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Impact of Digital Technologies on Business Performance in Serbia

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Abstract:

Research Question: The main goal of the study was to investigate the degree to which Serbian businesses accept and use digital technologies as part of the digital business transformation process. **Motivation:** The main aim was to research the specific determinants of the digital economy, digital technology and digital business transformation. Through an empirical analysis, digital technologies were classified as primary and secondary and the motive was to examine whether digital technologies affect revenue growth, productivity improvement, increase in market share, customer satisfaction and employee satisfaction, reduction in operating costs, development and use of digital products, digital market expansion and digital platform development. **Idea:** The main idea behind the study was to determine to what extent the said technologies are employed in Serbian businesses, as well as to develop a model of the impact of digital technologies on business performance, which may serve as a basis for further research. **Data:** The research was conducted from October 2020 to March 2021. A questionnaire was sent to over 500 email addresses of Serbian companies, and 98 questionnaires were filled in and duly returned. We displayed the most important characteristics of our sample and that way pointed out its randomness and representativeness and explained the choice of data analytics methods we use. **Tools:** The research instrument was a questionnaire including the general information (Part I). Part II included the question regarding the primary and secondary digital technologies used in their daily business activities. In Part III, the participants were required to state the specific outcomes their company expects to obtain as a result of digital business transformation. **Findings:** Mobile technologies, social networks and cloud computing were found to be dominantly employed technologies by the Serbian businesses from the sample. In percentage terms, the second class of disruptive technologies was shown to be insignificantly present in the Serbian companies. Finally, it appears that the role and importance of robotics and artificial intelligence have started to be recognised on the business scene. There is a significant impact of digital technologies on business performances, and we also give correlations between specific digital technologies and business performances, and intensity and statistical significance of impact in each case. We have also determined that some significant technologies make a latent, indirect impact on performances and shown the way that occurs. The analysis is performed after standardizing the ordinal scale values of variables making the results more accurate. **Contribution:** The paper provides the state of affairs regarding digital technologies use by Serbian businesses, as well as that of digital business transformation.

Keywords: digital economy, digital technology, digital business transformation

JEL Classification: M21, M15

1. Introduction

One of the worldwide trends in the global economy is the process of digitalisation, which represents a complete transformation of society and economy, as well as a necessary precondition for the survival of companies on domestic and international markets. The implementation of up-to-date and innovative technological solutions based on information and communication technology (ICT) is becoming one of the essential tools for boosting productivity, competitiveness and economic growth. The implementation of the abovementioned solutions brings about a change not only in economic trends but also in the entire society, owing to communications, information, innovations and networking.

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In essence, the digital economy transforms the market structure, or more specifically it conditions consumer behaviour and salesperson actions in line with their behaviour within traditional markets. On the one hand, market supply gets transformed with the launch of new products or services through their specific quality and purpose. Digital (virtual) products and services, which are made and offered by digital (virtual) producers, also emerge. On the other hand, digital markets create a completely new form of market demand. It is the market of digital (virtual) purchasers, both individuals as well as companies (Lazovic & Djurickovic, 2018, p. 208). Furthermore, digital technologies have brought about a specific revolution in *marketing communication* and *product distribution*. More precisely, the occurrence of digital marketing channels makes way for direct communication between the buyer and the seller. The digital economy allows for the exclusion of numerous go-betweens in the supply chain, hence significantly increasing the value for the end consumer through reduced prices and higher delivery speed. Digital technologies make a difference to *payment methods*, in a sense that nowadays the majority of transactions are carried out via cashless pay systems, with the highest growth of mobile payments and uses of cryptocurrencies. It is already evident at this point that future smartphones will be routinely equipped with apps enabling mobile payments (Apple Pay, Google Wallet, and the like). Digital economy trends will soon exert a great impact on almost all business sectors.

Underlining the significance of the digital economy, the European Union adopted the *Digital Agenda for Europe* in 2010, which was also launched for the Western Balkans by the European Commission in 2018. The objective of this agenda was to support the transition of the region into a digital economy and bring the benefits of digital transformation, such as swifter economic growth, more jobs and better services. The Commission is committed to the following: to invest in broadband connectivity; to increase cybersecurity, trust and digitalisation of industry; to strengthen the digital economy and society; to boost research and innovation. Despite the stated, there is still, to a certain extent, a high degree of digital inequality in Serbia, as well as in other countries of the Western Balkans in comparison with the developed EU countries. To reduce the level of this inequality, it is necessary to institute considerable changes in the economic system, besides the required financial assistance, so that these changes may provide support and construction of new business models based on knowledge, innovation and advanced technology (Celik, 2020; Spremic, 2020).

The most relevant infrastructural factors of the digital economy are digital technologies, relating to the use of digital resources (technologies, tools, apps and algorithms), through which digital goods in a computing environment are found, analysed, created, shared and used efficiently. Digital technologies may be classified into two groups, or more specifically as: *primary* and *secondary*. Primary digital technologies, which have been transforming the world's economy into the digital economy in the past years, are as follows: mobile technologies, social networks, cloud computing, the Internet of Things (IoT) and Big Data Analytics (Rogers, 2016, p. 21). The listed primary digital technologies represent convergent forces of digital disruption, which may significantly influence the changes about to happen on the market. These forces are innovative and revolutionary in their own right, but when combined, they will radically transform society and business, eliminate the old business methods and create new digital leaders (Schwertner, 2017, p. 392). Apart from primary, other, secondary digital technologies are also frequently employed, such as 3D printers, robotics, drones, wearable technology and artificial intelligence.

This paper aims to determine to what extent the said technologies are employed in Serbian companies, as well as to develop a model of the impact of digital technologies on business performance, and investigate whether digital technologies affect their revenue growth, productivity improvement, increase in market share, customer satisfaction and employee satisfaction, reduction in operating costs, development and use of digital products, digital market expansion and digital platform development. Like any other model of the impact, they are not necessarily instantly applicable in the improvement of any company's business performances but are important theoretical, and methodological tools for developing experimental models which can also depend on many factors, such as legal form, business size etc.

This paper has been constructed in the three aspects, all stated in the following way. The first aspect represents a theretical background and a releveant literature review, related to digital technologies and business performance. In the second part of the paper, the research methodology has been presented, the characteristics of the research sample, as well as the extent to which Serbian companies are acquainted with the digital technology concept and digital business transformation. The last segment stated here explains the research results and discussions and a model of the impact of digital technologies on business performance.

