The Impact of the COVID-19 Pandemic on the Digitalisation Practices of Hungarian Companies

Péter Fehér, Andrea Kő, Tibor Kovács, Dóra Őri, Ildikó Szabó, Zoltán Szabó & Krisztián Varga

Corvinus University of Budapest, Institue of Information Technology, 1093 Budapest Fővám tér 13-15., Hungary.
E-mail: peter.feher@uni-corvinus.hu, andrea.ko@uni-corvinus.hu, tibor.kovacs@uni-corvinus.hu, dora.ori@uni-corvinus.hu, ildiko.szabo2@uni-corvinus.hu, zoltan.szabo@uni-corvinus.hu, varga.krisztian@uni-corvinus.hu

Abstract The impact of the COVID pandemic was not only health-related but also had a significant impact on the way companies operate. Most commonly, the impact of enforced digitalisation can be mentioned, which was dominated by the implementation of enforced remote working. We aim to explore how Hungarian SMEs were facing challenges of the COVID-19 situation and using digital technologies to overcome these challenges, what were the changes which reflected in their operations. To understand the impact of the pandemic and to explore the role of digital technologies in the first part of the research a survey was conducted. 120 companies participated, 58% were SMEs and the rest are enterprises. Data was collected in the third quarter of 2021, more than one year after the emergence of the epidemic in Europe, and by then we had passed the third wave of the epidemic in Hungary.

Keywords: digitalization, SME, Covid-19 challenges.

University of Maribor Press

DOI https://doi.org/10.18690/um.fov.3.2022.16
ISBN 978-961-286-583-2

1 Introduction

Coronavirus disease has spread from January 2020 from Wuhan, and WHO declared it pandemic in March 2020. The impact of the COVID pandemic was not only health-related but also had a significant impact on the way companies operate, especially it has strongly affected SMEs. SMEs have key role in most economies, they drive economic growth, and they provide employment (Lu et al, 2020). SMEs situation became challenging and difficult all over the world in pandemic; in China 80% of SMEs have not resumed operations yet, in USA 96% of SMEs have been affected, in Germany 58% of SMEs experience a drop in turnover by on average 50% and in Italy 72% of them were directly affected (Klein and Todesco, 2021). SMEs faced with various threats, amongst other scarcity of financial resources, market new entrants, lack of digital skills, government regulation changes (Brussevich et al, 2020; Sandberg et al., 2020; Bartik et al., 2020; Pelletier et al., 2019).

SMEs were affected on both the supply and demand sides (OECD, 2020). On the supply side, companies experience a reduction in the supply of labour, lockdowns and quarantines lead to further and more severe drops in capacity utilisation. Furthermore, supply chains are influenced by shortages of parts and intermediate goods. On the demand side, the uncertain situation of SMESs, the sudden loss of demand and revenue severely affects their ability to function, and/or causes severe liquidity shortages. Furthermore, consumers financial situation became instable, because of loss of income, which resulted reduced spending and consumption. Some sectors, such as tourism and transportation, are especially vulnerable.

We aim to explore how Hungarian SMEs were facing challenges of the COVID-19 situation and using digital technologies to overcome these challenges, what were the changes which reflected in their operations. To understand the impact of the pandemic and to explore the role of digital technologies in the first part of the research a survey was conducted. 120 companies participated, 58% were SMEs and the rest are enterprises. Data was collected in the third quarter of 2021, more than one year after the emergence of the epidemic in Europe, and by then we had passed the third wave of the epidemic in Hungary.

This paper is organized as follows: Section 2 gives a literature review on the impact of COVID-19 pandemic on the digitalization practices of SMEs. Section 3 summarizes the research method. Results are introduced in Section 4 The COVID-19 Challenges in 4.1 and technological Responses in 4.2 are presented. An initial experiment is outlined in Section 4.3. Our conclusions are drawn in the final section.

