

Digitalizing in crisis: the role of organizational resilience in SMEs' digitalization

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Abstract

Purpose – Several studies have shown that economic shock and crisis trigger companies to move forward innovatively. This paper aims to complement this research topic by investigating how SMEs activate their organization resilience to adapt to changes generated by a crisis, with specific focus on how digitalization is used as an opportunity on this road. COVID-19 pandemic provided the context to investigate this situation.

Design/methodology/approach – The research approach combines literature review, quantitative data survey and data analysis and modeling using PLS-SEM. The quantitative data survey provided the database for building the structural equation model, exploring the structural relationships between the constructs and testing the hypotheses. Expert discussions contributed to the validation and interpretation of the results.

Findings – The model reveals that while organizational resilience has no direct effect on digitalization, combined with available resources, it realizes its indirect impact. Resilient companies require less external financial support to achieve their digitalization goals. The results also confirm that an uncertain environment encourages SMEs to go digital.

Originality/value – Several research studies highlighted the importance of SMEs in recovery from crises. Knowing more about how they can be supported and what capabilities they should develop is essential. This research explores the relationship between organizational resilience, resource availability and digitalization for SMEs in crises like the COVID-19 pandemic, revealing the self-reinforcing effect of organizational resilience and the level of digitalization that was not previously studied.

Keywords Crisis, Small and medium enterprises, Resilience, Digitalization

Paper type Research article

Introduction

Companies operate in a turbulent and challenging environment; they must face and manage various crises, such as pandemics, economic or natural disasters or cyberattacks. A crisis is “an abnormal situation which presents some extraordinary, high risk to business and which will develop into a business unless carefully managed” (Shaluf *et al.*, 2003, p. 29). In a broader sense, crises and extreme events activate organizational resilience which is considered as the companies' ability and skill to adapt to changes. Since these two phenomena are closely related, research differs in what skills are emphasized and how their relationship is described. How leaders navigate disruptive events depends on company culture, managerial attitudes, and available resources, among others. Leaders need to build organizational resilience, and determine how to cope with crises, which may include implementing new technologies, developing specific skills and competencies, or finding alternative suppliers (Mishra *et al.*, 2022; Sharma *et al.*, 2021). Small and medium enterprises (SMEs) are more vulnerable than larger

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companies in a crisis because they have limited resources. They are disadvantaged in their technological, digital, managerial, and human capacities. They have more substantial reliance on their customers and suppliers. On the other hand, in many cases, SMEs play an essential role in helping the economy out of the crisis (Paeffgen, 2022). Sullivan-Taylor and Branicki (2011) investigated how four resilience capabilities of SMEs – resourcefulness, swift decision making, technical and organizational capabilities contribute to cope with extreme events in UK. Meanwhile, SMEs have their survival instincts due to their vulnerability, but they must become more strategic and proactive in managing threats and extreme events. The Asian financial crisis in 1997 heavily affected the Korean economy. As a response, the corporate restructuring program of the government focused on the SME sector rather than on big companies, equipping them with technological capabilities to boost the economy (Gregory *et al.*, 2002). Thailand also proved that it is worth focusing on SMEs as a recovery strategy from the crisis. The Thai economy was also struck by the same Asian financial crisis in 1997. As a response, the government helped entrepreneurs to develop e-commerce to reach more customers, increase profits and contribute to economic growth (Sukasame *et al.*, 2008). The Indian government launched a demonetization plan in 2016, withdrawing 86% of bank notes, causing an economic shock. While the government was actively involved in causing the crises, affecting all stakeholders including SMEs, it also played an essential role in resolving the situation. Helping with digitalization, launching the government’s payment app and mandating customer verification helped the fast adoption of mobile payment, resolving the crisis (Pal *et al.*, 2019). These cases underline the importance of strengthening the resilience of SMEs with resources to deal with crises successfully. To support future decision-making, it is worth understanding how SMEs resilience contributes to managing a crisis, like the global shock caused by the COVID-19 pandemic.

The literature on SMEs’ resilience has grown in recent years due to the increasing interest (Burnard *et al.*, 2018; Duchek, 2018, 2020; Mpekiaris *et al.*, 2020; Pauluzzo, 2021). Marcazzan *et al.* (2022) investigated how the anticipation strategy of an SME is related to its experience of a crisis. They found that experiences gained from a crisis increase the likelihood of adopting proactive anticipation actions and, at the same time, decrease the likelihood of adopting a purely reactive strategy to adversities. In addition, entrepreneur resilience is associated nonlinearly with anticipation strategies. A study by Haneberg (2021) investigated how SME managers responded to crises and stated that the uncertainty experienced by SMEs primarily leads managers to focus on the affordable loss while learning from a crisis leads to experimentation behavior. Bürgel *et al.* (2023) investigated the relationship between crisis and digitalization in the light of resilience. They concluded that certain companies (non-family firms and firms heavily affected by globalization) showed a higher level of resilience in a pandemic if they had a higher level of digitalization before the crisis. In particular, Grözinger *et al.* (2022) used the COVID-19 pandemic as an example of a crisis and investigated its impact on SMEs. They proved that staying positive in a crisis will help SMEs coping with the effects of the crisis via innovative ideas, which ultimately will increase their performance and survival rate. These studies harmonize two crisis characteristics cited by Rak *et al.* (2022, p. 416): “a crisis produces uncertainty in evaluating the situation and formulating alternative solutions” (for example, in the form of defective attitude) and “provides an opportunity for those who are prepared” (e.g. anticipation strategy, innovative ideas). We focus on investigating how resilience connected to digitalization in the context of Hungarian SMEs in a crisis. In contrast to Grimmer *et al.* (2017), we see digitalization as an opportunity for crisis management rather than as an existing resource that the firm can rely on to cope with disruptive events. Analyzing how organizational resilience influences digitalization at SMEs is unique, according to our literature search. Investigating digitalization as an opportunity will expand the knowledge of organizational resilience and digitalization by making the relationship between these domains more understandable. Businesses and policymakers

could also benefit from this research by finding better responses to crises and thus helping business transformation.