2. Literature Review

The impact of information and communication technology (ICT), similarly to digital technologies, like mobile technologies, social networks, cloud computing, the Internet of Things (IoT), Big Data Analytics has been examined in a lot of studies. The business value of ICT and digital technologies (BVIT) is valuable from a management perspective and generally included to foresee the IT performance impact, together with productivity enhancement, profitability improvement, then cost reduction, competitive advantage, and finally, inventory reduction (Tang, Huang & Wang, 2018; Devaraj & Kohli, 2003; Hitt & Brynjolfsson, 1996). Kohli and Grover (2008) have emphasised IT value to be shown in a lot of ways, where several aspects are also within it, such as emphasising productivity gains, process improvements, profitability enhancement, increased consumer surplus, and improvements in supply chains or innovation at the inter-organizational level (p. 26). Sabherwal and Jeyaraj (2015) have examined the empirical BVIT, where the focus has been on "studies at the organizational level related to IT-related independent variables and the same stands for dependent variables related to IT's organizational impact" (p. 810). Melville, Kraemer & Gurbaxani (2004) have emphasized BVIT as "the organizational performance impacts of IT at both levels, comprise efficiency impacts and competitive impacts" (p. 287).

Mobile technologies are an imperative part of modern organizations (Car, Pilepic & Simunic, 2014) and influence competitive business environment globally, confronting organizations nowadays. Levi-Bliech, Naveh, Pliskin & Fink (2018) have developed the model to explain how the mechanisms of mobile technologies generate business value and how they enable collaborative capabilities, where six different dimensions of a business process performance (BPP) are stated: cost, efficiency, flexibility, quality innovation and the final one, sustainability. This model has been tested by utilizing survey data given by managers in six European countries. The obtained results have had an impact related to mobile technology to be positively associated with both external and internal collaborative capabilities, where BPP is the utmost, in a case when the development of internal capabilities has priority compared to the development of external ones. Braojos, Benitez & Llorens (2019) have recommended that the social commerce-IT capabilities of social media and e-commerce should influence positively and individually a firm performance via an online client engagement. As Gelogo and Kim (2014) have asserted cloud computing comprises performance and productivity and better tracking of organizational resources and raw material. Tang et al., (2018) have examined the impact of IoT implementation on any firm performance. Their study has confirmed for IoT implementation to have a positive influence on organizations' Tobin's q and financial performance. Specifically, it has to comprise the return on assets (ROA). Thus, having had a scope of measurements, the examined results show for IoT adopters to have a higher impact on performance and market value compared to non-IoT adopters. The findings of Wamba, Gunasekaran, Akter, Ren, Dubey & Childe (2017) have also confirmed the value of the entanglement conceptualization of the hierarchical BDAC (Big Data Analytics Capability) model, where both direct and indirect impacts have been present in firm performance.

The correlation between ICT, digital technologies, and business strategy and competitive advantage has been of interest in a lot of discussions in the past decade (Fadhilah & Subriadi, 2019, p. 259). Saeidi, Saeidi, Sofian, Saeidi, Nilashi & Mardani (2019) have researched the influence of the Enterprise Risk Management (ERM) on Competitive Advantage (CA), where a moderating role of information technology dimensions has been present; Information Technology (IT) strategy and Information Technology (IT) structure, both examined within it. The study has proved for ERM displayed to have an important positive impact on a firm competitive advantage. The obtained results proved for IT strategy and IT structure to have a direct effect upon the competitive advantage, and a moderating effect on ERM-competitive advantage relationship has also been an integral part of this effect. Having used structural equations modelling with data collected from 63 firms, Benitez, Llorens & Braojos (2018) have found IT capability to have a proactive environmental strategy and it is also of importance in mediating the effects of IT on firm performance.

As regards the data used from a matched survey of IT and business executives in 148 Chinese manufacturing firms, Chen, Wang, Nevo, Benitez & Kou (2017) have confirmed that there are positive, important links between IT support for core competencies and strategic flexibility, where strategic flexibility and firm performance are of equal status. Hao and Song (2016) have also wanted to research how strategic capabilities mediate the effect of technology-driven strategy on firm performance. Their data have shown for a technology-driven strategy to have very positive capabilities of both technology and information technology, but it has a negative effect related to marketing capabilities and market-linking capabilities. Additionally, all types of strategic capabilities are of a positive relation to firm performance (p. 757). The contribution of Morimura and Sakagawa (2018) is related to the development of an integrated framework to analyse the effect of IT use in exploiting and exploring a standardization of pricing and promotion strategies, where there are two different uses of IT. The IT use has had a positive effect on the

standardization of promotion strategies, and another positive effect of IT is visible in the standardization of pricing strategies.

DeGroote and Marx (2013) have argued for IT's impact on supply chain agility to be measured by the firm's ability to reply to market changes, and the impact of supply chain agility is closely related to firm performance. These results have proven that IT increases the supply chain's ability, while market changes can be accomplished by improving information quality and developing a response to it. Their research has also shown that the supply chain agility can be improved in the segment of the firm's financial and operating performance, where sales, market share, profitability, speed to market, and customer satisfaction cannot be excluded and they make an integral part of the entire process. The findings of Kim's study (2017) have shown for IT to be very positively associated with firm performance via supply chain integration (SCI).

Regarding the data of 125 multichannel retailers in Singapore, Oh, Teo & Sambamurthy (2012) have proven that the retail channel integration, when using IT, can be efficient in delivering the current offers, and it can also have an innovative role in creating offers in the future. The examined data of Ilmudeen and Bao (2018) has shown the empirical evidence of Val-IT's components (value governance, portfolio management, and investment management), all related to the management of IT (MIT); they are shown to be a significant mediator between Val-IT components and firm performance. Kim, Wimble & Sambamurthy (2018) have also investigated into when and how each IT capital type could contribute to firm performance by analyzing the 5-year panel data of 1,548 US firms. Their results have shown that individual information access capital and collective information access capital have immediate effects on profitability via cost efficiency or sales growth.

Dale Stoel and Muhanna (2009) have demonstrated in their research the relation of IT capabilities and firm performance, proving that it is more complex than previously theorized. Specifically, the effect of the external environment is the one of the most importance. Their analysis has given an insight into the general support of an IT capability that depends upon the characteristics of the environment/ industry, the area where all firms are in a process of competition.Their shown results have confirmed a link between the type of IT resources/capabilities of a firm and the demands of the environment, where the effect of the externally oriented IT capabilities has also been positive.

