

## DIGITALIZATION AND THE COVID-19-LED PUBLIC CRISIS MANAGEMENT: AN EVALUATION OF FINANCIAL SUSTAINABILITY IN THE AZERBAIJAN BUSINESS SECTOR

Nijat Gurbanov,  <https://orcid.org/0000-0002-2793-2380>

Master of Science in Data Science and Business Analytics, University of Warsaw, Warsaw, Poland

Nargiz Yagublu,  <https://orcid.org/0000-0002-0301-0082>

Master of Science in International Management, Goethe University, Frankfurt, Germany

Narmin Akbarli,  <https://orcid.org/0000-0001-9471-7421>

Master of Science in European Studies - EU Regional Policy, University of Wroclaw, Wroclaw, Poland

Ibrahim Niftiyev,  <https://orcid.org/0000-0003-3437-9824>

PhD Candidate, University of Szeged, Szeged, Hungary; Centre for Studies on European Economy (AIM) - Azerbaijan State University of Economics (UNEC), Baku, Azerbaijan

**Correspondence author:** Ibrahim Niftiyev, [niftiyev@eco.u-szeged.hu](mailto:niftiyev@eco.u-szeged.hu)

**Type of manuscript:** research paper.

**Abstract:** *One of the key challenges for businesses during the Covid-19 pandemic has been to maintain financial sustainability despite the public crisis and consumer demand shocks. While some companies have managed to digitize and cope with the new realities, others have not. This will determine the future of companies and the direction of anti-crisis tools in management strategies. The purpose of this study is to analyze the use of digitalization as an anti-crisis tool among Azerbaijani businesses during the Covid-19 outbreak. The data set is based on voluntary survey data gathered from key businesses of the Azerbaijan economy. Our analysis applied k-means clustering, the related-samples Wilcoxon Signed Rank test and the independent-samples Mann-Whitney U test to learn whether there was any connection between digitalization and financial sustainability. Our findings indicate that 42% of the businesses that participated in the study obtained benefits by using digitalization as a crisis management tool during the Covid-19 pandemic period, but 38% of the respondents did not report any significant changes in their businesses despite increased digitalization efforts. Moreover, 20% of the businesses examined experienced negative changes after digitalization. The results of the independent-samples Mann-Whitney U test indicated that those businesses that had high scores before and after the increased digitalization efforts during the Covid-19 pandemic, achieved higher median profits, while the businesses with lower scores experienced a financial loss. As can be seen from the results, the chances of benefiting from digitalization are rather uncertain for local businesses. The main policy conclusion from this study is that businesses in Azerbaijan need to address the digitization challenge comprehensively to increase benefits and reduce costs. The results of our study are useful for business owners, policy makers, and top managers when developing strategies for enterprise-level digitization, especially during and after viral outbreaks.*

**Keywords:** Azerbaijan economy, business survey, Covid-19, digitalization, dynamic capabilities.

**JEL Classification:** D22, D25, M15, O33.

**Received:** 23.06.2022

**Accepted:** 25.08.2022

**Published:** 30.09.2022

**Funding:** There is no funding for this research.

**Publisher:** Sumy State University, Ukraine.

**Cite as:** Gurbanov, N., Yagublu, N., Akbarli, N., & Niftiyev, I. (2022). Digitalization and the Covid-19-led public crisis management: an evaluation of financial sustainability in the Azerbaijan business sector. *SocioEconomic Challenges*, 6(3), 23-38. [https://doi.org/10.21272/sec.6\(3\).23-38.2022](https://doi.org/10.21272/sec.6(3).23-38.2022).



Copyright: © 2022 by the authors. Licensee Sumy State University, Ukraine. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

The Covid-19 pandemic began in late 2019 in China and quickly spread to 220 countries within half a year (BBC, 2022; Derrick, 2021). The main effects of the pandemic were de-globalization by closing the borders to diminish the international travel, disruption of the flow of capital and goods, and shutting down of businesses and production facilities (Barua, 2020). The pandemic's disastrous economic repercussions, which placed tens of millions of people in danger of falling into extreme poverty, left 690 million people undernourished, and led to a huge decline in the global GDP. This provided the global communities with an opportunity to reevaluate public health, food systems, education, different work culture and conditions (UN, 2021).

Companies treated the Covid-19-related economic slowdown as a demand shock rather than a supply shock, and this resulted in decreased business operations, sales and supply chain activity (Mayer et al., 2021). Belitski et al. (2021) reported significant adverse effects of the Covid-19 on small firms and enterprises in general, especially among the firms in tourism, retail, personal services, daycare, entertainment, and arts. The stock prices of the firms that are closely linked to the world economy by international trade and financial operations declined dramatically due to the pandemic (Ramelli & Wagner, 2020). All in all, firms of the high-income countries, like those in the USA, lowered their inflation expectations, wages, and unanchored "longer-run expectations to the downside" (Mayer et al., 2021: 15).

In spite of these adverse developments, businesses that succeeded in developing digital platform-based ecosystems were able to continue generating value and profits (Acs, 2021). In other words, the pandemic intensified the need to digitalize the economy and this meant establishing new social means "which arise in connection with the production, sale and consumption of digital goods and services or with the use of digital infrastructure" (Miethlich et al., 2020: 9-10). For instance, those businesses that shifted to online sales improved their profits by 180%, as certain strands of the consumers purchased online and moved away from the traditional means of shopping during the first few months of the pandemic (Fairlie & Fossen, 2021). Moreover, it changed the ways of how businesses managed their corporate social responsibility, marketing campaigns, and ethical aspects of consumption by adapting to the rapidly changing consumer demands and expectations (He & Harris, 2020).

While most executives recognize that digital transformation is necessary for the future, the business models required for the process are still not sufficiently developed (Ziyadin et al., 2020). The Covid-19 outbreak underlined the need for having tools to facilitate decision-making in times of crisis because it made clear that markets are dynamic, not static in nature (Jaworski et al., 2000). In fact, the digitalization of the economy and private companies create new markets, increase productivity, reduce production and transportation expenses. At the same time, unprepared societies have a low trust in the digitalization process where social security and part-time jobs also significantly increase (Miethlich et al., 2020). Nevertheless, leaders need to be flexible in order to handle problems that arise during the periods of transition from traditional economies to digital environments and they must provide the groundwork for the future to manage business continuity risks, sudden volume fluctuations, real-time decision-making, labor productivity and security threats (Accenture, 2020). Both during the period of an epidemic caused by a disease and after recovery, firms need to develop long-term strategies for increasing resilience and apply the lessons learned to develop digital technologies such as Big Data, Artificial Intelligence (AI), Cloud Computing and Internet of Things (IoT), which should help prepare them for possible future disruptions (OECD, 2020).

The Azerbaijan economy is an oil-rich, small, and open economy, where a significant number of reforms and developmental programs have been applied since the collapse of the Soviet Union in 1991 (ADB, 2014). Major oil and natural gas projects boosted the GDP of the Azerbaijan economy by 18.8% on average between 2005 and 2010, and also reduced the poverty rate from 45% in 2003 to 11% in 2009 (IMF, 2010). Economic growth contributed to an increased share of the private economy in Azerbaijan as 80% of the overall GDP and 72.4% of tax revenues came from the companies in the private sector (ADB, 2014). Though this is a remarkable achievement, many private companies rely in governmental contracts, not competitive markets (ADB, 2014). Massive public expenditures and inefficient subsidies create uncompetitiveness in the private economy. This does not attract foreign investments and government subsidies are closely correlated with the oil sector of the country (ADB, 2014). Low diversification of the industrial sector (Czech, 2018; Hamidova 2018; Ahmadova et al., 2021),

high domestic price levels (Mukhtarov et al., 2019) and a rising real effective exchange rate (Rahimli and Nazirov, 2020) were the main economic challenges. In these circumstances, the Covid-19 pandemic hit Azerbaijan with full force in 2020 and severely harmed the economy.

