9. How Did Digitalization Affect Company Performance During the Covid-19 Pandemic? A Developing Economy Perspective

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Abstract

The study aims to examine the impact of company digitalization on its response to the COVID-19 pandemic and financial performance. It also aims to examine the impact of company response to the COVID-19 pandemic on financial performance and the mediating role of company response to the COVID-19 pandemic in the relationship between company digitalization and financial performance. The results show that the more digitalized companies have responded to the COVID-19 pandemic more successfully and managed to improve their long-term financial performance. They also managed to improve their short-term financial performance but only indirectly, through response to the COVID-19 pandemic. The study contributes to the literature on the direct and indirect effects of digitalization on company financial performance in periods of crisis like the COVID-19 pandemic and the specificities of these effects in developing and transitioning economies. The study results have practical implications for company managers and owners, as well as policymakers in developing and transitioning economies similar to Serbian.

Keywords: *digitalization, digital technologies, crisis, performance management, developing economy*

JEL Classification: *L25, M15, O33*

1. Introduction

Global health and economic crisis caused by the COVID-19 pandemic have posed great challenges to the survival, growth and development of companies around the world (Obradović *et al.,* 2023; Pinzaru *et al.,* 2020). The crisis in the healthcare system has led to losses in the manufacturing and service sectors, a decrease in the stability of financial systems, disruptions in supply chains (Akram *et al.,* 2021; Guo *et al.,* 2020), and a decrease in the availability of financial resources for companies (Papadopoulos *et al.,* 2020). To respond to the crisis caused by the

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pandemic, companies were inclined to promote and introduce technological innovations (Priyono *et al.,* 2020; Amankwah-Amoah *et al.,* 2021) which became an important determinant and instrument of company survival and success (Amankwah-Amoah *et al.*, 2021).

We live in times of deep socio-economic transformations under the influence of digital technologies (DT) (Pelinescu *et al.*, 2021). Cloud computing, Big data analysis, the Internet of Things (IoT), and Artificial Intelligence (AI) are cited as some of the most important DT (Caputo *et al.,* 2021; Todorović and Čupić, 2023). Some authors indicate that the governments of most countries have encouraged digitalization during the COVID-19 pandemic. Guo *et al.* (2020) point out that China has encouraged the use of big data, AI, cloud computing, and other DT in pandemic monitoring, disease treatment, and business processes. The use of cloud computing was widespread in Germany, while the use of social media reached its peak in the United States during the COVID-19 pandemic (Tuli *et al.,* 2020).

The present study aims to examine the impact of company digitalization on its response to the COVID-19 pandemic and financial performance, as well as the impact of company response to the COVID-19 pandemic on financial performance and the mediating role of company response to the COVID-19 pandemic in the relationship between company digitalization and financial performance. In other words, the aim is to find out whether the crisis caused by the COVID-19 pandemic encouraged companies to digitalize their operations and, thus, improve their financial performance. The data were collected using a questionnaire, while the analysis was performed using regression and mediating analysis.

The study is conducted in the Serbian upper-middle-income, developing and transitioning economy in the Western Balkans. The level of information and communication technology (ICT) and digitalization in Serbia is still low compared to developed countries. Serbia's ICT Development Index is 87.7, while the average for higher-income countries is 91.7 (ITU, 2024), and Serbia's WB DESI is 34.8, while the Western Balkans average is 29.3 and the EU average is 52.2 (RCC, 2022). Serbia's rank on DiGiX is 53rd out of 98 listed countries (BBVA, 2024). World Bank (2023) notes that Serbia dealt effectively with the COVID-19 pandemic and kept the economy growing, but the recovery after the COVID-19 pandemic requires a transition to a more digitalized economy.

Several weaknesses of the previous studies are identified and addressed to contribute to the literature. First, previous empirical studies usually examined the role and importance of company digitalization (Gabryelczyk, 2020; Kim, 2020; Papadopoulos, 2020) but rarely its impact on the companies' financial performance in periods of crisis like the COVID-19 pandemic (Guo *et al.,* 2020; Luu *et al.,* 2023; Ribeiro-Navarrete *et al.,* 2021). The first contribution of the study is, therefore, a comprehensive analysis of the relationship between company digitalization and financial performance during the COVID-19 pandemic. Unlike the majority of previous studies but similar to Zhong and Ren (2023) and Adam and Alarifi (2021), the specificities and significance of the impact on short- and long-term financial performance are examined separately.

Second, previous studies usually examine only the direct impact of DT, digitalization and/or digital transformation on financial performance (Chouaibi *et al.,* 2022; Ribeiro-Navarrete *et al.,* 2021; Zhai *et al.,* 2022) during the COVID-19 pandemic (Guo *et al.,* 2020). The study contributes to the existing literature by examining the direct effect of company digitalization and response to the COVID-19 pandemic, but also the indirect effect of digitalization on financial performance, through the impact on company response to the COVID-19 pandemic. The direct and indirect effects are examined through the mediation analysis. The study shows that digitalization affects short-term financial performance only indirectly, through the impact on company response to the COVID-19 pandemic. It affects long-term financial performance directly.