The importance of the research underlines that the digitization of Hungarian SMEs lags behind many EU SMEs. The DESI report in 2022 (European Commission, 2022) affirms the slight progress in the digitalization of companies, yet, most Hungarian SMEs do not utilize digital technologies for their advantage. Compared with the EU average, they fall behind also in essential services, like using enterprise resource planning (ERP) software, sharing information electronically or sending e-invoices. Adopting leading digital technologies (big data, AI and cloud) is also low, Hungary scores below the EU average.

Decision-makers in such situations as in Hungary should be interested in understanding how the level of digitalization may be improved (North *et al.*, 2019), using the crisis as a business transformation opportunity. Therefore, it is worth investigating how a crisis – such as the COVID-19 pandemic – could drive SMEs towards digitalization and which factors and enablers, including organizational resilience, contribute to this. A crisis could be described by thirteen dimensions (Rak *et al.*, 2022), where uncertainty, inadequate information to contain the situation and changing relations between stakeholders are particularly relevant to our research. Organizational resilience could be connected to these dimensions, such as the ability to respond to uncertainty and changing relations between the parties. Hence, we chose disruptive events and circumstances to characterize the COVID-19 pandemic crisis.

This research studies the relationship between digitalization and organizational resilience in the context of Hungarian SMEs, using the COVID-19 pandemic as an example of a crisis. The research aims to understand and identify those factors that influence companies' actions. Does a turbulent environment, like an often changing and complex regulatory environment, or the changing customer needs result in an increased effort in digitalizing the companies? Does organizational resilience affect digitalization in any way?

The main research question of this study therefore is: How does organizational resilience affect the level of digitalization in the context of a crisis?

To answer the research question, data was collected from Hungarian SMEs and a PLS-SEM model was built focusing on the aspects (constructs) of organizational resilience, resource availability, environmental turbulence, and the level of digitalization. The relationships between these constructs were measured with a particular focus on the link between organizational resilience and digitalization. This research contributes to exploring the relationship between organizational resilience, resource availability and digitalization for SMEs in crises like the COVID-19 pandemic. It reveals the self-reinforcing effect between organizational resilience and the level of digitalization, within which the effect directed from organizational resilience to the level of digitalization has not been previously shown.

Additionally, it aims to confirm that the environmental turbulence generated by a crisis could affect positively digitalization and provides results on the impact of financial support packages on building resilience among SMEs while realizing their digitalization endeavors.

The structure of the rest of the article: Section 2 presents the theoretical background and hypotheses development. Section 3 summarizes the research methodology. Findings and discussion are detailed in Section 4, while Section 5 concludes the paper and provides limitations and avenues for future work.

Resilience and digitalization – theoretical background, constructs, and hypotheses development

Level of digitalization

In our study, we connect to Matalamäki and Joensuu-Salo (2022) who also used the research construct “digitalization” and concluded that digitalization opportunities and digitalization capabilities are pre-factors for business growth. The impact of COVID-19 on digitalization

acceleration was investigated in several recent studies (Agostino *et al.*, 2021; Kudyba, 2020; Soto-Acosta, 2020). Gabryelczyk (2020) analyzed the phenomenon in the public sector, while the digitalization of virtual enterprises during the COVID-19 pandemic was examined by Anthony Jnr and Abbas Petersen (2021). Fletcher and Griffiths (2020) examined digital transformation during the pandemic and proposed recommendations for companies to improve digital maturity to avoid fragility and achieve flexibility. Turning to SMEs, considerable research has been done in analyzing the impact of COVID-19 on digitalization, (Akpan *et al.*, 2022a, b; Bai *et al.*, 2021; Penco *et al.*, 2022). In their works, Bai *et al.* (2021) concentrated on sustainability, Penco *et al.* (2022) on the role of entrepreneurial orientation, and Akpan *et al.* (2022a, b) on emerging and developing markets. Abed (2022) gave an extensive literature review about technology's role in SMEs' business survival during the COVID-19 lockdowns. Papadopoulos *et al.* (2020) praised the role of digital technologies in SME productivity and performance improvement and specified it as a means of securing business continuity and survival.

The construct "Level of Digitalization" was used, for example by Isensee *et al.* (2020), who conducted a systematic review of the digitalization of SMEs about organizational culture and sustainability. Khlystova *et al.* (2022) examined the impact of COVID-19 on the creative industries. They provided a response matrix depending on digital capabilities and the ability to adapt to the crisis, indicating that the high level of digital capabilities promotes the adaptation to survive and adaptation to growth strategies. Several recent research dealt with the level of SME digitalization in response to the pandemic. For instance, Choirunnisa *et al.* (2021) measured the digital transformation readiness level of SMEs during COVID-19 pandemic, while Priyono *et al.* (2020) analyzed the level of digital maturity of SMEs in response to the changes due to the COVID-19 pandemic and identified different digital transformation paths. The above studies analyze the role of digitalization in a crisis, like the COVID-19 pandemic, but do not examine the role of organizational resilience in digitalization.

Organizational resilience

Resilience in small business literature is modeled as either "a dynamic process of adjustments to new contextual circumstances by the owner, the team, or the business" or "as the capacity and readiness to recover from disruptions" (Gianiodis *et al.*, 2022, p. 1031). The main difference between these approaches is that resilience is either investigated as a response to adversity or as an exploitable organizational competence, a resource. Brito *et al.* (2022) took a step forward by characterizing the static and dynamic resilience of 38 Brazilian small businesses in the shadow of the COVID-19 pandemic. In their approach, dynamic resilience transforms organizational resources into new pathways, such as products, markets, and processes, meanwhile, static resilience is just about adjusting business processes to return to the previous market position. They emphasized that human capital – including entrepreneurial competence and perceptions – played a meaningful role in how small businesses reacted to the adversity by leveraging their social or financial capital, and their capabilities to provide static or dynamic responses. Regarding the other approach, Zhang *et al.* (2021) defined organizational resilience from a dynamic capability view. In this sense, resilience is rooted in the abilities of companies supporting the efforts to adapt to environmental change. It helps to mobilize internal and external resources to resist and reconfigure these resources and capabilities to transform business.

