solutions on the customer's part do not affect the economic results of the company (the correlations are not statistically significant).

The results obtained from MARSplines indicate that the null hypothesis *H_0 2.1* is fully confirmed for questions Q2 and Q 10. The use of modern digital tools for customer communication (Q2) and barriers to implementing modern technologies in the area of customer service occurring on the part of the company (Q10) are significantly statistical predictors for all economic outcomes (Q14, Q15 and Q16). In addition, the variables Q1 (use of traditional methods of communication with customers) and Q 4 (sales through its own online store) are statistically significant determinants for the result- revenue growth higher than competitors (Q16). With regard to the remaining questions, hypothesis *H_0 2.1* was rejected, and the alternative hypothesis was accepted.

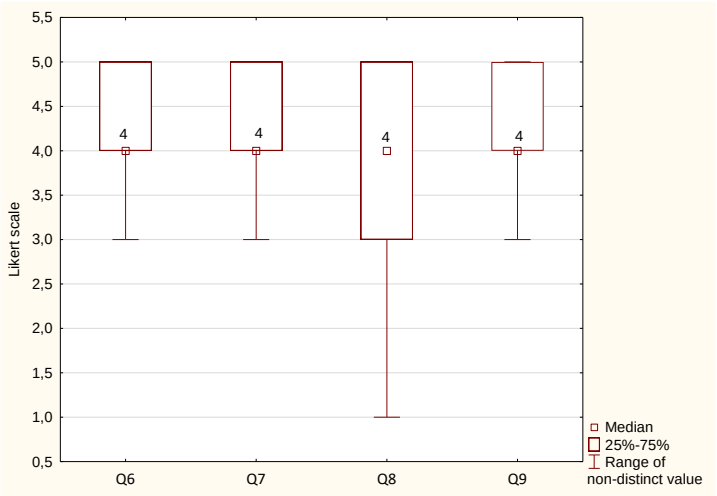
H_0 2.2 Implementing modern technology in customer service does not display any statistically significant differences when it comes to economic results

When examining responses to the questions on the impact of cutting-edge technology in the customer service area on the economic result (Figure 4), the response median is always 4. This means that more than one half of respondents indicated that the implementation of cutting-edge technology in the customer relations area "yes" influences the economic results, whereas the other half selected "difficult to say" or "no". For Q8 (improved financial results), both the interquartile range and the typical range (responses provided) is higher, which indicates higher diversity of responses.

The results of Kruskal-Wallis tests ($p = 0$) at the accepted level of significance ($\alpha = 0.05$) indicate rejection of the verified null hypothesis (Table 8). This means that responses to at least one question differ statistically from the others. The post-hoc

tests carried out indicate that this refers to the response to question Q8, meaning the impact on the improved financial results. The difference between the discussed effect and any other effects may be attributed to the modern solution implementation costs which accompany investment projects and, depending on their value, may exert either positive or negative impact on the financial results. Hence, null hypothesis H_0 *2.2* was rejected, the alternative hypothesis was accepted.

Figure 4. *Box-plot for groups of answers to questions Q6, Q7, Q8 and Q9*



Source: *Own study.*

5. Discussion

The obtained results indicate that Polish small and medium-sized enterprises use cutting-edge customer communication and sale tools, but to a limited extent. Relating to customer communications, all enterprises use traditional tools, including meetings in the company seat, phone, traditional mail and email. However, using cutting-edge communication instruments, e.g., in contrast, the degree of use of modern communication instruments, e.g., Facebook, Twitter, Instagram, WhatsApp, Messenger, LifeChat, mobile application, is less common among the surveyed companies in Poland and significantly different from traditional ones.

Using modern customer communication tools has a favorable impact on the companies' economic results, i.e., on the return on investment, on the company profitability higher than that of its competitors and on the revenue increase higher than earned by competitors (Stocchi *et al*., 2022).