Third, Ramdani *et al.* (2022) point out that a limited number of studies have been conducted in developing economies and call for more research to further our understanding of the role of DT in companies. This is especially important given that a strong digital capability can allow

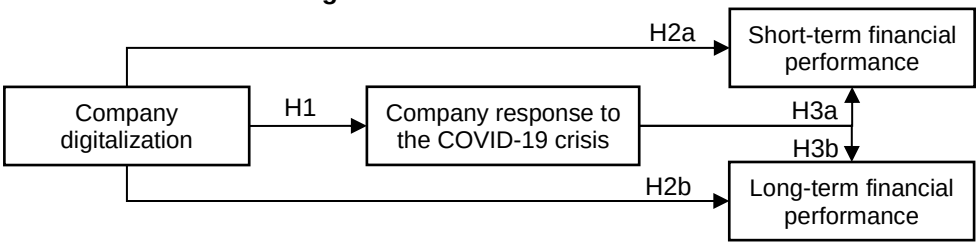
companies in developing economies to compete with more established companies (Heredia *et al.*, 2022). It is also important given that some studies (Song *et al.*, 2020) indicate that socio-economic, rather than institutional and innovation factors have to be tackled to improve ICT diffusion and overcome the digital divide. The study contributes to the literature by offering insights into links between company digitalization, response to COVID-19 and financial performance in the environment of the Serbian developing and transitioning economy. Although the research is conducted in a specific environment of the Serbian economy, the study does not consider the direct impact of this environment on the analysed associations but can benefit researchers and practitioners in economies similar to Serbian.

The study consists of six sections. After the introduction, an overview of previous research which served to formulate hypotheses is given. The third section introduces the methodology and the fourth section presents the results. The results are discussed in the fifth section. Theoretical and practical implications, as well as limitations and directions for future research, are presented in the conclusion.

2. Literature Review and hypothesis development

Figure 1 presents the research model used in the present study and identifies the key relationships investigated and hypotheses tested. Digitalization is a multifaceted phenomenon involving digital entrepreneurship, strategies, processes, and education (Kraus *et al.*, 2018). It follows after digitization and is a prerequisite for digital transformation and business model innovation (Eller *et al.*, 2020; Verhoef *et al.*, 2021). Gradillas and Thomas (2025, p. 113) emphasize the social and economic aspects of digitalization by defining it as "the transformation of the socioeconomic environment through processes of digital artifact adoption, application and utilization".

Figure 1. Research framework



The increasingly uncertain business environment and the pressure of global competitiveness increase the importance of digitalization for the survival of companies (Burchardt and Maisch, 2019). Digitalization and DT are often found to help companies accelerate the offer of integrated products and services, grow relationships with customers (Pirola *et al.,* 2020), increase quality of services, speed up information flow (Todorović and Čupić, 2023), manage information in supply chain (Zečević *et al.,* 2019), increase their innovation potential (Dana *et al.,* 2022), reduce risks, and improve performance (Khalil *et al.,* 2022; Matysek-Jędrych *et al.,* 2024).

Turel *et al.* (2021) emphasize that the benefits of digitalization have received considerable attention in the literature which is not the case with its adverse effects. Some of the adverse effects discussed in the literature are a decrease in job autonomy and satisfaction due to digital overload (Abdulkareem *et al.*, 2024), a decrease in firm profitability (Jardak and Ben Hamad, 2022) due to increased operational cost rate, reduced total asset turnover and increasing

management expenses (Guo *et al.*, 2023), as well as increase in workload, resistance to digital tools and data security concerns (Desharpiya *et al.*, 2024).

2.1. The importance of digitalization during the COVID-19 pandemic

To prevent the spread of the COVID-19 pandemic, the governments of most countries implemented restrictions that had negative implications for the sustainability and success of companies and the work of employees (Papadopoulos *et al.,* 2020). The disruptions caused by the COVID-19 pandemic did not affect all companies equally, which resulted in different approaches to overcoming the crisis (Thukral, 2021). Managers were forced to develop different scenarios for future actions and to rely more on the use of DT (Papadopoulos *et al.,* 2020). Pinzaru *et al.* (2020) point out that the COVID-19 pandemic accelerated digitalization, even among the companies that relied on DT before the pandemic, while Avalos *et al.* (2024) find that companies that did not use any digital platform or channel before the COVID-19 pandemic lagged in their response to the pandemic, increasing the digital divide with those that were more digitalized. Amankwah-Amoah *et al.* (2021) emphasize that the opportunities offered by DT during the COVID-19 pandemic have been diminished by organizational inflexibility, the digital divide, and the uneven effects on employee wellbeing.

Many companies could transition to online sales relatively quickly and easily which helped them keep and further develop contacts with their customers (Kim, 2020). Akram *et al.* (2021) argue that digital commerce is the typical way of shopping and paying for millennials in times of the pandemic and that retailers have been confronted with great challenges raised by millennials' expectations. By investigating seven Indonesian SMEs with different degrees of DT maturity level, Priyono *et al.* (2020) found that SMEs with a high level of DT maturity responded to the challenges caused by COVID-19 by accelerating the transition toward digitalized firms, SMEs experiencing liquidity issues and a low level of DT maturity decided to digitalize the sales function only, while the SMEs with very limited digital literacy were supported by business partners with excellent digital capabilities. Guo *et al.* (2020) find that digitalization has helped Chinese SMEs to better respond to the public crisis caused by COVID-19. Based on the majority of previous empirical results, the following hypothesis was formulated:

> *Hypothesis 1: Company digitalization had a positive impact on the company's response to the COVID-19 pandemic.*

2.2. Digitalization and financial performance

Digitalization can be considered as relying on the principles of effectiveness and productivity in performing business activities (Hendriarto, 2021) and contributing to optimizing business processes (Verhoef *et al.*, 2021). Kohtamäki *et al.* (2020) and Martinez-Caro *et al.* (2020) point out that digitalization can have a positive effect on performance, as it allows a company to develop a competitive advantage. Lee and Falahat (2019), however, find that the role of digitalization in achieving competitive advantages is significant, but not decisive. They find that companies should strive to develop their capabilities through digitalization, which will ultimately lead to incremental improvements in comparative advantage.