According to the State Statistical Committee of Azerbaijan in 2020, the country's GDP decreased by 4.3%, with a 2.6% decrease in the non-oil sector and a 7.2% decrease in the oil sector (IMF, 2021). While the capital investment, passenger, and freight turnover decreased by 11%, 40%, and 20%, respectively, the agriculture sector surprisingly failed to sustain its high growth rate and attained its lowest level in recent years (Rovshan, 2020). During the first six months of 2020, Azerbaijan's industry produced 2.7% less compared to that for the previous year (Suleymanov & Abdullayeva, 2021). Also, commercial services shrank by 19.2% in January–June 2020, compared to the same period in 2019 (Suleymanov & Abdullayeva, 2021). From our brief outline of the main macroeconomic developments of the Azerbaijan economy during the Covid-19 pandemic, it can be seen that the new disruptions in the consumer markets challenged the financial sustainability of enterprises. However, new trends in the digitalization of the economy in Azerbaijan might provide new opportunities during this time of crisis, as the digitalization of the Azerbaijan economy accelerated after the government's measures to increase digital literacy and access to the digital infrastructure by pursuing a liberal economic policy and adopting a key European Union (EU)-funded project—namely, the EU4Digital project (Miethlich et al., 2020).

Therefore, we shall investigate the impact of the Covid-19 in the workplace and the response rate of Small and Medium Enterprises (SMEs) and big companies to a crisis and focus on the use of digitalization as a solution for sustaining financial stability in the Azerbaijan commercial sectors. This study covered all the sectors and representative businesses in Azerbaijan during the Covid-19 pandemic and there was no previous literature on financial sustainability diagnostics of the digitalization strategies. Taking in account the need for digital transformation to survive the Covid-19 outbreak, the research question of this paper is as follows: What effect has digitalization had on the Azerbaijan companies to help them overcome the Covid-19-induced financial crisis? We will apply a quantitative research methodology, namely the Wilcoxon Sign Rank test and the Mann-Whitney U test on the business survey data. The research design was based on a voluntary survey method prior to and following the digitalization efforts of the companies surveyed. Our findings are consistent with the perception that digitalization helped many firms to sustain their financial stability and business continuity; however, not every economic sector or firm can benefit from digitalization owing to the characteristics of businesses and macroeconomic conditions in the country. To the best of our knowledge, there has been no study of the effects of digitalization on the financial sustainability of the Azerbaijan business sector since the start of the pandemic.

The structure of this paper is as follows. In the next section we give a literature review of the Azerbaijan economy, the public crisis notion and the dynamic capabilities approach. After, we present the data and methodology used in the study. Finally, we discuss our results section and then draw some pertinent conclusions.

## 2. Literature Review

### 2.1. *The concept of public crisis*

Public crises are commonly identified by terms such as natural disasters, human conflict and political upheaval (Hillyard, 2000). In other words, crises can be man-made or natural and contain "the ontological and epistemological nuances of chaos, complexity, turbulence, disasters, emergencies, conflict, or decline" (Kouzmin, 2008: 157). As pointed out by Kent (2010), "crises are unpredictable and represent threats to organizations" (Coombs, 1999: 2-3). Coombs (2007) lists adverse effects of crises on organizations, employees, customers, suppliers, and stockholders, and also outlines operational and financial disruptions due to unexpected events and threats. It seems that Covid-19 is a typical natural disaster-based public crisis, it is long-lasting, unexpected, and unpredictable (Bundy et al., 2017) and requires businesses to respond swiftly (Guo et al., 2020). Most companies applied some preventative measures to help predict crises, but even these preventative measures can fail and companies can suddenly find themselves threatened by a set of unforeseen circumstances (Müller, 1985). Organizations need to have the capability to cope with external events that are unexpected (Smart & Vertinsky, 1984). Thus, the Covid-19 pandemic is treated as a public crisis among businesses.

Systematic planning and coordination are required to solve the problems of crises rather than pursue ad hoc actions. Such actions are collectively called crisis management (Pearson & Clair, 1998; James et al., 2011). Public crisis management can be conceptualized and defined in many ways. For example, crisis management might be the activation of the key strategic functions to decrease threats and uncertainties and increase harmony between organizations and their public (Heath, 2005); and crisis management might be the set of processes to identify, study and forecast crisis issues and present specific ways to prevent and cope with a crisis (Darling et al., 1996). Meanwhile, crisis management strategies, which evolved with the dynamic development of management studies, are many and varied, depending on the environment of the companies (Smart & Vertinsky, 1984). However, crisis management strategies entail three basic sets of actions, namely (i) The prevention and preparation before a crisis (where possible), (ii) A response during the crisis, and (iii) learning and revision following the crisis (Coombs, 2015).

When the Covid-19 outbreak first occurred in China, most of the companies did not expect that it would quickly spread around the globe and dramatically affect their business. This is why they failed to take preventative or preparative measures to safeguard their business activities. This was one of the mistakes of crisis management (Müller, 1985) as the pandemic required a dramatic market shift mainly from in-store purchasing to online shopping. In most cases, even after the recognition of the problem, important actions were delayed as top management did not recognize the seriousness of the situation (Müller, 1985).

The second set of actions—response strategies of companies during a crisis (Coombs, 2015)—can be divided into emergency responses in the short-term for survival and strategic responses in the long-term for development (Müller, 1985; Smart & Vertinsky, 1984). Government and communities can support the companies during a crisis if the company adopts corporate social responsibility (Kearins, 2017). Investors appreciate ethical investment funds (Bauer et al., 2007) and corporate social responsibility helps businesses to protect their reputation during the crisis (Regester & Larkin, 2008). In fact, Bason (2010) argued that digital innovations in the public sector improve cost-saving strategies of firms from 20% to 60% and help increase customer satisfaction. Thus, a public crisis fueled by the pandemic can be controlled by both public administration innovations, and private sector adjustments via digitalization (Koch & Hauknes, 2005; Fuglsang, 2008).

## *2.2. Dynamic capabilities of firms and periods of crises*

The dynamic capabilities theory was developed as the extension of the resource-based view (RBV) of the firm (Barney, 1986, 1991) which emphasizes the importance of choosing specific resources to maintain a competitive advantage. In other words, up to the 1990s, it was thought that the success of firms depends on valuable, rare, inimitable, and non-substitutable resources (Wernerfelt, 1989). However, RBV provided an insufficient theory that failed to explain the true nature of competition (Priem & Butler, 2001) because resource advantage became a weak factor to rely on for the firms as the competition made it difficult to realize higher profit levels without specific ways to utilize the available resources (as cited in Wang & Ahmed, 2007; Penrose, 1959). Meanwhile, dynamic capabilities theory acknowledged the fact that becoming superior to your competitors is a dynamic process and the tools needed to achieve it are limitless (Hung et al., 2010). More specifically, dynamic capabilities mean the “firm’s behavioral orientation constantly to integrate, reconfigure, renew and recreate its resources and capabilities and, most importantly, upgrade and reconstruct its core capabilities in response to the changing environment to attain and sustain competitive advantage” (Wang & Ahmed, 2007: 35). Therefore, operating in a dynamic way is essential for companies to be able to enhance the capacity to adapt to rapidly changing business environments (Binti Samsudin & Ismail, 2019). Maintaining dynamic capabilities within a business setting plays a key role, especially in a changing environment and during a time of crisis, which without doing so would negatively affect the company’s performance and will harm its sustainability in the long run (Zollo & Winter, 2002).