2 Literature review

Even though a short time has passed since the outbreak of the pandemic, a growing body of literature has examined the impact of COVID-19 on the digitalization practices of SMEs. Tosheva (2020) presented a literature review on the economic impacts of the current COVID-19 pandemic and the digital transformation responses. Brussevich et al. (2020) in their IMF Working Paper proposed and examined a new feasibility index (Tele-workability Index) to work from home in order to explore which job types are most at risk. They studied 35 advanced and emerging economies. Sandberg et al. (2020) introduced results from a survey about the survival rate of businesses, displaying their location and their main challenges. Bartik et al. (2020) conducted a survey in the USA participating around 5800 small businesses. Their aim was to explore differences in the survival rate across industries. They summarized their results using three main categories: 1) the impact of COVID-19 on business operations and employment, 2) financial fragility, 3) expectations (such as duration and economic survival). Eggers (2020) presented a path with tactics and strategies for SMEs to overcome the COVID-19 crisis. Their recommendations focused on the responses of other market players as well, especially financing institutions and governments.

An OECD report (2020) summarized how the COVID-19 pandemic affected SMEs and how governments responded to the pandemic to stimulate SME resilience. Humphries et al. (2020) also explored the effects of the COVID-19 pandemic on small businesses using a survey design. Their main results showed that 59% of survey respondents laid off a significant number of employees, while 30% believe that their business will not recover in the next 2 years. Casalino et al. (2019) examined digital strategies and organizational performance of SMEs in the COVID-19 era. They focused on digital resilience as a critical success factor of an SME. According to their study, three essential elements of organizational resilience are: 1) product excellence, 2) process reliability and 3) people behaviour. They also proposed three functional

domains of organizational resilience in their literature review to promote to unlock the potential of within their organizations. These functional domains are: 1) operational resilience, 2) supply chain resilience and 3) information resilience. Fitriasari (2020) described an SME business model to apply during the COVID-19 pandemic. Klein and Todesco (2021) outlined a conceptual model about organizational resilience. Their work is based on a solid literature search investigating the responses of SMEs in the COVID-19 crisis. By screening related literature, they introduced several challenges an SME could face during the pandemic. Their focus was to examine how SMEs are responding to the COVID-19 crisis. In addition, they investigated the opportunities and challenges from the responses.

Verhoef et al. (2021) proposed a research agenda for digital transformation. In addition, they identified external factors that have strengthened the need for digital transformation and discussed strategic imperatives that result from digital transformation. Pelletier and Cloutier (2019) listed challenges of digital transformation in SMEs from an ecosystem perspective. In their literature review, Muditomo and Wahyudi (2020) presented a conceptual model for SMEs digital transformation during the COVID-19 pandemic in Indonesia. Priyono et al. (2020) identified three digital transformation paths for SMEs during the COVID-19 pandemic. Winarsih et al. (2021) proposed a conceptual framework examining the impact of COVID-19 on digital transformation and survival in SMEs. Guo et al. (2020) presented implications from a COVID-19 survey regarding the digitalization and public crisis responses of SMEs. Van den Born et al. (2020) examined the dynamics of digital maturity of SMEs, focusing on 1) its impact on digital innovation, and 2) the effect on organizational survival and success during COVID-19 pandemic in the Netherlands.

3 Research method

The research started with the literature review to explore the COVID related experiences, especially in the SME sector. The review helped to develop the initial questionnaire, and planning interviews for case studies. The research combines the case-study based qualitative approach, with the surveys based quantitative data analysis. The collected data allows preliminary SEM modelling to explore the relationship between the different variables.

Survey data was collected among Hungarian companies. The survey was an extension of the annual survey of our research group, analysing the digital practices of the Hungarian companies. Related to this survey, the Hungarian CIO Association was a strong partner to distribute the survey, and to encourage their network to participate in it. Therefore, the surveyed companies have an increased interest in digital technologies – regardless their digital maturity.

Data were collected in 2021 Q3, after the 3rd wave of the pandemic in Hungary, during a very quick period. During data analysis and interpretation of data, the consequences of the belief adjustment model (Hogarth and Einhorn, 1992) have been considered. We had to face the recency bias of the given answers: surveyed companies reflected the situation of the data collection and played down challenges in previous waves. Therefore, the still existing challenges are oversized, and the past challenges seem to be less important. As a consequence of recency bias Likert scale averages are less useable to compare values, but able to represent scale in question groups. Moreover, Likert scale average of questions groups can help us to identify current and past challenges.

4 Findings

Through the survey 120 answers were collected. Respondents work in large or small and medium-sized enterprises. The first two sections provide a holistic overview of the impact of Covid-19 challenges on these companies and their technological responses. The sample is not representative but gives opportunities to highlight interesting correlations between variables. These findings will be considered while designing the following questionnaire.