Digitalization can help reduce manufacturing costs, create new forms of demand, optimize business processes, and allow companies to integrate and relocate production closer to centres of demand (Stemmler, 2018). Bouwman *et al.* (2019) argue that SMEs undergoing digital transformation can improve their financial performance by allocating more resources to business model experimentation and engaging more in strategy implementation. Ramdani *et al.* (2022) similarly point out that DT help SMEs improve their profitability, customer satisfaction, competitiveness and internationalization, as well as advance organizational processes, increase efficiency and reduce costs.

Previous empirical studies often find that company performance is positively associated with digitalization/digital transformation in developed (Broccardo *et al.*, 2023; Eller *et al.*, 2020; Moro-Visconti *et al.*, 2025; Ribeiro-Navarrete *et al.*, 2021) and developing economies (Chouaibi *et al.,* 2022; L. Li *et al.*, 2022; Luu *et al.,* 2024; Zeng *et al.*, 2022; Zhai *et al.,* 2022). Cheng *et al.* (2023), however, find that digitalization improves profitability in manufacturing and not service companies and more for companies operating in highly competitive industries, smaller companies and companies with fewer skilled workers. Kharlamov and Parry (2020), similarly, find no significant impact of digitalization on the profitability of UK book publishers.

Guo *et al.* (2023), however, found a negative effect of digitalization on profitability, but a positive on the productivity of Chinese listed companies. Managerial myopia is found to amplify the negative (Guo *et al.*, 2023) and knowledge inertia to negatively moderate the positive (L. Li *et al.*, 2022) impact of digitalization. There are also studies finding the nonlinear relationship between digitalization and performance. Bhandari *et al.* (2023) find that among U.S. manufacturing firms this relationship is negative or flat at low-level digitalization and increasingly positive at higher-level digitalization, while Chen *et al.* (2024) find the opposite relationship among Chinese SMEs.

García-Cabrera *et al.* (2021) and Zhong and Ren (2023) find differences in the impact of digitalization on short- and long-term performance. Zhong and Ren (2023), for example, hypothesise that digital transformation negatively affects the short-term performance (return on assets) of companies in transitioning economies by inducing organizational dysfunction resulting in significant costs, and positively affects their long-term value (Tobins Q) by helping them accumulate and unlock their innovation potential, gain greater flexibility and resource efficiency, and lower the operating costs and risks. They verify their hypothesis on a sample of Chinese companies. The positive impact of digitalization on short-term performance was, however, found in the Middle East and Central Asia region (Abidi *et al.,* 2023) and China (Zeng *et al.,* 2022). Based on the majority of previous empirical results, the following hypothesis will be tested:

Hypothesis 2a: Digitalization has a positive impact on the short-term financial performance of companies.

Hypothesis 2b: Digitalization has a positive impact on the long-term financial performance of companies.

2.3. Company response to the COVID-19 pandemic and financial performance

Digitalization and technological evolution have helped companies to survive and thrive during the COVID-19 pandemic (Savvakis *et al.*, 2024) by improving the business environment for both their business partners and employees (Akram *et al.,* 2021). Sneader and Singhal (2020) explain that the crisis caused by the COVID-19 pandemic has stimulated companies to identify more opportunities to use DT and, thus, more easily identify the ways to improve business resilience to shocks, ability to deliver to customers, and performance. Santos *et al.,* (2023) point out that DT can help entrepreneurs identify, evaluate, and exploit market opportunities, scale a venture's competitiveness, and improve efficiency, especially during uncertain times like the COVID-19 pandemic. On the other hand, Amankwah-Amoah *et al.* (2021) find that digitalization in times of crisis may bring new opportunities, as well as challenges and costs, leading to positive and negative effects.

Guo *et al.* (2020) have found that digitalization helped Chinese SMEs improve current and predicted performance during the COVID-19 pandemic through the implementation of short- and long-term crisis response strategies. Adam and Alarifi (2021) have similarly found that managerial innovation practices have a positive and stronger impact on the short-term compared to the long-term performance of Saudia Arabia companies in times of the COVID-19 pandemic. On the other hand, Y. Li *et al.* (2022) found that emergency management innovation, including digital innovation, in times of the COVID-19 pandemic led to a company performance decline in the short term; nevertheless, it had a significant positive effect on organizational resilience, which in turn

can reverse firm performance decline. Based on the majority of previous empirical results, the following two hypotheses will be tested:

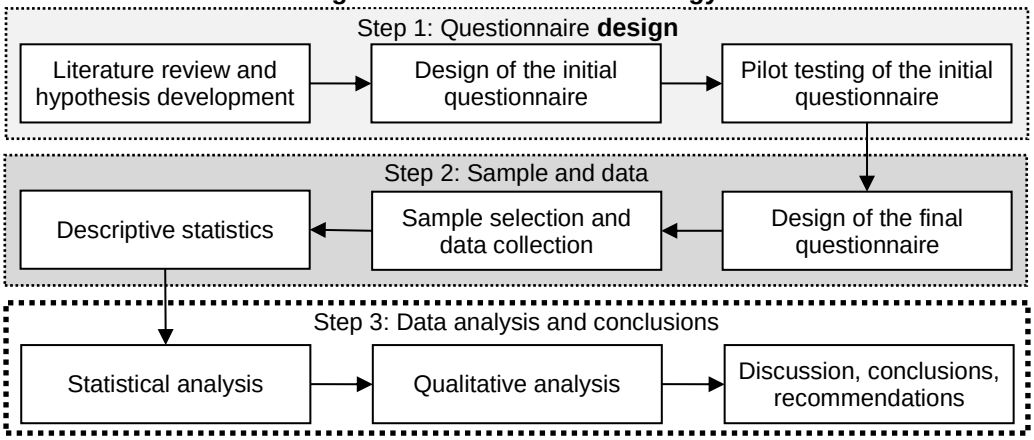
Hypothesis 3a: The company's response to the COVID-19 pandemic had a positive impact on short-term financial performance.