On the other hand, using solely traditional instruments is not sufficient to obtain positive economic results or even leads to a decrease in profitability and reduced sale revenues when compared to competitors. These conclusions are consistent with the results of the previous studies which revealed that the digital communication

channels using the Internet and social media offer new opportunities of marketing activities (Melewar and Nichola, 2003; Berthon *et al*., 2012; Hendrix, 2014; Charlesworth, 2018).

Besides an ongoing, close contact with customers, they enable communication between company customers, opinion exchange and product recommendations which contribute to building consumer trust and loyalty and, consequently, to improving economic results (Hanna *et al*., 2011; Salo, 2017).

According to the studies carried out for Polish companies, there are also differences between using modern and traditional tools for customer service. Running own e-shop or selling via other e-shops are more rarely used than the traditional sale in the company seat.

Similar trends are revealed by statistics for the United Kingdom and other European states of 2019 according to the Office for National Statistics, ONS, and Eurostat. It turns out that small and medium-sized enterprises do not display high readiness for online sales, in particular when compared to large enterprises.

Referring to the companies studied, the sale carried out solely in brick-and-mortar shops does not improve economic results. However, modern sale tools contribute to such results. Selling in own e-shop contributes to the revenues being higher than those of competitors. The results are consistent with the results of studies indicating that using e-marketing tools and digital technology by SMEs is reflected in positive economic results.

The instruments contribute to building brand awareness and brand loyalty (Hudson *et al*., 2016; Kumar *et al*., 2017; Ismail, 2017; Bill *et al*., 2020), improved customer service, increased customer satisfaction and trust (Kumar *et al*., 2016; Adam *et al*., 2020; Hochstein *et al*., 2023), which results in a growing number of new customers (Taiminen and Karjaluoto, 2015; de Vries *et al*., 2017).

The limited extent of using modern communication and sales tools by Polish companies should be attributed to the obstacles to their implementation. The main group of obstacles indicated by the companies studied included the obstacles on the enterprise's part, e.g., the absence of funds, low employee competence, and no expertise.

Those are the most often selected obstacles to implementing cutting-edge digital marketing tools in SMEs, regardless of the country or sector (Taiminen and Karjaluoto, 2015; Cenamor *et al*., 2019; Peter *et al*., 2020).

The studies reveal that, despite the existing limitations to using cutting-edge communication and customer service solutions, the companies expect that they will

improve economic results. This refers to improved speed and proficiency of service, customer satisfaction and company image.
Some companies identify those activities with improved financial results, whereas others associate them with the need to pay extra costs.

The presented results concerning the anticipated economic benefits of using cutting-edge sales and customer service tools are confirmed by the earlier SME studies both in developed and in developing economies. The survey of ca. 2 thousand SMEs from Europe and North America carried out more than a dozen years ago revealed positive effects of using Internet tools on financial results and increased efficiency (Johnston *et al*., 2007). Similar conclusions were drawn by the authors studying Swedish SMEs in 2017 (Beheshti and Sangari, 2017).

One of the most recent studies reveals positive effects of digital transformation in European SMEs (Skare *et al*., 2023). The authors prove that companies using cutting-edge digital tools in their operations have better and faster access to higher numbers of customers, are more flexible and competitive, and thus able to obtain better financial results.

The positive impact of implementing modern marketing tools (i.e., online advertising, social media, emailing) on financial results is also indicated by the studies in SMEs sector in developing countries, including Ghana, Nigeria, Kenya or Malaysia (Etim *et al*., 2021).

6. Conclusions

The purpose of the article was to assess the degree of using the cutting-edge marketing tools of communication and sales by Polish SMEs in the context of economic effects. The realization of the goal was served by the verification of two main research hypotheses, which were subordinated to detailed null statistical hypotheses.

Based on the results of the conducted research on Polish SMEs, it can be concluded that in the case of hypothesis *H1*:

- the studied companies use cutting-edge communication and sale tools to a limited extent as they mostly employ traditional channels and methods;
- the presence of obstacles to the implementation of modern digital forms of communication occurring on the side of the company can be identified with a limited degree of use of modern marketing solutions in the area of communication and sales.

Thus, the hypothesis presented *H1* was not confirmed.