Also, Melville et al., (2004) have developed a model of IT business value based on the resource-based view of a firm. Their primary result for IT is to be valuable, but the extent and dimensions depend on internal and external factors, where they also include complimentary organizational resources and a firm's partners, the competitive and macro environment. Drnevich and Croson (2013) have maintained for a greater business digitalisation to be beneficial to organisations by cost savings, increased connectivity, greater flexibility, and adaptability in currently increased complex and competitive environments. Benitez et al., (2018) have found that IT infrastructure provides the basics for business experimentation and the flexibility of exploring business opportunities; and IT-enabled business flexibility could help firms to develop operational proficiency, and also exploit opportunities for their increased performance.

The results of Arora and Rahman (2017) have shown the impact of superior IT capability on the financial performance of firms in the chemicals and chemical products industry in India. The most important result has been a positive association between superior IT capability and returns on sales (ROS). Turulja and Bajgoric (2018) have examined a conceptual framework to clarify the nature of the effects of a firm's information technology (IT) capability, the present knowledge management (KM) capability and the last segment of human resource management (HRM) capability in business performance of an organization. 39 IT capability also comprises HRM and KM capability. For this, KM capability together with IT capability influence highly the organizational business performance.

Perez-Mendez and Machado-Cabezas' (2015) Partial Least Squares (PLS) statistical technique has proved the positive effects the information systems (IS) strategy has on a firm's financial results. The IS quality has also shown a positive correlation with improved financial performance. The findings from a logistic regression analysis have also had a positive effect of NMTs (New Management Tools) on profitability improvement since they are part of an IS of high strategic relevance. The organizations with higher technological infrastructure, development methodologies, and competence of their programmers, have had better results of the quality of the system, where they have contributed to the individual and organizational development of the company (Solano, García, & Bernal, 2014, p. 33). Also, Cespedes-Lorente, Magen-Díaz & Martinez-Ros (2019) proved a positive relationship between extensive IT use in various business areas.

To understand better what leads to success and/or failure when a company uses ICT and digital technology in business performance, MIT Sloan Management Review and Capgemini Consulting surveyed in 2013,

examined 1,559 executives and managers in various industries. The participants' answers have illustrated that managers believe in technology and are aware that it can bring transformational changes to businesses and that there is difficulty in achieving excellent results via new technology (Fitzgerald, Kruschwitz, Bonnet & Welch, 2014). Martinez-Caroa, Cegarra-Navarrob and Alfonso-Ruiz, 2020) have conducted a survey with 93 multinational-company production centres in more than ten countries. Structural equation modelling has been used to test the given theoretical model, and these findings have indicated that business digitisation improves the development of value activities, and companies "unleash this potential" when a digital organisation culture is completely adopted.

3. Research Methodology

The research was conducted in the period from October 2020 to March 2021, in 98 Serbian companies. The research instrument was a questionnaire including the general information, such as the company's name, principal place and address of the business, legal form, business size, their core business. Namely, in its effort to comply with the EU standards, i.e., the European Statistical System (ESS) Standards, the Republic of Serbia adopted the Regulation on Classification of Economic Activities (The Official Gazette of the Republic of Serbia No. 54, 2010), under the law on the Classification of Economic Activities (The Official Gazette of the Republic of Serbia No. 104, 2009). In the current research, the Serbian businesses have been classified according to this Regulation. In addition, in this part, the participants were also required to state whether the management is acquainted with the digital technology concept, as well as that of digital transformation.

Part II of the questionnaire involved the questions on the companies' use of primary and secondary technologies in their daily business. In Part III, the participants were asked to state the specific results their company expects to achieve as a consequence of digital business transformation, or more precisely, whether digital technologies affect their revenue growth, productivity improvement, increase in market share, customer satisfaction and employee satisfaction, reduction in operating costs, development and use of digital products, digital market expansion and digital platform development. The data in Part II and Part III were collected using the 5-point Likert scale from strongly disagree to strongly agree. The questionnaire was sent via Google Docs, requiring that every question must be answered. It was sent to over 500 email addresses of Serbian companies, and **98 questionnaires were filled in and duly returned**, i.e., approximately 20% of the initial sample. All the participants were guaranteed data confidentiality. To analyse the data, we used Microsoft Excel 2020 and the statistical programme SPSS 25.0.

Based on the analysis of the acceptance level of digital technologies by Serbian businesses, it is possible to derive a *Model of the Impact of Digitisation on Business Performance* (Figure 1). Namely, the resource-based view (RBV) is the dominant theory in the literature, where the link between digital technologies and business performance has also been examined in detail (Melville, Kraemer & Gurbaxani, 2004). RBV has been used as a measuring unit to examine the superior performance and competitive advantage implications, where the following ones are also present and are firm-specific, valuable, rare, imperfectly imitable and, they cannot be strategically substituted by other resources (Ghobakhloo & Hong, 2014). In the context of digital technologies, as specific firm resources, it is useful to analyze whether and how digital technologies may be associated with competitive advantage and business performance. Strategy researchers have used RBV to analyze in theory the competitive advantage implications related to information technology (Mata, Fuerst & Barney, 1995), and they have empirically accessed the complementarities between technologies and other resources of any firm (Powell & Dent-Micallef, 1997). Digital and IT researchers have also started to employ the resource perspective, where they have expanded and deepened the understanding of IT business value (Bharadwaj, 2000; Caldeira and Ward, 2003; Melville, Kraemer & Gurbaxani, 2004;). The conceptual foundations of the literature on digital and IT-enabled organizational capabilities have been a strating platform to propose the model of the study as shown in Figure 1. *Model of the Impact of Digitisation on Business Performance* includes the most used digital technologies, i.e., a large number of independent variables affecting business performance, which in turn affects dependent variables on the right side of the model. Primary dependent variables from the model include revenue growth, productivity improvement, increase in market share, customer satisfaction and employee satisfaction, reduction in operating costs, development and use of digital products, digital market expansion and digital platform development.