Hypothesis 3b: The company's response to the COVID-19 pandemic had a positive impact on long-term financial performance.

3. Methodology

The main steps and activities of the research methodology used in this study are summarized in Figure 2.

Figure 2. Research Methodology



3.1. Questionnaire

The initial questionnaire was developed starting from the results of the previous studies. In addition to questions about the company and respondent, the initial questionnaire contained three sections with a total of 26 statements. The first section contained eight statements on company digitalization, the second section ten statements on the company response to the COVID-19 pandemic, and the third section eight statements on the company financial performance during the COVID-19 pandemic. Similar to Zhong and Ren (2023) and Adam and Alarifi (2021), this study provides insights into the short-term (over a year) and long-term (over two years) company financial performance.

An effort was made to avoid lengthy statements, ambiguous pronoun references, and negatively worded and connotatively inconsistent statements, as well as to consider the readability of each statement (DeVellis, 2016). The initial questionnaire was examined in a pilot study on a sample of five respondents, employed in five companies, who later also filled out the final version of the questionnaire. Respondents were sent a questionnaire via email with a request for feedback on the statements. Five academics familiar with digitalization, its determinants, and expected implications were also invited to judge the suitability of statements and check the clarity of the wording (DeVellis, 2016).

Based on the attitudes of respondents and academics several changes were made. The questionnaire was supplemented with the definitions of the terms used in the statements. Also, the questionnaire was supplemented with three open-ended questions. Finally, six statements -

four from the second and two from the third section, were removed from the questionnaire due to a lack of clarity, questionable relevance, or undesirable similarity to other items (DeVellis, 2016).

The final version of the questionnaire consists of five sections. Respondents were provided with general instructions and definitions in the introduction. Eight statements in the first section consider the degree of company digitalization and eight statements in the second section the company response to the crisis caused by the COVID-19 pandemic. Five-point Likert scale was used in the first and second sections and respondents were offered responses ranging from 1 – strongly disagree to 5 – strongly agree. The five-point Likert scale implies that a median and mean higher than 3.00 indicate that the respondents agree with the statement, while a median and mean lower than 3.00 indicate that the respondents disagree with the statement.

Six statements in the third section examine the short- and long-term financial performance of the company in times of the COVID-19 pandemic. Three-point Likert scale was used and respondents could choose the following answers: a) decrease (coded 1), b) approximately the same (coded 2) or c) increase (coded 3). The three-point Likert scale implies that a median and mean higher than 2.00 indicate that the respondents believe the performance has increased, while a median and mean lower than 2.00 indicate that the respondents believe the performance has decreased.

Respondents were offered open-ended questions at the end of the first three sections. These are as follows:

1. To what extent and in what way are business processes in the company digitalized?
2. How were the COVID-19 pandemic and digitalization interrelated?
3. To what extent and in what way did digitalization help the company survive in times of crisis caused by the COVID-19 pandemic?

At the end of the questionnaire, in the last two sections, the respondents were asked to provide general information about the company and themselves.

3.2. Sample

The questionnaire was sent to a total of 354 email addresses. The heads of the accounting and/or finance department were invited to fill it out given that they are expected to have the necessary information concerning the offered statements. Only one person from one company could answer the questionnaire. A total of 91 respondents completed the questionnaire from August to November 2022. This gives a fairly high response rate of 25.7%. An overview of the structure of the sample is given in Table 1.

Table 1. Structure of the sample

	Category	No.
Type of ownership	State-owned	2
	Private	89
Origin of dominant company owner	Domestic	72
	Foreign	19
Main business activity	Manufacturing	52
	Service	10
	Commerce	29
Region	Šumadija and Western Serbia	54
	Southern and Eastern Serbia	12
	Belgrade region	11
	Vojvodina	14
Total		91

3.3. Variables

The main research variables are company digitalization (DIG), company response to the COVID-19 pandemic (COV), short-term performance (STP), and long-term performance (LTP). Measurement model analysis was performed to ensure that each variable is valid and reliable. Table 2 shows the factor loadings, Cronbach-α, composite reliability (CR), and average variance extracted (AVE) on all variables. Items (statements) from the questionnaire to be included in the final model are determined by estimating individual item loadings using the exploratory factor analysis (EFA). The loadings above 0.50 (Hair *et al.,* 2019) are usually considered acceptable. Given that the smallest loading is 0.623, all items were included in the final model.

DIG was measured using all items in the first section of the questionnaire, given that their loadings ranged from 0.732 to 0.815. Given the loadings ranging from 0.623 to 0.874, COV was measured using all items in the second section of the questionnaire. STP was measured using three items in the third section of the questionnaire (items marked 15, 16, and 17 in Table 2), given that their loadings ranged from 0.847 to 0.924. Finally, LTP was measured using three items in the third section of the questionnaire (items marked 18, 19, and 20 in Table 2), given that their loadings ranged from 0.901 to 0.934.