Conclusions on the verification of the research hypothesis *H2*:

- the use of the cutting-edge marketing tools of communication and sales positively affects economic performance, such as return on investment, profitability and revenue growth, while modern forms of sales (own online store) sales positively affect revenue growth higher than that of competitors;
- the obstacles to implementing modern communication and sale tools referring to the limitations on the company's part decrease economic results. These are: the absence of sufficient funds, insufficient expertise and employees' competence;
- the studied companies perceive the positive effect of the modern solutions on the financial results but see also that this entails future investment expenditure.

Thus, hypothesis *H2* was confirmed.

The added value of this manuscript is to assess the extent to which Polish SMEs use cutting-edge communication and sale tools and how this affects their economic results. The studies also indicate the limited degree of use of e-marketing tools and digital technologies and the use of traditional customer communication channels and sales methods by Polish SMEs.

This situation is due to the fact that the Polish economy is still struggling with problems left over from the centrally planned economy. These include low levels of investment and innovation, low spending on business research and development, and a complicated legal system for businesses (Report on the state of small and medium-sized enterprises in Poland). In addition, Polish SMEs pointed to the importance of barriers to the implementation of modern digital forms of communication occurring on the side of the company, which negatively affect economic performance.

This situation is related to the specifics of the Polish SME sector. It is characterized by high fragmentation (95% of all enterprises are micro-enterprises). In turn, it is mainly for the microenterprise, due to limited financial, material, and intellectual resources, that the barriers associated with the implementation of digital technologies are particularly difficult to overcome. In an economy with a fragmented business structure, it is more difficult to implement modern, expensive tools, including digital tools.

Thus, the obtained results provide new quantitative information on the associations between the digital transformation in marketing activities and the effectiveness of Polish SMEs. These findings may constitute a basis for international comparisons and the point of reference for further studies in this area.

The studies presented in this paper have several limitations. Firstly, the surveys were restricted solely to Polish SMEs. Secondly, the sample covers primarily manufacturing companies. This results from the fact that the analyzed questions are a part of the broader studies of Industry 4.0 solution implementation in Polish SMEs in the industrial processing sector.

Thirdly, the studies are based on the results of surveys conducted by SME managers, without disclosing data on the financial results of the companies.

The obtained results and their limitations indicate directions for further studies. Limited to SME sector, subsequent studies could evaluate the impact of cutting-edge digital tools on the economic and financial results of small and medium-sized companies in various EU states. Broader studies could also cover large enterprises which would allow to assess the differences of such interdependencies depending on the company size.

These and many other studies (Johnston *et al*., 2007; Beheshti and Sangari, 2017; Etim *et al*., 2021) were based on survey methods which have their flaws. Future studies could be based on using mixed methods comprising the combination of surveys and financial data from the companies studied companies' reports (Skare *et al*., 2023).

These studies were carried out before the Covid-19 pandemic. However, more recent publications indicated that the challenges caused by those circumstances accelerated the digital transformation in SMEs (Guo *et al*., 2020). Consequently, it would be worth analyzing the extent to which cutting-edge customer communication and service tools have been used following the pandemic.

Another interesting direction of studies would be the analysis and effectiveness assessment of the institutional activities supporting the digital transformation on EU and national level.

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Appendix:

Table 4. *List of survey questions subject to the statistical analysis*

No.	Question
Q1	In our company, we communicate with our customers using traditional methods (meeting in the company seat, phone, traditional mail, email etc.)
Q2	In our company, we communicate with our customers using modern communication methods (Facebook, Twitter, Instagram, WhatsApp, Messenger, LifeChat, mobile application)
Q3	Our company customers most often buy using traditional methods in the company seat
Q4	Our company customers most often buy from our e-shop
Q5	Our company customers most often buy from other e-shops offering our products
Q6	Modern technology implementation in the customer service area contributes to improved service speed and effectiveness
Q7	Modern technology implementation in the customer service area contributes to increased customer satisfaction
Q8	Modern technology implementation in customer service area contributes to improved financial results
Q9	Modern technology implementation in the customer service area contributes to improved company image