4.1 Covid-19 Challenges

In general, companies surveyed felt the negative effects most strongly in turnover, with nearly 40% of respondents reporting a decline, and a similar proportion reporting some level of reduction in their investments and development (Fig.1). The least affected was the number of partners and suppliers. After the third wave, most respondents indicated that the structural difficulties related to the operation of companies had not significantly affected their management of the crisis, and the challenges related to changing customer expectations were also mostly manageable.

The technological knowledge to cope with the crisis was more or less available in almost 62% of companies.

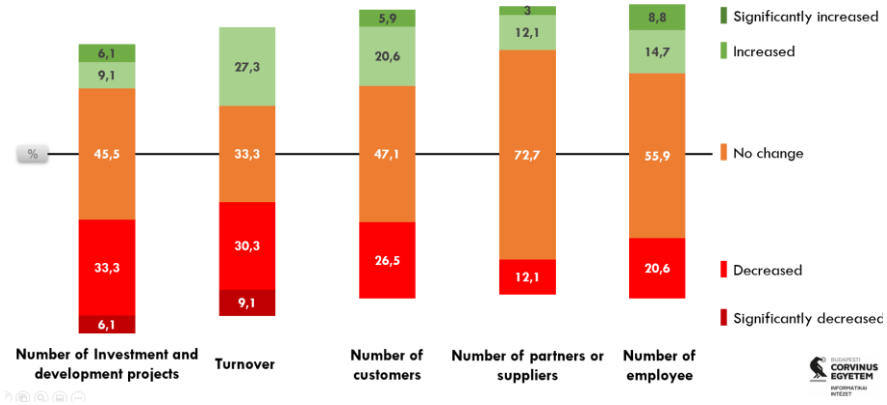

Figure 1: COVID-19 challenges

In dealing with customers, physical constraints were the main challenge. In addition, 38% of companies reported having to adapt to changing customer needs. To the greatest extent (and valid still today), disruptions in supply chains affect companies' operations: foreign and domestic suppliers are often unable to meet deadlines, it is difficult to find new suppliers and, ultimately, to serve their own customers.

4.2 Technological responses

Following the first wave of the pandemic, and after a significant number of companies had been able to switch to remote work, the general expectation was for IT budgets to fall by at least 2 years. Gartner's analysis (Lovelock et al, 2021) predicted a very significant expansion of 8-10% in 2021 after stagnation in 2020. This phenomenon is due to two key factors: first, the global economy has stabilised in most countries after a significant downturn, and GDP is expected to return to pre-crisis levels between 2021-2022. Second, the experiences from the previous year survey have shown that IT solutions are not only needed but can also open new opportunities: internationally, 65% of companies have increased their digital development budgets and 44% of companies have increased their staff in digital areas - far outstripping the growth in other areas. Expectations for 2021 in Hungary

are cautious for the time being, with IT budgets growing in line with the economic situation of companies. As we perceived earlier, the forced digital transformation caused by the epidemic did not come as a complete surprise to companies. Although they did not expect such a scale, most technology solutions were available before the crisis and the challenge was mostly to scale them up as experience gained. Not surprisingly, the most important area for development in the short term is the development of communication technologies (65.5% of respondents). The pandemic has also led to a strong focus on electronic identity management solutions (52%) and mobile IT solutions (48%). Although the most popular technologies of previous years lost their momentum, business, and artificial intelligence developments (45% and 35%, respectively) and cloud technology development (38%) remained significant. An important outcome of the crisis is the significant emergence of digital solutions in the minds of business decision-makers: while funding for development is increasing, the need to develop digital skills and knowledge has also been identified. On international level, this digital development is accompanied by the development of new digital business solutions and models. In Hungary, the signs of this trend are still only emerging.

4.3 Experiments

After cautious clearing of data, 47 SMEs data were selected to run the detailed analysis. For initial SEM modelling these companies served as sample data.