Cronbach's α and CR were used to examine the reliability of scales. As suggested by Hair *et al.,* (2019), both Cronbach's α and CR should be greater than 0.70. The analysis showed Cronbach-α values between 0.914 and 0.938, and CR values between 0.907 and 0.944. The convergent validity is evaluated with AVE which should not be less than 0.50 (Hair *et al.,* 2019). The analysis showed AVE values between 0.591 and 0.848. Thus, the study also met this criterion. The discriminant validity of variables has also been estimated. The square root of AVE for each variable is greater than their correlations with all other variables, implying that the variables are independent of each other. This suggests that the discriminant validity of DIG, COV, STP, and SLP is not an issue (Hair *et al.,* 2019).

Table 2. Descriptive statistics and quality criteria of variables

	Items and variables	L	Mean	SD	Med	Fl	Fh	t
I	**DIG (Cronbach's α: 0.930, CR: 0.920, AVE: 0.591)**		**3.53**	**0.99**	**3.75**			
1	The DS is promoted at all levels of the company	0.796	3.52	1.29	4.00	9	26	3.833[a]
2	The DS allows the fundamental transformation of business processes and/or business models of the company	0.775	3.36	1.28	3.00	11	20	2.706[a]
3	The company has digitalized its operations to a greater extent than the competition	0.732	3.05	1.17	3.00	14	9	0.449
4	The company relies on the use of modern DT	0.737	3.79	1.15	4.00	3	32	6.563[a]
5	The employees are trained in the use of DT	0.815	3.59	1.15	4.00	4	25	4.903[a]
6	Continuous learning about the benefits of DT is promoted in the company	0.779	3.58	1.31	4.00	6	31	4.246[a]
7	The company offers employees the opportunity to acquire skills in the field of using DT	0.732	3.57	1.30	4.00	6	30	4.191[a]
8	The digital skills of employees match the needs of their positions	0.779	3.76	0.97	4.00	3	20	7.457[a]
II	**COV (Cronbach's α: 0.932, CR: 0.907, AVE: 0.623)**		**3.14**	**1.12**	**3.17**			

	Items and variables	L	Mean	SD	Med	Fl	Fh	t
9	DT have helped the company mitigate the consequences of the pandemic	0.623	3.54	1.22	4.00	5	24	4.200[a]
10	DT have helped the company to see new opportunities during the pandemic	0.728	3.41	1.26	4.00	6	22	3.088[a]
11	DT have made it possible to redesign company sales and distribution channels in response to the pandemic	0.874	2.99	1.32	3.00	17	14	-0.079
	Items and variables	L	Mean	SD	Med	Fl	Fh	t
12	DT have made it possible to expand production/sales capacity in response to the pandemic	0.853	2.79	1.34	3.00	20	12	-1.489
13	DT have enabled more effective cost control during the pandemic	0.792	3.12	1.34	3.00	16	16	0.860
14	DT enabled the transformation of business processes of the company in response to the pandemic	0.836	2.97	1.27	3.00	15	12	-0.248
III	**STP (Cronbach's α: 0.914, CR: 0.925, AVE: 0.805)**		**2.46**	**0.62**	**2.67**			
15	Operating profit in 2021 compared to 2019	0.924	2.47	0.69	3.00	10	53	6.546[b]
16	Net profit margin in 2021 compared to 2019	0.919	2.44	0.69	3.00	10	50	6.108[b]
17	Return on assets in 2021 compared to 2019	0.847	2.46	0.64	3.00	7	49	6.903[b]
IV	**LTP (Cronbach's α: 0.938, CR: 0.944, AVE: 0.848)**		**2.38**	**0.65**	**2.33**			
18	Expected operating profit in 2022	0.927	2.41	0.70	3.00	11	48	5.550[b]
19	Expected net profit margin in 2022	0.934	2.37	0.69	2.00	11	45	5.139[b]
20	Expected return on assets in 2022	0.901	2.36	0.66	2.00	9	42	5.253[b]
	Control variables							
	REG		1.84	1.15	1.00	54	14	
	OWN		1.21	0.41	1.00	72	19	

Notes: A total of 91 respondents expressed their attitude towards each statement. DS is digital strategy, DT is digital technologies, CR is composite reliability, AVE is average variance extracted, L is factor loading, SD is standard deviation, and Fl and Fh indicate the number of respondents who expressed absolute disagreement or absolute agreement with the specified statement, respectively. t represents the results of the one-sample t-test.

[a] The difference between the mean and a neutral attitude (3.00) is significant at 0.05 (2-tailed).

[b] The difference between the mean and a neutral attitude (2.00) is significant at 0.05 (2-tailed).

To account for other factors that may influence dependent variables, control variables accounting for the origin of the dominant company owner (OWN) and region of company headquarters (REG) are included. Similar control variables were used in some recent survey studies (Eller *et al.,* 2020; Guo *et al.,* 2020). The choice of control variables also reflects the importance of foreign capital and infrastructure for the digitalization of companies.

OWN is coded 1 for domestic and 2 for foreign owner. Previous studies often find that foreign ownership and investments support company digitalization and, consequently, performance (Dang and Merino, 2024; Jiang *et al.*, 2011). REG is coded 1 for Šumadija and Western Serbia, 2 for Southern and Eastern Serbia, 3 for Belgrade region, and 4 for Vojvodina. According to the reports of the Statistical Office of the Republic of Serbia, regions 3 and 4 are more economically developed and rely more on information and communication technology (ICT). Previous studies often find a strong relationship between economic development and digitalization (Caglayan-Akay and Oskonbaeva, 2022; Sinha *et al.*, 2025).

