LUT University

RESILIENCE OF FINNISH SMEs: THE ROLE OF DIGITAL CAPABILITIES TO OVERCOME THE GLOBAL CRISIS

Case COVID-19

ABSTRACT

Resilience of Finnish SMEs: the role of digital capabilities to overcome the global crisis – case COVID-19

The pandemic of COVID-19 has influenced almost all of us somehow, as wide lockdowns and strict restrictions brought countries, businesses, and people one at a time making sudden halts. Unexpected changes in business environment required firms making rapid developments in their operations to adapt to new circumstances. One of the strategies of firms to manage and respond to the fundamental changes caused by COVID-19, has been relying on and increasing digitalization, as it offers more flexible business management and working arrangements in the era of social distancing and remote work.

The purpose of this thesis is to study and understand the role of digital capabilities in the resilience of Finnish small and medium-sized enterprises' (SMEs) during COVID-19, and how digital transformation has enabled firms to respond to the uncertain situations. Resilience is examined from the perspectives of digitalization and digital capabilities, and these are studied in the context of the pandemic of COVID-19. A literature review was conducted as a theoretical part of the study, supporting the later empirical part. The data for the empirical part of the research was collected through a survey, which sampled Finnish SMEs operating in the industries of manufacturing, retail, and wholesale.

The results of the study indicate that digital capabilities are positively associated with firms' resilience, and digital capabilities have had a significant role for firms to manage the crisis. Further, the results find a positive impact of technology on firms' ability to manage the effects of the pandemic, and recognize three main ways for utilizing technology to survive from the rapid and unexpected event. The findings highlight that digital capabilities have improved firms' resilience in COVID-19, and therefore this study suggests that firms should better aim to recognize their strengths and shortages regarding their digital capabilities, and to more carefully integrate digitalization as a solid part of firms' operations. Embracing digital capabilities more extensively and transforming the business more digital would enable firms becoming more digitally mature, and thus more resilient in similar crisis in a future.

TIIVISTELMÄ

Milja Jumppainen

Digitaalisten kyvykkyyksien merkitys suomalaisten pk-yritysten resilienssille globaalista kriisistä selviytymisessä – case COVID-19

Koronaviruspandemia (COVID-19) on vaikuttanut lähes jokaiseen meistä esimerkiksi kokoontumisrajoitusten, kontaktien välttämisen ja etätöiden kautta. Odottamattomat ja äkilliset muutokset liiketoimintaympäristössä vaativat yrityksiltä ja organisaatioilta nopeita toimia uusiin olosuhteisiin sopeutumiseksi. Monet yritykset alkoivatkin hyödyntää digitaalisia ratkaisuja entistä voimakkaammin, koska digitalisaation koettiin tarjoavan joustavampia työskentelytapoja ja työjärjestelyjä aikana, jolloin työskenneltiin laajalti kotoa käsin ja kollegoihin ja asiakkaisiin pidettiin yhteyttä pääasiassa puhelimitse tai tietokoneen välityksellä.

Tämän tutkimuksen tarkoituksena on tutkia digitaalisten kyvykkyyksien roolia suomalaisten pienten ja keskisuurten yritysten (pk-yritykset) kriisinsietokyvyssä ja kestävyydessä (resilienssi) COVID-19 -pandemian aikana sekä ymmärtää, miten digitaalinen transformaatio on auttanut yrityksiä reagoimaan tällaisiin epävarmoihin tilanteisiin. Resilienssiä tarkastellaan digitalisaation ja digitaalisten kyvykkyyksien näkökulmien kautta COVID-19-pandemian aikana. Tutkimuksen aluksi tehtiin kirjallisuuskatsaus, joka tukee empiiristä osiota. Empiirisen osan tutkimusaineisto kerättiin strukturoidulla kyselyllä, jonka kohderyhmänä oli suomalaiset pk-yritykset teollisuuden, vähittäiskaupan ja tukkukaupan toimialoilta.

Tutkimustulokset osoittavat, että digitaalisilla kyvykkyyksillä on positiivinen yhteys yritysten resilienssin kanssa ja digitaalisilla kyvykkyyksillä on merkittävä rooli yrityksille niiden taklatessa koronakriisin vaikutuksia. Teknologia tukee yrityksiä kriisin vaikutusten hallitsemisessa, ja selviytyäkseen ennakoimattomasta tilanteesta, yritykset hyödyntävät teknologiaa pääasiassa kolmella tavalla. Tulokset osoittavat, että digitaaliset kyvykkyydet ovat parantaneet yritysten resilienssiä COVID-19 –pandemian aikana, ja siksi yhtenä johtopäätöksenä ehdotetaan, että yritysten tulisi paremmin pyrkiä tunnistamaan omien digitaalisten kyvykkyyksiensä vahvuudet ja puutteet. Lisäksi nähdään, että digitalisaatio tuli integroida entistä vahvemmin ja kiinteämmäksi osaksi yritysten toimintaa ja prosesseja. Digitaalisten kyvykkyyksien kehittäminen ja liiketoiminnan vahvempi digitalisointi voisi auttaa yrityksiä tekemään itsestään digikypsän ja siten paremmin resilientin samanlaisen kriisin iskiessä tulevaisuudessa.

ACKNOWLEDGEMENT

Oh wow. I guess that at last, it is safe to say, that the work is over. And I did it!

I usually like to go forward and not look back that much, but having my thesis completed requires that I write few words to thank everyone who has helped me over these past two, seven, and twenty-something years.

I need to begin by thanking my supervisors & examiners: **Mikko Pynnönen & Luke Treves.** Without your guidance and valuable comments, the outcome would have not been the same. Thank you for having patience with my numerous questions.

Kuvanz bellas, I am extremely grateful for always having you in my corner. Thank you.

Äiti, Salla, Joona, mummi(t) ja papat. Thank you for your unwavering belief in me. Doctoral hat awaits.

J. You are by far my biggest supporter. Thank you.

In Helsinki, 24.10.2022

Milja Jumppainen

Symbols & abbreviations

COVID-19	The pandemic of coronavirus disease 2019
EU	European Union
DCs	Dynamic Capabilities
SMEs	Small- and medium-sized enterprises
DT	Digital transformation
IoT	Internet of Things
AI	Artificial Intelligence
AR	Augmented Reality

Table of contents

Abstract

Acknowledgements

Symbols and abbreviations

FIGURES

TABLES

1 Introduction

"Uncertainty is the only certainty there is, and knowing how to live with insecurity is the only security." – John Allen Paulos.

The world has faced numerous different crises in the history, and the scope of them have differed from global shocks to more local challenges. To mention a few examples of crises from the 20th and 21st centuries, we have witnessed several wars, threat of new diseases, natural disasters, environmental problems, and economic decline and depression. These crises are only a few from the past, and new ones are already happening. In this study, we explore the pandemic of COVID-19 as the example of global crisis.

Global challenges have an influence on countries' political, economic, socio-cultural, environmental and other issues, on which the future rests (World Economic Forum 2018). In general, the crises have negatively affected the global economy through reduced capital flows, due to increase in prices and reduce in availability of financing, thus resulting declines in investments and trade (OECD 2020a). In Finland, the economic impacts of COVID-19 were significant, although Suomen Pankki (Euro & talous 2019) had estimated already before the pandemic entered Finland any broader, that the economic growth in Finland would slow down over the next three years due to international and domestic reasons. At the end of 2021, Suomen Pankki (Euro & talous 2021) forecasted that Finnish economy had recovered from the deep slump rather quickly and some economic growth was expected in upcoming years. Recently Suomen Pankki (Bank of Finland Bulletin 2022) has analyzed that despite good economic growth in the beginning of 2022, economic trends have and will weaken due to difficulties in global economy, as the war increases uncertainty, exacerbates supply shocks and raises the prices of raw material, food and energy. Rapid changes in operating environment and uncertain circumstances have brought firms new challenges and during COVID-19, we have witnessed one of the most peculiar periods for a long time. This has been a time when organizations have been forced testing their ability to adjust themselves to their new operating environment.

These uncertain years and rapid changes in our daily operations and activities raised the interest in designing a thesis about studying, how Finnish SMEs have modified their activities to survive from the pandemic of COVID-19. The publications of Suomen Pankki

(Euro & talous 2019; Euro & talous 2021; Bank of Finland Bulletin 2022) imply that Finnish firms have been able to recover from the shocks and thus it could be considered, that firms have been adaptive and resilient ahead of unexpected events. But have they? And if so, why? It is challenging, or even impossible, to come up with one exact answer. Digitalization has considered being one solution, and many governments and businesses indeed have taken great digital leaps during COVID-19 (e.g., Strusani & Houngbonon 2020 in International Finance Corporation 2021; LaBerge, O'Toole, Schneider & Smaje 2020). This is because digital solutions have helped keeping societies and businesses afloat and filling the gaps of strict restrictions, wide lockdowns, and social distancing by enabling to establish new ways of operating, such as remote work, omnichannel commerce, and platformification (BDO 2020). In this study, digitalization is regarded as the practice of improving firm's processes by leveraging digital technologies and digitized data (e.g., Setia, Venkatesh & Joglekar 2013). As a result, this thesis is interested in to examine, how digital transformation specifically has strengthen firms' resilience in crisis.

1.1 Background

The coronavirus disease 2019 (COVID-19) shut down the world in March 2020, when The World Health Organization declared it global pandemic (WHO 2022). As it has been learned from the news, publications and articles, the impact of COVID-19 has been different between the countries and industries (e.g., The World Bank 2021). In Finland, the government declared a state of emergency over COVID-19 outbreak in March 2020, and thus almost all gatherings and events (whether related to leisure, work, or hobbies) were recommended to be avoided, or the number of people allowed to join was restricted (Finnish Government 2020). COVID-19 has influenced almost every one of us somehow, as restrictions around the world brought countries one at a time, businesses, and people to make abrupt halts. These rapid changes in society and new consumer demands brought the Finnish government, firms and people new challenges, which required all of us to adapt to new circumstances and enabled, for example, establishing new ways of communicating with each other (Nyström 2021). The lockdown and strict restrictions forced almost all Finnish firms and individuals to reconsider their ways of operating and working, which accelerated the speed of digitalization for its part (e.g., Varanka et al. 2022). For instance, business was

required to be transferred online, due to shut downs of offices and brick and mortar stores (Tulevaisuusvaliokunta 2020; Nyström 2021).

According to Finnish Industry Investment Ltd (TESI 2020a), COVID-19 has significantly complicated and influenced on firms' operations, yet Finnish SMEs have been more resilient than anticipated during the pandemic. TESI is Finnish state-owned investment company that wants to raise Finland to the forefront of transformative economic growth by sharing financial risk, accelerating international growth, and believing in active ownership (Suomen Teollisuussijoitus 2020), and it regularly publishes new research-based information regarding the market situation and market structures. According to the findings of TESI (TESI 2020b), Finnish SMEs in all sectors have, for instance, greatly adapted their operations during COVID-19 by boosting sales, targeting new customer segments, or discovering new ways of delivering products and services to customers through digital channels. Overall, the role of digitalization and digital tools for the Finnish firms' resilience and ability to survive better through the pandemic have been recognized (Varanka et al. 2022).

In general, the strategies for businesses' survival have been diverse across industry sectors, as well as even between firms: some have restricted their operations (e.g., hospitality; Gursoy & Chi 2020), while others have established new ways of doing things (e.g., banking, grocery; Baig, Hall, Jenkins, Lamarre & McCarthy 2020). COVID-19 has influenced on firms' daily operations, and challenged previously normal working methods, requiring firms to revise their existing business models to adapt into changing environmental conditions and consumer demands (Khan 2022). Increasing organization's digitalization has been considered being appropriate response to the COVID-19, as the adoption of digital technologies has enabled firms to prevent and better manage the effects of the pandemic (Eurofound 2021a). Utilizing digital technologies has been considered making things easier, comfortable and flexible in the environment, where people have been asked to work remotely and keep a distance from each other. Moreover, digitalization has offered more flexible business management and work arrangements, and it also makes firms better placed to adopt innovations in the post-pandemic period. (Eurofound 2021a)

Based on this background, the objective of this study is to find out, what has been the role of digital transformation in Finnish SMEs' resilience during the times of COVID-19, and how technology has enabled firms to respond to the uncertain situations. The study aims to

recognize how Finnish SMEs have utilized their internal digital abilities in survival, and how these together with digital technologies have supported firms to maintain their functionality. Additionally, this project aims to research the degree of digitalization of the firms before, during and after the pandemic to find out when Finnish firms have adopted digital technologies the most actively.