Zighan *et al.* (2022) dealt specifically with Jordanian SMEs during COVID-19 and identified five capabilities of SME resilience: (1) Efficiency-based, (2) Adaptive, (3) Collaborative, (4) Mastering Change and (5) Learning Capability. Zutshi *et al.* (2021) also dealt with SME resilience during COVID-19 and explored five steps to enhance SME's resilience, namely via (1)

Collaboration, (2) Openness, (3) Victory, (4) Innovation and (5) Durability. Turning to the level of digitalization, [Xie et al. \(2022\)](#) analyzed the influence of digital technology on organizational resilience capacity and business networks during the COVID-19 pandemic. In their study, the role of digital technologies in organizational resilience has been investigated, focusing on the impact of digital technologies in crises. Having overviewed these approaches, we concluded that organizational resilience is an ability that (1) is activated by new circumstances (environmental changes, disruptions, crisis) forcing companies to adapt rapidly, (2) relies on company capability and exploitable assets and (3) results in adjusted business operations (competencies, processes, cultures, new technologies).

We aim to investigate how companies' digitalization endeavors are altering while adapting to the crisis; as we found, this aspect was not discussed in the literature before. Organizational resilience in our approach is manifested in (1) monitoring changes in the business environment to identify potential crises, (2) reacting rapidly to these crises, (3) implementing new technologies (4) adjusting business processes, (5) adjusting organizational culture and (6) developing critical competencies to the changed business environment. As digitalization could play an essential role in many items of the above, in both ways, we propose the following hypothesis:

H1. Organizational resilience has a positive effect on the level of digitalization.

Resource availability for digitalization

Resource availability is widely mentioned in the literature as a barrier in crisis situations, like the COVID-19 pandemic. Financial constraints acted as the biggest difficulty in the survival of SMEs during the pandemic ([Hossain et al., 2022](#); [Klein and Todesco, 2021](#)). [Hossain et al. \(2022\)](#) revealed that cash flow shortages and limited access to working capital are common concerns for most SME owners during the pandemic. Lack of non-digital skills and lack of employees were mentioned as additional barriers by [Bartik et al. \(2020\)](#), [Humphries et al. \(2020\)](#) and [Klein and Todesco \(2021\)](#), who concluded that these scarcities were among the main challenges faced by SMEs during the pandemic. [Grimmer et al. \(2017\)](#) analyzed the impact of resource availability on business performance for SMEs. They not only confirmed the positive relationship, but highlighted that firms with prospector orientation, which are innovative, and respond rapidly to changes benefit more from resources than the ones with defender orientation. They looked digitalization as a type of resource that would impact business performance the same way as other resources.

Most of the cited studies deal with the prohibitive role of resource availability in a crisis. Like [Grimmer et al. \(2017\)](#), we also aim to examine the positive effect of resource availability, however, in our study we intend to analyze the impact of financial support packages on building organizational resilience among SMEs while realizing their digitalization endeavors in a crisis. As we found, this indirect impact of resource availability, as well as the relationship with organizational resilience were not examined before in the literature. We assume that resilient companies are better prepared financially for the crises and resource availability plays an unmissable role in digitalization, therefore, we propose the following hypotheses:

H2. Organizational resilience has a positive effect on resource availability for digitalization projects.

H3. Resource availability has a positive effect on the level of digitalization.

Environmental turbulence during crisis

Like [Witschel et al. \(2022\)](#), [Bodlaj and Čater \(2019\)](#) and [Turulja and Bajgoric \(2019\)](#), we also use the research construct "Environmental turbulence" for the uncertainty around an

organization and split environmental turbulence into different sub-categories. In our study, environmental turbulence in a crisis, such as the COVID-19 pandemic, is made up of three dimensions: market turbulence (Turulja and Bajgoric, 2019; Witschel *et al.*, 2022), the fragility of supply chains (Hossain *et al.*, 2022; Lu *et al.*, 2020; Pratama *et al.*, 2021; Vanany *et al.*, 2022) and changes in the regulatory environment (Witschel *et al.*, 2022).

Several recent articles dealt with the market turbulence caused by COVID-19, for example, Adam and Alarifi (2021), Hossain *et al.* (2022) or Pratama *et al.* (2021). These studies explored the ways of changing customer needs, and the reasons behind the phenomenon and identified several new customer behavior patterns as the response to the crisis. Hossain *et al.* (2022) enumerated the reasons for changing customer patterns in shopping and consumption (for example lockdown periods, social and physical distancing and transportation barriers), while Pratama *et al.* (2021) denoted the accumulation of fundamental goods and services and, in parallel, the reduced consumption of non-essential commodities. Adam and Alarifi (2021) drew attention to the decrease in consumer spending due to the reduction in consumers' income and the perception of uncertainty.

Several studies analyzed the fragility of supply chains in the context of SMEs too, for example, Hossain *et al.* (2022), Marconatto *et al.* (2022), Semerádová *et al.* (2022), Vanany *et al.* (2022) or Zutshi *et al.* (2021). Semerádová *et al.* (2022) dealt with disrupted supply chains and reached the conclusion that the fragility of supply chains is a crucial challenge SMEs were facing during COVID-19. Like the customer side, Hossain *et al.* (2022) listed the reasons of supply chain disruptions (for example movement restrictions, more rigorous commodity inspections and air-flight control). Marconatto *et al.* (2022) analyzed the behavior of suppliers and pointed out that in response to the crisis, suppliers were disappearing, experiencing disruptions, or offering worse trade terms. Zutshi *et al.* (2021) warned about the overreliance on a few suppliers and advised for replacing the inflexible suppliers with new partners. Marconatto *et al.* (2022) have also suggested - as part of COVID-19-related SME response critical success factors - that there is an urgent need for SMEs to find new business partners and suppliers. As for other coping strategies, Vanany *et al.* (2022) introduced a supply chain resilience framework for SMEs during COVID-19 pandemic, and differentiated supply chain disruptions as supply-side, production-side and demand-side disruptions.