Recently, with the arrival of the unprecedented global pandemic, many business processes have been switched to online transactions to make remote operation flow possible. However, many of them failed to make the required improvements in efficiency and effectiveness for long-term planning (Gabryelczyk, 2020), where the ability to design and bring new processes into the business flow would require the absorbed dynamic capabilities approach. In terms of the dynamic capabilities theory, three main aspects were once clarified with the purpose of identifying the capacity of the firms to undertake the required actions. These are:

1. Being able to recognize and perceive the threats and their advantages and disadvantages;
2. Address and seize the opportunities in a given turbulent situation;
3. Adjust both tangible and intangible assets by expanding, securing and reconfiguring the way the business is being operated (Teece, 2007).

During a time of crisis, starting with perceiving/identifying the upcoming opportunities and threats, executives must act accordingly to be able to draw positive conclusions from these opportunities by addressing issues such as what markets to analyze, and what improvements to make to a part of its operations (Teece, 2007). Additionally, in order for a firm to maintain its survival and sustainability, it must invest in innovations (Day & Schoemaker, 2016), which actually should be done by redirecting its resources called “disaster entrepreneurship” (Linnenluecke & McKnight, 2017). Exploiting the potential arising from the dynamic capabilities approach, firms should be able to implement new courses of decision choices (Eisenhardt & Martin, 2000) and through reconfiguration, they can differentiate themselves in the market by developing completely new resources (Zott, 2003).

### *2.3. Digitalization from a dynamic perspective*

Digitalization basically means the use of digital technologies and data to generate revenue, enhance business processes, and create a digital business climate in which digital information is central (Clerk, 2017). It is a means to create and harvest added value in new ways (Gobble, 2018). As digital technologies emerge and improve, digitalization affects businesses and society more and more. Currently, many of the leading companies such as Facebook (Meta), Airbnb and Uber have switched to platform-based innovative business models (Goodwin, 2015). The digitalization of business processes by the use of information technologies (IT) not only helps businesses to cut costs and improve control, but it also enables them to better analyze operations and identify areas for improvement (Zubolf, 1985).

Among digital technologies, emerging technologies such as IoT and other advanced technologies such as social media and cloud computing deserve a mention (Fitzgerald et al., 2014; Gartner, 2017). Haddud et al. (2016) documented the following critical success factors in the supply chain organization that employs IoT: A higher flexibility in a production system; effective information sharing with supply chain members; A focus on core strengths; The development of effective supply chain management strategies; the use of modern technologies; Dedicated resources for the supply chain; The forecasting of demand on point-of-sale; The development of reliable suppliers; A focus on core strengths; and logistics synchronization. Moreover, according to Yoo et al. (2010), digital technologies differ from previous technologies in three main ways: the possibility to be reprogrammed, the homogenization of data and the analysis of digital content. Isaksson et al. (2018) point to the capabilities of digitalization to generate new market shares by finding new ways to meet the customers’ changing needs and the need to be competitive. All these point to the possible benefits for companies in the new business climate caused by the Covid-19 outbreak.

With the emergence of the Covid-19 pandemic in late 2019, the world started to adapt to digitalization faster than ever before and achieved decades of improvement in a comparatively short time. The practice of remote schooling and working, as well as the digitalization of many business operations, has helped significantly reduce the adverse effects of the crisis. Moreover, many applications have been developed to track and analyze the scales of the pandemic and artificial intelligence was used to learn about the virus and accelerate the creation of vaccines. While many political borders were closed, scientific communities did their best to withstand the first blows of the pandemic by increased collaborations in the form of scientific publications (Kirkpatrick & Apuzzo, 2020). These significant changes in processes and habits make it very unlikely that businesses will return to operating the same way as in the “pre-Covid” era (OECD, 2020).

However, the digitalization of businesses would bring only minimal benefits if there were no associated changes in the organizational structure (Venkatraman, 1994). Although most companies are aware of the basics of digitalization, many are struggling with digital transformation. The digital transformation process requires the involvement of the whole organization, and this will lead to significant changes in working practices and habits (Henriette et al., 2015). Organizational inertia (resistance to change) is one of the main challenges that prevents

organizational transformation towards digitalization (Besson & Rowe, 2012) and a careful analysis might shed light on the current status of digitalization as a useful response to the global pandemic.

#### *2.4. Business environment and digitalization practice in Azerbaijan*

Azerbaijan experienced rapid reforms after the collapse of the Soviet Union in 1991 that peaked in 2008–2009 and then it became a player in the global competitive markets (Touchtidou, 2015). Despite these developments, bureaucratic obstacles, systemic challenges and widespread corruption together all significantly hinder the further development of the business environment in Azerbaijan; but this could be solved by the digitalization of both public and private sectors of society (Touchtidou, 2015).

Azerbaijan's digitalization process is growing quickly. From the public sector viewpoint, the government is attempting to make the bureaucratic processes more transparent and speedier, and make the analysis of the reforms more visible (Valiyeva, 2020). The creation of Web resources such as [monitoring.az](http://monitoring.az) and [azranking.az](http://azranking.az) has helped to foster effective governance and the rule of law (Valiyeva, 2020). Another example is the ASAN services centers which may be viewed as a social innovation by means of the digitalization of the public services. ASAN Service centers concentrate public services in one place. All the government services can be accessed in a one-stop-shop way, and these have also been integrated into e-government services.

The relationship between the business environment and the digitalization process in Azerbaijan seems to have developed in recent years; however, many challenges need to be overcome for customers to benefit from digitalization. For example, the digital economy on a macro level is not innovative and state support is required to help increase the adoption of new knowledge-based technologies, argues Rahimova (2020). Manafov and Sadigov (2021) say that businesses in Azerbaijan are lagging behind when it comes to the application of Information and Communication Technologies (ICTs) due to issues related to technological availability, financial resources, cybercrime, and other factors. Therefore, even though innovation and digitalization are not yet at the desired level, Azerbaijan business people are now aware that ICT-driven business growth is an inescapable condition for successful business outcomes during and even after the Covid-19 pandemic.

Valiyev and Valehli (2021) claimed that the Azerbaijani economy was not ready to adjust to the rapid anticrisis measures implemented by the government during the Covid-19 outbreak. Whether this is the case or not, one of the solutions by the government was to create a digital ecosystem that is included in the nation's economic development priorities up to 2030. During the pandemic, the state encouraged digital transformation by developing several digital solutions such as E-TABIB, (E-Tabib, 2020) and [icaze.e-gov.az](http://icaze.e-gov.az). (Icaze, 2020). Unfortunately, while electronic measures to support both public crises and economic-related challenges are appropriate and have been well implemented, a large number of small businesses and entrepreneurs "have been left without resources for living" (Valiyev & Valehli, 2021: 10). The question that remains unclear in the literature is whether the businesses in Azerbaijan are ready or digitized enough to cope with any future unexpected crisis.