Challenges, responses, and technological objectives were measured on ordinal scales, hence Spearman correlations based on pairwise complete observations were calculated. The following figure (Fig. 2) presents correlations accepted above 95% significance level. Due to the low number of respondents, the correlations are not so strong. Sales revenue and factors measuring business impact on investment projects, employees, transactions, and partners are correlated with each other. The business impact on the partners' number is negatively correlated with the usage of CRM system, social media integration and the planning of future AI projects, but this relationship is very weak. It is interesting that companies possessed workflow management or used cloud computing services are interested in digitalization projects in different field (business intelligence (BI), artificial intelligence (AI), unified communication, or electronic personal ID) in the future. An initial Partial Least Squares Structural Equation model (PLS-SEM) model was developed to

validate if the questionnaire could be used to understand the relationship between various constructs, and eventually the impact of COVID-19 pandemic.

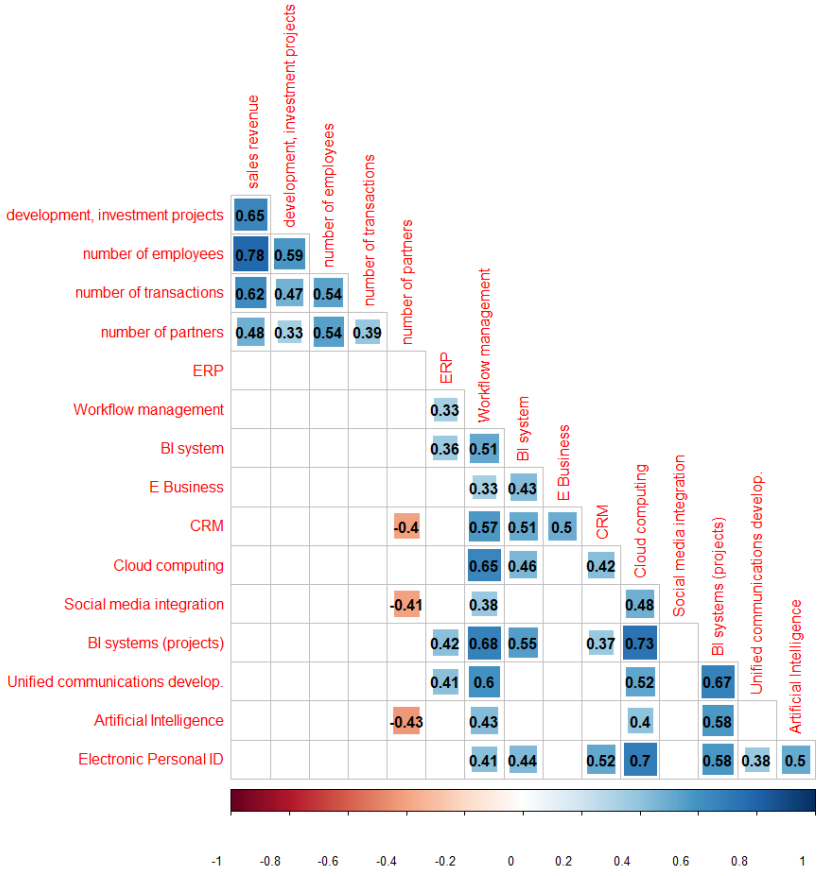

Figure 2: Sperman correlations on SMEs data

The model was formulated using SMARTPLS3 software (Ringle et al, 2015). The following simple model utilises three sets of questions: 1) the impact of COVID-19 on the business where the scale has been modified that the higher numbers express negative impact. 2) the existence and use of various IT systems and 3) the likelihood and the certainty of the implementation of various IT related projects. The first construct "negative covid business impact" was measured on a 1 – 5 Likert scale, where 1 would represent significant positive impact, while 5 would represent significant negative impact. It was modelled as a reflective measure, supported with strong correlation between the measurement variables. The second construct

"available IT systems" was originally measured on a 1 – 4 scale, where 1 represented that the system is available and being used, 2, that the system is not available but planned, 3 that the system is available but being upgraded while 4 that the system is not available and planned either. It has been recoded to a binary scale, where 0 represents that the system is not present, while 1 represent that the system is present and being used. This was also modelled as a reflective construct, although the correlations between the measurement variables are not as strong as for the business impact construct. Finally, the third construct, "certainty of IT projects" was modelled as a formative construct and measured on a 1 – 4 scale indicating if and when the project is planned to be implemented. The final coding is such, that 1 represents that the IT project is not planned to be implemented, 2 that it is planned to be implemented in the next 3-5 years, 3 that in the next 1-3 years and 4 that it is planned to be implemented in the next year.

