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THE EFFECT OF DIGITAL TECHNOLOGIES ON ORGANIZATIONAL PERFORMANCE: AN EMPIRICAL STUDY IN BRAZILIAN MSMEs

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1. INTRODUCTION

A paradigm shift in economic and social dimensions has been brought about in recent years by the rapid digital revolution that has been occurring (Brocke et al., 2016; Wilms et al., 2017). With an emphasis on business models and their immediate effects on society, scholarly study has zoomed out at the macrolevel of digital change (Brocke et al., 2016). However, the microlevel of digital transformation, particularly in small and medium-sized businesses, has received less research attention (Bouncken et al., 2019; Li et al., 2018; Yasin et al., 2022; Tripadi, 2019; Matt et al., 2015).

This digital revolution needs to be adopted by many organizations, especially MSMEs. MSMEs have made significant contributions to economic growth. For MSMEs to grow and remain competitive on a global scale, the use of smart technology has become essential (Tripati A., 2019). The OECD observed that the uptake of digital technologies remains particularly low among small firms, even for technologies that seem particularly relevant for MSMEs, such as cloud computing (OECD, 2017).

Li et al. (2018) claim that there are clearly differences in how quickly SMEs adopt digitalization. The "ubiquity of non-proprietary technologies and open-access platforms" (Morgan-Thomas, 2016, p. 1122) offers MSMEs unheard-of chances to build their technological foundation (Audretsch et al., 2015). For instance, by using social media to manage customer connections, digital technology can expand a MSME's value proposition (Ainin et al., 2015).

Social media use has a favorable impact on SMEs' financial performance since it lowers marketing expenses while enhancing consumer relations (Ainin et al., 2015). In a broader sense, MSMEs may begin to digitize some business activities by implementing digital technologies to alter the value proposition, value creation, and value capture processes, all while defining the digitalization's scope and level (Matt et al., 2015; Bouncken et al., 2019).

According to recent analyses of the literature, digitalization is a complex phenomenon that affects many distinct levels, including digital entrepreneurship, digital strategies, digital processes, and digital education (Kraus et al., 2018). Recent publications have demonstrated the topic's relevance as well as the need for additional study (Kraus et al., 2019). Even though the recent influx of academic research on digitization is appreciated and offers much-needed clarification, it is primarily focused on large-firm scenarios. The majority of MSMEs with limited resources cannot meet the demands of the digitalization imperatives (Verhoef et al., 2021), and according to Li et al. (2018), MSMEs digitization is still an understudied phenomenon.

Several studies, like those by Nasiri et al. (2020), Bu et al. (2020), and Frank et al. (2019), attempted to identify the true influence of digitalization on bringing about a revolutionary transformation in the production process and relationships. These earlier studies, however, left some research gaps, such as Nasiri et al.'s (2020) explanation of internal and external collaboration as a performance factor linked to digitalization, and Yasin's (2022) attempt to explain the relationship between market share, earnings growth, and sales growth, but they neglected to take other endogenous (dependent) variables of firm performance, such as quality, process efficiency, customer satisfaction, and responsiveness.

Therefore, this study contributes to the existing literature by adding these neglected endogenous variables of performance to understand the digital initiatives effect. To fill this research gap, this study attempts to holistically address the following research question (RQ).

RQ1: What is the impact of digitalization technologies on the performance of micro, small and medium-sized companies in Minas Gerais between 2021 and 2022?

RQ2: Which digitalization technologies are predictors of superior performance?

The purpose of this article is to comprehend the impacts of digitalization on the overall performance of MSMEs and to investigate whether digitalization techniques are predictors of superior performance. A better understanding of this context is fundamental. Indeed, around 98% of companies in Brazil are micro and small, "more susceptible to market fluctuations and the fragile economic situation, exposing them to risk situations" (Nassif et al., 2020, p. 3), requiring higher performance techniques, including digitalization (Eller et al., 2020). In principle, this paper answers recent requests for additional study on the performance of MSMEs and digitalization (Bouncken et al., 2019; Li et al., 2018; Yasin et al., 2022; Tripathi, 2019; Matt et al., 2015).

2. DIGITALIZATION AND ORGANIZATIONAL PERFORMANCE

2.1 Digitalization

For the past 20 years, the significance of digital transformation has grown. Technologies have made it possible for businesses to improve stakeholder involvement in addition to productivity. The production process has undergone innovation as a result of the digital transformation in the workplace. Intelligent products are being introduced by this revolution, which is a magnificent phenomenon (Martinez-Caro et al., 2020). Due to digital transformation, customers now have access to the best services (Agrawal & Narain, 2018).

Büyüközkan and Göçer (2018) define digitalization as the use of digital technology and the transition of traditional businesses to digital businesses, which results in the creation of new sources of income. In both economic and cultural respects, digitalization is a technical force that strengthens globalization (Isaksson et al., 2016) and can be composed of three crucial stages: digitalization strategy, digital organization and culture, and digital operations. Setting up digital goals, developing a digital strategy, and putting it into practice are the main objectives of the digitalization strategy (Lee et al., 2022).