Our literature review helped us to design the survey questions to incorporate our aims and intentions and encourage business people to discuss their challenges arising from the Covid-19 pandemic in Azerbaijan. In this paper, the main focus is on the digital transformation of business processes from a dynamic capabilities approach, since supporting businesses with digital technologies has been addressed in the literature as a technique for responding to substantial environmental changes (Richter, 2020). With the help of digitalization, companies can quickly transform the way they operate and do so in an innovative manner (Wäger, 2019). This will be discussed later on in detail.

### **3. Data and Methodology**

For the collection of primary data, an online survey was carried out and the data collection was realized by sending the survey to the official email accounts of the companies. The main target was managers and executives of the companies. Moreover, the data results are unevenly distributed and a voluntary response method, which is one type of non-probability sampling, was chosen. Actually, the number of companies that we sent the survey to was 84, 50 of which participated in the survey from different sectors and had varying sizes, thereby making the response rate 59.52%. In our survey, the main industries are finance, education, marketing and

consulting/accounting, making up 18%, 16%, 12%, and 10%, respectively. Sectors like oil and gas, car manufacturing, retail and fast-moving consumer goods (FMCG), accounted for less than 5–8% overall (see Table 1). The majority of the respondent companies were privately owned, making up to 68% of the general sample, while the percentage of foreign companies and state-owned firms was 24% and 8%, respectively. Of the companies surveyed, 40% had more than 250 employees and 34% had 10–49 employees.

Table 1. Categorization of the survey data.

| Sector       | Number of firms |                     |             |    |
|--------------|-----------------|---------------------|-------------|----|
| Finance      | 9               | Number of workers   | 250+        | 20 |
| Education    | 8               |                     | 50-249      | 11 |
| Marketing    | 6               |                     | 10-49       | 17 |
| Consulting   | 5               |                     | 1-9         | 2  |
| Transport    | 4               | Company type        | Private     | 34 |
| Retail       | 4               |                     | Foreign     | 12 |
| Oil and gas  | 3               |                     | State-owned | 4  |
| Production   | 3               | Respondent position | Specialist  | 33 |
| FMCG         | 2               |                     | Manager     | 13 |
| Agriculture  | 1               |                     | Director    | 4  |
| Construction | 1               | Company age         | 15+         | 17 |
| Tourism      | 1               |                     | 11-15       | 8  |
| ITs          | 1               |                     | 6-10        | 7  |
| Technology   | 1               |                     | 0-5         | 18 |
| Wholesale    | 1               |                     |             |    |

Source: The authors' own elaboration.

Notes: FMCG means fast-moving consumer goods; ITs means information technologies.

Taking into account the distinction between technologies we devised questions that contained the following general concepts: Big data and data analytics, IoT, AI, cloud computing, social media and platforms and mobile technology. The method we used in order to measure the digitalization level of the companies was based on their adoption of digital technologies, represented by four items: (1) Big data, (2) Cloud computing, (3) IoT, (4) AI (Bharadwaj et al., 2013; Sebastian et al., 2017; Vial, 2019). To get a score, each variable has a value ranging from 0 to 5 that respondents must choose, where 0 indicates a low adoption level of specified technology and 5 represents the highest level. In our analysis provided, we take the mean of four different technology adoption scores and calculate the digitalization score for the companies according to their responses. The idea of using this scoring approach came after the careful consideration of the paper "The digitalization and public crisis responses of small and medium enterprises" by Guo et al. (2020), which also focused on evaluating the digitalization level of companies and their responses to the Covid-19 pandemic in the case of China. See Table 2 for descriptive statistics of the survey data concerning the digitalization scores before and after the digitalization efforts.

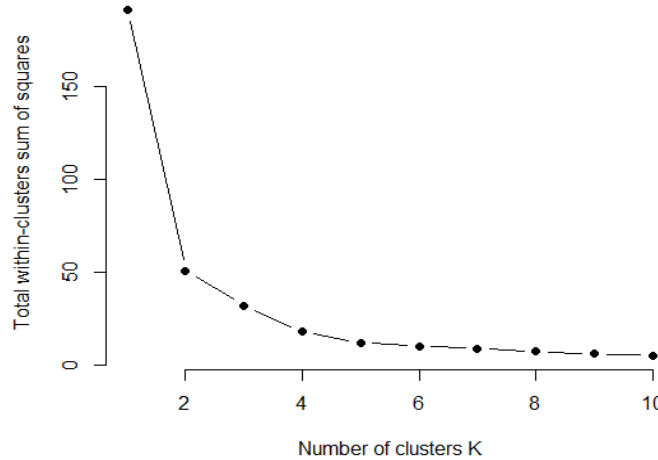
Table 2. Descriptive statistics of the digitalization scores.

| Statistics | Digitalization before | Digitalization after |
|------------|-----------------------|----------------------|
| Count      | 50.0                  | 50.0                 |
| Mean       | 2.7                   | 2.8                  |
| Minimum    | 0.0                   | 0.0                  |
| Maximum    | 5.0                   | 5.0                  |
| Median     | 3.0                   | 2.8                  |
| Mode       | 3.5                   | 4.0                  |

Source: The authors' own elaboration.

To get more insights from our analysis, we decided to categorize our data. To determine the number of groups we decided to use k-means clustering. To find the optimal number of clusters, we used the elbow method (Pacheco, 2015). The elbow method captures the relationship between the percentage of variance explained by the number of clusters (Bholowalia & Kumar, 2014). Despite its simplicity, the elbow method-based k-means clustering served us well and helped us to clearly identify two groups in terms of the high and low digitalized firms. From Figure 1, the total within-clusters sum of squares are given for the model with different numbers of clusters. Two

and three groups were deemed suitable for our analysis. For an exact determination, we compare the silhouette indices of two k-means models with two and three groups. The higher the silhouette index, the better in terms of the quality of the cluster. According to Table 3, the optimal number of clusters is 2. After we carried out k-means clustering in the SPSS Modeler, it said the threshold was 3.5.



**Figure 1. The elbow method used to determine the optimal number of clusters**

Source: The authors’ own elaboration.

**Table 3. Number of clusters and their silhouette indices.**

| Number of clusters | Silhouette indices |
|--------------------|--------------------|
| 2                  | 0.722              |
| 3                  | 0.665              |

Source: The authors’ own elaboration.

Here, the advantages of this grouping procedure are its simplicity, intuition, and clarity. Therefore, if the digitalization score turns out to be less than or equal to 3 it means the given company possesses a low level of digital transformation; if it is more then the opposite is true. According to our survey results, the number of companies that had a low or high level of digitalization before the Covid-19 outbreak was 27 and 23, respectively (see Table 4 where the distribution of low- and high-level digitalized companies across sectors can be seen). The total number of highly digitalized companies dropped from 23 to 22 after the virus outbreak, and the number of low-level digitalized companies rose from 27 to 28.