1.2 Objectives and delimitations

Against the background introduced above, the objective of this thesis is to study and understand the role of digital capabilities in Finnish small and medium-sized enterprises' (SMEs) resilience during the times of unexpected crisis, and how digital transformation has enabled firms to respond to the uncertain situations. The interest of the topic originated from the current situation in the global operating environment, in which resilience plays a significant role. In this study, resilience is examined from the perspective of digitalization because in the 2020s, technology is becoming implemented in everything (Sitra 2019) and rapid and sustained technological change is certain (Project Management Institute 2022).

Specifically, this thesis studies the role of digital capabilities in Finnish SME's resilience during the recent COVID-19 pandemic. The pandemic of COVID-19 was chosen as a 'case crisis' of the research, because of its nature as a global challenge, and which has had an influence on all sectors, but also because of the suggestions provided in the previous literature. For example, Gamage, Ekanayake, Abeyrathne, Prasanna, Jayasundara & Rajapakshe (2020) suggested, that COVID-19 should be considered as an additional challenge to investigate the possible short-term and medium-term actions of SMEs: how those deal with the challenges during a crisis, and take advantage of opportunities arising due to the pandemic. Therefore, this research adopts the survey approach and examines the pandemic as one unexpected event. As will be introduced later, the literature and previous studies highlight, that the role of digital technologies for the survival of firms during the pandemic have been great all around the world. Therefore, it can be expected that also this study will find similar results and explore great number of digital leaps and digitalization actions among Finnish SMEs. However, as pointed out in the literature, there are heterogeneity of dynamic capabilities across firms and especially between industries (e.g., Jantunen, Ellonen & Johansson 2012), and therefore it might be challenging to be able to

provide larger conclusions from this study, especially when target firms are from different industries.

The pandemic of COVID-19 have affected most of the industries somehow, but due to, for example, limited timeframe for conducting this research, not all industries can be studied and considered. According to Gandhi, Khanna & Ramaswamy (2016), not all industries have been digitalized as much, and there can be seen differences between industries in Europe (e.g., Novak, Purta, Marciniak, Ignatowicz, Rozenbaum, Yearwood 2018). Therefore, and to make the study more manageable and relevant to the objectives, the study has been limited focusing on only few industries. Moreover, as the author is located in Finland, it was reasonable to focus on studying Finnish SMEs only. This was seen justified, as examining all industries and firms from a global perspective would have provided too broad results and recommendations. Therefore, this research is limited to focusing on the traditional industries that are important to Finland's economy. The survey of Finnish Industry Investment Ltd (TESI 2020a) investigating Finnish SMEs on different industries and their resilience during the COVID-19 crisis, and the analysis of Larja & Räisänen (2019) were exploited to recognize potential industries for the research. Based on the survey and analysis (TESI 2020a; Larja & Räisänen 2019), to limit the scope of the study, only three industries were chosen. Thus, the study covers and considers only industries of manufacturing, wholesale and retail.

1.3 Research Gaps

The scoping review of literature portrays that research has been made regarding the organizational resilience in crises, and what role digitalization and technology have played in organizations' strategic planning & operational development in crisis (e.g., Papadopoulos, Baltas & Balta 2020; Guo, Yang, Huang & Guo 2020; Zutshi, Mendy, Sharma, Thomas, Sarker 2021; Cugno, Castagnoli, Büchi & Pini 2022). Overall, the studies examining the relationship between digital transformation and strategic management are at an early stage (Rêgo, Jayantilal, Ferreira & Carayannis 2021) or studies lack the exploration of an effect mechanism of firms' digital transformation for organizational resilience (Zhang, Long & von Schaewen 2021). Moreover, quite limited research have been conducted about the role of digital transformation in building organizational resilience (He, Huang, Choi & Bilgihan

2021), even though it seems that the number of studies is increasing. For example, the recent study of Corvello, Verteramo, Nocella & Ammirato (2022) highlights digital technologies' positive impact in developing antifragility. Additionally, the relationship of organizational resilience and digital maturity of specific industries has still been only sparsely studied (Botha, Walker, Wordsworth & Balzarova 2022), which raised the interest of focusing on few specific industries only. The review of literature highlights few research gaps that are relevant for the topic of this research. For example, the usage of digital technologies for coping with the consequences of extreme events has not been found out explicitly (Papadopoulos et al. 2020). Moreover, even though firms' dynamic capabilities have been recognized being a solution to public crisis responses, the ways how SMEs should build and exploit dynamic capabilities in crisis like COVID-19 remain unclear (Guo et al. 2020). Further, only recently has been proposed a framework for building dynamic capabilities for digital transformation (Warner & Wäger 2019), which implies that the topic will need further research.

1.4 Research questions

The main objective of the study is to find out, how and what kind of digital capabilities have supported Finnish SMEs to tackle and survive through the pandemic of COVID-19. To be able to carry out research with good quality and to be able to reach these mentioned objectives, proper research questions are needed.

The main research question is formulated as follows:

RQ: What has been the role of digital capabilities to overcome the crisis of COVID-19?

This research question aims to find out and make conclusions about the phenomenon, and provide wider recommendations for firms, which could be utilized in a future and for the later research. Two sub-questions are formed to support the main research question and to approach the main research question from more practical perspective:

RQ1: How is technology utilized in managing the crisis?
RQ2: How could firms better utilize digital capabilities to react to similar crises in the future?

Together these research questions are expected to complement existing literature by providing some viewpoints of the relationship of organizational resilience and digital capabilities in specific industries.

1.5 Key concepts

The research aims to base its theoretical background on three major constructs: (1) *dynamic capabilities* (e.g., Teece & Pisano 1994; Teece, Pisano & Shuen 1997); (2) *organizational resilience* (e.g., Vogus & Sutcliffe 2007); and (3) *digital transformation* (e.g., Warner & Wäger 2019). These key concepts will be considered especially from the perspective of SMEs. The literature review will serve as a background for the research, and it will be discussed more carefully in the next chapters.

Dynamic Capabilities (DCs)

This thesis uses the dynamic capability view (DCV) by Teece (1997) to understand and describe the internal digital dynamics and capabilities that are related to organizational renewal in times of crisis. Teece (2007) defines DCs as capabilities that *"enable firms to create, deploy, and protect the intangible assets that support superior long-run business performance"*. Firms, who are able to develop strong DCs, are better at innovating and creating new business models, and reinventing themselves and their resources, thus staying ahead of rivals (Helfat & Peteraf 2009; Schoemaker, Heaton & Teece 2018).

Organizational Resilience

In North & Varvakis (2016), "organizational resilience" is explained as the firm's capability to develop strategic actions that maintain and adapt the organization in their environment, which demonstrates a positive impact on organizational performance overall. In general, literature considers organizational resilience as firm's capacity to adapt successfully when facing disturbance, stress, or adversity (Alonso, Kok, Bressan, O'Shea, Sakellarios, Koresis, Solis & Santoni 2020). Based on this, organizational resilience could be seen being strongly related to the firm's DCs.

Digital transformation

Digital transformation is described as an ongoing process of using new digital technologies in firm's everyday life (Warner & Wäger 2019). Digital transformation means a change in

firm's business strategy, since firm digitalizes its tools and applications to automate systems, to optimize processes and to empower people to improve the business performance (e.g., Yokogawa 2021). Digital transformation goes beyond digitalization, which is considered as the implementation of digital technologies (Setia et al. 2013). To summarize, digitalization refers to enabling or improving firm's processes by leveraging digital technologies and digitized data, while digital transformation is a business transformation that is enabled by digitalization.

In the context of this study, following the previous definitions in the literature, the main concepts are regarded as follows. *Resilience* is firm's ability to cope, learn, adapt to and maintain its functionality during unexpected circumstances. *Dynamic Capabilities (DCs)* are considered as firm's orientation and ability to respond to the needs for strategic renewal by purposefully creating, extending and modifying resources and processes to adapt to changing and turbulent environment. *Digital Transformation* is regarded as a comprehensive change in terms of how firm's processes and operations are executed.

1.6 Small- and Medium-sized Enterprises (SMEs)

Small and medium-sized enterprises (SMEs) are defined as non-subsidiary, independent firms that employ less than a certain number of employees and whom financial assets are on below the specific level. In the European Union (EU), the upper limit designating an SME is 250 employees, and either SMEs' annual turnover do not exceed EUR 50 million, or an annual balance sheet in total does not exceed EUR 43 million. (OECD 2005)

It is widely recognized that SMEs make a significant contribution to national economies by forming the backbone of most economies (e.g., Macpherson & Holt 2007; Kilimis, Zou, Lehmann & Berger 2019; The World Bank 2022). The number of SMEs is already high and still increasing in the region of the EU (e.g., Clark 2021), and therefore this study wants to put a research focus on SMEs. Even though SMEs (less than 250 employees) account the most of all enterprises in Finland (e.g., Suomen Yrittäjät, Finnvera Oyj & työ- ja elinkeinoministeriö 2022), SMEs are the most vulnerable to suffer from business slowdowns due to their financial fragility, smaller capital reserves and smaller networks, and fewer number of partners (OECD 2020b). Therefore, and due to SMEs' importance for economies,

more understanding is needed about the speed and the ability of SMEs to recover from the global crisis (Cugno et al. 2022).

1.7 Methodology

The explanation of methodology with more detailed information is discussed during the upcoming chapters. As highlighted earlier, the objective of this research is to find out, what has been the role of digital capabilities in Finnish SMEs' resilience during the times of crisis, and how digital transformation has enabled firms to respond to the uncertain situations. The pandemic of COVID-19 is the empirical context of the study, the object is Finnish SMEs, and the industries investigated in the context of COVID-19 are manufacturing, retail, and wholesale.

A scoping review of literature was conducted to serve as a theoretical background of this study. The objective of the review was to conduct a general overview of the topic, which served as a basis for the research. Objectives included understanding the responses that firms have made to tackle the crises, what has been the role of organizational resilience for firms' success in the crisis, and what has been said about the use of digital technologies – how digital capabilities may have enabled firms to respond to the crises or what have been their role in firms' ambitions in strategic development. Material gathered from the scoping review included mostly peer-reviewed academic articles, and other materials completing the theoretical basis included conference papers, industry reports and book chapters. Conducted review exposes that studies have considered firms' practical responses to the uncertain events (e.g., Doern 2021, Mithani & Kocoglu 2020, Conz & Magnani 2020), and often the use of digital tools have been considered as an option to ensure businesses' continuity (e.g., Loureiro, Ferreira & Simões 2021; Zhen, Yousaf, Radulescu & Yasir 2021). Studies have also provided multiple findings regarding internal capabilities of firms that are important in carrying out digital transformation (Warner & Wäger 2019; Zhen et al. 2021). Even though both quantitative and qualitative research have been made, most of the studies (discovered in the review) have conducted either questionnaire surveys or interviews.

To fulfil the objectives of the research and to find answers to research questions, the overall strategy was to adopt the approach of quantitative research, and to conduct a survey to a sample of SMEs operating in the industries of manufacturing, retail, and wholesale. These

industries were chosen due to their importance to Finnish economy (e.g., TESI 2020a), and because it was expected to find differences between these industries in terms of their levels of digitalization. The survey aims to find out, how firms themselves assess and analyze their digital transformations and digital competences that have enabled them to survive from the pandemic. The survey used questionnaire that was partly established for this project and partly utilized existing statements in the literature. Survey provided topic-related statements that the respondents were asked to assess on the Likert Scale. Survey questionnaire is included in the appendices (Appendix 3). The collected data was summarized in terms of descriptive statistics, and the results were highlighted in tables and figures by using response frequencies. The relationships of variables were studied and analyzed through correlation, Kruskal-Wallis H test and regression analysis. Both benefits and limitations of approaches (data collection & analysis techniques) are recognized, and together with the validity and reliability, these are discussed within the research methodology.

1.8 Structure of the Study

This study contains seven chapters and is divided into two main sections: theoretical and empirical part (Figure 1). The first chapter introduces the topic and theme by summarizing the background and existing research gaps, which have been utilized in establishing the study and its research questions. Additionally, the first chapter briefly introduces the methodological premises and key definitions.

Theoretical part includes chapters two and three (Figure 1). The second chapter describes the literature review process in more detail, and chapter three explains theoretical framework and highlights the existing relevant literature regarding the key concepts of the study. This chapter serves as a basis for the study and justifies created research questions.