Q10	Major obstacles to implementing cutting-edge technology in the customer service area are the ones on the company's part (e.g. absence of funds, low employee competence, absence of expertise).
Q11	Major obstacles to implementing cutting-edge technology in the customer service area are the ones on the customers' part (unwillingness to use new technology, no expertise, no trust in mobile devices and artificial intelligence)
Q12	Our website allows us to select a product/service meeting specific expectations and needs of customers (customize a product/service).
Q13	We are fully prepared to serve digital customers (customers using mobile devices to do shopping or handle official matters etc.).
Q14	In our company, we have positive return on investment.
Q15	Profitability of our company is higher than that of competitors.
Q16	Revenue increase in our company is higher than that of competitors.

Source: *Own study.*

Table 5. *Mann-Whitney U test results for the comparisons of the groups of responses to questions Q1 and Q2*

	Mann-Whitney U test (with a continuity correction) Relative to the variable: question Indicated results are significant with p < 0.05000								
Variable	Rank total Q1	Rank total Q2	U	Z	p	With corrections	p	N valid Q1	N valid Q2
Answer (Likert scale)	396007.00	263519.00	98494.00	**11.79**	**p<0.0001**	**13.38**	**p<0.0001**	574.00	574.00

Source: *Authors' calculations.*

Table 6. *Results of ANOVA Kruskal-Wallis test and post-hoc analysis for the groups of responses to questions Q3, Q4 and Q5*

Dependent: Answer	ANOVA Kruskal-Wallis rank; Independent (grouping) variable: question Kruskal-Wallis test: H (2, N = 1722) = 279.9311 p = 0.000			
	Code	N valid	Rank total	Average rank
Q3	1	574	647578.00	1128.18
Q4	2	574	420432.50	732.46
Q5	3	574	415492.50	723.85

Dependent: Likert scale (answers)	Value p for multiple (two-way) comparisons; answer Independent (grouping) variable: question Kruskal-Wallis test: H (2, N = 1722) = 279.9311 p = 0.000		
	Q3 R:1128.2	Q4 R:732.46	Q5 R:723.85
Q3		**p<0.0001**	**p<0.0001**

Q4	**p<0.0001**		1.0000
Q5	**p<0.0001**	1.0000	

Source: *Authors' calculations.*

Table 7. *The results of Mann-Whitney U test results for the comparison of responses to questions Q10 and Q11*

Variable	Mann-Whitney U test (with a continuity correction) Relative to the variable: question Indicated results are significant with p < 0.05000								
	Rank total Q10	Rank total Q11	U	Z	p	With corrections	p	N valid Q10	N valid Q11
Answer (Likert scale)	351945.50	307580.50	142555.50	**3.95**	**0.00**	**4.06**	**p<0.0001**	574.00	574.00

Source: *Authors' calculations.*

Table 8*. Results of ANOVA Kruskal-Wallis test and post-hoc analysis for the groups of responses to questions Q6, Q7, Q8 and Q9*

Dependent: answer	ANOVA Kruskal-Wallis rank; answer (Sheet2) Independent (grouping): question Kruskal-Wallis test: H (3, N = 2296) = 31.51557 p = 0.0000			
	Code	N valid	Rank total	Average rank
Q6	1	574	690001.50	1202.09
Q7	2	574	654514.00	1140.27
Q8	3	574	592927.50	1032.97
Q9	4	574	699513.00	1218.66

Dependent: answer	Value p for multiple (bilateral) comparisons; answer (Sheet2) Independent (grouping) variable: question Kruskal-Wallis test: H (3, N = 2296) = 31.51557 p = 0.0000			
	Q6 R:1202.1	Q7 R:1140.3	Q8 R:1033.0	Q9 R:1218.7
Q6		0.6848	**0.0001**	1.0000
Q7	0.6848		**0.0367**	0.2708
Q8	**0.0001**	**0.0367**		**p<0.0001**
Q9	1.0000	0.2708	**p<0.0001**	

Source: *Authors' calculations.*