An even broader list of literature dealt with the impact of changes in the regulatory environment towards SMEs about the COVID-19 pandemic, for example, Adam and Alarifi (2021), Barragan-Quintero *et al.* (2021), García-Pérez-de-Lema *et al.* (2022), Zighan *et al.* (2022) or Zutshi *et al.* (2021). Adam and Alarifi (2021) pointed out the importance of external support to contribute to SMEs' business continuity in crisis situations and argued that several financial support packages can develop the resilience of small enterprises in facing crises like the COVID-19 pandemic. In their research model, they examined the role of external support in business performance and business survival. García-Pérez-de-Lema *et al.* (2022) also stressed that governmental public policies have become a fundamental tool in supporting small businesses. Barragan-Quintero *et al.* (2021) examined the difficult adaptation to ever-changing government regulations, while Zighan *et al.* (2022) suggested strategies for the access to and the utilization of government support and advised three fundamental steps: (1) Maximize the use of government support policies, (2) Identify government support avenues, and (3) Apply for suitable government support. Zutshi *et al.* (2021) stressed the need for SMEs' agility and adaptation in their policies towards changing government regulations and described this strategy to improve business performance.

In general, our investigation regarding environmental turbulence in crises relates to the study of Haneberg (2021), who analyzed the impact of crises on uncertainties and to organizational responses in the SME context, and Brown and Rocha (2020), who examined explicitly the impact of COVID-19-induced uncertainty to the availability of entrepreneurial start-up finance sources in China.

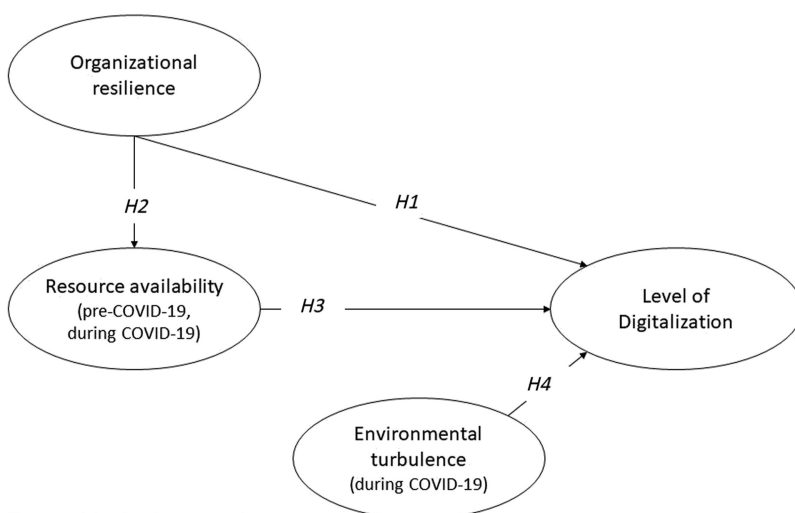
All three aspects used in this study as sub-categories of environmental turbulence show that environmental turbulence undermines business performance, business continuity and the survival of SMEs, see for example [Adam and Alarifi \(2021\)](#). Yet, despite the adverse effects of environmental turbulence listed above, our preliminary assumption in this study is that environmental turbulence has a positive effect on the level of digitalization. In our study, we consider crisis-induced uncertainty and turbulence as an opportunity to stimulate business competition, shape the decision-making process of the company ([Penco et al., 2022](#)) and formulate new organizational responses ([Haneberg, 2021](#)), for instance in the form of digitalization endeavors. In the last aspect, we draw on the research results of [Grimmer et al. \(2017\)](#) in a sense that we agree that those companies who can respond quickly to environmental changes can benefit more from resources - and we share their view of considering digitalization asset of a company as a type of resource. Therefore, in our study, we propose the following hypothesis:

H4. Environmental turbulence in the business environment has a positive effect on the level of digitalization.

Figure 1 shows the conceptual model, the hypotheses, and their relations.

Research method

The research was conducted using a combined approach, including a literature review, quantitative data survey and data analysis and modeling using PLS-SEM. The quantitative data survey provided the database for building the structural equation model, exploring the structural relationships between the constructs, and testing the hypotheses. Expert discussions contributed to the validation and interpretation of the results. The research process (Figure 2) started with surveying the literature relevant to SMEs' resilience and digitalization, and the factors contributing to digitalization. These steps were followed by formulating the research questions and the hypotheses, building on the results of previous research. The next step was to develop the survey instrument and formulate the interview questions. The questionnaire is available in the [Appendix](#).



Source(s): Authors' work

Figure 1.
Conceptual
research model

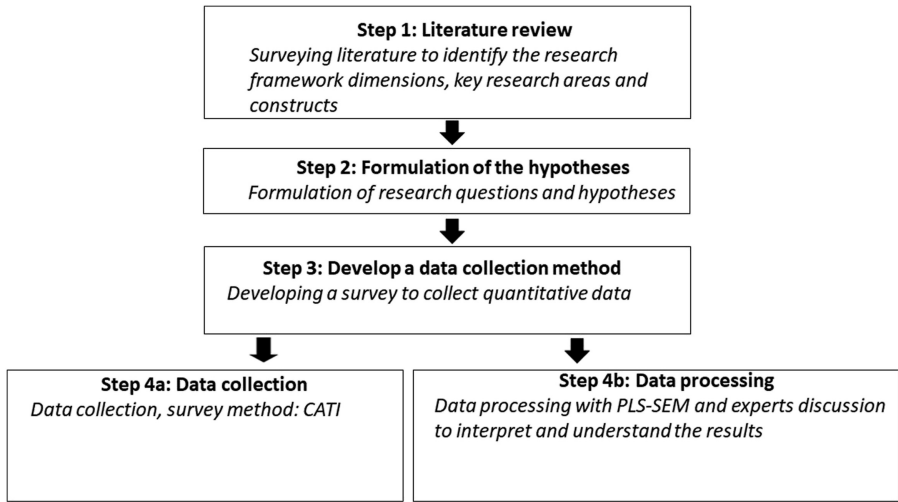


Figure 2.
Research process

Source(s): Authors' work

Data was collected from the participants of the survey using Computer-Assisted Telephone Interviewing method (CATI) and was subsequently processed using PLS-SEM. The initial results were followed up by experts' discussions with seven researchers from the digitalization field to help understand and interpret the results.