**Table 4. Sectoral distribution of the high and low digitalization scores before and after the Covid-19 pandemic**

| Sector         | Before the Covid-19 outbreak |     | After the Covid-19 outbreak |     |
|----------------|------------------------------|-----|-----------------------------|-----|
|                | High                         | Low | High                        | Low |
| FMCG           | 1                            | 1   | 1                           | 1   |
| ITs            | 1                            | 0   | 1                           | 0   |
| Consultation   | 4                            | 1   | 4                           | 1   |
| Agriculture    | 0                            | 1   | 0                           | 1   |
| Finance        | 3                            | 6   | 3                           | 6   |
| Marketing      | 0                            | 6   | 2                           | 4   |
| Oil and gas    | 2                            | 1   | 1                           | 2   |
| Transportation | 3                            | 1   | 2                           | 2   |
| Retail         | 2                            | 2   | 1                           | 3   |
| Technology     | 1                            | 0   | 1                           | 0   |
| Construction   | 1                            | 0   | 1                           | 0   |



Table 4 (cont.). Sectoral distribution of the high and low digitalization scores before and after the Covid-19 pandemic

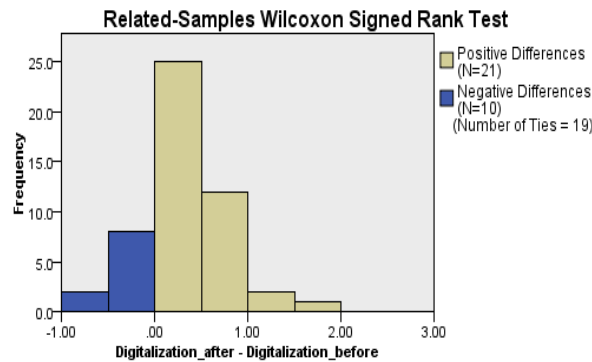
| Sector       | Before the Covid-19 outbreak |           | After the Covid-19 outbreak |           |
|--------------|------------------------------|-----------|-----------------------------|-----------|
|              | High                         | Low       | High                        | Low       |
| Wholesale    | 0                            | 1         | 0                           | 1         |
| Tourism      | 0                            | 1         | 0                           | 1         |
| Education    | 4                            | 4         | 4                           | 4         |
| Manufacture  | 1                            | 2         | 1                           | 2         |
| <b>Total</b> | <b>23</b>                    | <b>27</b> | <b>22</b>                   | <b>28</b> |

Source: The authors' own elaboration.

Notes: FMCG means fast-moving consumer goods; ITs means information technologies.

#### 4. Results

The results of our survey indicate that since the emergence of the Covid-19 pandemic, the level of digitalization within companies in Azerbaijan has increased significantly, but there is still plenty of room for improvement. In order to see whether the Covid-19 pandemic had any effect on the level of digitalization within companies, we tested the significance level of the change between the digitalization scores of the companies before and after the Covid-19 crisis using the Wilcoxon Signed rank test. The test revealed a significant difference between groups (Sig (0.013) < 0.05, Z = 2.479) with 21 participant firms out of 50 displaying a positive difference, 19 displaying no difference at all, and only 10 participants displaying a negative difference.



|                                |         |
|--------------------------------|---------|
| Total N                        | 50      |
| Test Statistic                 | 373.000 |
| Standard Error                 | 50.416  |
| Standardized Test Statistic    | 2.479   |
| Asymptotic Sig. (2-sided test) | .013    |

Figure 2. Results of the related-samples Wilcoxon Signed Rank Test

Source: The authors' own elaboration.

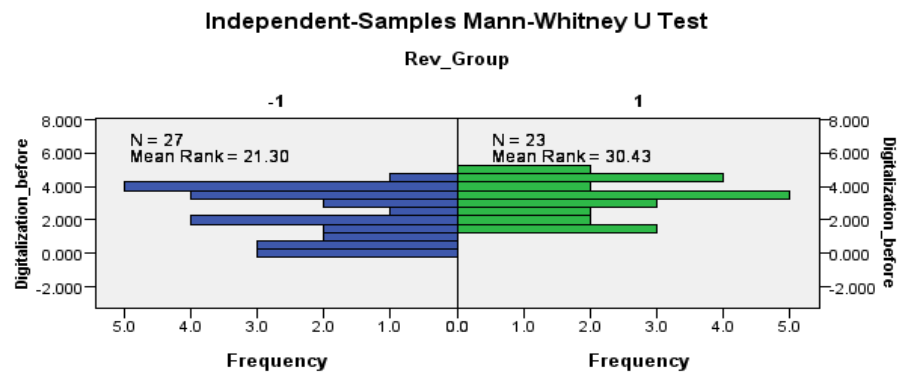
One of the main purposes of the survey was to focus on the financial situation of the companies and see how they were affected during the Covid-19 crisis so we could draw some conclusions about the effects of digitalization. Our observations revealed that 27 companies suffered from a loss in revenue, while 10 firms said that they had an increase in revenue during the crisis. Only 3 out of these 10 companies had a lower level of digitalization. Hence, the companies with a high level of digitalization were generally able to maintain the sustainability of their business even during this crisis.

Table 5. The effect of digitalization on the revenue groups among the businesses surveyed.

| The difference | Negative change | No change | Positive change | Total |
|----------------|-----------------|-----------|-----------------|-------|
| High           | 10              | 6         | 7               | 23    |
| Low            | 17              | 7         | 3               | 27    |
| Total          | 27              | 13        | 10              | 50    |

Source: The authors' own elaboration.

A Mann-Whitney U test was performed to determine whether there were any differences in digitalization scores between revenue groups. There are two distinct revenue groups, namely negative and non-negative revenue groups. The negative revenue group consists of those companies that experienced negative revenue effects during the crisis, while companies that experienced positive or no change in revenue are included in the second group. The distributions of the digitalization scores for revenue groups were similar, as assessed by visual inspection (see Figure 3). The median engagement score was statistically significantly lower in negative revenue groups (2.00, see Figure 3, "Report" part) than in non-negative revenue groups (3.25). Here,  $U = 424$ ,  $z = 2.215$ ,  $p = 0.027$ .



|                                |         |
|--------------------------------|---------|
| Total N                        | 50      |
| Mann-Whitney U                 | 424.000 |
| Wilcoxon W                     | 700.000 |
| Test Statistic                 | 424.000 |
| Standard Error                 | 51.233  |
| Standardized Test Statistic    | 2.215   |
| Asymptotic Sig. (2-sided test) | .027    |

| Report    |                       |
|-----------|-----------------------|
| Rev_Group | Digitalization_before |
| -1        | 2.00000               |
| 1         | 3.25000               |
| Total     | 3.00000               |

Figure 3. Results of the Independent-Samples Mann-Whitney U Test

Source: The authors' own elaboration.

#### 4. Conclusions

In our study we analyzed the nexus between the Covid-19 outbreak and public crisis management strategies, by focusing on digitalization as an anti-crisis response in Azerbaijan. To the best of our knowledge, the effect of using digitalization as an anticrisis tool in the Covid-19 led public crisis had not been previously investigated in the case of Azerbaijan. Our sample consisted of various companies in the economy, both privately and state-owned, as well as foreign companies. The size of the companies is also diverse and the respondents included specialists, managers and directors. Our study should contribute to an exploration of the usefulness of the digitalization efforts at the firm level to ensure business revenue and its ability to respond to the Covid-19-led public crisis. The significance of our study is that we overcame the challenge of data scarcity by collecting firm-level data among the Azerbaijani businesses both prior to and following the digitalization efforts of these businesses. Here we achieved our objective by capturing the relationship between digitalization efforts and financial sustainability brought about by the Covid-19 outbreak.