This digitization, which is based on a quick and widespread adoption of technology and even more so in contact with one another, has a great deal of potential to fundamentally alter how people conduct business and perform their jobs. The technological underpinnings of digitalization can be divided into the following fields of technology: a) technologies related to the collection, processing, and analysis of digital data, like big data approaches; b) technologies for networking systems (like cloud computing) and for virtualization, like augmented and virtual reality (AR / VR); c) technologies for automation, like robotics approaches (Gilchrist, 2016).

A wide-ranging, dynamic, and complex change is being driven by a number of factors, including digitalization and networking. Everything will be interconnected, the evolution curve will be much steeper, and technology will collaborate with people to affect performance and business processes in the day-to-day operations of the company (Schmidt et al., 2015).

A number of prominent digital business technologies, according to Schmidt et al. (2015), have a substantial influence on several sectors. Technology enablers include internet of things (IoT), augmented reality (AR), cyber-physical system (CPS), cloud manufacturing and smart factory (robotics, 3D printing, sensors) (Alzoubi et al., 2021; Ghazal et al., 2021; Pereira & Romero, 2017; Schmidt et al., 2015; Turki et al., 2021).

These technologies can promote collaboration across the entire organization and supports ongoing agility, visibility, and controllability (Ben-Daya et al., 2019), providing a quickly and easily access configurable manufacturing resources across a network (Gomes et al., 2018), and an intelligent environment to achieve flexible and adaptive processes (Pereira & Romero, 2017).

2.2. Organization Performance

The performance of the company determines whether it succeeds or fails (Rehman et al., 2019). According to Richad et al. (2009), the firm's performance tells us how well it is accomplishing its goals. Regarding the goals, each business or organization wants to make the most profit possible and endure for a long time in the market.

The performance of the company is impacted by a variety of variables, including internal and external cultural issues, rewards, financial matters, the development of novel business models, administrative issues, leadership abilities, teamwork, environmental uncertainty, and planning (Rehman et al., 2019).

A company's performance is crucial for survival in a competitive market (Cania, 2014). Both qualitative and quantitative metrics can be used to assess a firm's performance, achieved through departmental and employee efforts. As businesses and organizations become more competitive, their performance is essential for achieving objectives and targets for small, medium-sized, and large companies in both emerging and developed countries (Zehir et al., 2016).

According to Pires and Aravechia (2001), an organizational performance evaluation system must be results-driven and should be guided by stakeholders' interests. Performance organization is viewed from the perspective of team management as an assessment activity that enables companies to judge and compare goals, patterns, previous decisions, and other processes and results. As a result, the creation of value is the fundamental component of organizational performance. The assets will continue to be available to the organization so long as the value created by the contributed assets is equal to or greater than the value anticipated.

Historically, the majority of researchers have used both financial and non-financial factors to evaluate an organization's performance, incorporating ROI, market share, profit margin on sales, ROI growth, sales growth, market share growth, and overall competitive position (Stock et al., 2000), however performance evaluation is still a difficult topic for many organizations (Abu-Jarad et al., 2010; Lee et al., 2022).

Since the late 1980s, the majority of researchers and consulting firms have stressed the need of including and utilizing non-financial variables in the process of analyzing organizational performance (Lee et al., 2022). As a consequence, this research takes into account both financial and non-financial components of organizational performance.

Financial performance may be defined as the financial outcomes of management decisions and how those decisions are implemented by organization members. Owner-managers would also get non-monetary returns in the form of lifestyle advantages for their employees and the environment, such as workplace enhancements, work hours, and social interactions (Lebas & Euske, 2007; AlKurdi et al., 2020; AlShebli et al., 2021; Alameeri et al., 2020; AlShehhi et al., 2021; Alsuwaidi et al., 2021).

As a result, organizational performance includes three types of firm outcomes: (a) financial performance (profits, return on assets, return on investment); (b) product market performance (sales, market share); and (c) shareholder return (total shareholder return, economic value added). Richard and colleagues (2009).

Performance outputs can be quantified in a variety of ways. Jeong and Hong (2007) evaluated performance using the following metrics: delivery reliability, responsiveness, adaptability, cost, and efficiency. Lee et al. (2007), on the other hand, utilized cost containment and dependability criteria. Sezen (2008) used output, resource performance, and adaptability to determine effectiveness. Vanichchinchai and Igel (2009) chose to evaluate organizational success in terms of cost, flexibility, relationship, and responsiveness. Many studies also employ resource efficiency indicators such as filling rates, timely delivery time, customer response time, and flexibility measures (Lee et al., 2022).

2.3 Digitalization and SME's Firm Performance.

Digitalization has gained significance during the last two decades. Technology has paved the way for businesses to boost not just their output but also their contact with stakeholders. The digitalization has changed the way we operate, introducing innovation to the manufacturing process. This transformation is a great phenomenon that heralds the arrival of intelligent products (Martinez-Caro et al., 2020).

Digitalization significantly increases company performance by introducing new concepts and methodologies into the manufacturing process (Chege et al., 2020). Windahl (2015) asserts that the firm's technical modernization has a substantial influence on how well it performs in the market and how much money it makes. Businesses must adapt new technologies in order to sell their products and develop their manufacturing techniques (Bryjolfsson & Suanders 2010; Chege et al. 2020). The digital revolution turned the basic company model into a digital business model. The digital business strategy immediately improves market and corporate performance (Verhoef & Bijimolt, 2019).