Figure 1: Study Structure

Empirical part of the study combines chapters four, five and six (Figure 1). The fourth chapter concludes the overall research process by describing the research approach and explaining used research methods. During methodology, the analysis of limitations and ethics, as well as validity and reliability are considered. Chapter 5 explains data analysis of the sample more carefully, and chapter six introduces and analyzes the findings of the study. Last chapter concludes the study by discussing theoretical and practical implications, limitations and possible future research paths.

2 Review of Literature

The methodology adopted in this study involved scoping review of literature. Scoping review is usually exploited if the body of literature is complex or has not been reviewed comprehensively before (Peters, Godfrey, Khalil, McInerney, Parker & Soares 2015). One recommendation for the definition of the scoping review is the following, formed by Heather, Colquhoun, Levac, O'Brien, Straus, Tricco, Perrier, Kastner & Moher (2014): "*A scoping review or scoping study is a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting and synthesizing existing knowledge.*" Scoping review was used to clarify working definitions and conceptual boundaries of resilience and the digital transformation in crisis (Peters et al. 2015). The scoping review of this study aimed to scan the literature on crisis events, resilience, and digital transformation, and identify key concepts and gaps in the research. A review of prior and relevant literature creates a firm foundation for academic projects (Webster & Watson 2002), and successfully done it allows clear conclusions to be reached about what is and is not known in existing studies regarding the specific topic (Denyer & Tranfield 2009). As a literature review is concept-centric, to accumulate knowledge on certain topic requires that the review is logically structured around the topic's key ideas (Webster & Watson 2002).

In the beginning of the project, preliminary topic investigation was conducted, after which scoping review of literature was carried out. The search was conducted during spring 2022 (mainly between January – April 2022). The review was restricted to published and peer-

reviewed academic articles, reviews and conference papers, which could be found with open access from the database of Scopus. Additionally, articles and studies published in the subject areas of business and management, and economics were prioritized. The chosen keywords and keyword combinations were searched from the titles, abstracts and keywords, and a search date and numbers returned were recorded. The protocol for the literature review is highlighted in Table 1. As more than 700 studies were found, exclusion criteria was needed to be included, in order to refine the search. The criteria for inclusion (Appendix 1) and exclusion (Appendix 2) can be found in appendices.

Parameter	Value
Research Questions	RQ) What has been the role of digital capabilities to overcome the crisis of COVID-19?
	RQ1) How is technology utilized in responding to/managing the crisis?
	RQ2) How could firms better utilize digital capabilities to react to similar crises in the future?
Objective of the overall study	To find out:
	• What has been the role of especially digital capabilities in firms' resilience during the times of crisis, and
	• How digitalization has enabled firms to respond to the uncertain situations?
Keywords (in title or abstract)	'strategic response', 'management', 'resilience', 'capabilities', 'SME', 'crisis'
Virtual base(s)	Scopus
Type of materials	Articles, reviews, conference papers
Year(s) of publication	2010–2022
Selection criteria	• Full-text studies available in English
	• Full-text studies published in conference proceedings and journals
Data extraction method	Language, subject area, document type, exact keywords [e.g., digital transformation added], type of access
Search refinement (cycles)	5
Total No. of articles analyzed	51 articles

Table 1: Research protocol for literature review (following Macpherson & Holt 2007)

The objective of the scoping review was to conduct a general overview of the topic, which would serve as a basis for the research. Objectives included understanding the responses that firms have made to tackle the crises, what has been the role of organizational resilience for firms' success in the crisis, and what has been said about the use of digital technologies – how digital capabilities may have enabled firms to respond to the crises or what have been their role in firms' strategic development ambitions.

Overall, the total number of possibly relevant studies retrieved was 79. Studies were exported from the database of Scopus to Excel, in which closer analysis was conducted. At this stage, following the process and protocols outlined by Tranfield, Denyer & Smart (2003) in Macpherson & Holt (2007), a thorough review of the abstracts was conducted and the articles were briefly categorized in to one of four categories of *primary, secondary, peripheral/conceptual*, and *not relevant*. However, this brief classification was not a stand-alone judgement about the quality of one study, but of its fit with the review criteria of this research. Resulting this, 28 studies were categorized as not relevant for few different reasons: 1) studies did not create value for the objectives determined in this research, 2) studies focused on other resilience than organizational, or 3) they considered other capabilities than digital. Altogether, 51 studies were read more carefully to gather understanding about the topic, of which 30 were classified as primary or secondary.

Table 2 concludes findings of the scoping review. Resilience was found being an integrative topic across the studies. However, it is important to highlight, that the categorization based on three key themes is not fully precise, due to overlapping in studies as many studies considered more themes than just one.

Key theme	Resilience as a cross-cutting topic	Authors
Crisis	- Resilient firms tend to perform better in crisis / the ability to adapt increase the likelihood to withstand crisis - There is not an approach for creating resilience which would fit for all SMEs, due to their differences in, e.g., characteristics, success factors, and resources → studies highlight different factors (e.g., entrepreneurial orientation, networks, innovativeness, firm type, ability to learn & adapt) - Firms' strategic responses are not applied on their own, but combined by using set of different interventions	*Sullivan-Taylor & Branicki (2011); Mithani & Kocoglu (2020); Anwar, Coviello & Rouziou (2021); Neise, Verfürth & Franz (2021); Kraus, Clauss, Breier, Gast, Zardini & Tiberius (2020); Huang & Farboudi Jahromi (2021); Dias, Cunha, Pereira, Costa & Gonçalves (2022); Brown, Kalafsky, Mawson & Davies (2020); Lorenzo, Rubio & Garcés (2018); Dolz, Iborra & Safón (2019); Caiazza, Phan, Lehmann & Etzkowitz (2021)*
Capabilities (DCs)	- Crisis readiness is positively linked to firm performance - The strategic challenges faced by SMEs can differ when compared to large firms, thus developing and adopting suitable DCs support firms in their resilience strategy - Firms utilize the pool of capabilities to adapt to the changes following the crisis - DCs improved operating performance & revenues during crisis - DCs increase firms' resilience - Crisis can create opportunities for SMEs, as entrepreneurial orientation (EO) and market orientation (MO) have the potential to increase performance and help surviving from times of crisis	*Parnell (2021); Wieczorek-Kosmala (2022); Ali, Arslan; Chowdhury, Khan & Tarba (2022); Doern (2021); Duchek (2020); Battisti & Deakins (2017); Clampit, Lorenz, Gamble & Lee (2021); Parnell (2021); Saad, Hagelaar, van der Velde & Omta (2021); Zighan, Abualqumboz, Dwaikat & Alkalha (2021); Eggers (2020)*
Digitalization/ Digital Transformation	- SMEs adopt a different degree of digital transformations, depending on the firms' contextual factors - Technological advancements have beneficial impact on SMEs' ability to survive in the context of the COVID-19 pandemic - Digital technologies could help transforming the challenges of COVID-19 into opportunities - Increased technological adaptation could help to develop resiliency after the pandemic	*Papadopoulos, Baltas & Balta (2020); Priyono, Moin & Putri (2020); Guo, Yang, Huang & Guo (2020); Cugno, Castagnoli, Büchi & Pini (2022); *Khai, Onn, Zulkifli, Kandasamy & Ahmad (2020); *Klein & Todesco (2021); *Zutshi, Mendy, Sharma, Thomas & Sarker (2021)* ** = another literature search*

| | • Digitalization has enabled SMEs to respond effectively to the public crisis by making use of their DCs
• Digitalization is beneficial to firms' DCs
• Technological adoption & reorganization of activities can help firms to develop resiliency after the COVID-19 | |

Table 2: Summary of literature review

In addition to articles and studies found during the scoping review process, also other references were utilized to make sure, that theoretical part of the study included enough valid and relevant references. Based on the scoping review of literature, the initial setting and the starting point for this study is that DCs enable improving firm's resilience in times of crisis and on the other hand, the more resilience firm, the stronger DCs firm has. Resilience and DCs together drive organizational and strategic development of firm. As firms have experienced and undergone great changes, which have affected especially their digital competences and preparedness, of all capabilities of firm, this study aims to focus on digital capabilities specifically. The key themes of this study – *resilience, DCs,* and *digital transformation* – are discussed in more detail during the next chapters. Key concepts are first defined and discussed separately, and key findings, as well as the current state of research of each key concept are discussed in more detail. Finally, the synthesis of key concepts in the context of this research will be considered, and some recent findings from the time of COVID-19 are highlighted.

3 Theoretical framework

As mentioned earlier, the scoping review of literature and theoretical framework consider three main concepts: 1) *DCs* (e.g., Teece & Pisano 1994; Teece, Pisano & Shuen 1997); 2) *organizational resilience* (e.g., Vogus & Sutcliffe 2007); and 3) *digital transformation* (e.g., Warner & Wäger 2019). Literature review aims to provide general understanding about the responses that firms have made to tackle the crises, and what has been the role of organizational resilience for firms' success in the crisis. Additionally, the literature review aims to highlight, what has been said about the use of digital technologies – how digital

capabilities may have enabled firms to respond to the crises or what have been their role in firms' ambitions in strategic development.

The review highlights that there has been made some research regarding the organizational resilience in crises, and about the role that digitalization and technology have played in organizations' strategic planning & operational development (e.g., Papadopoulos et al. 2020; Guo et al. 2020; Zutshi et al. 2021; Cugno et al. 2022). Even so, research exploring the relationship of organizational resilience and digital maturity, is still sparse as some industries have not been researched that specifically (Botha et al. 2022). Overall, the studies examining the relationship between digital transformation and strategic management are at an early stage (Rêgo, Jayantilal, Ferreira & Carayannis 2021) or studies lacks the exploration of effect mechanism of firms' digital transformation for organizational resilience (Zhang, Long & von Schaewen 2021). Moreover, the research of He, Huang, Choi & Bilgihan (2021) states that quite little research has been conducted about the role of digital transformation in building organizational resilience, even though it seems that the number of studies is increasing and for example, the recent study of Corvello, Verteramo, Nocella & Ammirato (2022) highlights digital technologies' positive impact in developing antifragility.

As there will be highlighted later, organizational resilience is commonly defined as the capacity to recover quickly from the challenges and disruptions, with the emphasis on the ability to adapt after a crisis or unexpected event has occurred (e.g., Wieczorek-Kosmala 2022). However, the ability to recover from the shock and the ability for strategic renewal are determined by firm's DCs (Wieczorek-Kosmala 2022), as DCs have a direct effect on competitive advantage and firm performance, and thus they can help firms to reinvent themselves and their resources (Helfat & Peteraf 2009). DCs are defined as the firm's capacity to deliberately create and modify its resources to explain, how business can adapt to changing circumstances and turmoil environment (e.g., Maijanen & Jantunen 2016; Eisenhardt & Martin 2000; Teece 2007). In the context of this thesis, DCs are used to describe how firms, specifically Finnish SMEs, improve their competitiveness and develop sustainable competitive advantages during the times of global crisis. DCs theory is applied to the research to understand these above-mentioned abilities and characteristics more, and to better understand, how digital capabilities enhance both the firms' survival during times of global crisis, and firm resilience overall.

3.1 Resilience

Resilience is usually considered as an ability of individual to be able to manage unpleasant events and uncertainties, and to feel better after something challenging happens (Conz & Magnani 2020). The review of Portuguez Castro & Gómez Zermeño (2021) found out that the authors consider the concept of resilience differently, and it ranges from macro-level vision to micro view of characteristics that the individual entrepreneur possesses (Figure 2). As this research considers the resilience of firms, the theoretical framework will focus on the levels of business and entrepreneur resilience. Even though the focus is on firms' resilience and survival, the characteristics of individuals and entrepreneurs must be taken into consideration, as individual resilience, and coordination between functions of firm support organizational resilience (Anwar, Coviello & Rouziou 2021). Moreover, organizational resilience is seen positively influencing organizational outcomes as well (Anwar et al. 2021).

Figure 2: Concepts of resilience (Portuguez Castro & Gómez Zermeño 2021)

In the academic literature, the conceptualization and exact definition of the term remain fragmented due to large variation of different interpretations and definitions. Despite increased number of resilience-related topics and studies, there are no consistency on whether, for example, resilience should be considered as a process in time. (Conz & Magnani 2020) Prior studies have aimed to define resilience by conducting multiple conceptualisations from earlier studies. Common themes arisen and compounded from the conceptualisations, are the capacity to adapt successfully when facing disturbance, stress, or

uncertainty. (Alonso et al. 2020) The studies of Pietrzak & Southwick (2011) and Kim-Cohen & Turkewitz (2012) define resilience as the capacity and ability of adapting successfully in the face of adversity, and which may change over time and exist on different levels across multiple domains of life. Related to the resilience, Parnell (2021) defines organization's crisis readiness as its ability to cope and deal with shocking events when they occur.