In terms of the strategies companies adopted in response to the pandemic, it was observed that most of the high-level and low-level digitalized companies chose digitalization as the main strategy to cope with the effects of the Covid-19 crisis in Azerbaijan. This confirmed our opinion that awareness between firms regarding the importance of digitalization was at a sufficient level. Following the peak of the Covid-19 outbreak in December 2020, the Azerbaijan businesses decided to increase their efforts to digitalize in order to better manage the pandemic-related public crisis. From a financial sustainability standpoint, for companies or firms where the digitalization was higher, the revenue sustainability was also higher. These findings tell us that the crisis management strategies of the businesses can indeed be responsive to the changing circumstances of our lives. A strategic approach towards firm-level digitalization can sustain a revenue stream and minimize the financial damage caused by the Covid-19 outbreak.

The Azerbaijan economy is small and oil-dependent, and the government spending and decisions largely shape the behavior of both the private sector and consumers. The government has significantly increased its digitalization efforts since the oil boom period started in 2005 and lasted until 2014. From our study, we were able to extract useful knowledge about the supply side of the national economy. However, a question that still needs to be answered to fully capture the ongoing trends and dynamics in the digitalization environment of the Azerbaijani economy is: Can the businesses in Azerbaijan rely on a nationwide digital environment that would meet their expectations of digitalization? Indeed, the adoption of state-of-the-art and consumer-oriented digital technologies is costly and time-consuming. Businesses have the right to doubt the efficiency and efficacy of the digitalization efforts to harness the public crisis in the case of the Covid-19 outbreak. Therefore, future studies should focus on this aspect of the problem and try to include both the private sector of the economy and consumer markets for the nationwide digitalization capabilities driven by the state.

Our study outlines the importance of digitalization to help bolster the financial revenue stream during a public crisis like the Covid-19 pandemic. From our results, the following policy implications are suggested for Azerbaijan. The first is that digitalization is an effective way to fight against the adverse effects of the virus on economic agents. Both the government and the business sector must endeavor to meet and surpass the expectations regarding the digitalization in the near future to help keep the markets vibrant and dynamic. One way for the state to do this is to boost government expenditure on e-government development and large-scale digitalization. Also, the business sector should increase its budget to help implement the latest technologies and keep abreast with the leading global companies from the developed or newly industrialized countries. The Covid-19 outbreak has at least showed that digitalization brings benefits to businesses by helping to sustain their revenue. It permits the customers to shop and purchase the goods and services they desire without leaving their home. The situation might not change much in the near future, as the expectation of new pandemics and ecological tragedies are high according to some recent risk assessments and predictions (Noy, 2022; Behl et al., 2022).

The encouraging results of this study should be considered within the context of certain limitations. First, the study analyzed a relatively small sample size, especially when it comes to small and medium-sized enterprises. This limits the generalizability of its findings. However, as a statistical analysis of the data produced significant results, a similar analysis with a bigger sample size ought to produce similar results and increase the reliability of

our findings. Second, the regional distribution of the businesses was not taken into account during the research design stage. This means that, if we decide to distinguish between rural and urban areas, consumer behavior and business strategies to manage the Covid-19 effects and the public crisis might differ quite significantly. Put another way, the digitalization process might proceed at a different pace in rural and urban areas, especially in Azerbaijan where economic growth and development is mainly concentrated in the Baku-Absheron region. Third, the concept of financial sustainability should be developed further and not only include the revenue aspect but also factors such as customer satisfaction, environmental impact, market share and competition status. Other statistical techniques such as principal component analysis and a composite index approach could be applied in future studies. In addition, it should be noted that our approach to measuring digitalization, based on big data, cloud computing, etc., is not necessarily present in all companies in Azerbaijan. Figures on e-commerce, website growth, and similar indicators could also show the level of digitization of companies and businesses in a more accessible way. Lastly, our main challenge was the low motivation of the respondents who participated in the survey. It would be nice if the participants of a survey could see the practical benefits, and we think they would be interested if they could apply the fruits of the research and incorporate them in their own business strategies.

**Author Contributions:** conceptualization, Nijat Gurbanov, Nargiz Yagublu, and Narmin Akbarli; methodology, Nijat Gurbanov; software, Nijat Gurbanov; validation, Nijat Gurbanov, Nargiz Yagublu, and Narmin Akbarli, and Ibrahim Niftiyev; formal analysis, Nijat Gurbanov, Nargiz Yagublu, and Narmin Akbarli; investigation, Nijat Gurbanov, Nargiz Yagublu, and Narmin Akbarli; resources, Nijat Gurbanov, Nargiz Yagublu, Narmin Akbarli, and Ibrahim Niftiyev; writing-original draft preparation, Nijat Gurbanov, Nargiz Yagublu, Narmin Akbarli, and Ibrahim Niftiyev; writing-review and editing, Ibrahim Niftiyev; visualization, Nijat Gurbanov; Nargiz Yagublu, and Narmin Akbarli; supervision, Ibrahim Niftiyev.

**Conflicts of Interest:** Authors declare no conflict of interest.

**Data Availability Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Acknowledgement:** The authors would like to thank Mr. David P. Curley (University of Szeged, member of the MTA-SZTE Research Group on Artificial Intelligence) for proofreading this article and providing useful suggestions.

## References

1. Accenture. (2020). *Driving Value and Values During COVID-19*. [\[Google Scholar\]](#).
2. Acs, Z. J., Song, A., Szerb, L., Audretsch, D. B. and Komlosi, E. (2021). The Evolution of the Global Digital Platform Economy: 1971-2021. *Small Business Economics, Springer*, 57(4), 1629–1659. [\[CrossRef\]](#).
3. ADB – Asian Development Bank (2014). Private Sector Assessment (Summary). *Country Partnership Strategy: Azerbaijan, 2014–2018*. [\[Google Scholar\]](#).
4. Ahmadova, E., Hamidova, L. and Hajiyeva, L. (2021). Diversification of the Economy in the Context of Globalization (Case of Azerbaijan). In *SHS Web of Conferences*, 92. [\[CrossRef\]](#).
5. Barney, J. B. (1986). Organizational Culture: Can it be a Source of Sustained Competitive Advantage? *Academy of Management Review*, 11(3), 656–665. [\[CorssRef\]](#).
6. Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99–120. [\[CrossRef\]](#).
7. Barua, S. (2020). Understanding Coronanomics: The Economic Implications of the Coronavirus (COVID-19) Pandemic. *SSRN Electronic Journal*. [\[CrossRef\]](#).
8. Bason, C. (2010). *Use Co-creation to Drive Public Sector Innovation*. [\[Google Scholar\]](#).
9. Bauer, R., Derwall, J. and Otten, R. (2006). The Ethical Mutual Fund Performance Debate: New Evidence from Canada. *Journal of Business Ethics*, 70(2), 111–124. [\[CrossRef\]](#).
10. BBC – British Broadcasting Corporation. (2022). *The Visual and Data Journalism Team. Covid map: Coronavirus Cases, Deaths, Vaccinations by Country*. [\[Google Scholar\]](#).