Data collection and sample characteristics

The hypotheses were empirically tested using data from Hungarian SMEs. Data collection was performed by a professional Hungarian multinational market research and consulting firm; the interview questions and the surveying method were developed jointly. Data was collected from August 2022 to September 2022. The data collection method was CATI. The sample size is 250 SMEs, with SMEs having 10–249 employees. The answers were collected from SMEs Directors or employees of equivalent positions. The data is representative of the regional aspect and of the size distribution of SMEs in Hungary (Table 1).

Characteristics	Percentage (%)
Number of employees: 10–49	86
Number of employees: 50–249	14
<i>Region</i>	
Budapest	34
Central Hungary	13
Central Transdanubia	10
Western Transdanubia	10
Southern Transdanubia	6
Northern Hungary	7
Northern Great Plain	10
Southern Great Plain	10

Table 1.
Distribution of SME
respondents

Source(s): Authors' work

Constructs and measurement instruments

The foundation of the instruments was developed in collaboration with our Slovenian research partners in “Impact of COVID-19 pandemic on SMEs digital transformation journey”, Slovenian - Hungarian scientific and technological cooperation Project No. 2019–2.1.11-TET-2020–00172.

The questionnaire (see [Appendix](#)) was organized as follows. The organizational readiness to implement a digitalization project was measured based on the availability of resources such as financial resources, IT infrastructure and required employee skills (Q10.1-Q10.3) from [Lokuge et al. \(2019\)](#). Environmental turbulence was studied based on the items which investigated how the collaboration with customers changed ([Jaworski and Kohli, 1993](#); [Li et al., 2022](#)) (Q11.1-Q11.3), the supply chain was disrupted, and the regulation caused uncertainty (Q11.5-Q11.9). Crisis can intensify digital transformation, hence the questions from [He et al. \(2023\)](#), [Lokuge et al. \(2019\)](#) and [Klein and Todesco \(2021\)](#) were rephrased to emphasize the intensive usage of technology in customer connection and the companies' commitment to improving organizational capabilities (Q12.10-Q12.21). [Akpan et al. \(2022a, b\)](#) examined the relationship between dynamic capabilities – meaning sensing- and reconfiguration capability – and organizational resilience measured by adaptability and agility and their measurement items fitted best to our approach (see in Organizational resilience subchapter) (Q13.1-Q13.8). A few statements were derived from interviews conducted in the above-mentioned project. Finally, the application for governmental assistance was questioned. Beyond this preparatory work, a professional Hungarian multinational market research and consulting firm helped us to tailor the instrument for the SME sector. To sum up, instrument validation was performed by a combination of reviewing the literature, consulting researchers and experts, and an interview with some potential respondents. The questions were measured on a 5-point scale (where 1 = strongly disagree, 5 = strongly agree). The instrument consists of the following constructs:

Organizational resilience: [Chen et al. \(2021\)](#) defined five dimensions for developing their measurement scale of organizational resilience: (1) capital resilience, the financial strength of the company, (2) strategic resilience, the ability to choose and maintain the right growth model (3) relationship resilience, the good reciprocal relationship between the business and its stakeholders, (4) cultural resilience, a corporate culture that supports and fosters employees in critical situations and (5) learning resilience, the ability to learn both proactively and also from the experiences in crisis situations. [Lee et al. \(2013\)](#) built their organizational resilience model on the previous model of [McManus et al. \(2008\)](#). They emphasized two main dimensions: (1) the adaptive capacity of the organization and (2) its planning strategies and processes for crisis. The first dimension focuses on the availability of internal resources, staff involvement, innovation and creativity, and information and knowledge among others. The second dimension focuses on planning and preparation for critical situations that would include simulation exercises and recovery plans among others. [Zhang et al. \(2021\)](#) measured organizational resilience using a four-item scale based on the research of [Parker and Ameen \(2018\)](#). They focused on the ability to cope with changes, the adaptation of business processes, the quick response, and the utilization of new opportunities in crises.

Our initial scale included eight items (the related questionnaire is available in [Appendix](#)): Q13.1 focuses on planning for crisis situations, Q13.2 – Q13.6 focuses on the adaptive capacity of the company, that is, its proven capabilities to respond and adapt to changes in environment, and Q13.7 – Q13.8 focuses on the cultural and learning resilience of the organization. Q13.1, Q13.5 and Q13.6 were omitted from the final model as they did not carry sufficient information.

Resource availability: The capital resilience of the organization was measured as a separate construct, asking specifically about the resource availability for digitalization projects prior to (Q10.1 – Q10.3) and during (Q12.15, Q12.17, Q12.18) the COVID-19 pandemic.

Environmental turbulence as highlighted by Rak *et al.* (2022) is connected to several dimensions of a crisis. It is measured on two main dimensions in several research (Bodlaj and Cater, 2019; Hung and Chou, 2013): 1) market turbulence, looking at the changing needs of customers, and 2) technological turbulence looking at the impact the disturbance and the opportunities technological advancement have on the industry the business operates in. Our initial scale focused on one hand on the market-related dimension of environmental turbulence (Q.11.1 – Q11.3), but also added new dimensions related to the uncertainty caused by suppliers (Q11.4 – Q11.6) and the regulatory environment (Q11.7 – Q11.9). Finally, the supplier-related dimension was removed from the construct together with the question related to new customer demand uncertainty (Q.11.2), as they did not carry sufficient information.