The introduction of new ideas and techniques into the production process boosts firm performance significantly (Chege et al., 2020). Windahl (2015) asserts that technical modernization in the company is vital to increasing market performance and creating money. Manufacturing and marketing processes must accept technology innovation and change (Bryjolfsson & Suanders 2010; Chege et al. 2020). The old business model was also changed into a digital business model as a result of the digitalization. Verhoef and Bijimolt (2019) argue that digital business strategy directly increases market and firm performance.

There are two critical components for a firm's operations: technical innovation and market forces. The use of technological devices enhances the business level of the corporation (Daveport et al., 2019; Grewal et al., 2018;). In other words, the use of technology in business makes it easier for managers to incorporate innovation into their company operations. Smart technology has lately emerged as a critical component (Lee et al., 2022).

Consumers are employing smart technologies to obtain services for various purposes, and this act has a direct impact on the functioning of organizations (Roy et al., 2019). According to Alicke et al. (2017), digitization enables firms to be quicker, more flexible, granular, accurate, and efficient in their processes. Firms may efficiently estimate consumers' demands with sophisticated prediction methods such as predictive analytics, allowing them to respond to client requests rapidly.

Since technical enablers are increasingly driving the market, the majority of organizations must implement cutting-edge creative solutions (Hanaysha et al., 2021; Schrauf & Berttram, 2016; Al-Zu'bi et al., 2012; Alnuaimi et al., 2021; Alzoubi & Aziz, 2021). As a result, the organization's entire level, which includes management procedures, human and technological partnerships, and infrastructure technologies, must actively engage in this process. Digitalization, in particular, increases productivity and improves overall organizational performance (Shamout et al., 2022; Alzoubi et al., 2021; AlShurideh et al., 2019; Alzoubi et al., 2022; Joghee et al., 2021; Ali et al., 2021; Rachinger et al., 2018).

According to Bughin et al. (2018), several digital technologies, such as Blockchain, Big Data, cloud computing platforms, Internet of Things, Man-Machine Learning, Artificial Intelligence, and many more applications, assist boost organizational performance.

Digitalization helps SMEs to increase the efficiency of business processes such as financial data processing, inventory management, and product delivery. Furthermore, digitization opens up new business opportunities through e-commerce, social media, and other digital platforms, as well as the use of AI. Using artificial intelligence (AI) offers a lot of potential for assisting SMEs in digitalizing. AI can assist SMEs in optimizing inventory management, analyzing customer data, and improving marketing and business management effectiveness and efficiency (Mosavi & Triansyah, 2023).

However, many SMEs are still not ready to digitalize because they lack access to technology and people resources with information technology experience (Wendt et al. 2022). As a result, the government and a number of private firms have made a variety of measures to assist SMEs with digitization, including providing information technology training and counseling, as well as access to technological infrastructure such as the internet and software.

Kazakov et al. (2020) establish the feasibility of digitalization on SMEs' organizational performance and give adequate empirical evidence for SMEs to operationalize. According to Charina et al. (2022), the sustainable education program provides small businesses with critical information and expertise for developing economic, social, and environmental innovations. According to these studies, digitization is an important aspect that may improve SMEs' performance, sales, effectiveness, and resilience (Mosavi & Triansyah, 2023).

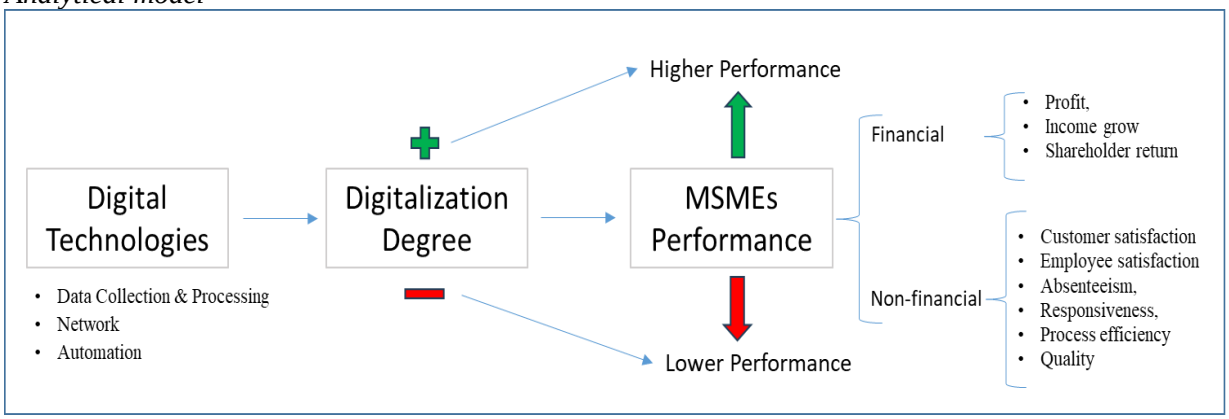
The digital economy offers a competitive environment in which MSMEs may profit from an entrepreneurial strategic approach. Because firms are expected to maintain a market advantage through innovative, proactive, and risk-taking efforts (Covin & Slevin, 1989), the use of digital technologies opens up new opportunities to enhance current entrepreneurial orientation by optimizing processes, managerial, and strategic decisions (market entry, customer targeting, partnership, pricing decisions), and customization (Kraus et al., 2019; Lumpkin & Dess, 2004; Aagaard et al., 2019; Watson et al., 2018). MSMEs may quickly and easily increase their abilities and performance through digital technology (Nambisan, 2017; Lumpkin & Dess, 2004).