11. Belitski, M., Guenther, C., Kritikos, A. S. and Thurik, R. (2022). Economic Effects of the COVID-19 Pandemic on Entrepreneurship and Small Businesses. *Small Business Economics*, 58(2), 593–609. [\[CrossRef\]](#).
12. Besson, P. and Rowe, F. (2012). Strategizing Information Systems-Enabled Organizational Transformation: A Transdisciplinary Review and New Directions. *Journal of Strategic Information Systems*, 21(2), 103–124. [\[CrossRef\]](#).
13. Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., ... and Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly*, 37(2), 471–482. [\[CrossRef\]](#).
14. Bholowalia, P. and Kumar, A. (2014). EBK-Means: A Clustering Technique Based on Elbow Method and k-Means in WSN. *International Journal of Computer Applications*, 105(9), 17–24. [\[Google Scholar\]](#).
15. Binti, S. Z. and Ismail, M. (2019). The Concept of Theory of Dynamic Capabilities in a Changing Environment. *International Journal of Academic Research in Business and Social Sciences*, 9(6), 1071–1078. [\[CrossRef\]](#).
16. Bundy, J., Pfarrer, M. D., Short, C. E. and Coombs, W. T. (2016). Crises and Crisis Management: Integration, Interpretation, and Research Development. *Journal of Management*, 43(6), 1661–1692. [\[CrossRef\]](#).
17. Coombs, W. T. (1999). *Ongoing Crisis Communication: Planning, Managing and Responding*. Thousand Oaks, CA: Sage.
18. Coombs, W. T. (2007). Protecting Organization Reputations During a Crisis: The Development and Application of Situational Crisis Communication Theory. *Corporate Reputation Review*, 10(3), 163–176. [\[CrossRef\]](#).
19. Coombs, W. T. (2015). *Ongoing Crisis Communication, 4th edn*. Thousand Oaks, CA: Sage.
20. Czech, K. (2018). Oil Dependence of Post-Soviet Countries in the Caspian Sea Region: The Case of Azerbaijan and Kazakhstan. *Acta Scientiarum Polonorum. Oeconomia*, 17(3), 5–12. [\[CrossRef\]](#).
21. Darling, J., Hannu, O. and Raimo, N. (1996). Crisis management in international business: A case situation in decision making concerning trade with Russia. *The Finnish Journal of Business Economics*, 4, 12–25.
22. Day, G. S. and Schoemaker, P. J. (2016). Adapting to fast-changing markets and technologies. *California Management Review*, 58(4), 59–77. [\[CorssRef\]](#).
23. Derrick, B. T. (2021). A Timeline of the Coronavirus Pandemic. *The New York Times*. [\[Google Scholar\]](#).
24. Eisenhardt, K. M. and Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic management journal*, 21(10-11), 1105–1121. [\[Google Scholar\]](#).
25. Fairlie, R. and Fossen, F. M. (2021). The early impacts of the COVID-19 pandemic. *Small Business Economics*, 1–12. [\[CrossRef\]](#).
26. Fitzgerald, M., Kruschwitz, N., Bonnet, D. and Welch, M. (2014). Embracing digital technology – a new strategic imperative. *MIT Sloan Management Review*, 55(2), 1–12.
27. Fuglsang, L. (2008). Capturing the benefits of open innovation in public innovation: A case study. *International Journal of Services Technology and Management*, 9(3-4), 234–248. [\[CrossRef\]](#).
28. Gabryelczyk, R. (2020). Has COVID-19 Accelerated Digital Transformation? Initial Lessons Learned for Public Administrations. *Information Systems Management*, 37(4), 303–309. [\[CrossRef\]](#).
29. Gobble, M. M. (2018). Digital Strategy and Digital Transformation, *Research-Technology Management*, 61(5), 66–71. [\[CrossRef\]](#).
30. Goodwin, T. (2015) The Battle is for the Customer Interface. TechCrunch. [\[Google Scholar\]](#)
31. Guo, H., Yang, Z., Huang, R. and Guo, A. (2020). The Digitalization and Public Crisis Responses of Small and Medium Enterprises: Implications from a COVID-19 Survey. *Frontiers of Business Research in China*, 14(1), 1–25. [\[CrossRef\]](#).
32. Hamidova, L. (2018). Diversification of The Economy of Azerbaijan: How to Overcome Resource Dependence? *Economics and Management, Faculty of Economics, South-West University "Neofit Rilski", Blagoevgrad*, 14(1). 2–13. [\[Google Scholar\]](#).
33. He, H. and Harris, L. (2020). The Impact of Covid-19 Pandemic on Corporate Social Responsibility and Marketing Philosophy. *Journal of Business Research*, 116, 176–182. [\[CrossRef\]](#).
34. Heath, R. L. (2005). Issues Management. In R. L. Heath (Ed.), *The Encyclopedia of Public Relations* (pp. 460–463). Thousand Oaks, CA: Sage

35. Henriette, E., Mondher, F. and I. Boughzala, I. (2015). The Shape of Digital Transformation: A Systematic Literature Review. In Ninth Mediterranean Conference on Information Systems (MCIS), Samos, 3–5 October 2015.
36. Hillyard, M. J. (2000). Public Crisis Management: How and Why Organizations Work Together to Solve Societies Most Threatening Problems. Writers Club Press: Lincoln, NE.
37. Hung, R. Y. Y., Yang, B., Lien, B. Y. H., McLean, G. N. and Kuo, Y. M. (2010). Dynamic capability: Impact of process alignment and organizational learning culture on performance. *Journal of World Business*, 45(3), 285–294. [\[CrossRef\]](#).
38. IMF – International Monetary Fund (2010). Republic of Azerbaijan: 2010 Article IV Consultation: Staff Report; Public Information Notice on the Executive Board Discussion; and Statement by the Executive Director for Azerbaijan, 113. [\[Google Scholar\]](#).
39. IMF – International Monetary Fund (2021). IMF Executive Board Concludes 2021 Article IV Consultation with the Republic of Azerbaijan. [\[Google Scholar\]](#).
40. Jagjit, S. S. and Harri L. (2019). Developing design principles for the digitalisation of purchasing and supply management, *Journal of Purchasing and Supply Management*, 25(1), 78–98. [\[Google Scholar\]](#).
41. James, E. H., Wooten, L. P. and Dushek, K. (2011). Crisis Management: Informing a New Leadership Research Agenda. *Academy of Management Annals*, 5(1), 455–493. [\[CrossRef\]](#).
42. Jaworski, B., Kohli, A. K. and Sahay, A. (2000). Market-driven versus driving markets. *Journal of the academy of marketing science*, 28(1), 45–54. [\[CrossRef\]](#).
43. Kearins, K. (2017). Corporate social responsibility: The Good, the Bad and the Ugly. *Society & Business Review*, 34(2), 51–79.
44. Kent, M. L. (2010). What is a Public Relations “Crisis?” Refocusing Crisis Research. *The Handbook of Crisis Communication*, 705–712. [\[CrossRef\]](#).
45. Koch, P. and Hauknes, J. (2005). On Innovation in the Public Sector–Today and Beyond.
46. Kouzmin, A. (2008). Crisis Management in Crisis? *Administrative Theory & Praxis*, 30(2), 155–183. [\[CrossRef\]](#).
47. Laerd Statistics (2015a). Wilcoxon Signed-Rank Test Using SPSS Statistics. Statistical tutorials and software guides. [\[Link\]](#).
48. Laerd Statistics (2015b). Mann-Whitney U Test Using SPSS Statistics. Statistical tutorials and software guides. [\[Link\]](#).
49. Li, J., Merenda, M. and Venkatachalam, A. (2009). Business Process Digitalization and New Product Development: An Empirical Study of Small and Medium-Sized Manufacturers. *IJEER*, 5(1), 49–64. [\[CrossRef\]](#).
50. Linnenluecke, M. K. and McKnight, B. (2017). Community Resilience to Natural Disasters: The Role of Disaster Entrepreneurship. *Journal of Enterprising Communities: People and Places in the Global Economy*, 11(1), 166–185. [\[CrossRef\]](#).
51. Manafov, G. N. and Sadigov, N. A. (2021). Problems of Digital Entrepreneurship Development in Azerbaijan, Economic and Social Development. In *70th International Scientific Conference on Economic and Social Development Development*, (Eds.) Yagubov, S., Aliyev, S. and Mikic, M., 66–665.
52. McCormick, J., Doty, C.A., Sridharan, S., Curran, R., Evelson, B., Hopkins, B., Little, C. Leganza, G., Purcell, B. and Miller, E. (2016), “Predictions 2017: Artificial Intelligence Will Drive the Insights Revolution”, *FORRESTER Research for Customer Insights Professionals*. [\[Google Scholar\]](#).
53. Miethlich, B., Belotserkovich, D., Abasova, S., Zatsarinnaya, E. and Veselitsky, O. (2020). Digital Economy and its Influence on Competitiveness of Countries and Regions. *Revista Espacios*, 41(12). [\[Google Scholar\]](#).
54. Mukhtarov, S., Mammadov, J. and Ahmadov, F. (2019). The Impact of Oil Prices on Inflation: The case of Azerbaijan. *International Journal of Energy Economics and Policy*, 9(4), 97–102. [\[CrossRef\]](#).
55. Müller, R. (1985). Corporate crisis management. *Long Range Planning*, 18(5), 38–48. [\[CrossRef\]](#).
56. OECD – Organisation for Economic Co-operation and Development. (2020). The Impact of Big Data and Artificial Intelligence (AI) in the Insurance Sector. [\[Link\]](#).