Study of Ali, Arslan, Chowdhury, Khan & Tarba (2022) identified that firms are more resilient when they have both domestic and global business partners, because that will not only enable firms to remain competitive, but also reduce their dependency on one specific partner, if unexpected crisis occurs. Duchek (2020) suggests resilience as a fundamental organizational ability that enables firms to withstand stress, rapidly adapt to changes and continue innovating. Therefore, resilience may be an important source of sustainable competitive advantage. In Anwar et al. (2021) resilience is considered as the process by which either an individual or a firm develops and leverages its capacity to handle with adverse situations.

Entrepreneurs are constantly challenged with numerous different situations and events that affect in their operations and survival, and therefore entrepreneurs must possess great ability to handle high levels of stress and unexpected situations (Portuguez Castro & Gómez Zermeño 2021). During the pandemic of COVID-19, research has been conducted about the characteristics that have enabled firms to respond to or tackle the crisis. By using a slightly different terms and concepts, the articles reveal that firms with abilities related to the dimensions of entrepreneurial orientation, such as risk-taking (dealing with uncertainty: organizational resilience) and innovativeness, have been more capable of surviving from the crisis (strict restrictions and lockdowns) in general (e.g., Anwar et al. 2021; Zutshi et al. 2021).

Mithani & Kocoglu (2020) describes resilience as an organizational adaptation in the face of extreme events, and the paper of Anwar et al. (2021) defines organizational resilience as a set of capabilities that equip firm with readiness that can facilitate its reaction to unexpected events. Similarly, Aldianto, Anggadwita, Permatasari, Mirzanti & Williamson (2021) consider organizational resilience as an important capability to cope and survive during unexpected situations, as it enables firms to quickly adapt to disruptions and maintain the functionality of operations. The study of Anwar et al. (2021) views that organizational

resilience of young ventures and venture's performance under uncertainties is driven by the resilience of individuals managing the firm, and by the degree of inter-functional coordination within the firm. These internal capabilities of firm must also be taken into consideration when researching firms' responses to the pandemic. The article of Duchek, Raetze & Scheuch (2020) concludes organizational resilience as firm's competences to predict potential threats, to cope with surprising events and to learn from these so that the organization can develop a dynamic capability that promotes organizational change. Considering the topic of this study, resilience is regarded as the firm's ability to cope, learn, adapt to and maintain its functionality during unexpected circumstances.

3.1.1 Resilience of firm during the crisis

A systematic literature review of Korber & McNaughton (2017) reveals that the studies use only a limited amount of current literacy on both resilience and entrepreneurship, and the literature review of Doern, Williams & Vorley (2019) states, that only a limited number of studies have considered resilience and crises in the context of entrepreneurship. One of those has been the study of Bullough, Renko & Myatt (2014), which also examines how individuals, organizations and communities respond to turbulent events or changes, and how they transform resources into action. The review of Doern et al. (2019) reveals that studies in the area usually focus on the time before the crisis, and on the capabilities or resources that enable entrepreneurs and organizations to adjust to or withstand the events. Bullough et al. (2014) stated that little is known about the factors that are related to individuals' entrepreneurial decisions during war (crisis). Their findings suggest that if individuals are able to grow from adversity (improve their resilience), and they believe in their entrepreneurial abilities (entrepreneurial self-efficacy), individuals are able to develop their entrepreneurial intentions, even under the conditions of war. Moreover, the findings highlight that resilience is strongly and positively related to entrepreneurial decisions under extremely challenging conditions. (Bullough et al. 2014)

Futher, several studies have considered how firms practically respond to the shocks and uncertain events (e.g., Doern 2021, Mithani & Kocoglu 2020, Conz & Magnani 2020). Studies examining firm responses to crises have many similarities, even though they discuss about the solutions by using a little bit different terms and concepts. These are briefly highlighted in the theoretical section, to explain the extent of the research of resilience in

crises. For example, the study of Doern (2021) found and characterized that small firms possess five different initial crisis responses to increase their chances on survival: *checking vitals, blocking, deflecting,* and *developing tactical awareness.* The research of Mithani & Kocoglu (2020) suggests that there can be identified four organizational responses and two underlying drivers that can explain how firm improves its resilience and managerial insights, when faced extreme events. Similarly to Doern (2021), the study of Mithani & Kocoglu (2020) argues that the responses are identical to individual-level responses, being therefore called as *freeze, flight, fight,* and *fright,* which are driven by *slack & routines.* The state of hypervigilance (freeze) determines firm's later responses – whether to flight or fight. Overall, Mithani & Kocoglu (2020) suggest that organizational survival is determined by the firm's initial estimates and early decisions.

Moreover, the findings of Hutchinson, Fergie, Fleck, Jouflas & Parry (2021) identified five factors of resiliency, in terms of how it is exercised. The study suggests that personal & business experience of crises, positive mindset, personal faith, learning & leading, and relationships are important factors in resiliency of entrepreneurs and small business leaders (Hutchinson et al. 2021). Additionally, the study (Hutchinson et al. 2021) points out three main challenges that entrepreneurs and organizations have faced during the first lockdown in the COVID-19: adversity related to business model change, information flow & sense-making, and weak strategy. Furthermore, as a result of their literature review and analysis, Conz & Magnani (2020) considers resilience as an *"attribute the firm possesses along a continuum: before, during and after an event (either external or internal)".* Additionally, the study (Conz & Magnani 2020) provides framework that identifies resilience as dynamic attribute of firm, which evolves in time along three temporal phases (before, during, after), and recognizes two different resilience paths that firms possess – the adaptive and absorptive. Overall, resilience is identified as dynamic cycle, and thus it requires continuous adjustment and implementation (Conz & Magnani 2020).

3.2 Dynamic Capabilities

The topic of DCs has been broadly researched, and multiple definitions for the concept can be identified from the literature. Table 3 specifies the definitions of DCs discussed in this chapter, in terms of how scholars define DCs, and which aspects they identify as key

dynamic capabilities that enable firms to respond to changing circumstances. During the recent years, the literature related to DCs has been growing rapidly, which has led to a rich but complex body of research (Barreto 2010). Overall, the framework of DCs has had a significant impact on strategic management theory and practice (Teece 2014), yet research findings still remain disconnected (Wang & Ahmed 2007). Scholars have outlined distinct definitions, as conceptualizations vary significantly, for example, in terms of the nature, specific role, context, creation, types of outcomes, and purposes of DCs (Barreto 2010). Scholars have defined DCs both as abilities or capacities, and as routines or processes (Barreto 2010).

The early concept of DCs refers to the organizations' abilities and competences that enable responding to the market changes and creating new products and processes (Teece & Pisano 1994). Later Teece et al. (1997) has defined DCs as the foundation of organizations' competitive advantages: firm-specific, both internal and external, competences and skills that can be sources of advantage, and which can be improved, implemented, and protected. Authors following Teece et al. (1997) have defined DCs as an ability or capacity of firms, while, Eisenhardt & Martin (2000) considered DCs as specific and identifiable processes. Eisenhardt & Martin (2000) argues DCs being a set of specific and identifiable processes in product development, strategic decision making and alliancing, for example. Even though Eisenhardt & Martin (2000) considers competitive advantage being more challenging to achieve through DCs, when compared to Teece, the basic logic is quite similar (Helfat & Peteraf 2009) and approaches agree in many regards (Kump, Engelmann, Keßler & Schweiger 2019): both originate from the RBV, and both take a multi-level perspective by combining managerial and organizational processes (Kump et al. 2019). Moreover, Zollo & Winter (2002) conceptualized DCs being systematically applied activities of learned and stable patterns in the strategic adaptation, and Winter (2003) defined dynamic capabilities as capabilities that operate to extend, modify or create ordinary capabilities. Jantunen et al. (2012) defines DCs the higher-order capabilities that firm needs for changing operational-level capabilities and learning into new domains, which is why DCs are critical for innovation activities. Additionally, Teece (2014) considers DCs as a multidisciplinary framework to explain long-run enterprise performance, and Maijanen & Jantunen (2016) considers that DCs enable an organization to respond to the needs of developing strategies to achieve long-term success in changing operating environment.

Definition of DCs	Author
Organizations' abilities and competences that enable responding to the market changes and creating new products and processes.	Teece & Pisano (1994)
Firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments.	Teece et al. (1997)
The firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die.	Eisenhardt & Martin (2000)
A learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness.	Zollo & Winter (2002)
Capabilities that operate to extend, modify, or create ordinary capabilities.	Winter (2003)
A firm's behavioral orientation to constantly 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)
Three levels of DCs which are related to managers' perceptions of environmental dynamism: 1) incremental, renewing and regenerative capabilities.	Ambrosini, Bowman & Collier (2009)
The higher-order capabilities needed for changing operational-level capabilities and learning in new domains, and thus they are critical for innovation activities.	Jantunen et al. (2012)
DCs enable organization to respond to the need for strategic renewal in the pursuit of long-term success in changing environment.	Maijanen & Jantunen (2016)

The capacity of an organization to purposefully create, extent or modify its resources to explain how businesses can adapt to changing and turbulent environment.	Wieczorek-Kosmala (2022)

Table 3: Definitions of DCs

Teece (2014; 2019) separates organizational capabilities into two categories: ordinary capabilities, which are largely operational, and DCs, which are strategic in nature in general. Ordinary capabilities are defined as firm's ability to perform efficiently in its essential operations and routines (Teece 2014) and about "doing things right", while DCs are considered as "doing the right things", meaning that even though fundamental, ordinary capabilities alone are not seen providing competitive advantage in a long-term in a current rapidly changing environment. As the nature is operational and administrative (Teece 2019), every firm has these ordinary capabilities, but to build competitive business models and improve firm performance, firms need DCs. Further, there are variation in opinions about the nature and role of DCs, how those are created and whether DCs are considered unique or not (Barreto 2010). Some scholars see DCs as "best practices" and assume similarities across firms, while other studies consider DCs firm-specific and unique; the evolution and development of firm's capabilities are seen path-dependent, since there is heterogeneity among firms and not all follow the best practice (Jantunen et al. 2012; Teece 2014). Thus far, limited research exists on how multinational enterprises (MNEs) make their DCs functional (Zahra, Petricevic & Luo 2022).

In general, the concepts related to DCs have maintained their conceptual core, as common factor in the definitions of different scholars is, that all originates from the theory about the abilities and competences of recognizing, developing and reconfiguring skills for responding to the changing surroundings (Loureiro et al. 2021). Moreover, for example Maijanen & Jantunen (2016) states that many DCV definitions are based on the definition of Teece et al. (1997). Still, the sizable literature on the topic has not always been unified (Teece 2014), and there can be seen evolution and development of the concept of DC in the literature (Loureiro et al. 2021). For example, Wang & Ahmed (2007) defined DCs as firms' capacity and behavioral orientation to constantly develop and improve their core capabilities in response to the changing operating environment and to remain their competitive advantage. The paper of Wieczorek-Kosmala (2022) concludes DCs as firm's capacity and ability to

intentionally establish, develop and improve its resources to describe how a firm can adapt to new circumstances.

Furthermore, advancement has also been made in the idea of describing capability hierarchy. For example, Winter (2003) suggested two levels, first-order capabilities and higher-order capabilities, and Ambrosini, Bowman & Collier (2009) extended the study by categorizing capabilities into three groups: capabilities that modify firm's resource base (incremental capabilities), capabilities that refresh, adapt and augment the resource base (renewing capabilities), and capabilities that enable firm moving away from previous change practices and adopt new forms of organizational change (regenerative capabilities). Incremental and renewing capabilities are usually combined as one, representing dynamic capabilities in the literature (Ambrosini et al. 2009). This categorization is closely linked to the capabilities of *sensing, seizing,* and *reconfiguring* by Teece*,* as it suggests that reconfiguring is regenerative capability, while sensing and seizing are renewing capabilities of firm (Makkonen, Pohjola, Olkkonen & Koponen 2014).