However, the rising usage of digital technologies has changed the role of founders. Indeed, governance becomes less centralized and, as a result, more dispersed across groups of stakeholders that create value together (Nambisan, 2017). Although most entrepreneurship research has focused on the entrepreneur as an individual who leads operations from idea inception to realization, the use of digital technologies is expanding this role by allowing a broader set of actors with varying goals to participate in entrepreneurial initiatives.

According to Nambisan (2017), these new stakeholders, whether individuals or enterprises, are actively participating in finding opportunities and evaluation via digital platforms, social media, or crowdsourcing and crowdfunding systems. This creates a global network with a plethora of new opportunities for innovative collaboration, strategic partnerships, co-creation, open innovation, networking, and creativity (Bell & Loane, 2010). However, the use of digital technology has resulted in a shift in the functions of businesses. Entrepreneurs are then faced with transformation across internal and external dimensions of their business (Kraus et al., 2019; Pagani, 2013; Schallmo et al. 2017; Bharadwaj et al., 2013; Matt et al., 2015; Porter & Heppelmann, 2015; Autio et al., 2018; Gray & Rumpe, 2015; Aagaard et al., 2019). According to Greif et al. (2017), these dimensions can be classified into four main pillars of transformation: processes and infrastructure (operations), people and culture (training), and digital sales (experience) and customer involvement (relationship).

Firms can shape a new value proposition and orientation supported by decision-makers by combining current capabilities with capabilities enabled by digital technologies (Ross et al., 2016; Kane et al., 2015; Sebastian et al., 2017; Bharadwaj et al., 2013; Matt et al., 2015). We offer the analytical model used in this study (Figure 1) based on the considerations and analysis performed here.

Figure 1
Analytical model



Note: Elaborated by the authors.

In the proposed model, we consider that the digital technologies affect organization performance (Lumpkin & Dess, 2004; Nambisan, 2017), boosting productivity and enhances overall organizational performance (AlShurideh et al., 2019; Alzoubi et al., 2022; Ali et al., 2021; Rachinger et al., 2018; Alzoubi et al., 2021; Joghee et al., 2021; Shamout et al., 2022), special for MSMEs to achieve flexibility and effectiveness (Lumpkin & Dess, 2004; Mosavi & Triansyah, 2023; Nambisan, 2017). We consider financial and non-financial factors of performance (Abu-Jarad et al., 2010; Stock, Greis, & Kasarda, 2000), such as employe satisfaction and low absenteeism (AlShehhi et al., 2021; AlKurdi et al., 2020; Alsuwaidi et al., 2021; AlShebli et al., 2021; Kaplan & Norton, 2009; Alshurideh et al., 2020; Lebas & Euske, 2007;). To evaluate performance, we`ve considered, as financial factors, profit, income grow and shareholder return (Eller et al., 2020; Richard et al., 2009); and for non-financial factors is included customer satisfaction, employee satisfaction, absenteeism, responsiveness, process efficiency and product quality (Lee et al., 2007; Jeong & Hong, 2007; Lee et al., 2022; Vanichchinchai & Igel, 2009). The digital technologies considered in this work, follow the classification of Gilchrist (2016), for a) collection and processing, we considered big data, ERP, website, e-commerce and digital bank b) for network it was considered internet of things, social networks, cybersecurity, intranet, and remote work; c) for automation it was consider robotization.

3. METHOD

3.1. Demographic profile and sampling design

Micro, small, and medium-sized companies (MSMEs) in Minas Gerais, Brazil, are included in the research universe. Minas Gerais has a total population of 1,914,064, of which 1,775,694 are micro-enterprises, 63,610 are small-sized businesses, and 74,760 are medium-sized businesses (Sebrae, 2020). The sample was stratified by size within each stratum, 266 organizations were chosen using simple random sampling with a 95% confidence interval and a 6% error margin (Cochran, 1977).

3.2. Questionnaire

The study enabled the development of a collecting instrument comprised of 30 structured questions drawn from the conceptual model. The questionnaire had two blocks. The first set of questions focused on the features of the companies. The second set of queries sought information on how digital technology affected corporate performance. The assertions were

developed using research on digitalization and firm performance. Following Perrien et al. (1984), the researchers originally covered the replies with a representative number of closed-question alternatives. Furthermore, questions that were closely connected to the research issue were used. The ramifications of the questions were taken into account during the data tabulation and analysis methods.

3.3. Pre-test

The number of questions, the form, the sequence, and the introduction were all taken into account during the pre-test (Gil, 2002). The pre-test was operationalized through telephone interviews with 19 entrepreneurs. The number of respondents satisfied the stage's recommended requirements (Malhotra, 2011). The technique was designed to examine the electronic platform's public approval as well as the respondents' grasp of the assertions.