57. OECD – Organisation for Economic Co-operation and Development. (2020), Digital Transformation in the Age of COVID-19: Building Resilience and Bridging Divides, Digital Economy Outlook 2020 Supplement. [\[Google Scholar\]](#).
58. Pacheco, E. R. (2015). Unsupervised Learning with R. Packt Publishing Ltd.
59. Pearson, C. M. and Clair, J. A. (1998). Reframing Crisis Management. *Academy of Management Review*, 23(1), 59–76. [\[CrossRef\]](#).
60. Penrose, E. T. (1959). The Theory of the Growth of the Firm. *Oxford University Press*. [\[Google Scholar\]](#).
61. Priem, R. L. and Butler, J. E. (2001). Is the Resource-Based “View” a Useful Perspective for Strategic Management Research? *Academy of Management Review*, 26(1), 22–40. [\[CrossRef\]](#).
62. Rahimli, N. and Nazirov, M. (2020). Impact of Oil Price On Azerbaijan Economy: Relationship Between Oil Prices, Real Effective Exchange Rates and Real GDP. *ASERC Journal of Socio-Economics Studies*, 3(1), 37–45. [\[Google Scholar\]](#).
63. Rahimova, V. (2020). Organizing Production Innovation in Azerbaijan and Researching Modern Development Trends, In *55<sup>th</sup> International Scientific Conference on Economic and Social Development*, (Eds.) Ismayilov, A., Aliyev, K. and Benazic, M., 158–166. [\[Google Scholar\]](#).
64. Ramelli, S. and Wagner, A. F. (2020). Feverish Stock Price Reactions to COVID-19. *The Review of Corporate Finance Studies*, 9(3), 622–655. [\[CrossRef\]](#).
65. Register, M. and Larkin, J. (2008). Risk Issues and Crisis Management in Public Relations: A Casebook of Best Practice. Kogan Page Publishers: London.
66. Richter, A. (2020). Locked-down Digital Work. *International Journal of Information Management*, 55, 102–157. [\[CrossRef\]](#).
67. Robey, D. and Sahay, S. (1996). Transforming Work Through Information Technology: A Comparative Case Study of Geographic Information Systems in County Government. *Information Systems Research*, 7(1), 93–110. [\[Google Scholar\]](#).
68. Rovshan, A. (2020). Pandemic 2020: Key Outcomes for Azerbaijan’s Economy. *Baku Research Institute*. [\[Google Scholar\]](#).
69. Sebastian, I., Ross, J., Beath, C., Mocker, M., Moloney, K. and Fonstad, N. (2017). How Big Old Companies Navigate Digital Transformation. *MIS Quarterly*, 16(3), 197–213. [\[Google Scholar\]](#).
70. Smart, C. and Vertinsky, I. (1984). Strategy and the Environment: A Study of Corporate Responses to Crises. *Strategic Management Journal*, 5(3), 199–213. [\[CrossRef\]](#).
71. Suleymanov, E. and Abdullayeva, F. (2021). Azerbaijan Economy in During Covid-19 Pandemic. *InterConf*, 59–65. [\[Google Scholar\]](#).
72. Teece, D. J. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance. *Strategic management journal*, 28(13), 1319–1350. [\[CrossRef\]](#).
73. Touchtidou, S. (2015). Evaluation of the Competitiveness and the Business Environment of Azerbaijan. [\[CrossRef\]](#).
74. UN – Nited Nations (2021). UN report: Pandemic Year Marked by a Spike in World Hunger. *World Health Organization*. [\[Link\]](#).
75. Valiyev, A. and Valehli, F. (2021). COVID-19 and Azerbaijan: Is the System Resilient Enough to Withstand the Perfect Storm? *Problems of Post-Communism*, 69(1), 1–12.
76. Valiyeva, I. (2020). Impact of E-Government Services on Business Environment Development in Azerbaijan. *Economic and Social Development: Book of Proceedings*, 2–4, 1–5. [\[Google Scholar\]](#).
77. Venkatraman, N. (1994). IT-Enabled Business Transformation from Automation to Business Scope Redefinition. *Sloan Management Review*, 35, 73–87. [\[Google Scholar\]](#).
78. Vial, G. (2019). Understanding Digital Transformation: A Review and a Research Agenda. *The Journal of Strategic Information Systems*, 28(2), 118–144. [\[CrossRef\]](#).
79. Wang, C. L. and Ahmed, P. K. (2007). Dynamic Capabilities: A review and Research Agenda. *International journal of management reviews*, 9(1), 31–51. [\[CrossRef\]](#).
80. Warner, K. S. and Wäger, M. (2019). Building Dynamic Capabilities for Digital Transformation: an Ongoing Process of Strategic Renewal. *Long Range Planning*, 52(3), 326–349. [\[CrossRef\]](#).

81. Wernerfelt, B. (1989). From Critical Resources to Corporate Strategy. *Journal of General Management*, 14, 4–12. [\[CrossRef\]](#).
82. Yoo, Y., Henfridsson, O. and Lyytinen, K. (2010). Research Commentary—The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, 21(4), 724–735. [\[CrossRef\]](#).
83. Ziyadin, S., Suieubayeva, S. and Utegenova, A. (2020) Digital Transformation in Business. In: *Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems*, 84, 408–415. [\[CrossRef\]](#).
84. Zollo, M. and Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, 13(3), 339–351. [\[CrossRef\]](#).
85. Zott, C. (2003). Dynamic Capabilities and the Emergence of Intra Industry Differential Firm Performance: Insights from a Simulation Study. *Strategic Management Journal*, 24(2), 97–125. [\[CrossRef\]](#).
86. Zuboff, S. (1985). Automate/informate: The Two Faces of Intelligent Technology. *Organizational Dynamics*, 14(2), 5–18. [\[Google Scholar\]](#).