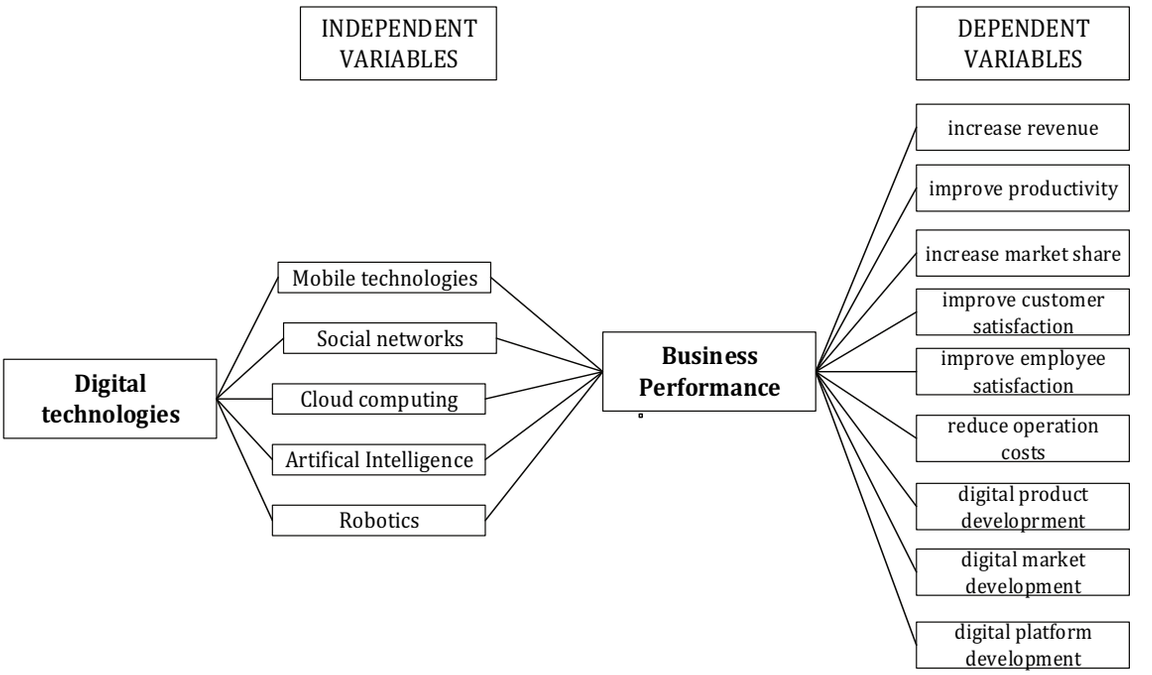

Figure 1: Model of the Impact of Digitisation on Business Performance

The choice of variables is determined by the digital technologies most used worldwide (Statista, 2021, https://www.statista.com/topics/6778/digital-transformation/), and the ones we kept among all of such variables and included in our analysis are the ones that are commonly used in Serbian companies, based on the responses we got by the companies included in this research.

The reliability of data, i.e., the validity of the questionnaire was checked using Cronbach's alpha coefficient. A value that is higher than 0.6 is acceptable, higher than 0.8 is excellent and higher than 0.9 is perfect (Fajgelj, 2021).

We will find a significant effect of the independent variables, i.e., digital technologies on the dependent variables, i.e., business performances. We will also determine in what way, significantly or not, each digital technology affects each business performance. Since we have an ordinal scale of measurement, i.e., {1, 2, 3, 4, 5}, and our goal is to determine the effect of digital technologies on business results, we will transform our scale into a numerical one which will enable us to perform the analysis in accordance to our goal using linear regression analysis. The smaller the number of dependent variable modalities, the greater need for proper data modification is required (Vukovic, 1997; Vukovic, 2007; Bogdanovic et al., 2013).

Usually, when the measurement scale of the dependent variable is ordinal the multinomial regression analysis is used, however, it determines how changes of predictors affect the value of odds ratio of exactly two modalities, which is not what we need. Also, the sample size, more than three modalities, same scale variables, and many more, counterwork the precision of results of multinominal logistic regression analysis (Fajgelj, 2021; IBM, 2021, https://www.ibm.com/docs/en/spss-statistics/version-missing?topic=regression-multinomial-logistic).

For each variable, each sample element in the variable we obtained, we have computed standardized Z-values. The Z value is calculated as the difference between the element of the sample and the sample mean divided by the standard deviation. This way we made new variables that are numerical and are scaling more precisely. Since new variables contain standardised values, their mean is 0, and the standard deviation is 1 (Bogdanovic et al., 2013).

Multivariate linear regression analysis, when performed on standardized Z values, usually does not change the conclusion, always gives us the more precise percentage of change of dependent variable caused by the change of predictor, and has the regression **constant** negligibly different from zero with **no statistical significance**. Also, standardized Beta coefficient equals to regression coefficient when linear regression analysis is performed on Z values of the sample. That makes results much more concise and easier to read. In subchapter 4.2. we have also formed a new variable "Digital technologies utilization" which represents the

sum of all the Z-values of independent variables, thus the values of the total digitalisation measure of the company. The same is done for dependent variables, i.e., a new dependent variable "Business results" is created.

Using multivariate linear regression analysis, in chapter 4. subchapters 4.2. and 4.3, we will present how increased digital technologies utilization (in general) affects business results more precisely.

The (partial) regression coefficients "B" for predictor (independent variable) show how much the value of the dependent variable changes (B>0 indicates increase, B<0 indicates decrease) if a given predictor is increased by one unit of measurement (in multivariate linear regression analysis, i.e., with multiple predictors, all other predictors are considered unchanged). We also have the 95% confidence intervals for partial regression coefficients, i.e., the interval which will contain the regression coefficient for a given predictor with a probability of 95%. **The coefficient of multiple determination gives us information on what percentage of the variability of the dependent variable is determined** R^2 **(predicted) by changing the values of the predictor variable(s).** ANOVA gives us the statistical significance of the predictive ability of the obtained model.

The results of correlation and the "stepwise" method of multivariate linear regression analysis will overlap when it comes to significant interdependence between chosen independent variables and one dependent variable. That is why we will only determine which independent variables have a significant effect on the dependent variable, and in what way it can be achieved, using multivariate linear regression analysis. This will be done for each dependent variable. The multivariate linear regression is given with the equation:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon$$

Where Y is the dependent variable, betas are partial regression coefficients an Xs are independent variables or predictors, alpha is a regression constant (zero when values of variables are standardized) and epsilons are residuals.