Overall, in the literature, DCs are considered important for the competitiveness and competitive advantages, since they allow staying congruent with market and technological developments, and therefore allow challenging competitors (e.g., Teece 2014). It is argued that together with good strategy, existing VRIN resources (Valuable, Rare, Inimitable, Non-substitutable), and strong ordinary capabilities, DCs enable firms to achieve long-term growth and survival (e.g., Teece 2014). Moreover, it is also argued that firms differentiate themselves (from competitors) by their capabilities to decide, innovate and change, which can be achieved through learning, entrepreneurship, innovation, and astute decision-making. (Teece 2019). Considering the previous definitions in the literature and the context of this research, the definitions of Maijanen & Jantunen (2016) and Wieczorek-Kosmala (2022) are followed. Therefore, in the context of this study, DCs are considered as firms' orientation and ability to respond to the needs for strategic renewal by purposefully creating, extending and modifying resources and processes to adapt to changing and turbulent environment.

3.2.1 Sensing, seizing, transforming

To understand and analyze DCs better, Teece (2007) created the framework of three fundamental categories, *sensing, seizing*, and *reconfiguring* (or transforming), which enable

looking at the different 'stages' that have an impact on firm's crisis response. According to Schoemaker et al. (2018), developing firm's DCs relies on these three managerial activities. However, scholars have also argued that not all of the DCs identified can be categorized onto one stage specifically, as the research has pointed out overlaps and interconnection between these capacities (Leemann, Kanbach & Stubner 2021). This thesis uses the dynamic capability view (DCV) by Teece (1997) and considers three capacities of *sensing, seizing,* and *reconfiguring* to understand and describe the internal digital dynamics that are related to organizational renewal in times of crisis. However, it is also understood that there may not be found clear distinction between 'stages', as there may exist more overlapping capabilities, such as *sensing-by-seizing,* gaining knowledge through action (Leeman et al. 2021). Overall, these three competences are used and briefly discussed to gain understanding about, how firms can and practically react and respond to the changes in the market or in the operating environment. Related to this, Warner & Wäger (2019) more specifically identifies internal capabilities that are important for firm's digital transformation, and Ellström, Holtström, Berg & Josefsson (2022) contributes to that research by identifying six routines that are required for digital transformation in firms, and which correspond to the capabilities.

Sensing refers to the activity of identifying and assessing opportunities outside a firm. It means scanning, creating, learning and interpreting, as there are constant changes in market environment, consumer needs, technological opportunities and competitor activity (Teece 2007). If firms are not able to sense precisely and accurately the environment surrounding them, firms will be more exposed to risks in a future (Teece 2000). Results of Makkonen et al. (2014) show that when new business opportunities disappear (as a result to the crisis), sensing the market and driving the firm towards new opportunities are more valuable capabilities.

Seizing means firm's capability to seize the sensed opportunities; to take action, and to mobilize the resources to capture value from the opportunities that were identified – addressing innovations, selecting business models and investing in appropriate technologies, for example (Maijanen & Jantunen 2016). This stage of activity usually requires investments in development and commercialization, as addressing opportunities involves maintaining and improving firm's technological competences and assets (Teece 2007). *Sensing-by-seizing* is a novel modelling by Leeman et al. (2021), which proposes that a firm senses its environment more concretely and reliably when it seizes particular opportunities.

Reconfiguring refers to continuous renewal firm must possess. Once the opportunity has been identified [sensing] and the strategy and new business model has been established and implemented [seizing], firm need capabilities to transform the strategy into profitable actions (Teece 2017). Reconfiguring refers to activities such as combining and recombining, renewing, learning new skills, developing, and adopting new processes and practices (Maijanen & Jantunen 2016). Firms, who put effort on these three activities and thus develop strong DCs, are better at innovating and creating new business models, and reinventing themselves and their resources, thus staying ahead of rivals (Helfat & Peteraf 2009; Schoemaker et al. 2018).

3.2.2 Digital capabilities

Above-discussed DCs and DCV by Teece (1997) are exploited in this study, to better understand and describe firms' internal digital capabilities that are related to organizational renewal in times of crisis. In the paper of Korhonen & Gill (2018), digital capability is defined as an organization's ability to create added value to its constituents and beneficiaries by utilizing and integrating digital data and information technologies in the products, services, processes, systems, operations, and practices. Digital capabilities are not considered just about learning new skills and how to use new technologies (Bartlett-Bragg 2017), and for example, according to Uhl, Born, Koschmider & Janasz (2014), digital capabilities are a mechanism in an organization that ensures the integration and transformation of technological resources. As digital devices are always "on" and enable continuous connectivity, new models for working and learning are requested, which challenge traditional structures and shifts firms towards networked ecosystems (Bartlett-Bragg 2017). According to Warner & Wäger (2019), some organizations have shifted their focus to use technology to understand and predict human behavior to be able to sense new opportunities or threats better (digital sensing capabilities). Strong seizing capabilities enable firms to rapidly respond to changes and to take strategic actions faster, such as reallocating their resources to new projects and technologies more quickly (Warner & Wäger 2019). Moreover, digital reconfiguring (or transformation) capabilities are needed to execute a digital strategy and to gather the advantages of strategic development (Warner & Wäger 2019).

Zhen et al. (2021) states that some scholars have defined digital capabilities as a part of dynamic capability of an organization in the era of digitalization. Therefore, it is suggested that digital capabilities can predict and boost commitment and readiness to implement technological improvements and adopt advanced business models, which, for example, according to Teece (2007), "*reflect management's hypothesis about what customers want, and how an enterprise can best meet those needs, and get paid for doing so*". Overall, Setia et al. (2013) states that digital technologies are widely considered as a key enabler of organizational capabilities. Technological capabilities, which complement digital capabilities to exploit a firm's value proposition, refer to a firm's ability to develop new products and services by aligning its strategy with innovative processes (Wang & Ahmed 2007). Technological capabilities include, for example, the abilities to create, adopt, utilize, and develop new technological knowledge, products, and processes, which aim to reach improved organizational efficiency (e.g., Tsai 2004; Iammarino, Padilla-Pérex & Von Tunzelmann 2008; Guerra & Gamargo 2016). Furthermore, technological capabilities include skills of individuals and teams, the processes, and the routines, as well as other technical assets that together have a contribution to the firm's technology potential (Kyläheiko, Jantunen, Puumalainen, Saarenketo & Tuppura 2011). Additionally, firms with strong technological capabilities have more efficient processes, and technological capabilities help firms recognizing the opportunities to develop its knowledge into new products (Kyläheiko et al. 2011). Moreover, the study of Kyläheiko et al. (2011) also found out the positive relationship between firms' technological capabilities and innovation.

The study of Karttunen, Pynnönen, Treves & Hallikas (2021) contributed on research by clarifying operational capabilities that are necessary for implementing Internet of Things – Product-Service System (PSS) business models. Additionally, the research makes supplement to discussions of business model transformation by providing examples about required seizing and transformation capabilities of firms. Karttunen et al. (2021) identified the most prominent operational capabilities for firms being connectivity, data management & storage, monitoring, data analytics, control, operations management, maintenance, communication, applications, and security. Further, the study of Ellström et al. (2022) identifies six routines (or microfoundations) corresponding to the capabilities and which are required for firms' digital transformation, in the categories of sensing, seizing, and reconfiguring. These routines are defined as sensing cross-industrially and inside-out digital infrastructure, digital strategy development, determination of enterprise boundaries, digital

transformation decomposition into specified projects, and the creation of unified digital infrastructure (Ellström et al. 2022).

3.3 Digital transformation

As highlighted above, digital capabilities enable firms carrying out more successful digital transformation processes (e.g., Korhonen & Gill 2018). Warner & Wäger (2019) concludes digital transformation being an ongoing process of using new digital technologies in firm's everyday life, and requiring specific capabilities from firms. Parviainen, Tihinen, Kääriäinen & Teppola (2017) combines earlier definitions of digital transformation and defines it as an internal or external changes of firm: changes in ways of working, roles, and products and services caused by the adoption of digital technologies in firm, or changes in firm's operating environment. Digital transformation goes beyond digitalization, which is defined as the implementation of digital technologies or as the transformation of socio-technical structures and relationships from analog data into digital data sets (Setia et al. 2013; Yoo, Lyytinen et al. 2010).

Digital transformation is considered as a comprehensive change in firm's business strategy, as digital transformation changes firms' business models through, for instance, changing value creation processes, organizational tasks and how the business is made overall (Verhoef, Broekhuizen, Bart, Bhattacharya, Dong, Fabian & Haenlein 2021). Verhoef et al. (2021) defines digital transformation as "*a change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for the firm*". Digital transformation applies digital technologies to automate systems, to optimize processes and to empower people to improve the business performance (Yokogawa 2021). The pace of change and pressure to adapt into the new operational circumstances challenge firms and thus one of the greatest challenges for people and organizations in the current decade is to adapt to digital environments to work and learn (Bartlett-Bragg 2017).

The importance of digitalization is widely recognized, yet firms still have difficulties to understand the potential benefits of it (Parviainen et al. 2017), such as, for instance, adopting new technologies opens up new opportunities and possibilities for firms to increase productivity and competitiveness (e.g., Peschl & Schüth 2022). Moreover, the role of digital

solutions is considered to be increasing in a future in driving green, resilient, and inclusive economic growth (The World Bank Live 2022). Despite several triggers causing digitalization, there are many obstacles for digital transformation, too. For example, as digital transformation is a major change in habits and how firm operates in a future, firms face challenges in successfully implementing digital capabilities that support transformation, which then have an influence on the entire organization, its processes, resources, and both internal and external stakeholders. (Parviainen et al. 2017) Further, it has been considered that the overall success of digital transformation will be specifically dependent on the abilities of SMEs to adopt and implement digital technologies, as SMEs generally form the backbone of most economies (Kilimis et al. 2019). Digitalization is seen to increase firm performance and resilience, as highly digitalized SMEs are more determinant making long-term responses to deal with the crisis, and thus they are more likely to find potential opportunities in uncertain environment and integrate resources for strategic transformation and changes (Guo et al. 2020). Additionally, technology emphasizes the possibility of creating capabilities to design, manage, and adapt to the network structure more quickly (Bharadwaj et al. 2013).

Literature review highlights that technology and digital solutions are often seen as a part of the organizational capabilities that support innovation and this way also increase firms' competitiveness and performance (e.g., Guo et al. 2020; Salisu & Bakar 2019). Especially during the pandemic, digitalization and adapting digital technologies are considered being beneficial for SMEs to remain their competitiveness and to avoid economic halts, as digitalization enables keeping operations running, and enhancing product development or providing better services (Khai, Onn, Zulkifli, Kandasamy & Ahmad 2020). Considering the context of this study, digital transformation is regarded as a comprehensive change in terms of how firm's processes and operations are executed.

3.3.1 Digital transformation in times of crises

The uncertain time of COVID-19 has challenged companies to develop their earlier processes, activities, and strategies, and forced them to adapt to the era of "new normal". New circumstances and transformation in operating environment have required companies to improve their operations and create new ways of doing things, and quite often, the utilization and the use of digital tools have been taken into consideration to ensure

businesses' continuity. (Loureiro et al. 2021; Zhen et al. 2021) This is because digital solutions have enabled establishing new ways of operating, such as remote work, omnichannel commerce, and platformification, and thus helped keeping businesses active, and bridging the gaps of wide lockdowns and social distancing (BDO 2020). Business model transformation supported by digital technology is seen as one of the strategies to respond to disruptive environmental changes, which is why digital technologies are considered suitable for responding to the fundamental changes caused by the pandemic of COVID-19, too (Priyono, Moin & Putri 2020). Additionally, firms often adopt digital technologies to better sense and respond to consumer needs (Setia et al. 2013).

According to Zhang et al. (2021), digital transformation of enterprises helps improving organizational resilience. As an example, the study of He et al. (2021) highlights digital transformation as a precursor of both survival and success for service organizations in surprising disturbances. Moreover, the study (He et al. 2021) found out that investing in digital technologies could help service organizations building concrete infrastructure and processes that enable them to maintain the control and sustain their operations over the crisis. For instance, the working paper of International Monetary Fund (IMF) by Abidi, El-Herradi & Sakha (2022) found out that comparing to digitally-constrained firms, digitally-enabled firms experienced lower decline in sales during the pandemic.