3.4. Methods

To examine the impact of digitalization on a company response to the COVID-19 pandemic and financial performance, multiple regression is used. To test H1 and examine the impact of digitalization on the company response to the COVID-19 pandemic, the following regression equation was used:

$$COV_i = \beta_0 + \beta_1 DIG_i + \beta_2 OWN_i + \beta_2 REG_i + \varepsilon_i$$

To test H2a and H2b and examine the impact of company digitalization on the financial performance of Serbian companies in times of the COVID-19 pandemic, the following regression equation was used:

$$FP_i = \beta_0 + \beta_1 DIG_i + \beta_2 OWN_i + \beta_2 REG_i + \varepsilon_i$$

where FP is short-term or long-term financial performance. To test H3a and H3b and examine the mediating role of company response to the COVID-19 pandemic in the relationship between company digitalization and financial performance, mediation analysis was used.

Given that the data for the independent and dependent variables were collected from the same respondents, concerns about common method bias could arise (Podsakoff *et al.,* 2012). Harman's single-factor test is, therefore, conducted by loading all the items into an EFA, which showed that there are four factors presented in Table 2, that are extracted with eigenvalues greater than 1, explaining 76.827% of the total variance. The largest loading variance accounts for 41.685%, which is less than 50% indicating that no single factor accounts for the majority of the covariance among the measures (Podsakoff *et al.,* 2012).

4. Research results

4.1. Descriptive statistics

Table 2 presents descriptive statistics for the main and control variables used in the study. The results of the one-sample t-test revealed 15 statistically significant and positive and no statistically significant and negative differences between the mean and the neutral attitude (3.00 or 2.00) indicating respondents' agreement with the statements or their attitude that the performance is improving. Five differences between the mean and the neutral attitude (3.00) in relation to one statement concerning company digitalization and four concerning company response to the COVID-19 pandemic are not statistically significant. The mean attitude scores towards main variables imply that the respondents perceive the companies to be digitalized, able to respond to the COVID-19 pandemic, and to keep financial performance improving in times of the COVID-19 pandemic.

The mean level of respondents' agreement with the statements on company digitalization is between 3.05 and 3.79, indicating that the respondents consider companies to be highly digitalized. About 35.2% of respondents completely agree that the company relies on the use of modern DT but only 9.9% completely agree that the company has digitalized its operations to a greater extent than the competition. Respondents express a relatively high level of agreement with statements 5-8 concerning the employees and their status in the company. Specifically, 20 or more respondents completely agreed that employees have the skills and knowledge necessary to use DT and that the company provides support to employees through continuous education in this field.

The mean level of agreement with the statements on the company response to the COVID-19 pandemic ranges between 2.79 and 3.54, which is relatively low. Statistically insignificant results of the one-sample t-test indicate that the respondents do not believe that DT has made it possible to redesign sales and distribution channels, expand production/sales capacities, increase the

effectiveness of cost control, and transform the business processes of the company in response to the pandemic. On the other hand, respondents generally agree that DT have helped companies mitigate the consequences of the pandemic and see new opportunities during the pandemic. This means that the respondents could more easily identify short- compared to long-term benefits of digitalization during the pandemic.

The mean and median attitude scores towards STP and LTP indicate that the respondents believe that the financial performance of the company has increased in 2021 compared to 2019 or expected that the financial performance of the company will increase in 2022. Additionally, 46.2-58.2% of the respondents completely agreed, while only 7.7-12.1% completely disagreed that the financial performance measures increased or will increase. This means that the companies on average managed to keep and increase financial performance in the short-term (one year) and long-term (two years) during the COVID-19 pandemic. Given the mean values, respondents believe that the companies were slightly more successful in the short than in the long-term.

4.2. Regression analysis

The results of multiple regression analysis are presented in Table 3. Three regression models are statistically significant ($p < 0.05$), while two models regressing STP on DIG and LTP on COV are not statistically significant. The amount of explained variance of dependent variables ranges from 5.4% to 42.7% in statistically significant models. The relatively low explanatory power of the regressions of STP and LTP on DIG and COV is arguably due to the relatively small sample. It is comparable to some previous survey studies on samples from developing economies (Guo *et al.,* 2020) but lower than in some developed economies (Eller *et al.,* 2020). To check the robustness of analysed models, both control variables are replaced by the main business activity. After this change, the statistical significance of models does not change, while their explanatory power changes only marginally.

Table 3. Results of regression analysis

	COV	STP	STP	LTP	LTP
OWN	-0.055	-0.100	-0.079	-0.068	-0.035
	(-0.684)	(-0.943)	(-0.774)	(-0.651)	(-0.334)
REG	0.051	0.065	0.049	0.136	0.125
	(0.644)	(0.626)	(0.482)	(1.328)	(1.202)
DIG	0.674*	0.231*		0.262*	
	(8.312)	(2.190)		(2.515)	
COV			0.313*		0.210*
			(3.081)		(2.017)
Adjusted R^2	0.427	0.027	0.074	0.054	0.030
F	23.365*	1.837	3.414*	2.708*	1.941

* Statistically significant at 0.05.

The results presented in Table 3 show that COV is significantly, strongly, and positively affected by DIG, meaning that the H1 should not be rejected. On the other hand, DIG significantly and positively affects only LTP, but not STP; although the regression coefficient of DIG is statistically significant, the regression model of the association between DIG and STP is not. This means that H2a should be rejected, while H2b should not be rejected, and that the more digitalized companies could more strongly affect their long- compared to short-term financial performance. Finally, COV significantly and positively affects only STP, but not LTP; the regression coefficient

of COV is statistically significant, but the regression model of the association between COV and LTP is not. This means that the companies which used DT to more strongly and decisively respond to the crisis caused by the COVID-19 pandemic contributed more to their short- compared to long-term financial performance. This also means that H2a should not be rejected, while H2b should be rejected.