3.4. Data collection

The firms were contacted using an internet platform, which was operationalized by sending e-mails and conducting a phone survey. Structured interviews were conducted between February and May of 2022. It's important to note that confidentiality was maintained. Free and informed consent was established in the register on the virtual platform used in the study. The registration on the virtual platform utilized in the study established free and informed consent. The collection was carried out by a team of qualified experts, including three researchers, one coordinator-supervisor, and three technicians. To ensure the quality of data collection, we used the following procedures: i) auditing electronic form transcripts; ii) calling respondents to validate information; and iii) assessing form completion as recorded in the electronic research system.

3.5. Nonresponse and common method bias

The single-factor Harman test was used to confirm the presence of common method bias (Podsakoff et al., 2003). When the explained variance of the factor analysis does not reach 50%, the common data collection technique does not warrant concern (Podsakoff et al., 2003). The principal components extraction method and the unrotated factorial solution were used with the SPSS® v.25 system. The variance was 49.67%, indicating that there was no substantial evidence of common technique bias.

3.6. Measuring instruments

Cronbach's Alpha Coefficient was used to evaluate the scales' reliability (Malhotra, 2011). Landis and Koch (1977) indicate that the scales' internal consistency is satisfactory for values greater than 0.61. The coefficient obtained in this study was 0.958. We also looked for missing data, unusual response patterns, outliers, and linear response patterns (straight lines), all of which might suggest acquiescence bias (Podsakoff et al., 2003). The univariate analysis accepted values greater than four standard deviations as a reference for describing an abnormal observation to check for outliers (Hair et al., 2013). The researchers created indices to assess digitalization initiatives and performance, which were operationalized using Likert-scale questions. The questions were divided into three areas for digitization and two categories for performance (Table 1).

Table 1.
Questions according to interest variables

Category	Element	Questions
Digitalization	Data collection and Processing	Q1. Indicate which technologies do you use in your company and what is their degree of importance: a) big data, b) ERP, c) website, d) e-commerce and e) digital bank.
	Network	Q2. Indicate which technologies do you use in your company and what is their degree of importance: a) internet of things, b) social networks, c) cybersecurity, d) intranet, and e) remote work.
	Automation	Q3. Indicate which technologies do you use in your company and what is their degree of importance: a) robotization.
Performance	Financial	Q4. Indicate how the digital technologies has impacted the performance indicators: a) profit, b) income grow and c) shareholder return
	Non Financial	Q5. Indicate how the digital technologies has impacted the performance indicators: a) customer satisfaction, b) employee satisfaction, c) absenteeism, d) responsiveness, e) process efficiency and f) product quality

Note: Elaborated by the authors.

The questions mentioned above, grouped in the mentioned categories, are made up of specific questions for each element of interest; for example, the data collection and processing category made up of question Q1 (indicate which technologies was applied in the MSME), has an intensity check at the levels: 1.1) big data, 1.2) ERP, 1.3) Website, 1.4) E-commerce and 1.5) Digital bank, using a scale that varies between negative and positive impact. The other questions were also elaborated on using intensity scales.

The researchers validated statistical significance by performing normality and correlation tests between each category and the performance factors. Following that, multiple linear regression analysis with the t-test was carried out. The goal was to determine if the variables of interest explained the variances in performance in order to derive the equation for the model. In this regard, we propose hypothesis H1:

H1: Digital technologies has a positive impact on MSMEs performance.

3.7. Data analysis

Multidimensional data analysis was performed (Hair et al., 2013). The questionnaire data was organized according to analytical categories and based on Likert scale questions. We statistically examined the aggregated results because the overall answer was not exactly proportionate to the population. The statistical tests and contrasts performed in the succeeding phases of the study have levels of significance or degrees of precision set by the data acquired efficiently in the investigation, that is, without considering "absent" replies and in accordance with the statistical procedures employed and the amount of aggregation created in each circumstance.

4. RESULTS

Of the entrepreneurs, 60.2% are men, 39.8% are women, and 59% are microenterprises. In addition, 59.5% have higher education. Regarding the period of operation, 38.5% are less than five years old, 55.2% are less than ten years, and 75.2% are less than 20 years. Table 2 shows the composition of the sample.

Table 2. Sample

Economic Sector	No. of Companies	%
Construction	8	3.0%
Energy	1	0.4%
Extractive Industry	2	0.8%
Manufacturing	32	12.0%
Other	60	22.6%
Primary Sector	9	3.4%
Retail Commerce	24	9.0%
Services	130	48.9%
Micro-sized enterprise	157	59.0%
Small-sized enterprise	74	27.8%
Medium-sized enterprise	35	13.2%

Source: Research data.

The data was subjected to the Shapiro-Wilk test for sample normality, yielding a p-value of 0.05. Based on the sample size, Spearman's correlation was utilized to produce the results shown in Table 3.

Table 3. Spearman correlation for the variables of interest

		Data collection & Processing	Network	Robotization
Performance Financial	Pearson Correlation	,782**	,852**	,503**
	Sig. (2-tailed)	.000	.000	.000
	N	266	266	266
Performance Non-Financial	Pearson Correlation	,696**	,815**	,368**
	Sig. (2-tailed)	.000	.000	.000
	N	266	266	266
General Performance	Pearson Correlation	,755**	,852**	,443**
	Sig. (2-tailed)	.000	.000	.000
	N	266	266	266

Note: ** The correlation is significant at the 0.01 level (2-tailed).
Source: Research data.