On some occasions there is a possibility of an insignificant direct effect of one predictor (X) on some dependent variable (Y), however, the effect of our predictor on some other variable (M) and the effect of that variable on our dependent variable can be significant. In that case, we have the mediation model, where the corresponding variable is called the mediation variable.

The mediation analysis model is performed through three univariate linear regression analyses and it is given in the following model.

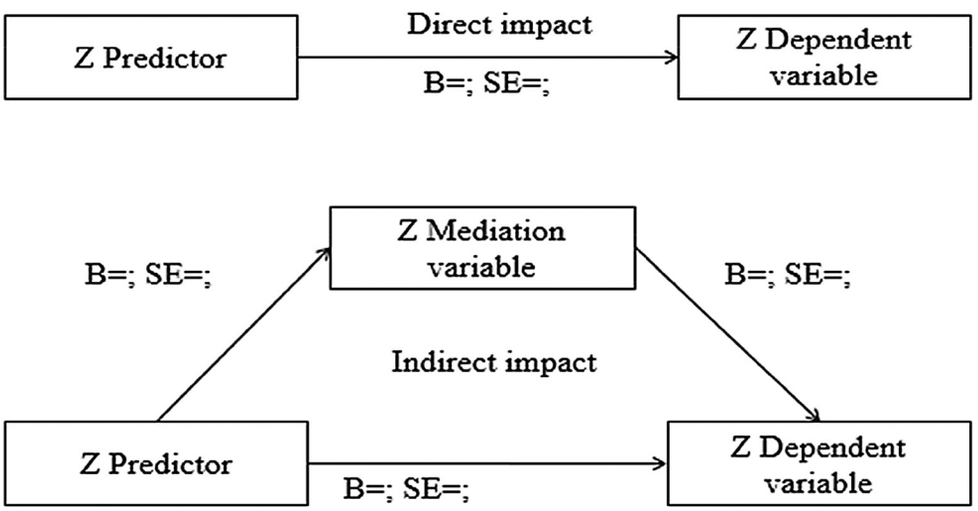

Figure 2: Basic Mediation model performed on variables with standardized values

Usually, there are partial regression coefficients B and its standardized values Beta involved in the model, but since our variable's values are standardized, we can neglect the Beta coefficients.

Based on the Aroian test, when the absolute value of $z = \frac{B_{XM} \cdot B_{MY}}{\sqrt{B_{MY}^2 \cdot SE_{XM}^2 + B_{XM}^2 \cdot SE_{MY}^2 + SE_{XM}^2 \cdot SE_{MY}^2}}$ is higher than 1.96 there is a significant indirect impact (Fajgelj, 2021; Kim, Cologne, Cullings, 2017; Henry Nwankwo, 2016; Pearl, 2001; Popovic & Blagojevic, 2003; Reinhart, 2015, Jevremovic, 2013).

Mediation proportion is calculated using $\frac{\text{Beta}_{XM} \cdot \text{Beta}_{MY}}{\text{Beta}_{D-XY}}$.

4. Results and Discussion

Concerning the place where companies conduct business, the sample distribution was as follows: twenty-nine companies were from Belgrade (29.59%), nine from Novi Sad (9.18%), seven from Novi Pazar and Nis (7.14% each), four from Kragujevac (4.08%), three from Vranje, Uzice and Becej (3.06% each), two from Sombor, Kraljevo, Nova Varos, Majdanpek, Raska and Ruma (2.04% each), and one from Leskovac, Zrenjanin, Prijepolje, Bujanovac, Indjija, Subotica, Kosjeric, Crvenka, Paracin, Zlatibor, Bor, Arilje, VrnjackaBanja, Novi Becej, SmederevskaPalanka, Aleksinac, Kovin, Cacak, Valjevo, Vrbas and Zagubica (1.02% each). The classification of the companies according to the legal form and business size is presented in Table 1.

Table 1: Legal form and business size of the sample

Legal form	Entrepreneur	Partnerships	Limited liability companies	Joint-stock companies	Public companies	Σ
No. of companies	7	15	15	59	2	98
%	7.14%	15.31%	15.31%	60.20%	2.04%	100
Business size	Micro enterprises	Small enterprises	Medium-sized enterprises	Large enterprises		Σ
No. of companies	7	36	45	10		98
%	7.14%	36.73%	45.92%	10.20%		100

Concerning the legal form of the businesses involved in the current research, joint-stock companies were present in the largest number (60.20%), followed by fifteen partnerships and limited liability companies (15.31% each), seven entrepreneurs (7.14%) and two public companies (2.04%). The sample included medium-sized enterprises in the largest number (45.92%), followed by small (36.73%), large (10.20%) and micro (7.14%) enterprises.

Concerning the core business, thirty companies from the sample did business in the field of manufacturing (30.61%), nine in wholesale and retail trade, and repair of motor vehicles and motorbikes (9.18% each), eight in mining (8.16%), seven in construction industry, transport and warehousing, accommodation and food services, together with agriculture, forestry and fishery (7.14% each). The distribution of the remaining businesses in percentage terms was as follows: six in the field of information and communication services (6.12%), four in financial services (4.08%), four in other service activities (4.08%), two in electricity, gas, steam and air conditioning supply (2.04%), two in professional, scientific and technical activities (2.04%), two in education(2.04%), two in health and social security (2.04%), one in art, entertainment, and recreation (1.02%). In the following table we present this sample structure in comparison with the structure of the population of all Serbian enterprises in 2018 (Statistical Yearbook, 2020).