The model consisted relatively small number of samples, only 47 observations with some missing data. The reflective constructs were internally consistent with good Chronbach's alpha measures. The average variance extracted (AVE) measures were also acceptable. The outer loadings of the reflective constructs on the other hand were not as good: E-Business, ERP and the number of employees measurements had less than the required 0.7 value. The assessment of the formative construct would require different measures. The collinearity statistics showed that the variance inflation factors (VIF) were all acceptable, however the outer loadings would question the inclusion of certain measurements: the projects related to artificial intelligence, social media integration and unified communication. In summary, even these small number of samples were sufficient to build a model, that could be accepted as a valid one. The path coefficients of the mode show, that the availability and the use of IT systems could have mitigated the negative impact of the COVID-19 pandemic, however, the coefficient of determination is small, therefore other factors could be more relevant than this. The other finding is that those businesses that were negatively impacted with the COVID-19 pandemic are not as forthcoming with the implementation of their IT projects. However, those businesses that use more IT systems are more willing to develop them further. The coefficient of determination for these two constructs jointly could have a strong influence on the implementation of new IT projects.

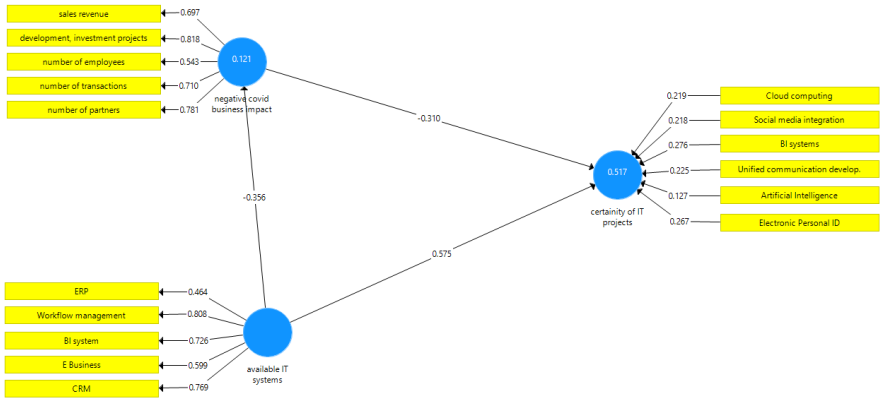

Figure 3: **PLS-SEM model as initial experiment**

5 Conclusion

The aim of our research under the umbrella of 2019-2.1.11-TÉT-2020-00172 project is to explore how Hungarian SMEs were facing challenges of the COVID-19 situation and using digital technologies to overcome these challenges, what were the changes which reflected in their operations. Several other studies have also been conducted to explore the behaviour of companies in relation to digitalisation or the COVID-19 pandemic. This paper presented initial findings of a survey on Hungarian companies. The results are not representative but provide an opportunity to test the exploratory power of these questions. The section presenting our findings was split into two parts. The first part coped with responses from large companies as well, the second part dealt with only SMEs' data. Our preliminary findings underpinned the phenomenon identified by other researchers, meaning lack of financial resources and disruption in supply chain were big challenges for companies. Especially for SMEs, it was stated that the use of IT systems could have mitigated the negative impact of the COVID-19 pandemic, but other factors can also play a key role in it. Launching digitalization projects are not a first priority by the SMEs suffered from COVID-19, but companies supported by digital technologies earlier are willing to do it. Finally, we can state that several questions from the survey are applicable to identify symptoms triggered by the COVID-19 pandemic in the life of the company.

Acknowledgements

The publication was prepared within the „Impact of COVID-19 pandemic on SMEs digital transformation journey", Slovenian - Hungarian scientific and technological cooperation Project No. 2019-2.1.11-TÉT-2020-00172 has been implemented with the support provided from the National Research, Development and Innovation Fund of Hungary.

References

Bartik, A. W., Bertrand, M., Cullen, Z. B., Glaeser, E. L., Luca, M., Stanton, C. T. (2020). How are small businesses adjusting to covid-19? Early evidence from a survey (No. w26989). National Bureau of Economic Research Inc, https://www.nber.org/papers/w26989.pdf.

Brussevich, M., Dabla-Norris, E., Khalid, S. (2020). Who will bear the brunt of lockdown policies? Evidence from Tele-workability Measures Across Countries, https://www.imf.org/en/Publications/WP/Issues/2020/06/12/Who-will-Bear-the-Brunt-of-Lockdown-Policies-Evidence-from-Tele-workability-Measures-Across-49479.