It is suggested that during the COVID-19, firms have adopted different degrees of digital transformation and that even though digital actions were utilized to ensure the survival, there lays higher potential in digital technologies to be unleashed (Priyono, et al. 2020; Klein & Todesco 2021). Most of the studies in the literature review highlight that the adoption of digital technologies has been rapid during the pandemic, and that digital adoption and solutions can help firms to take advantage of this challenging situation. This is because undertaking digital transformation enables firms to keep operating properly and offers more flexible working arrangements in the era in which employees are working remotely to a large extent (Priyono et al. 2020; Eurofound 2021a), and consumers are asked to avoid personal contacts. Additionally, adopting digital solutions rapidly helps narrowing the gap that would be faced later, regarding the changes needed in the business environment (Priyono et al. 2020). Overall, the adoption of digital technologies has enabled firms to prevent and better manage the influence of the pandemic, and it makes firms better prepared for adopting innovations after the period of COVID-19 (Eurofound 2021a). Moreover, LaBerge et al.

(2020) found out, that firms expect the radical changes in operating environment and regarding the ways of operating faced during COVID-19 will be long-lasting. Thus, they are already making the kinds of investments on their operations that ensure the changes will stick (LaBerge et al. 2020). Most firms have recognized the importance of technology from strategic point of view, and technology being a critical component for the business, not just a solution for cost-efficiency (LaBerge et al. 2020). Moreover, firms with successful crisis responses seem to report a range of capabilities that other firms don't, related to, for example, in faster experimenting and innovating, the abilities in filling the gaps for technology talent, and in utilizing more advanced technologies (LaBerge et al. 2020).

SMEs are extremely vulnerable to times of crisis, and they are easily affected by the other crisis-related problems and constraints (Pal, Torstensson & Mattila 2014). Due to their relatively small size, SMEs are particularly vulnerable to failures in both continuous shifts and unpredictable events. Still, their relatively small size makes them more flexible, and market- and learning oriented SMEs are also more adaptive, innovative, and resilient. Earlier studies see that SMEs need to improve their access to finance and their individual competitiveness to balance their soft and hard assets. (Pal et al. 2014.) The analysis of Priyono et al. (2020) shows that under the pressure, SMEs adopt a different degree of digital transformations, depending on the firms' contextual factors. Strategy formulation in SMEs is seen being a combination of external (market-based) and internal (resource-based) practices (Mashingaidze, Phiri & Bomani 2021) and especially small businesses increase their chances to survive by constantly monitoring the changes and by making proactive actions (Doern 2021).

Moreover, considering digital transformation in different industries, the study of Botha et al. (2022) found out, that digital maturity of SME retailers is positively associated with higher levels of organizational resilience during COVID-19. In particular, digital maturity was positively related to retailers' innovation and creativity, and devolved and responsive decision-making. Further, Pal et al. (2014), focusing on Swedish SMEs in textile and clothing industry, proposed a model for SMEs' resilience, which addressed the significance of three key assets, and which are considered as enablers of resilience: firms' resourcefulness, dynamic competitiveness, and learning & culture. The model presented in Pal et al. (2014) has identified similar assets and capabilities as is proposed in the framework by Conz & Magnani (2020), which considers essential capabilities during two different

resilience paths, and was briefly discussed earlier. According to Pal et al. (2014), the first enabler of resilience is assets & resourcefulness, including material, social, financial, and network resources. The assets improving dynamic competitiveness are flexibility, robustness, redundancy, and networking. The third asset, learning and culture, highlights the role and importance of leadership, collectiveness, sense-making, and the wellbeing of employees.

Overall, according to the research digest of OECD (Eurofound 2021a), COVID-19 has accelerated the digitalization of public and private sector activities. It has been recognized that many organizations have carried out digital transformation at some level, firms are increasingly relying on digital solutions as a response to the shock to improve their resilience (Apedo-Amah et al. 2020) and, for instance, public funding in Finland is used to support digital transformation projects (International Monetary Fund 2021). The roles of digitalization and the adoption of digital tools for firms' resilience during the crisis have been recognized (Guo et al. 2020; Zhang et al. 2021; Eurofound 2021a), and many firms have been required to rapidly establish or adopt digital tools and solutions, which have helped firms to maintain their operations active, during the era of isolation when face-to-face interaction was asked to be reduced (Eurofound 2021a).

3.4 Theory in the context of the study

Even though there have been multiple life-threatening events, natural disasters as well as man-made disasters and crises during the human evolutionary history, the understanding of organizational survival in the face of such extreme threats remains quite limited (Mithani & Kocoglu 2020). Overall, the pandemic of COVID-19 and the effects of it (e.g., social distancing, restrictions) have made it crucial for firms to quickly change the ways of working (Eurofound 2021a), and many organizations have carried out digital transformation at some level: firms have either established novel digital solutions, developed the existing ones, or replaced the old products and processes with new solutions. Due to COVID-19, we have witnessed and experienced rapid changes in processes and activities, as government and businesses have improved their broadband connectivity, adopted online business models, promoted online payments, and enhanced their digital skills to maintain their operations functional and running (Eurofound 2021a). Many firms were forced to start utilizing or

increasing their usage of technologies such as telemedicine, video, collaboration tools and platforms, mobile apps, and contact centers (Yesner 2021). Therefore, it is considered that COVID-19 has improved firms' digitalization of customer and supply chain interactions and of internal operations by three to four years (LaBerge et al. 2020). At the latest, the pandemic has accelerated the adoption and utilization of technology and digital solutions and it is suggested that responses to COVID-19 have speeded up the adoption of digital technologies by several years (LaBerge et al. 2020).

Digital transformation is considered as a key solution to support long-term resilience in a future and to prepare for other upcoming crises (Hegarty 2021). Thus, digital transformation and digitalization are considered closely and side-by-side in this thesis, as it depends on the firm, what has been the level of their digital transformation during the pandemic. In summary, the focus of this study is to find out, how firms have utilized their internal digital capabilities in survival, and how these, together with digital technologies, have supported firms to maintain their functionality and increase their resilience. As the study of Anwar et al. (2021) views, organizational resilience is accumulated by the resilience of individuals and inter-functional coordination, and therefore it is important to consider and analyze these internal capabilities of firms too, when researching firms' responses to the pandemic.

As discussed earlier, firms need digital sensing capabilities in order to understand unanticipated developments in the business environment and to take actions to manage change (Warner & Wäger 2019). In the context of this study, "*the unanticipated development in the business environment*" is the pandemic of COVID-19, and practical actions and responses are expected to be increased digitalization, digital transformation and adaptation of digital technologies at some level. When considering firms' sensing, seizing and reconfiguring capabilities, practically this could mean that, for example, firms execute constant market scanning to learn how competitors react to the pandemic, what expectations, needs and requirements consumers have in times of lockdowns, and to what direction the market may be changing soon in terms of digitalization. Seizing could mean that once the most critical changes and new opportunities have been identified (e.g., demand for increased use of digital technologies), firms take action and aim to develop their products, services and business models that fit to new market dynamics. For firms tackling the challenges established by COVID-19, reconfiguring could mean that new pandemic-related products, services, and business models are implemented into firm's operations and culture.

Following the above discussion, Figure 3 aims to explain the overall framework for the topic and to generalize, how different factors are related with each other. Based on the scoping review of literature, the initial setting and the starting point for this study is that DCs enable improving firm's resilience in times of crisis and on the other hand, the more resilience firm, the stronger DCs firm has. Resilience and DCs together drive firm's organizational and strategic development (changes in operations, processes, products and services) in times of crisis, to not only survive, but to perform better than the competitors in the market. As firms have experienced and undergone great changes, which have affected especially their digital competences and preparedness, of all capabilities of firm, this study aims to focus on digital capabilities specifically.

The combination of key theories of this research (*resilience*, *digital capabilities,* and *digital transformation)* is expected to allow finding answers to the research questions, since DCs, such as the digital capabilities, and the degree of digitalization in firms, have played great roles in firms' survival by enabling them to continue the operations even during lockdowns. Therefore, firms' digital capabilities, such as digital competences and knowledge, have been considered improving firms' resilience. These technological and digital capabilities improving firms' resilience can be expected being DCs of firm, and thus those can be considered being competitive advantages for firms, too. By researching firms' ability to adopt and utilize digital solutions during the crisis, the research is able to make conclusions about the role of digital capabilities to overcome the crisis of COVID-19 (RQ). Additionally, by searching firms' DCs and digital transformation, the operations and firms' resilience before, during and after the pandemic, it is possible to support the main RQ and find out, how is technology utilized in managing the crisis (RQ1), and how could firms better utilize digital capabilities to react to similar crises in the future (RQ2).
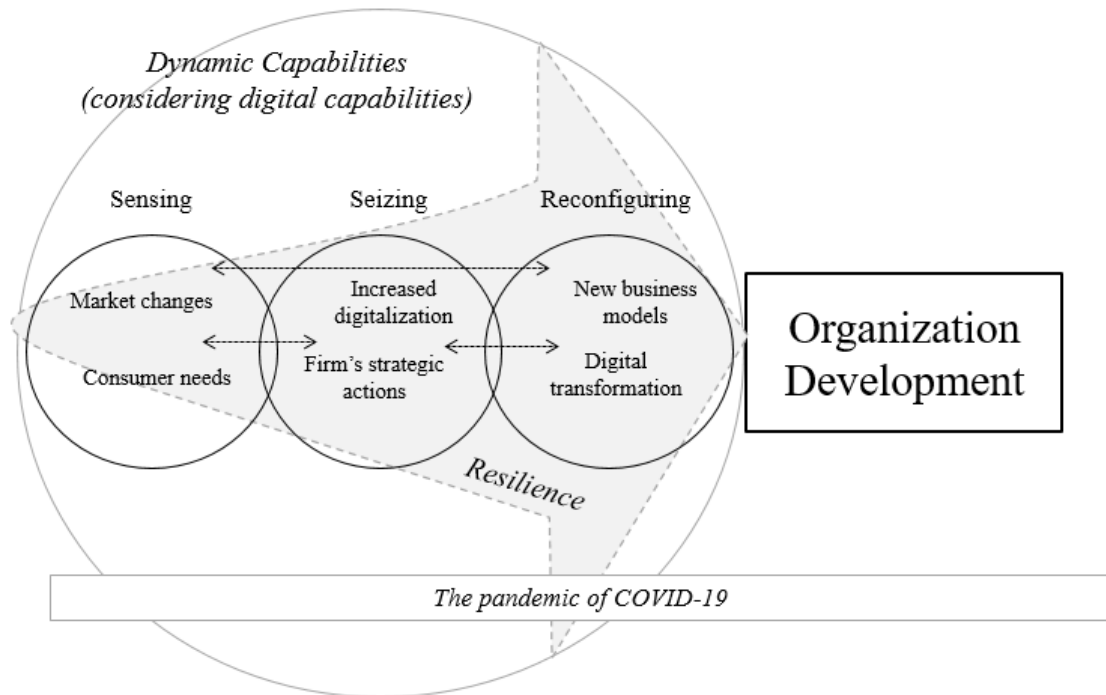
Figure 3: Framework of the study (applying the model by Maijanen & Jantunen 2016)

As Cugno et al. (2022) concludes, the past times (before COVID-19), will not return exactly as they were, and therefore preparing for a new post-pandemic normal – with new business models and new competitive advantages – is required. Even though this pandemic has likely taught firms new ways of preparing for and responding to the uncertainties, it is important to remember that the more multidimensional crisis, the more unique are the causes and effects (Caiazza, Phan, Lehmann & Etzkowitz 2021), and therefore it may be challenging to find and conclude exact solutions that would be unambiguously applicable in future crises. Further, the extended lockdowns in some countries may have changed the preferences and behaviour habits of consumers permanently, meaning the increased use of online technology, for example (Caiazza et al. 2021). Therefore, the longer the pandemic lasts, the more likely these habits and preferences will become new norm, and thus creating new business opportunities for entrants and start-ups (Caiazza et al. 2021). As the study of Caiazza et al. (2021) concludes, knowing how SMEs behave in one specific crisis does not necessarily mean they will behave similarly in others.

4 Research methodology

This chapter discusses research methodology of the study more carefully, by first introducing the chosen research approach and explaining the criteria for targeted industries and companies, after which the process of data collection and analysis are discussed and justified, and the limitations of the study are considered. As SMEs have rapidly adopted new digital tools and solutions to maintain their functionality during the lockdowns caused by the pandemic of COVID-19, the overall objective of this research is to find out, 1) what has been the role of especially digital capabilities in firms' resilience during the times of crisis, and 2) how digitalization has enabled firms to respond to the uncertain situations. The purpose of this research is to understand the origins, the current state, and potential and possible future research directions on how firms' resilience and their digital capabilities are related in the times of crisis.