Table 2: Business structures of Serbian enterprises in 2018 and the obtained sample

Business	Serbia in 2018		Obtained sample	
	Enterprises			
	Number	%	Number	%
Mining and quarrying	315	0.36	8	8.16
Manufacturing	15831	18.11	30	30.61
Electricity, gas, steam and air conditioning supply	781	0.89	2	2.04
Water supply; sewerage; waste management and remediation activities	800	0.92	0	0
Construction	7562	8.65	7	7.14
Wholesale and retail trade; repair of motor vehicles and motorcycles	30591	35.00	18	18,37
Transportation and storage	5942	6.79	7	7.14
Accommodation and food service activities	3414	3.91	7	7.14
Information and communication	4935	5.65	6	6.12
Real estate activities	1403	1.61	0	0
Professional, scientific and technical activities	11976	13.70	11	11,22
Administrative and support service activities	3390	3.88	2	2,04
Repair of computers and personal and household goods	467	0.53	0	0
Total	**87407**	**100.00**	**98**	**100.00**

Based on table 2 we can see that our sample is randomly obtained. The sample size could be an issue when it comes to the generalization of conclusions but considering that process of digitalization has just started in Serbia, there are not many enterprises using digital technologies other than some mobile ones (mobile devices and laptops). For example, in 2019 only 27,9% of Serbian enterprises distributed their products and services through digital technologies, 37% of the internet population uses e-government for getting information and 43% of them have never purchased goods or services through digital technologies (Kovacevic, Sutic, Rajcevic & Milakovic, 2020). In terms of the first question in the questionnaire, whose aim was to determine the extent to which they are acquainted with the digital technology concept and digital business transformation, the managements of all the tested businesses believed that they were familiar with the given concepts, which gave us the green light to continue with the data analysis, i.e., based on the stated facts we can consider our sample as the representative one (Bogdanovic, Milosevic, Dolicanin & Lazarevic, 2013). In the following sections, we elaborate on digital technology determinants, possibilities of their use, as well as the acceptance level of primary and secondary digital technologies by Serbian businesses.

We emphasise that the highest distribution in the Serbian businesses was present in case of mobile technologies, such as using mobile devices and laptops (100%). Social networks, as a modern business tool, were stated to be used by ninety Serbian businesses (91.84%). Cloud computing, as a technology for storing business data, was recognised by seventy-nine businesses (80.61%). The following two concepts, the Internet of Things and Big Data Analytics are present in Serbian businesses to a lesser extent than the previous three concepts. In other words, 18 businesses (18.37%) recognised the significance of using the Internet of Things technology, whereas only 19 (19.39%) recognised the importance of the Big Data Analytics concept.

Serbian businesses from the sample are beginning to recognise the significance of these disruptive technologies. Disruptive technologies are frequently termed “emerging technologies” or “converging technologies” in the literature. Emerging technologies are indeed technical innovations that, as a rule, cause a shift of the already formed paradigms, regulations and standards. This is exactly the reason why only one business from the sample (1.02%) recognised the importance of 3D printing. For automation of production, twenty-three businesses (23.47%) started using different forms of robots displacing manual labour. Drones were used by five companies, augmented reality by two, and artificial intelligence by eleven businesses included in the sample.

4.1. Digital technology and business performance – descriptive statistics

Cronbach’s alpha for independent variables (items), i.e., digital technologies is 0.607 which is acceptable. Hence, the data are reliable and the questionnaire is valid.

Cronbach’s alpha for dependent variables (items), i.e., business performances is 0.861 which is good. Hence, the data are reliable and the questionnaire is valid.

Table 3: Descriptive statistics for variables in the *Model of the Impact of Digitisation on Business Performance*

Variable	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Independent variables						
Mobile technologies	2	1	3	1.27	0.488	0.238
Social networks	4	1	5	1.59	0.929	0.863
Cloud computing	4	1	5	2.01	1.288	1.660
Artifical Intelligence	4	1	5	3.88	1.018	1.036
Robotics	4	1	5	3.59	1.267	1.605
Dependent variables						
Revenue growth	4	1	5	1.28	0.859	0.738
Productivity improvement	4	1	5	1.48	1.124	1.262
Increase in market share	4	1	5	2.31	1.732	2.998
Customer satisfaction	4	1	5	2.13	1.647	2.714
Employee satisfaction	4	1	5	3.77	1.491	2.223
Reduction in operating costs	4	1	5	1.67	1.383	1.913
Development and use of digital products	4	1	5	2.89	1.899	3.606
Digital market expansion	4	1	5	3.11	1.827	3.338
Digital platform development	4	1	5	4.19	1.042	1.086

Table 4: Descriptive statistics for variables with standardized values in the *Model of the Impact of Digitisation on Business Performance*

Variable	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Independent variables						
Z Mobile technologies	4.09818	-0.54364	3.55454	0	1	1
Z Social networks	4.30677	-0.63723	3.66955	0	1	1
Z Cloud computing	3.10489	-0.78414	2.32075	0	1	1
Z Artifical Intelligence	3.92913	-2.82657	1.10256	0	1	1
Z Robotics	3.15747	-2.04591	1.11156	0	1	1
Dependent variables						
Z Revenue growth	4.65701	-0.32076	4.33624	0	1	1
Z Productivity improvement	3.56000	-0.42684	3.13316	0	1	1
Z Increase in market share	2.31013	-0.75433	1.55580	0	1	1
Z Customer satisfaction	2.42795	-0.68751	1.74045	0	1	1
Z Employee satisfaction	2.68299	-1.85482	0.82817	0	1	1
Z Reduction in operating costs	2.89211	-0.48694	2.40517	0	1	1
Z Development and use of digital products	2.10648	-0.99413	1.11235	0	1	1
Z Digital market expansion	2.18943	-1.15615	1.03328	0	1	1
Z Digital platform development	3.83882	-3.06518	0.77364	0	1	1

4.2. General impact

Spearman's rho correlation coefficient for variables „Digital technologies utilization" and „Business performances" is 0.723 which indicates that there is a high positive correlation. The correlation significance test gives us a p-value of 0 which is less than 0.05, thus the correlation is statistically significant.
The linear model based on which business results are affected by digital technologies utilization is:

$$\text{Business performances} = 1.538 \cdot \text{Digital technologies utilization} - 2.44$$

Hence, if we increase the variable „Digital technologies utilization“ by 1, the value of the variable „Business performances“ increases by 1.538 (95% confidence interval is [1.285, 1.791]). The increase is statistically significant (p=0<0.05).

Multiple determination coefficient R^2 equals 0.602, which indicates that 60.2% of business performances variability is determined by changes in the values of digital technologies utilization.
ANOVA results (F=145.47 with p=0<0,05) confirm that the prediction of the dependent variable (business performances) values through the obtained model are statistically significant.
Further results can be interpreted analogously.

4.3. The impact of digital technologies on each business performance

We used the “stepwise” method of regression which excludes variables that make no significant prediction out of the model. The p-values of the significance of included variables are also given.
The following tables give us the results of multivariate linear regression analysis.