There is a positive correlation between performance and dimensions of data collection and processing, network and robotization digital technologies. The categories with the highest correlation (closer to 1) are network and data collection and processing. Robotization technologies despite being positive, have a lower degree, especially for non-finance performance and general performance. For the correlation analysis, the Cohen (2013) categorization was used, with values less than 0.30 deemed small, values between 0.30 and 0.49 considered moderate, and values more than 0.50 considered large. Multiple linear regression was employed to test whether categorical factors predict performance oscillations, generating a mathematical model of this connection. The model's output variable (dependent) was performance (general, finance and non-finance), and the predictor variables (independent) were robotization, intranet, own e-commerce, remote work, social networks, ERP, digital bank, cybersecurity, own site, e-commerce third parts, internet of things, and big data.

Table 4 presents the forward method, in which each variable was inserted in turn. The model with all variables had a higher adjusted R^2 of 0.837 and R of 0.919 for general performance; adjusted R^2 of 0.849 and R of 0.925 for finance performance; and adjusted R^2 of 0.777 and R of 0.881 for non-finance performance, indicating its ability to explain 92% of

variations in general performance and finance performance, and 88% in non-finance performance, the better, the closer the R is to 1.

Table 4. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square Change	F Change	df 1	df 2	Sig. F Change	
Performance Geral	,919	.844	.837	.4263971	.844	114.483	12	253	.000	1.879
Performance Finance	,925	.856	.849	.4080960	.856	125.148	12	253	.000	1.810
Performance Non-Finance	,881	.777	.766	.5368869	.777	73.425	12	253	.000	1.947

Note: Source: Research data.

When the model is subjected to the ANOVA test (Table 5), a p-value of 0.05 is obtained, suggesting a different model fit in the absence of a predictor; this finding led to the conclusion that the addition of analytical categories improves the model.

Table 5. Anova[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
Performance Geral	Regression	249.776	12	20.815	114.483	,000
	Residual	45.999	253	.182		
	Total	295.775	265			
Performance Finance	Regression	250.110	12	20.842	125.148	,000
	Residual	42.135	253	.167		
	Total	292.245	265			
Performance Non-Finance	Regression	253.976	12	21.165	73.425	,000
	Residual	72.927	253	.288		
	Total	326.903	265			

Note: Source: Research data.

The analysis resulted in a statistically significant model [$F(12)=114.483$; $p<0.001$; $R^2=0.844$] for general performance, [$F(12)=125.148$; $p<0.001$; $R^2=0.856$] for finance performance and [$F(12)=73.425$; $p<0.001$; $R^2=0.777$] for non-finance performance . However, when the t-test was run for each variable, it was discovered that the results differed by category. Some categories have p-values greater than 0.05, indicating that the null hypothesis that the components were created randomly was not rejected. In this regard, a new model was created that did not include such variables (Table 6), keeping only those related to digital bank, internet of things, social networks, intranet, remote work and robotization for general performance and non-finance performance; and own site, own e-commerce, digital bank, internet of things, social network, intranet, remote work and robotization for finance performance.

Table 6. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square Change	F Change	df 1	df2	Sig. F Change	
Performance Geral	,915	.837	.833	.4315090	.837	221.58	6	259	.000	1.878
Performance Finance	,925	.855	.850	.4062249	.855	189.24	8	257	.000	1.828
Performance Non-Finance	,879	.772	.767	.5365755	.772	146.07	6	259	.000	1.958

Note: Source: Research data.

When the model is subjected to the ANOVA test, a p-value of 0.05 shows predictor validity (Table 7).

Table 7. Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
Performance Geral	Regression	247.550	6	41.258	221.580	,000
	Residual	48.226	259	.186		
	Total	295.775	265			
Performance Finance	Regression	249.835	8	31.229	189.248	,000
	Residual	42.410	257	.165		
	Total	292.245	265			
Performance Non-Finance	Regression	253.976	12	21.165	73.425	,000
	Residual	72.927	253	.288		
	Total	326.903	265			

Note: Source: Research data.

Table 8 shows the authors' verification of collinearity statistics for general performance. We aimed to see if the tolerance values for each category were greater than 0.1 and the VIF values were less than 9, indicating the absence of multicollinearity. Regarding the residuals, we identified the existence of outliers.

Table 8. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-.758	.136		-5.589	.000		
Digitalbank	.123	.028	.134	4.415	.000	.681	1.469
Internetofthings	.201	.028	.224	7.195	.000	.650	1.539
SocialNetworks	.444	.025	.529	17.725	.000	.706	1.416
Intranet	.117	.030	.112	3.933	.000	.775	1.290
RemoteWork	.134	.027	.144	4.960	.000	.749	1.335
Robotization	.201	.034	.162	5.827	.000	.815	1.227

Note: a. Dependent variable: General Performance.
Source: Research data.