To investigate the relationship between firms' resilience and digital capabilities both in the recent literature and through the survey, the study utilized one main research question and two sub-questions:

RQ: What has been the role of digital capabilities to overcome the crisis of COVID-19?

RQ1: How is technology utilized in managing the crisis?
*RQ2: How could firms better utilize digital capabilities to react to similar crises in the future?*

Defining research questions enable making the research objectives more specific and concrete. Framing research questions helps connecting and building logical links between abstract concepts of theoretical part and specific and concrete data collected during the empirical part of the study. (Punch 2003)

To answer these research questions, the overall strategy was to conduct a case study by surveying a sample of SMEs of different sizes, and from different industries. These two firm characteristics were selected to research possible differences in their resilience, and in the levels of digital capabilities and digital transformation. Survey for SMEs was established by using a questionnaire that utilized existing measures, but was mainly developed for this

project. The collected data was then concluded in terms of the main variables (*resilience, digital capabilities, digital transformation*), and the relationship of them was studied.

4.1 Research Approach

This study adopted the quantitative research methodology, applying an online questionnaire. In the stage of planning, recent literature related to resilience in crisis was reviewed. Literature review examining resilience of firms in crisis exposed that multiple studies have considered firms' practical responses to the uncertain events (e.g., Doern 2021, Mithani & Kocoglu 2020, Conz & Magnani 2020), and often exploiting and adapting digital tools have been considered as an option to ensure businesses' continuity (e.g., Loureiro et al. 2021; Zhen et al. 2021). Warner & Wäger (2019) and Zhen et al. (2021) have identified internal capabilities of firms that are important in carrying out digital transformation. Even though both quantitative and qualitative research have been made, most of the studies (analyzed in literature review) have conducted either questionnaire surveys or interviews. Quantitative research aims to describe things through measurable numerical data, and explain the relations of different interests and changes in specific phenomenon (Heikkilä 2014). The quantitative data is usually collected by using close-ended or multiple-choice questions (Heikkilä 2014). The research data in this study was collected through electronic survey, which was sent to SMEs via email. The data was collected at specific point in time (in August 2022), meaning that the time horizon of the study was cross-sectional (Olsen & St George 2004).

The data collection method of this thesis is an online survey, which includes topic-related statements. Survey and formed statements are based on and guided by the research questions. In general, the survey is a method to collect data from people regarding who they are, what they do, and how they think, and it usually takes a form of questionnaire (Balnaves & Caputi 2001). The research questions are the starting point for the development of questionnaire or survey, as the questions provide a conceptual map for the survey and help identifying the list of information that will be required to collect (Punch 2003). As a data collection tool, Internet-based surveys offers many advantages, such as simple usage, reduced response time, cost-effectiveness (Wright 2005), and it also provides high quality of data as the automatic data transfer minimizes data entry errors (Sebo, Maisonneuve, Cerutti, Fournier,

Senn & Haller 2017). Additionally, web-based surveys enable reaching thousands of people within a short period of time, as the responses to online survey can be transmitted to the researcher immediately (Wright 2005). Moreover, when compared to non-anonymous research methods, it appears that anonymous survey methods generate greater disclosure of sensitive or stigmatizing information (Murdoch, Simon, Polusny, Bangerter, Grill, Noorbaloochi & Partin 2014), which supports the decision to not ask any information, through which the participants could be recognized.

On the other hand, some constraints and limitations have been recognized, too. For example, item scales themselves are vulnerable to special kinds of biases or errors, and the words used in statements can have a dramatic impact on the results (Balnaves & Caputi 2001). As the responses are asked to assess on a scale 1-5, respondents may avoid using extreme response categories, agree with the statements as presented, or try to portray their firm in a more favorable light (e.g., Chakrabartty 2014). Additionally, as the author of this study has only a limited research and measurement expertise and experience, the development of good and high quality survey may be challenging. This interacts directly with the quality of research, and whether the survey enables finding answers to the defined research questions. (Punch 2003) In order to the thesis would be able to provide generalizable results and broader conclusions about how Finnish SMEs could aim to respond to this kind of surprising global crises in a future, the study considered and utilized the COVID-19 pandemic as a case study. Conducting a research with a case study approach means that an issue, event or phenomenon of interest is studied in real-life context to allow and to generate in-depth and multi-faceted understanding of otherwise complex issues (Crowe, Cresswell, Robertson, Huby, Avery & Sheikh 2011).

4.2 Data Collection

This chapter discusses about the data collection process of this research more specifically, as clear and objective process of data collection increases the reliability of the research (Heikkilä 2014). Therefore, the data collection is documented and described in the next chapters. The next sub-chapters explain the methods for data collection, describe the sampling strategy and highlight the overall sample of the study.

4.2.1 Survey

As mentioned, the study adopts the quantitative research methodology and involves an electronic survey questionnaire (established in Webropol), sent to SMEs via email. The survey was chosen to research method because the goal was to examine firms' opinions and assessments with structured questions that could be analyzed with structured quantitative methods, and broader conclusions could be drawn from the results. Survey allows collecting large amount of data within relatively short period of time, which was considered beneficial regarding the objectives. Moreover, survey enables collecting relevant and structured background information of firms, which allow comparing different groups of respondents (Sukamolson 2007). Questionnaire was formed including only Likert scale items, because Likert scale enables collecting and measuring the opinions and assessments of firms in a uniform manner, as the scale and response options were the same for everyone (Boone & Boone 2012).

As the objective of this research was to examine the relationships between different variables and possible effects of one variable on other (Punch 2003), conducting a quantitative research was considered the best option. A survey was assessed the most favorable method, as a high number of responses was wanted, so that the objectives of the research would be reached and the results would be generalizable. Utilizing only Likert-scale questions enabled collecting the responses on pre-specified scale, thus the comparison of responses was coherent and consistent. LUT University has a license for the students to use Webropol in their studies, which is why it was convenient and reasonable to decide using the software in the creation of the survey. To maximize the number of responses, the survey was created in both Finnish and English (Appendix 3).

The questions took a form of statements and the answers were asked to assess on the summative scale. The findings and data gathered in the literature review were utilized in the development of the survey questionnaire and statements. The data was collected via online survey during the period of 14 days in August 2022. The link to the survey was sent to firms via email, which included a short covering letter that explained the purpose of the survey and objectives of the research in more detail. Survey and the questionnaire were first open for one week after which firms were sent a reminder message and re-invitation to participate the survey. Firms were contacted on the third time at the end of the second week. Altogether,

28 out of 456 firms responded to the survey, thus the final response rate ended up being 6 %.

The survey aimed to investigate the relationship between firms' resilience and digital capabilities in times of crisis, and how firms themselves assess and analyze their digital transformations and digital competences that enabled them to survive from the pandemic. The planning of data collection started with the consideration of research objectives and of the time available. After the decision to use online survey for data collection, the planning and drafting the theme, the structure, and the statements of the questionnaire form were conducted. The survey was divided into four groups: 1) background information, 2) resilience & the effects of COVID-19, 3) digital capabilities, and 4) digital transformation. The first group of questions (background information of firms) was obligatory and captured information about SMEs' business characteristics (question 1: industry & question 2: size of a firm), and therefore included multiple-choice questions. All other groups of questions were formed as close-ended questions and these topic-related statements were asked to assess on the summative scale (Likert scale), which is used to enable the respondent to express, how much they agree or disagree with the particular statement (Hirsjärvi, Remes & Sajavaara 2009; Tutz 2021). Responses are normally given on a scale of 1-5 or 1-7, for instance (1) strongly agree; (2) agree; (3) neither agree nor disagree / neutral; (4) disagree; (5) strongly disagree (Hirsjärvi et al. 2009). Altogether, the survey included 14 statements and all indicators were measured as ordinal-scaled questions. As the objective was to conduct research about firms' technological skills and individual capabilities that enabled firms to tackle the operational challenges, and because these aspects are strongly related to firms' overall competitiveness, the basic assumption was that most of the firms prefer staying anonymous with their answers and opinions. Therefore, the survey did not include too specific background information about participants, so that no one respondent could be identified. Still, as a survey research enables making comparison between groups (Sukamolson 2007), the industry was asked, so that the differences between industries and their firms could be assessed and compared.

4.2.2 Questionnaire

As mentioned above, the survey and its questionnaire utilized existing measures, but was mainly developed for this project. The survey was developed to cover all three main topics,

and thus the questionnaire included fourteen questions, which were divided into four groups. The first group contained the background information of firms, and thus the industry and firm size based on the number of employees were asked. Background of firms was desirable to recognize, in order to compare possible differences between groups of respondents.

The second theme of questions covered the topic *resilience*. Questions three, four, and some of the statements in the question twelve examined the effects COVID-19 has had on firms both overall and on their supply chains. Additionally, as strategies for firms' survival have had variation between industries and firms (e.g., Gursoy & Chi 2020; Baig et al. 2020; Khan 2022), the survey wanted to examine, how firms' have modified their activities as a result to the pandemic – can there be recognized significant development through the survey results? Supply chain resilience was covered in the survey because supply chains have a notable effect on firms' operations, and global supply chains have faced significant challenges during COVID-19 (Harapko 2021). Statements related to supply chain resilience were formed by utilizing the previous study of Ambulkar, Blakchurst & Grawe (2015).

The theme of *digital capabilities* included questions five, six, and nine. The theory of DCs, especially regarding the capabilities of sensing, seizing and reconfiguring (e.g., Maijanen & Jantunen 2016; Warner & Wäger 2019; Leeman et al. 2021; Ellström et al. 2022) was exploited while formulating the statements. The statements were formed to find out the scope of utilization of digital capabilities on different stages – whether firms have exploited their digital sensing capabilities in identifying new opportunities during COVID-19, if the value of these opportunities have been captured, and whether firms have managed to reconfigure their business models by adopting new digital-related tools, products and/or services.

The third main theme of the survey was *digital transformation*, covering the questions ten, eleven, and the first statements of the question twelve. First, the survey wanted to recognize the current situation of firms in terms of their digital transformation and how it has changed due to COVID-19. This change wanted to be asked in the survey, because the news and publications have highlighted that the adoption of digital technologies have been rapid during COVID-19 (Eurofound 2021a; LaBerge et al. 2020). Therefore, the questions ten and eleven asked firms to evaluate the situation of firms before the pandemic, and then to assess whether the overall level of digitalization, and the use and adoption of digital technologies have increased due to COVID-19. While designing the first items of the question twelve, which considered firms' internal implementation and managerial abilities to build and use

digital technologies, studies of Mata, Fuerst & Barney (1995), Bharadwaj (2000) and Lu & Ramamurthy (2011) were benchmarked, as they provided practical examples about the abilities needed.

Originally, it was planned that the survey would include only background information of firms and these three categories of main topics of the research. However, as will be described in the upcoming chapter five, while starting the data analysis, it was realized that some of the statements in the survey did not truly fell into any of these three main categories of questions, even though formed statements were planned to describe one of those. This observation affected statements seven, eight, thirteen and fourteen, which were realized evaluating firms in general. Therefore, the fourth category of questions was formed during the data analysis. The results of these statements were used to describe and analyze firms on general level, but were not included in the main data analysis. In the formulation of the statement seven, considering the general impacts of COVID-19 on firms' operations, the study of Kilimis et al. (2019) was utilized. Moreover, as the adoption of digital technologies and carrying out digital transformation may include several challenges and thus it can be expected that also Finnish SMEs have faced obstacles that have reduced their willingness to adopt digital technologies, the question thirteen wanted to ask firms' views about potential challenges. For example, European Central Bank (Elding & Morris 2018) has listed obstacles for the adoption of digital technologies, which were exploited in formulating the possible obstacles in this survey.