Table 5: Multivariate regression analysis results for revenue growth and productivity improvement

Dependent variables	Name of regression result	Predictors		R^2	ANOVA	
		Z Social networks	Z Cloud computing		F	P
Z Revenue growth	B	0.327	0.306	0.291	19.526	0
	95% CI for B	[0.135, 0.519]	[0.114, 0.498]			
	p-value of significance	0.001	0.002			
Z Productivity improvement	B	0.259	0.635	0.618	76.482	0
	95% CI for B	[0.117, 0.400]	[0.494, 0.776]			
	p-value of significance	0	0			

Table 6: Multivariate regression analysis results for an increase in market share, employee satisfaction, reduction in operating costs, development and use of digital products and digital market expansion

Dependent variables	Name of regression result	Predictors		R^2	ANOVA	
		Z Cloud computing	Z Robotics		F	p
Z Increase in market share	B	0.546	0.246	0.432	36.154	0
	95% CI for B	[0.386, 0.705]	[0.087, 0.406]			
	p-value of significance	0	0.003			
Z Employee satisfaction	B	0.158	0.779	0.699	110.290	0
	95% CI for B	[0.042, 0.274]	[0.663, 0.895]			
	p-value of significance	0.008	0			
Z Reduction in opertaing costs	B	0.892	-0.145	0.746	139.539	0
	95% CI for B	[0.785, 0.999]	[-0.252, -0.038]			
	p-value of significance	0	0.008			
Z Development and use of digital products	B	0.250	0.521	0.405	32.316	0
	95% CI for B	[0.084, 0.413]	[0.357, 0.684]			
	p-value of significance	0.003	0			
Z Digital market expansion	B	0.159	0.618	0.461	40.582	0
	95% CI for B	[0.003, 0.314]	[0.462, 0.773]			
	p-value of significance	0.046	0			

Table 7: Multivariate regression analysis results for digital platform development

Dependent variables	Name of regression result	Predictors		R^2	ANOVA	
		Z Artificial intelligence	Z Robotics		F	p
Z Digital platform development	B	0.795	-0.476	0.326	22.949	0
	95% CI for B	[0.560, 1.031]	[-0.712, -0.240]			
	p-value of significance	0	0			

Table 8: Multivariate regression analysis results for customer satisfaction

Dependent variables	Name of regression result	Predictor	R^2	ANOVA	
		Z Cloud computing		F	p
Z Customer satisfaction	B	0.650	0.423	70.322	0
	95% CI for B	[0.496, 0.804]			
	p-value of significance	0			

It is worth mentioning that robotics utilization results in neglecting Digital platform development (Table 5) and requires additional Operating costs (Table 4). This fact does not mean that Robotics utilization is not an important factor in optimizing business performances, quite the opposite, as it can be seen in the bigger part of analysis results. Here we see that, even though beneficial, digitalization needs to be implemented after planning, previous priorities determined and innovations based on priorities.

The "stepwise" method has not recognised mobile technologies as a significant factor when it comes to impact on business performances. That is because mobile technologies are an integral part of modern Serbian business (Kovacevic et al., 2020). Therefore, the business performance of most companies operating today is determined by mobile technologies even since their inception. The same goes for our sample. Hence, mobile technologies have not scaled as diverse as the other digital technologies in the model; that is why their impact is not significant in comparison with one of the other digital technologies. However, the Spearman correlation coefficients for interdependence between mobile technologies and productivity improvement, and mobile technologies and reduction in operating costs are respectively 0.296 and 0.231 and are both statistically significant ($p=0.003<0.05$ and $0.022<0.05$). In the following table, the univariate regression analysis results are also given.

Table 9: Univariate regression analysis results for customer productivity improvement and reduction in operating costs with mobile technologies as a predictor

Dependent variables	Name of regression result	Predictor	R^2	ANOVA	
		Z Cloud computing		F	p
Z Productivity improvement	B	0.367	0.135	14.961	0
	95% CI for B	[0.179, 0.556]			
	p-value of significance	0			
Z Reduction in operating costs	B	0.313	0.098	10.423	0.002
	95% CI for B	[0.121, 0.505]			
	p-value of significance	0.002			

These seemingly contradictory conclusions indicate that mobile technologies might have a significant **indirect** impact on productivity improvement and reduction in operating costs. To be more precise in our conclusion we will perform the mediation analysis. The results are given in the following mediation models.

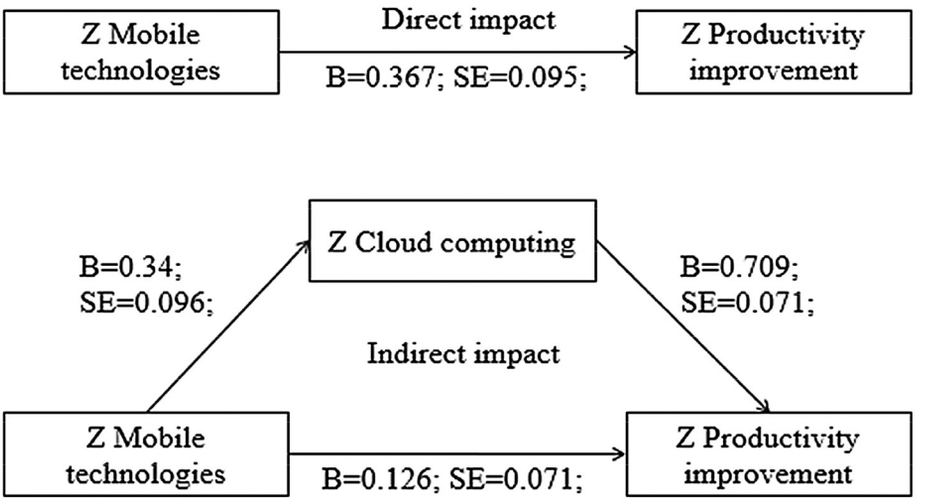

Figure 3: Mediation model of mobile technologies impact on productivity improvement

Since the direct impact of mobile technologies on productivity improvement weakens by including cloud computing as another predictor, so it is no longer a significant predictor, full mediation occurs. Using B=Beta and standard error SE we can use the Aroian test. We get z=3.323 which is higher than the critical value of 1.96, hence the mediation, i.e., the indirect impact of mobile technologies, through cloud computing, on productivity improvement is statistically significant.

The mediation proportion is 0.6568 which means that 65.68% of the impact is determined by mediation through cloud computing.