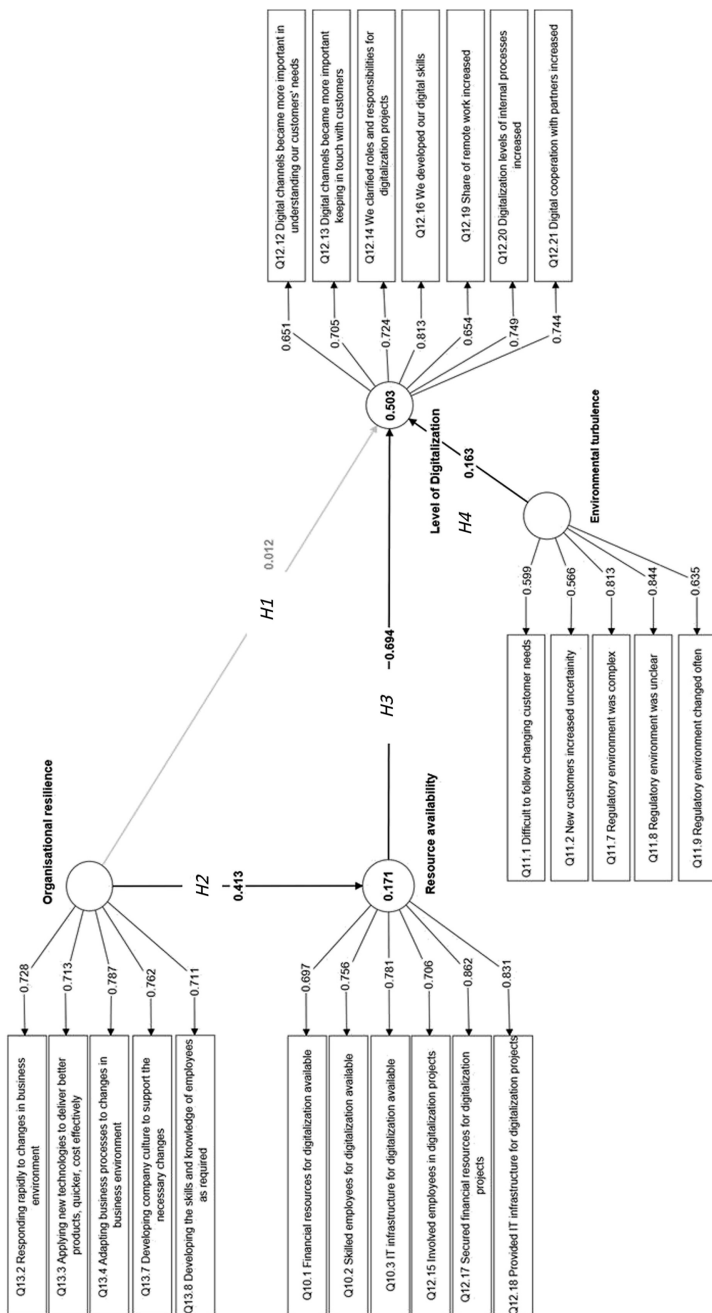
Level of Digitalization: Yu *et al.* (2021) identified four dimensions to measure the level of digitalization: (1) value chain digitalization, that is, the use of digital systems in procurement, production and logistics, (2) business process digitalization, that is, the use of digital solutions for supporting and connecting business activities and for decision making, (3) product and services digitalization, that is, the inclusion and application of smart components and data collection using these components and (4) the application of specific, leading-edge technologies, for example, big data or cloud computing. They have defined these dimensions and the corresponding instruments for companies. Raimo *et al.* (2022) measured the digitalization levels of SMEs, their instrument looked at the use of digital technologies to online presence, information flows, research and development, human resources, data security, logistics, operations, sales, and services. Zhang *et al.* (2021) used a five-item scale based on the research of Chu *et al.* (2019) and Nwankpa and Roumani (2016) to measure digital transformation. They focused on driving new business processes based on new technologies, integrating digital technologies to drive change, shifting towards leading-edge technologies, developing digital products and services, and developing digital skills.

Our questions measured if customer-related digital channels became more important (Q12.12, Q12.13), the involvement of employees in digital transformation (Q12.14, Q12.15), the development of digital skills (Q12.16) and the digitalization of business processes, including remote work (Q12.19–Q12.21). The question Q12.15 was removed from the final model as it did not carry sufficient information.

Findings

Figure 3 depicts our PLS-SEM model and its results. Note that solid lines indicate accepted hypotheses, while greyed-out lines indicate rejected hypotheses.

PLS-SEM was used to understand the relationship between the constructs. The use of PLS-SEM was justified by (1) the exploratory nature of this research; (2) the relatively small (245) sample size; and (3) the scale development assessed in this study (Hair *et al.*, 2012). The risk of systematic measurement error was avoided by assessing internal consistency, convergent validity, and discriminant validity. Certain variables had to be removed from the model to ensure the constructs are reliable and valid. The constructs' reliability was evaluated (Table 2) using Dijkstra and Henseler's (2015) rho A, where the decision criterion is $\rho A > 0.707$. The average variance extracted (AVE) index was applied to measure convergent validity (values should be above the threshold of 0.5 in each construct (Hair *et al.*, 2017)). Although AVE was below this threshold for the Environmental turbulence construct, we accepted this construct as reliable as the discriminant validity (Table 3) of this construct was within the established guidelines Henseler *et al.* (2016). The model's overall assessment was done by performing bootstrapping of 5,000 samples. The hypotheses were evaluated measuring the



Source(s): Authors' work

Figure 3.
PLS-SEM model and
its results

significance of the path coefficients using t-statistics of the bootstrapping results (Table 4).