Given that DIG was found to significantly impact COV, which in turn had a significant impact on STP, mediation analysis was conducted with COV as a mediating variable. Table 4 shows that the mean indirect effect in DIG → COV → STP is positive and significant. It also shows that a unit increase in DIG increases COV by 0.750 and that holding DIG constant, a unit increase in COV increases STP by 0.168. The direct effect was not significant, indicating full mediation. Given that the total effect is positive and significant, the mediation effect is complementary. On the other hand, the mean indirect effect in DIG → COV → LTP is positive but not significant, indicating no mediation. Specifically, a unit increase in DIG increases COV by 0.750, but holding DIG constant, a unit increase in COV does not affect LTP. The direct effect was also not significant.

Table 4. Results of mediation analysis

	Effects	B	Adjusted R2	F
DIG → COV → STP	DIG → COV	0.750*	0.434	70.061*
	COV → STP	0.168*	0.076	4.709*
	DIG → STP	0.008	0.076	4.709*
	Total effect	0.134*	0.035	4.240*
	Indirect effect	0.126*		
	Sobel test statistic	2.163		
DIG → COV → LTP	DIG → COV	0.750*	0.434	70.061*
	COV → LTP	0.050	0.045	3.122*
	DIG → LTP	0.125	0.045	3.122*
	Total effect	0.163*	0.052	5.887*
	Indirect effect	0.038		
	Sobel test statistic	0.623		

* Statistically significant at 0.05.

4.3. Analysis of the respondents' qualitative answers

Although useful, the results of regression analysis are not sufficient because some attitudes of the respondents that require attention may remain hidden behind average scores. Accordingly, the analysis of the qualitative answers of respondents to three open-ended questions is conducted.

Although respondents on average consider the companies to be highly digitalized, some respondents indicated that this is still insufficient to significantly improve company efficiency, especially given the growing customers' demands. The respondents indicated that the obstacles to company digitalization are inadequacy of equipment and software and lack of organized employee training in using DT. They also see obstacles concerning the low level of management commitment to digitalization, and employees' aversion to innovative solutions. This is in line with Todorović *et al.* (2024) who argue that Serbian companies often need to spend much time to manage problems of insufficient motivation or resistance to change, which are rooted in the mentality of people and the Serbian cultural and political heritage.

Some respondents proposed the following solutions to the identified obstacles: a) replacement of the outdated DT with advanced systems and software for signalling and control of business processes; b) more effective technological leadership, through the organization of employees training in using DT in procurement, production, accounting, and finance; c) automation and harmonization of national standards with European Union standards. This means that the respondents believe that the success of digitalization depends, not only on company owners, managers and employees but also on the support from national regulatory and professional organizations and agencies.

The respondents point out that the COVID-19 pandemic accelerated the company digitalization - it encouraged the management to introduce and/or improve working from home, access to software, creation and exchange of information and documents, etc. Respondents pointed out that digitalization made it easier to connect with business partners, primarily with customers and suppliers, which facilitated sales and procurement. This is in line with the findings of Kim (2020). On the other hand, part of the respondents expressed the view that the COVID-19 pandemic did not significantly accelerate digitalization, primarily in the manufacturing industry, which could not be digitalized to a significant extent and where the physical presence of workers was required.

The majority of respondents pointed out that digitalization was a significant but not decisive factor for the survival of companies during the COVID-19 pandemic. Specifically, most companies were already digitalized to a certain extent, so the increase in the degree of digitalization did not significantly change their position on the market; it has contributed to a more efficient realization of daily tasks and an increase in revenues. Digitalization has helped companies to replace traditional with online trade, which in turn has helped companies to respond to the demands of consumers and continue cooperation with business partners. Some tourism, hospitality, and telecommunications companies have taken advantage of digitalization and, thus, minimized the negative effects of the COVID-19 pandemic.

5. Discussion

The study contributes to the literature on the company response to the COVID-19 pandemic (Guo *et al.,* 2020; Gabryelczyk, 2020; Kim, 2020; Pinzaru *et al.,* 2020; Priyono *et al.,* 2020; Thukral, 2021). The results show that Serbian companies have rapidly adopted DT and digitalized their operations to survive and thrive in times of COVID-19 pandemic. This is in line with the improved index and/or rank of Serbia in the reports of various international organizations (e.g. ITU, BBVA). Similar to Guo *et al.* (2020), the results also confirm that digitalization enabled companies in developing and upper-middle-income Chinese economy to respond to the crisis caused by the COVID-19 pandemic more effectively.

The COVID-19 pandemic increased the uncertainty and complexity of the business environment, which has affected the digitalization of companies. Exposed to increasing pressure, companies were forced to change traditional forms of business to make their business sustainable in the short and long term. The company response to the crisis caused by the COVID-19 pandemic was determined by available DT and readiness to further digitalize their business. Similar to Priyono *et al.* (2020) and Gabryelczyk (2020), the descriptive statistics show that companies reacted to the crisis by implementing DT, with different levels of emphasis on digital strategy.

The study results add to the literature finding that digitalization contributes to company financial performance (Kohtamäki *et al.,* 2020, Martinez-Caro *et al.,* 2020; Ramdani *et al.,* 2022) and more specifically the literature finding the differences in the impact of digitalization on short- and long-term financial performance (Zhong and Ren, 2023). The results show that digitalization does not affect short-term financial performance, which differs from Abidi *et al.* (2023), Zeng *et al.* (2022), and Zhong and Ren (2023). This could mean that the costs and benefits of digitalization cancel each other out in the short-term; i.e. more benefits should be expected in the longer term, when

new digital capabilities are better utilised, and costs should be expected around the introduction of new DT, concerning adapting to new ways of doing business.