The digital bank (β=0.134; t=4.415; p<0.05); internet of things (β=0.224; t=7.195; p<0.05); social networks (β=0.529; t=17.725; p<0.05); intranet (β=0.112; t=3.933; p<0.05); remote work (β=0.144; t=4.960; p<0.05) and robotization (β=0.162; t=5.827; p<0.05) are general performance predictors. The model equation is given by y=-0.758+0.123 (digital bank) +0.201(internet of things) +0.444(social networks) +0.117(intranet)+0.134(remote work) +0.201(robotization). Table 9 shows the authors' verification of collinearity statistics for finance performance.

Table 9. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-1.122	.131		-8.554	.000		
Ownsite	.078	.026	.089	3.010	.003	.653	1.533
OwnEcommerce	.071	.025	.078	2.831	.005	.747	1.339
Digitalbank	.115	.027	.126	4.299	.000	.657	1.521
Internetofthings	.193	.027	.217	7.291	.000	.639	1.565
SocialNetworks	.368	.025	.441	15.018	.000	.656	1.525
Intranet	.100	.028	.096	3.529	.000	.765	1.307
RemoteWork	.126	.026	.135	4.823	.000	.716	1.397
Robotization	.248	.033	.201	7.489	.000	.787	1.271

Note: a. Dependent variable: Finance Performance.
Source: Research data.

The own site (β=0.089; t=3.010; p<0.05); own e-commerce (β=0.078; t=2.831; p<0.05); digital bank (β=0.126; t=4.299; p<0.05); internet of things (β=0.217; t=7.291; p<0.05); social networks (β=0.441; t=15.018; p<0.05); intranet (β=0.096; t=3.529; p<0.05); remote work (β=0.135; t=4.823; p<0.05) and robotization (β=0.201; t=7.489; p<0.05) are finance performance predictors. The model equation is given by y=-1.122+0.078 (own site) + 0.071 (own e-commerce) +0.115(digital bank) +0.193(internet of things) +0.368(social networks) +0.100(intranet)+0.126(remote work) +0.248(robotization). Table 10 shows the authors' verification of collinearity statistics for non-finance performance.

Table 10. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-.523	.169		-3.099	.002		
Digitalbank	.110	.035	.114	3.179	.002	.681	1.469
Internetofthings	.195	.035	.206	5.601	.000	.650	1.539
SocialNetworks	.490	.031	.555	15.713	.000	.706	1.416
Intranet	.136	.037	.124	3.667	.000	.775	1.290
RemoteWork	.124	.034	.126	3.684	.000	.749	1.335
Robotization	.126	.043	.097	2.937	.004	.815	1.227

Note: a. Dependent variable: Non-finance Performance.
Source: Research data.

The digital bank (β=0.114; t=3.179; $p<0.05$); internet of things (β=0.206; t=5.601; $p<0.05$); social networks (β=0.555; t=15.713; $p<0.05$); intranet (β=0.124; t=3.667; $p<0.05$); remote work (β=0.126; t=3.684; $p<0.05$) and robotization (β=0.097; t=2.937; $p<0.05$) are non-finance performance predictors. The model equation is given by y=-0.523+0.110(digital bank) +0.195(internet of things) +0.490(social networks) +0.136(intranet)+0.124(remote work) +0.126(robotization).

Thus, despite the positive correlation between the digital technologies and performance (Table 4), at a statistical significance level of 0.05, only the own site, own e-commerce, digital bank, internet of things, social networks, intranet, remote work and robotization are performance predictors. The variables big data, e-commerce third parts and cybersecurity are not performance predictors, nether finance or non-finance.

5. DISCUSSION

This study investigated the digital dimensions of collection and processing, network and automation (Gilchrist, 2016), starting from the hypothesis that Digital technologies have a positive impact on MSMEs performance (Shamout et al., 2022; Joghee et al., 2021; AlShurideh et al., 2019; Rachinger et al., 2018; Alzoubi et al., 2022; Ali et al., 2021; Alzoubi et al., 2021). We also consider finance and non-finance aspects of MSMEs (Abu-Jarad et al., 2010; Stock, Greis, & Kasarda, 2000), and the Spearman's correlation tests and t-test results confirmed the hypothesis that digital technologies are positively correlated with performance (Nambisan, 2017; Lumpkin & Dess, 2004).

Both finance and non-finance aspects are influenced, but network and data collection and processing have a higher correlation compared to robotization technologies and influence more finance than non-finance performance. Networks have a higher degree of performance in all categories, and data collection and processing are more correlate with financial performance, corroborating the proposition of Mosavi and Triansyah (2023) that digitalization improves the financial efficiency of MSMEs.

The Digitalization technologies in particular enhance overall organizational performance (AlShurideh et al., 2019; Alzoubi et al., 2022; Ali et al., 2021; Alzoubi et al., 2021;

Joghee et al., 2021; Shamout et al., 2022; Rachinger et al., 2018), but the t-test results showed that some technologies, such as big data, e-commerce third parties, and cybersecurity, are not predictors of superior performance ($p>0.05$), and some technologies that have a significant impact on financial performance ($p<0.05$), haven`t a significant impact on non-financial performance, such as own site and own e-commerce ($p>0.05$), which indicates that investments in own site and own e-commerce can increase profit, income growth, and shareholder return (Richard et al., 2009), but don`t necessarily affect, at a significance level of 0.05, non-financial aspects like customer satisfaction, employee satisfaction, absenteeism, responsiveness (Lumpkin & Dess, 2004; Mosavi & Triansyah, 2023; Nambisan, 2017), process efficiency, and product quality (Lee et al., 2007; Jeong & Hong, 2007; Lee et al., 2022; Vanichchinchai & Igel, 2009).