The path coefficients (Table 4) show that the hypotheses H2, H3 and H4 are accepted while H1 is rejected. However, while hypothesis H1 as a direct effect is rejected, it is worth recognizing that there is a significant indirect effect between Organizational resilience and the Level of Digitalization. This result would highlight the importance of financial resources, skills, and infrastructure in strengthening resilience. This finding corroborates why financial resources were included in the organizational resilience construct of Chen *et al.* (2021). Without the financial resources, skills and infrastructure, the elements of organizational resilience are not effective in driving digitalization. This finding aligns with the results of

Table 2.
Construct reliability and reliability measures of the model

Construct reliability and validity	Cronbach's alpha	Composite reliability (rho A)	Composite reliability (rho C)	Average variance extracted (AVE)
Environmental turbulence	0.732	0.743	0.824	0.491
Level of digitalization	0.849	0.871	0.883	0.521
Organizational resilience	0.796	0.796	0.859	0.549
Resource availability	0.867	0.878	0.899	0.600

Source(s): Authors' work

Table 3.
Discriminant validity measures of the model

Discriminant validity - HTMT matrix	Environmental turbulence	Level of digitalization	Organizational resilience	Resource availability
Environmental turbulence				
Level of digitalization	0.161			
Organizational resilience	0.166	0.338		
Resource availability	0.185	0.737	0.489	

Source(s): Authors' work

Table 4.
Path coefficients and significance measures of the model

Path coefficients	Original sample (O)	T-statistics ((O/STDEV))	p-values
Environmental turbulence → Level of digitalization	0.163	2.236	0.025
Organizational resilience → Level of digitalization	0.012	0.220	0.826
Organizational resilience → Resource availability	0.413	7.065	0.000
Resource availability → Level of digitalization	0.694	16.937	0.000
<i>Indirect effects</i>			
Organizational resilience → Level of digitalization	0.287	7.130	0.000
<i>Total effects</i>			
Environmental turbulence → Level of digitalization	0.163	2.236	0.025
Organizational resilience → Level of digitalization	0.299	4.876	0.000
Organizational resilience → Resource availability	0.413	7.065	0.000
Resource availability → Level of digitalization	0.694	16.937	0.000

Source(s): Authors' work

[Brito et al. \(2022\)](#), which proved that organizational resilience is heavily dependent on skills. However, it is essential to point out a difference that, unlike our study, the Brazilian research model did not incorporate the level of digitalization.

Discussion

Our research measured the relationship between Organizational resilience and the Level of Digitalization in an opposite direction as the common research approach, e.g. [Zhang et al. \(2021\)](#). They argue that digitalization supports organizational resilience, through contributing to the dynamic capabilities of the firm. Dynamic capabilities are crucial to adopt to a rapidly changing environment and to ensure survival. However, the digitalization level of firms is not static. There is an ongoing development to follow technological advancements and capture business opportunities offered by digitalization. There are certain factors required for the successful implementation of digitalization projects, which increase the overall digitalization level of the firm, digital readiness being a key one ([Zoltmers et al., 2021](#)). There is a significant overlap between organizational resilience and digital readiness, through organizational and individual skills and competencies, through the rapid response to opportunities arising, the agile implementation of business cases and through a supporting company culture. This overlap, the combined results of these previous studies and our results, suggests that the relationship between organizational resilience and digitalization is most likely bi-directional. Digitalization supports organizational resilience; however certain elements of organizational resilience are required for the successful implementation of digitalization projects. Our results confirm this relationship, even though it is not effective on its own, it requires the availability of certain resources. Focusing on both directions therefore could lead to a self-reinforcing effect, a virtuous cycle of developing capabilities that the organization can benefit from.

While environmental turbulence, that is a symptom of a crisis undermines business performance and often leads to the collapse of firms ([Adam and Alarifi, 2021](#)), it could trigger responses that lead to experimentation and the implementation of various projects, including digitalization. The significant positive path coefficient between the constructs of Environmental turbulence and the Level of Digitalization suggests its positive impact on digitalization: companies respond to the uncertainty by developing digital capabilities, increasing their level of digitalization. This finding supports the research results of [Haneberg \(2021\)](#) with an example of how SMEs respond to uncertainty and environmental turbulence. Given the self-reinforcing effect of digitalization and organizational resilience, this relationship brings the opportunity of a positive response to the crisis, an effective way of building organizational resilience, strengthening the company by developing new digital capabilities that will make it more resilient to future crises.

Our data gave us the opportunity to identify potential differences between those companies that did or did not receive financial support from the government during the COVID-19 pandemic ([Table 5](#)). Most of the companies did not receive financial support. In their case, the effect of Environmental turbulence on the Level of Digitalization, as well as the effect of Organizational resilience on Resource availability was weaker, while the effect of Resource availability on the Level of Digitalization was stronger. In other words, they relied more on their own resources to manage their digitalization strategy. The total effect of Organizational resilience on the Level of Digitalization was less than half of what those companies experienced that received financial support from the government. This finding suggests that government funding is an effective way to support those companies that already have resilience capabilities and their own resources in driving digitalization. This finding is in line with the results of [Gregory et al. \(2002\)](#), that is, equipping the SME sector with technological capabilities to support

Path coefficients	Original sample		<i>p</i> -values	
	Not received COVID support (n = 201)	Received COVID support (n = 49)	Not received COVID support (n = 201)	Received COVID support (n = 49)
Environmental turbulence	0.171	0.259	0.131	0.024
→ Level of digitalization				
Organizational resilience	-0.014	0.220	0.722	0.037
→ Level of digitalization				
Organizational resilience	0.401	0.582	0.000	0.000
→ Resource availability				
Resource availability → Level of Digitalization	0.711	0.580	0.000	0.000
<i>Indirect effects</i>				
Organizational resilience → Level of digitalization	0.276	0.336	0.000	0.000
<i>Total effects</i>				
Environmental turbulence	0.172	0.258	0.131	0.024
→ Level of digitalization				
Organizational resilience	0.254	0.571	0.000	0.000
→ Level of digitalization				
Organizational resilience	0.388	0.592	0.000	0.000
→ Resource availability				
Resource availability → Level of digitalization	0.712	0.568	0.000	0.000

Source(s): Authors' work

Table 5. Path coefficients and significance measures of the subsets (received/not received government funds)

the recovery from crisis. Given the potential self-reinforcing effect of Organizational resilience and the Level of Digitalization, supporting those companies with government funding, which have demonstrated resilience capabilities could be an effective way of building resilience within the SME sector. Regarding crisis situations, our result confirms previous evidence provided by [Adam and Alarifi \(2021\)](#), who stressed the relevance of external support to contribute to SMEs' business continuity in crisis situations and emphasized the role of financial support packages in developing SME resilience while facing crises.