On the other hand, the results show that digitalization contributed to the improvement of long-term performance during the crisis caused by the COVID-19 pandemic, which is in line with Zhong and Ren (2023). As hypothesised by Zhong and Ren (2023), this could mean that digitalization helps companies improve their innovation potential, flexibility and resource efficiency, and lower operating costs and risks, which become even more important in times of crisis.

The results show that the company's response to the COVID-19 pandemic has had a positive effect only on short-term financial performance. Guo *et al.* (2020) point out that Chinese companies have improved their financial performance by applying short- and long-term digital strategies. Our results are in line with Adam and Alarifi (2021) who find that the response of managerial structures to the crisis caused by the COVID-19 pandemic in terms of innovation had a stronger impact on short- compared to long-term financial performance. It should be, nevertheless, noted that the results differ from Y. Li *et al.* (2022), who confirmed that digital innovations during the COVID-19 pandemic caused a decline in short-term financial performance.

Mediation analysis shows that the company response fully mediates the impact of digitalization on short-term performance. This means that the company could have improved its short-term performance only by using DT to mitigate the consequences of the pandemic and identify new opportunities during the pandemic. Otherwise, digitalization has not affected short-term financial performance if the company increased the degree of digitalization, but continued to use DT in the same manner as before the pandemic. This finding is in line with Adam and Alarifi (2021).

There is no mediation effect of company response to crises when it comes to long-term financial performance, meaning that digitalization exerts only a direct effect. There are two possible explanations for this finding. First, Table 2 shows that DT were seldom used to achieve long-term changes in business processes in response to the pandemic. Instead, they were mostly used to address immediate crisis, which is more important for short-term performance. Second, company response is more important to help a company survive and strive in the short term and less in the long term. The impact of digitalization is stronger and more straightforward when it comes to long-term financial performance.

6. Conclusion

The crisis caused by the COVID-19 pandemic increased the uncertainty and complexity of the business environment and adversely affected companies around the world. Faced with new challenges, companies were forced to rapidly and significantly change the way of doing business, often through more extensive adoption and use of DT. The results of the study show that the more digitalized companies have responded to the COVID-19 pandemic more successfully and managed to improve their long-term financial performance. They also managed to improve their short-term financial performance but only indirectly, through response to the COVID-19 pandemic. On the other hand, no mediation effect of company response to crises was identified when it comes to long-term financial performance, meaning that company response is more important to help a company survive and strive in the short-term and less in the long-term.

From a theoretical point of view, the study is important given the way it examines the connection between digitalization and the company financial performance during the COVID-19 pandemic. Unlike the previous studies, it examines the direct and indirect impact of digitalization on the financial performance of companies in the Serbian developing economy. Analysis of the company response to the crisis caused by the COVID-19 pandemic and mediation analysis allowed identification and a better understanding of the indirect impact of digitalization on short- and long-term financial performance. The study also showed that digitalization significantly positively

directly affects long-term financial performance, which gives justification to the adoption and use of DT.

The study results have several practical implications. They are relevant for owners and managers of manufacturing, service, and commerce companies of all sizes. Specifically, digitalization can contribute to company performance if company owners and managers 1) understand and regularly review the degree of company digitalization, as well as the number and variety of adopted DT; 2) understand and regularly monitor the level of digital education of the employees and promotion of the importance of continuous digital training of employees; and 3) analyze the business environment and the need for new DT in the times of crisis to develop response strategies minimizing the adverse effects of the crisis.

The differences in the influence of the digitalization and response to the COVID-19 pandemic on the short- and long-term financial performance have additional practical implications. They indicate that the managers and owners should put more effort into achieving the positive impact of digitalization on short-term performance by providing employees with more opportunities to acquire necessary digital skills and preparing the integration of DT in business processes and organization with more care, and thus improving the benefits and decreasing the costs of digitalization. Concerning the response to COVID-19, managers and owners should pay more attention to the opportunities to increase long-term performance by redesigning business processes, improving customer relations, and developing more effective cost controls.

The results of the study also have practical implications for policymakers in developing and transitioning economies similar to Serbian. DT can help companies from these economies to develop a better business environment, improve their competitive position in national and global markets, and ultimately contribute to macroeconomic indicators and standard of living. Analysis of the respondents' qualitative answers indicates that the respondents expect support from national regulatory and other organizations and agencies in the processes of harmonization of national standards with European Union standards. Policymakers can also support companies, sometimes with the help of international organizations like the World Bank, by developing and promoting national digital strategies and providing tax and financial incentives for developing and using DT.

The study has certain limitations that indicate possible directions for future research. First, the highest percentage of responses was received from the region of Šumadija and Western Serbia. To increase the relevance of the obtained results, it is necessary to include more companies from other regions in Serbia. Second, the questionnaire is exclusively focused on companies operating in Serbia. To determine the degree and benefits of digitalization, it could be useful to conduct a comparative analysis of Serbia and other neighbouring or European Union countries. Third, the financial performance of the company was measured through the questionnaire which is less precise than the reported financial data. It could, therefore, be useful to associate respondents' attitudes towards digitalization and crisis response to financial performance measured by using reported financial data. Finally, it could be hard to identify and neutralise the answers that, intentionally or unintentionally, do not reflect respondents' attitudes.

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