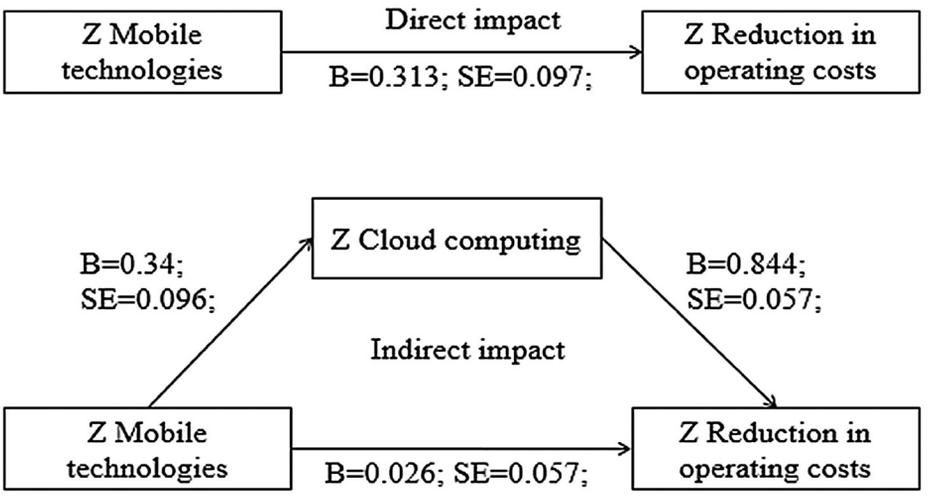

Figure 4: Mediation model of mobile technologies impact on Reduction of operating costs

The conclusion here is the same as for figure 2, with z=3.437 and mediation proportion 0.7819. Therefore, mobile networks are as well a significant factor in optimizing some of the business performances, but indirectly.

Based on the results the model of impact can be suggested based on the following diagram. The quantity of each digital technology utilization can be determined based on the results in tables of chapter 4 and its current utilization in a company.

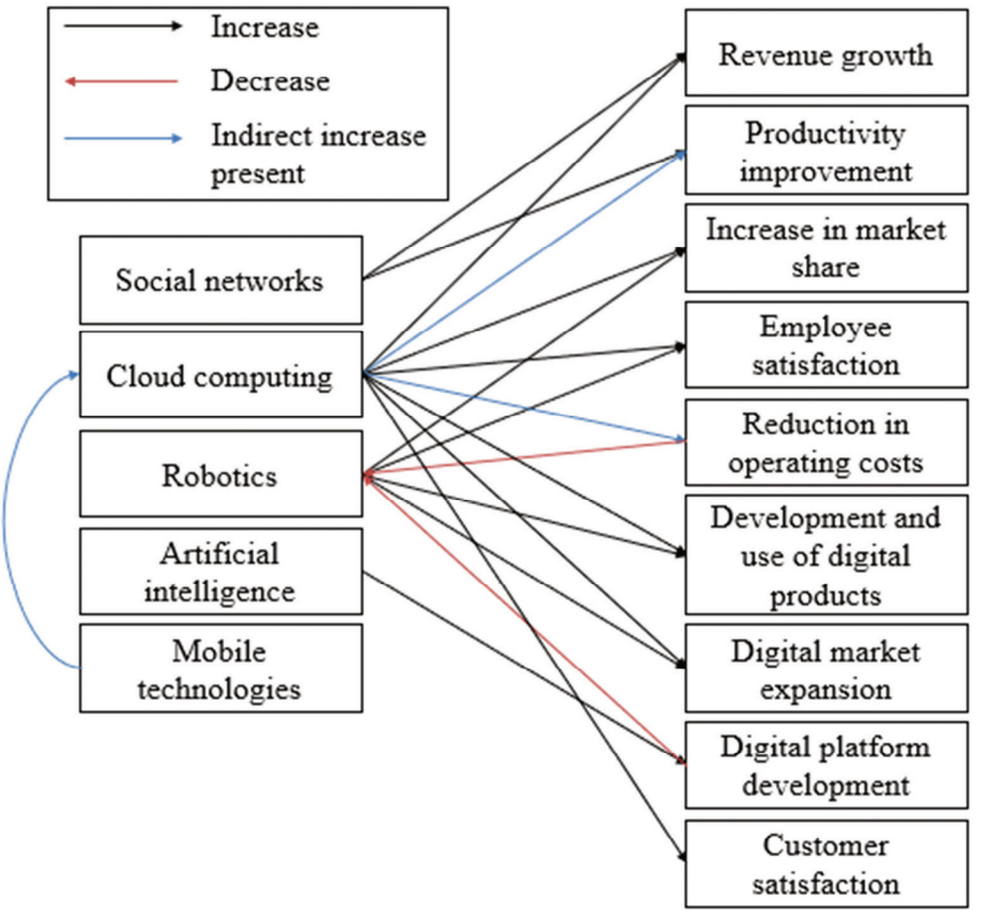

Figure 5: Final model of the impact of digital technologies on business performance

Conclusion

It is important to emphasize that the model we suggest in section 3 at the moment has only a theoretical contribution, i.e., we have determined whether the digital technologies are implemented in business and how they affect business performance. This kind of result can be a basis for further research of the same type or the one that gives the results based on measurement, and not the response of the company manager which can be subjective. Digital business transformation has become the "*condition sine qua non*" of modern organisations. The issue of digital transformation has only become the subject of interest of management theorists and practitioners in the last few years, thus there are not many contributions in this area. The introduction of a large number of digital technologies to a business may produce anticipated benefits, provided that a clear, comprehensive digital transformation strategy has been developed, underlining the key advantages. In this paper, we have shown that:

- digitalization results in higher business performance;
- every digital technology improves and optimizes specific business performance better than other ones;
- digitalization, even though beneficial, must not be spontaneous;
- none of the technologies should be neglected without a thorough analysis due to a possible indirect impact;
- advanced, properly chosen, statistical analysis with convenient data modification will yield better and more precise results, and thus conclusions.

Hence, we can conclude that a more objective study of the phenomenon of the impact of digital technologies on business performance is possible, but through more expenses and time requiring research. Also, based on our results, new experimental models for improvement of business performance can be developed, and as such examined and elaborated through the mentioned research.

Further research will consist of new approaches to recognizing technological innovations as a significant factor in improving business results, discovering latent connections of importance, as well as forming new optimal models for the application of these innovations with its effectiveness examination and elaboration.

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