In general, our results are consistent with the results of [Zhang et al. \(2021\)](#), who dealt with the utilization of new opportunities in crises, concurs well with the results provided by [Xie et al. \(2022\)](#), who measured the impact of digital technologies in crisis situations and confirms the previous result of [Papadopoulos et al. \(2020\)](#), who specified the role of digital technologies in the operation of SMEs as a means of securing business continuity and survival. As for the setting of the research, our results share several similarities with the setting of [Grözinger et al. \(2022\)](#), who also used the COVID-19 pandemic as an example of crisis situations and its impact on SMEs. Finally, our study provides additional support for the argument of [Grimmer et al. \(2017\)](#), who deduced that those companies that can respond quickly to changes will benefit more from different types of resources.

Conclusion

In this study, a conceptual model was built and validated in Hungarian SMEs. Our research explored the relationship between organizational resilience, resource availability and digitalization for SMEs in crises like the COVID-19 pandemic. Several research highlighted the importance of SMEs in recovery from crises, therefore it is important to know more about how they can be supported and what capabilities they should develop. They proved that

digitalization can be an important resource for business performance and building organizational resilience. Our research is based on an instrument (developed and validated by a research partnership) that surveyed a representative sample of Hungarian SMEs. While having data from a single country is a limitation of our results, Hungarian SMEs could benefit from the findings, especially as they have low levels of digitalization. It is worth noticing that the whole process of the study is repeatable. Hence, each country struggling with low-level digitalization of SMEs can also scrutinize this problem area in the way presented in the article and draw its consequences. Our research confirmed that organizational resilience has a positive effect on the level of digitalization, however, only for those companies that have the necessary financial resources, skills, and infrastructure available. This finding aligns with previous research (Chen *et al.*, 2021), which modeled resource availability as part of the organizational resilience construct. We measured the organizational resilience and level of digitalization relationship in the opposite way as other previous research (Zhang *et al.*, 2021). Our findings in context with that research suggest that this relationship may be bi-directional. Having a bi-directional relationship could mean that it is self-reinforcing, meaning that increasing the level of digitalization could improve organizational resilience and vice versa, leading to a virtuous cycle. Our research also confirmed that environmental turbulence in a crisis have positively affected the level of digitalization; SMEs with resilience capabilities and the necessary resources available respond to a crisis by implementing new digital systems for surviving and striving in the changed environment. The question arises whether a planned crisis such as that happened in India due to demonetization policies (Pal *et al.*, 2019) would facilitate the digitalization of SMEs. We had the opportunity to analyze the impact of government funds in the crisis by measuring the differences between those SMEs that did or did not receive funds for recovery. Our results indicate that the impact of resilience and resource availability on digitalization is twice as strong for those who received government funds than for those who did not. This finding suggests that the selective support of SMEs with resilience capabilities and their own resources could be an effective way of driving digitalization and further strengthening SME resilience. These results could have an impact on the factors that can be considered in public tenders to encourage SMEs to go digital.

Our work has led us to conclude that there is a positive impact on a company's digitalization level if it continuously monitors and prepares for potential crises. Furthermore, a crisis can reorient business competition by stimulating digitization, that is, a negative event can create a positive opportunity in the business environment.

Our work has some limitations. The first limitation is the single-country sample. Secondly, our research did not measure the level of digitalization of the company before the pandemic, so we did not have the opportunity to compare our results in the light of resilience with, for example, the results provided by Bürgel *et al.* (2023). Thirdly, this study did not measure whether companies that became more digitalized through the crisis operated better or worse in the new business environment.

As part of future work, we intend to conduct a cross-country comparison of the results with other Central and Eastern European countries. Additionally, we plan to investigate our model and hypotheses using a post-COVID-19 survey.

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Appendix

The questionnaire

The following questions were answered on a 5-item Likert scale:

1: strongly disagree

2: disagree

3: neutral

4: agree

5: strongly agree

Q10: pre-COVID status

Q10.1: The company had financial resources to implement digitalization projects.

Q10.2: The company had skilled employees to implement digitalization projects.

Q10.3: The company had IT infrastructure to implement digitalization projects.

Q11: status during the COVID pandemic

Q11.1: The changing needs of our customers were difficult to follow.

Q11.2: New customers increased uncertainty.

Q11.3: Forecasting sales volumes was difficult.

Q11.4: Suppliers could not fulfill our requirements.

Q11.5: Delivery times were unpredictable.

Q11.6: Finding alternative suppliers was difficult.

Q11.7: Regulatory environment was complex and complicated.

Q11.8: Regulatory environment was unclear.

Q11.9: Regulatory environment changed frequently.

Q12 status during the COVID pandemic

Q12.10: We used more extensively digital channels (e.g. social networks, mobile applications or digital surveys) for promoting our products and services.

Q12.11: We developed digital channels for selling our products and services.

Q12.12: Digital channels became more important for the in-depth understanding our customers' needs.

Q12.13: Digital channels became more important in keeping in contact with our customers.

Q12.14: We clarified roles and responsibilities for our digitalization projects.

Q12.15: We involved our employees in the digital transformation.

Q12.16: We developed our digital skills.

Q12.17: We were able to secure financial resources for digital transformation.

Q12.18: We were able to provide the IT infrastructure for digital transformation.

Q12.19: The share of remote work increased.

Q12.20: Digitalization levels of our internal processes increased.

Q12.21: Cooperation with our partners (e.g. suppliers, contractors) using digital channels increased.

Q13 in the last three years

Q13.1: We monitor the changes in business environment to identify potential crisis situations.

Q13.2: We respond rapidly to the changes in business environment.

Q13.3: We apply new technologies swiftly to deliver better products, quicker and more cost effectively.

Q13.4: We adapt our business processes to the changes in business environment.

Q13.5: If needed, we are able to change suppliers to achieve lower prices, better quality or shorter lead times.

Q13.6: We adjust our products and services to the changes in business environment.

Q13.7: We develop our organizational culture to support the changes.

Q13.8: We develop the individual and organizational skills as required.

Q15: Did your company receive government support related to the COVID pandemic?

1: yes

2: no

3: don't know

Source(s): Authors work

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