The regression analysis derivates three equation models: for general performance, y=-0.758+0.123 (digital bank) +0.201(internet of things) +0.444(social networks) +0.117(intranet)+0.134(remote work) +0.201(robotization); for finance performance, y=-1.122+0.078 (own site) + 0.071 (own e-commerce) +0.115(digital bank) +0.193(internet of things) +0.368(social networks) +0.100(intranet)+0.126(remote work) +0.248(robotization); and for non-finance performance, y=-0.523+0.110(digital bank) +0.195(internet of things) +0.490(social networks) +0.136(intranet)+0.124(remote work) +0.126(robotization).

All the models have social networks the main factor to predict performance, followed by robotization and internet of things for finance performance, and internet of things and intranet for non-finance. In this way firms can afford capabilities enabled by these digital technologies (Westerman et al., 2011; Bharadwaj et al., 2013; Pagani, 2013; Kane et al., 2015; Matt et al., 2015; Ross et al., 2016; Sebastian et al., 2017) to improve the efficiency like optimize inventory management, analyze consumer data, and improve marketing and business management effectiveness and efficiency (Mosavi & Triansyah, 2023), responsiveness, flexibility, cost and efficiency (Jeong & Hong (2007), and lifestyle benefits for their workers and the environment, such as improvements to the workplace, work hours, and social contacts (Kaplan & Norton, 2009; Kurdi et al., 2020; AlShebli et al., 2021; AlShehhi et al., 2021; Lebas & Euske, 2007; Alsuwaidi et al., 2021).

The study results align with recent studies on digitalization strategies used by companies to boost performance (AlShurideh et al., 2019; Ali et al., 2021; Alzoubi et al., 2022; Rachinger et al., 2018; Joghee et al., 2021; Shamout et al., 2022). Digital technologies can help SMEs optimize inventory management, analyze consumer data, and improve marketing and business management effectiveness and efficiency (Mosavi & Triansyah, 2023). This demonstrates that digitalization is a critical factor that can boost SMEs' performance, sales, effectiveness, and resilience (Mosavi & Triansyah, 2023). Digital technologies enable MSMEs to quickly and easily improve their skills and performance in order to produce value (Lumpkin & Dess, 2004; Nambisan, 2017).

6. CONCLUSION

6.1. Theoretical and methodological implications

This research makes important contributions. By combining new dimensions of performance, such as finance and non-financial elements; and digitalization, such as network, data collection, processing and robotization technologies, including a set of technologies investigated, this article helps to fill gaps associated with, even today, a lack of work that seeks integrated models capable of better understanding the impact of digital technologies, considering non-finance endogenous variables of firm performance, such as quality, process efficiency, customer satisfaction, and responsiveness on MSMEs (Yasin's, 2022; Kraus et al., 2019). Indeed, by expanding the analysis beyond the traditional categories of market share,

earnings growth, and sales growth (Nasiri et al., 2020; Yasin's, 2022), this article provides a more comprehensive knowledge of the endogenous variables that influence company success.

6.2. Practical implications

Initially, this article underlines the necessity of MSMEs better understanding the various digitalization technologies and their influence on performance (including financial and non-financial aspects). A model that combines several factors, such as those suggested here, can assist them in this approach. Indeed, knowledge of these technologies and their relationship with organizational performance can help managers formulate initiatives that allow superior performance considering financial and non-financial aspects. Furthermore, by indicating which digitalization technologies are perform predictors, managers can choose the most appropriate technology based on the organization's primary goal (financial or non-finance). This study gives insight on the importance of digital technology and the desired outcome, both of which require further investigation. Finally, the regression model developed here might be a beneficial tool for managers to calibrate their digitization endeavors, emphasizing elements of higher productivity in performance.

6.3. Implications for public policies

In compliance with such rules and taking into account the potential advantages of adopting digitalization technologies, policymakers should devise methods to stimulate the adoption of technologies based on efficacy and the intended financial or non-financial outcome. MSMEs face resource constraints that may be mitigated by financial incentives from governments; findings may assist both the government and executives in selecting the appropriate technology; the outcomes benefit the firm and, as a result, the productive sector as a whole.

6.4. Limitations

There are limitations in this study. The first is concerned with performance cross-sectional analysis. The study focuses on the immediate returns of the digital technologies. However, the influence on performance may have a long-term effect that may be observed over a longer time horizon than that addressed in this work. Another limitation is the assumption of causation. It was believed that digital technology will lead to improved performance. However, the possibility of reverse causation cannot be ruled out.

6.5. Suggestions for future research

The impact of entrepreneurs' cultural traits on their choice of digital technology may be the subject of new research. Furthermore, some variables, such as big data, e-commerce third parties, and cybersecurity, did not predict performance, representing research opportunities. In addition, longitudinal studies are shown to be significant given that the performance impact of digital technology may change over time.

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