Casalino, N., Żuchowski, I., Labrinos, N., Munoz Nieto, Á. L., Martín, J. A. (2019). Digital Strategies and Organizational Performances of SMEs in the Age Of Coronavirus: Balancing Digital Transformation with an Effective Business Resilience, LAW AND ECONOMICS YEARLY REVIEW, Vol. 8 – Part 2, 347-380.

Eggers, F. (2020). Masters of disasters? Challenges and opportunities for SMEs in times of crisis. Journal of Business Research, 116, 199–208. https://doi.org/10.1016/j.jbusres.2020.05.025.

Fitriasari, F. (2020). How do Small and Medium Enterprise (SME) survive the COVID-19 outbreak?. Jurnal Inovasi Ekonomi, 5(02).

Guo, H., Yang, Z., Huang, R., 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.

Hogarth, R. M., Einhorn, H. J. (1992). Order effects in belief updating: The belief-adjustment model. Cognitive Psychology, 24(1), 1–55. https://doi.org/10.1016/0010-0285(92)90002-J.

Humphries, J. E., Neilson, C., Ulyssea, G. (2020). The evolving impacts ofCOVID-19 on small businesses since the CARES Act, https://econpapers.repec.org/paper/ cwlcwldpp/2230.htm.

Klein, V. B., Todesco, J. L. (2021). COVID-19 crisis and SMEs responses: The role of digital transformation. Knowledge and Process Management, 28(2), 117-133.

Lovelock, J. D., Wang, L., O'Connell, A., Atwal, R., Graham, C., Amarendra ., Betskov, G., Fernandez, M. (2021). Gartner Market Databook, 4Q21 Update, Gartner, ID: G00763023.

Lu, Y., Wu, J., Peng, J., Lu, L. (2020). The perceived impact of the Covid-19 epidemic: evidence from a sample of 4807 SMEs in Sichuan Province, China. Environmental Hazards, 19(4), 323-340.

Muditomo, A., Wahyudi, I. (2020). Conceptual Model for Sme Digital Transformation During the Covid-19 Pandemic Time in Indonesia, Journal of Business and Entrepreneurship, 3(1), 13-23.

Organisation for Economic Co-operation and Development (OECD) (2020). Coronavirus (COVID-19): SME policy responses, https://www.oecd.org/coronavirus/policy-responses/coronavirus-covid-19-sme-policy-responses-04440101/.

Pelletier, C., Cloutier, L. M. (2019). Challenges of digital transformation in SMEs: Exploration of IT-related perceptions in a service ecosystem. In Proceedings of the 52nd Hawaii international conference on system sciences, 4967-4976.

Priyono, A., Moin, A., Putri, V. N. A. O. (2020). Identifying digital transformation paths in the business model of SMEs during the COVID-19 pandemic. Journal of Open Innovation: Technology, Market, and Complexity, 6(4), 104.

Ringle, C. M., Wende, S., Becker, J. M. (2015). Smartpls 3. Bönningstedt: SmartPLS. http://www.smartpls.com.

Sandberg, S., Stanford, J., Buttle, R. (2020). State of small business report. [White Report]. Facebook & Small Business Roundtable, https://dataforgood.fb.com/wp-content/uploads/2020/05/SMBReport.pdf.

Tosheva, E. (2020). Covid-19 Crisis as an Accelerator of Digital Transformation and Digital Economy, in: International Scientific Conference "Towards a Better Future: Human Rights, Organized Crime and Digital Society", Conference Proceedings, Vol. I, 179-187.

Van den Born, A., Bosma, B., Van Witteloostuijn, A. (2020). The effect of digital maturity on digital innovation under extreme adversity. https://osf.io/r6c5j/download.

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889-901.

Winarsih, I. M., Fuad K. (2021). Impact of Covid-19 on Digital Transformation and Sustainability in Small and Medium Enterprises (SMEs): A Conceptual Framework. In: Barolli L., Poniszewska-Maranda A., Enokido T.(eds) Complex, Intelligent and Software Intensive Systems. CISIS 2020. Advances in Intelligent Systems and Computing, vol 1194. Springer, Cham. https://doi.org/10.1007/978-3-030-50454-0_48.