4.2.3 Sample & Sampling Strategy

In order to describe a phenomenon based on the numerical data, quantitative research requires that the sample size is representative and large enough (Heikkilä 2014), even though it is worth of noticing that a large sample alone is not a guarantee of accuracy (Balnaves & Caputi 2001). The original population of the research was Finnish SMEs, and as almost all employer firms are SMEs in Finland (99.1%; OECD 2022), using the population of this size in the study would have been extremely large and time-consuming (Heikkilä 2014), which is why the search was limited to consider smaller sample of SMEs (Figure 4).
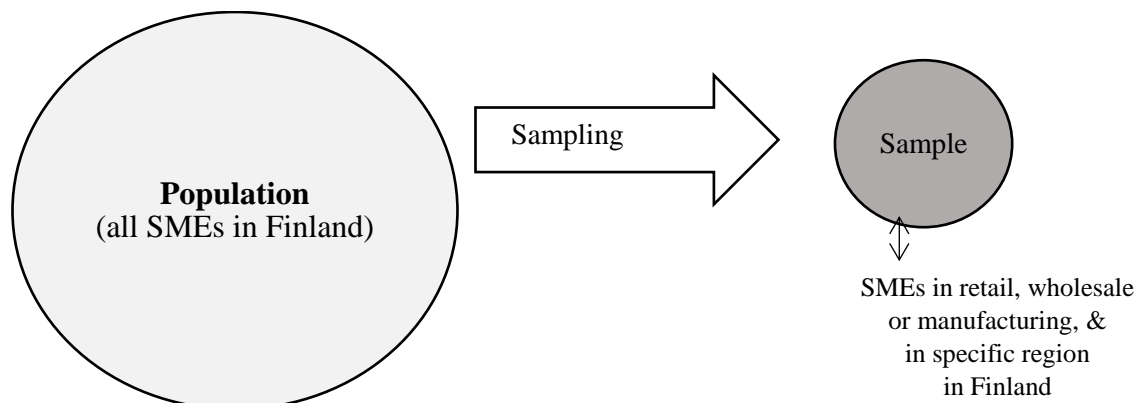
Figure 4: Population sampling of the study

To gather relevant and comprehensive sample for the survey, the database of Amadeus was utilized in the search of firms. The reason to consider only SMEs was based on their importance for Finnish economy (e.g., TESI 2020a). Furthermore, it was expected that there would be found differences between the industries in terms of their levels of digitalization, and thus next the exclusion of firms was done by the industry (manufacturing, wholesale and retail included). However, more exclusion had to be made as the sample was still considered being too large for this research. The search strategy and exclusion criteria are summarized in the Appendices (Appendix 4). As a result, the highest number of enterprise openings as well as closures were recorded in the third quarter of 2021 in Uusimaa (Official Statistics Finland 2022), and therefore it was decided to narrow the sample consisting only firms operating in the cities Helsinki, Espoo or Vantaa. Searching small- or medium-sized firms operating in cities of Helsinki, Espoo or Vantaa, and in the industries of manufacturing, retail or wholesale, resulted 12 150 firms and the list of results was exported from Amadeus database to Excel for closer consideration. List of firms was then filtered based on the number of employees (less than 250 employees), last year of operations (2019-2021), and whether they had some kind of contact information (email address) available in the results. As SMEs were the target group of the research, firms having more than 250 employees were excluded. Last year of operations was defined so that the respondents would have experienced the impacts of COVID-19. Contact information was filtered to gather email addresses of firms directly from the database.

Altogether, 496 firms were identified into the sample. However, while contacting firms, 40 of them immediately sent automatic acknowledgment message which informed that the invitation could not be delivered to them. Therefore, the overall sample involved 456 firms,

to whom two separate reminder messages were sent. Out of these firms, altogether 67 got interested about the survey by opening it, 42 individuals began answering to the survey, and 28 ended up finalizing the survey. All responses were given in Finnish survey, and no answers were received through English survey, even though five respondents opened English version of the survey. The results will be discussed more carefully during the data analysis and findings.

4.3 Methodological Limitations

No one research design or methodology is completely perfect, and as there are trade-offs between the ideal design and the actual outcome, all studies have limitations (e.g., Ross & Bibler Zaidi 2019). The choice to conduct a quantitative research in this kind of subject may raise opposite opinions, as another great option instead of survey would have been personal interviews. Interviews could have given more personal insights to the firms' internal strategic development processes and provide deeper understanding about their instinctive behavior and the causes and effects of it (Heikkilä 2014). However, as the objective was to examine the relationship between resilience and digital capabilities of firms, and to be able to draw broader conclusions from the results, it was preferable to aim gathering a higher number of responses by using standardized questionnaire. Having the same setup of questionnaire and standardized questions allowed to collect data that could be generalizable (Hirsjärvi et al. 2009).

Weaknesses and constraints in conducting a survey are recognized. Usually a research material gathered via survey is considered superficial, the interpretation of results may turn out problematic, and survey studies in general have been considered theoretically modest (Hirsjärvi et al. 2009). Additionally, the greatest constraints in this study can be expected being time and low response rate in the sample. As will be discussed later, the timeframe for data collection was limited, which may have had its impact on the response rate. Having low response rate means that the results of the study cannot be explicitly declared statistically significant.

4.3.1 Reliability & constraints to validity

All quantitative research methods are subject to bias and error (Balnaves & Caputi 2001), and in order that the results would be accurate, it is important to establish the validity and reliability in research. *Validity* of research considers the accuracy of a measure, while *reliability* refers to the consistency of measure (Hirsjärvi et al. 2009). Validity of the research means that the topic is accurately measured in a study and the results really represent the objective, what they are supposed to measure. The research is reliable if the results can be reproduced under the same conditions again. (Hirsjärvi et al. 2009; Heale & Twycross 2015) Validity and reliability of the research can be supported in advance, for example by establishing clear and well-restricted research problem, defining the population accurately, preparing a good research plan and precise questionnaire, choosing suitable methods for data collection and data analysis, and reporting the research (overall process and the results) clearly and objectively (Heikkilä 2014).

Demonstrating that a research is valid, it should be made sure that the research questions are developed accurately: they are clear and unambiguous, they measure the things that were targeted, and they cover the whole research problem (Hirsjärvi et al. 2009). Sampling should be representative, the sample should be defined accurately and the response rate of the survey should be high enough (Heikkilä 2014). To receive reliable results from the research, it is required that the sample is large enough and representative: as similar as possible with the overall population in the research (Heikkilä 2014). Moreover, measures or research methods do not always correspond to the reality that the researcher is supposing to be investigating. For instance, the respondents of survey may understand the questions differently than the researcher has intended. (Hirsjärvi et al. 2009)

Considering the sample of the study, only firms in manufacturing, retail, and wholesale were studied. It is worth noticing that having the sample of respondents that operates in three specific industries only, exposes this research to bias: it does not include all industries that have suffered during the pandemic, which limits the external validity of the study – the ability to generalize the results to other setting, or in this case, to other industries (Ferguson 2004). Having reliable results also require that data collection, documentation and handling of results are done carefully and impeccably (Heikkilä 2014). The overall data collection of this study, including the sample and the sampling process, has been documented and

described, and the results of the survey have been processed and dealt carefully, following the data analysis methods of quantitative research.

5 Data Analysis

This chapter explains more carefully the approach, methods and techniques used in the data analysis. As has been highlighted earlier, the total number of respondents was 28 firms. The research sample consisted nine firms in the industry of manufacturing, seven firms in retail and twelve firms in wholesale. The collected data in this study was analysed by using the software of Stata as the primary tool for the statistical analysis of the survey data, with the support of Excel. Descriptive statistics and correlation analysis were conducted to gather the basic information on variables. Before the analysis, the gathered data was downloaded from Webropol in .xls format after completing the questionnaire. The data was prepared in Excel after which it was downloaded to Stata.

The survey composed of a series of statements, which represented questions of similar theme that aimed to measure one main variable. The main variables of the study were defined being *Resilience, Digital Capabilities* and *Digital Transformation.* During the data analysis, it was realized that some of the statements in the survey did not explicitly fell into any of these three variables, even though formed statements were planned to describe one of those three. More likely, statements described firms' activities and evaluation somehow, and therefore, rest of the statements formed the fourth category for the analysis: *Evaluation of firms.* Statements in this category are discussed during chapter 6.

The data was coded and tabulated in preparation for analysis, and the survey data was prepared, tested and analysed by using software of Stata and Excel. Descriptive statistics were used to determine the main features of the collected data in quantitative terms. Specifically, since the data was considered as ordinal data, the descriptive statistics of results were reported regarding mode, median, minimum and maximum. The normality and reliability of the data were tested by running tests of Shapiro-Wilk's and Cronbach's Alpha in Stata. Additionally, the skewness and kurtosis were tested in Stata as well. The

relationship between variables was investigated using correlation and Kruskal-Wallis H test and regression analysis.

5.1 Measurement scale

The appropriate methods for analyzing the data depends on the scale of data. Defined variables can be measured on four scales: *nominal, ordinal, interval and ratio* (McKillup 2006). Identifying this scale of measurement is crucial to identify, as it determines, how variables can be used later, and what kind of tools and statistical tests can be used and run to analyse the data (Vehkalahti 2014; McKillup 2006; Tutz 2021). *Nominal scale* variables consist a set of alternative and mutually exclusive categories, and values are classified according to an attribute, so that each observation is assigned to one state only and variable can be described by one category only, such as a respondent's home region, but categories have no natural order (McKillup 2006; Hildebrand, Laing & Rosenthal 1970). *Ordinal-scaled* variables mean that values are ranked and specific value indicates their relative order (McKillup 2006). The questions in ordinal scales call for ratings of quality, agreements, and economic status, for example (Mishra, Pandey, Singh & Gupta 2018). Even though ordinal data enables grouping observations, just like nominal data, this scale also enables ranking and ordering of values. However, it is not possible to calculate the distance between different values, like would be on interval scale. (Stevens 1946)

Considering the data of this study and its analysis, there are controversy between two schools about whether Likert scale should be addressed as ordinal or interval scale (e.g., Jamieson 2004; Joshi, Kale, Chandel & Pal 2015). The Likert data can be considered both ordinal and interval data, depending on whether the distance between data points is treated to be equal (Joshi et al. 2015). Mangiafico (2019) argues that even though the response categories on Likert scale are numbered for convenience, the responses are not truly numerical. In the article of Bishop & Herron (2015), it has been suggested that extremes of a Likert-type responses tend to be used less often than the more central choices, and therefore the intervals closer to extremes may be further apart, than those closer to middle options. Bishop & Herron (2015) argues that this itself rejects the idea of considering Likert-type responses on interval scale. Moreover, in the case of this research, the distance between two scale values is not meaningful as the purpose is to compare "greater than" relationship of responses

between industries in terms of the values and order relation, but the interest of this study is not to imply, how much greater certain item is compared to other.

Altogether, the study included two background information questions, which are defined nominal, and twelve statements that are defined as ordinal Likert-type questions. Following Heikkilä (2014), the appropriate statistical indicators to introduce and analyse the ordinal data, are mode, median, percentiles, minimum & maximum, and quartiles. As the study data is considered ordinal data, the data can be analysed by using non-parametric analysis methods (Mangiafico 2019), such as chi-squared, Spearman Rho, or the Mann-Whitney U test (Jamieson 2004; Sullivan & Artino 2013). As a result, the data on the main variables was summarized in tables and charts, using median values of statements. Moreover, the data is presented as frequency distributions and portrayed as frequency tables, charts and graphs (e.g., Boone & Boone 2012; Joshi et al. 2015).

5.2 Descriptive Statistics

The survey composed of a series of statements, which represented questions of similar theme that aimed to measure one main variable. Variables were operationalized by using three to four statements (depending on the variable) measured on a five-point Likert scale (1 = strongly agree, 5 = strongly disagree). The main variables of the study were defined being *Resilience, Digital Capabilities* and *Digital Transformation*, of which *resilience* was dependent variable and *digital capabilities* and *digital transformation* were independent variables, as it was assumed that better digital capabilities and higher level of digital transformation in firms improve firms' overall resilience. Additionally, two background variables (industry & firm size) were used to determine potential differences in relationships of these variables between different firm groups. During the planning of questionnaire, it was realized that some of the questions in the survey did not explicitly fell into any of these three variables, and more likely, statements described firms' activities and evaluation somehow. Therefore, rest of the statements formed the fourth category for the analysis: *evaluation of firms.*

As one variable consisted of the series of statements, it was needed to make sure that the collection of items in the variable measured the same characteristic, and thus Cronbach's Alpha was used to test the reliability of data (e.g., Tavakol & Dennick 2018). As concluded

in Table 4, the values of all variables indicate acceptable internal consistency in items, as the values are at least 0.7. The value of *digital capabilities* (0.9200) is considered being strong, values of *the evaluation of firms* (0.9038) and *digital transformation* (0.8925) are reliable, and *resilience* (0.8126) is robust. (Taber 2018)

Cronbach's Alpha				
Variable	**Theme of statements**	**No. of question**	**Cronbach's Alpha**	
Resilience	Impact of COVID-19	3ab	0,9275	**0,8126**
Resilience	Strategical changes	3cd	0,9136	
Resilience	Supply Chain Resilience	4	0,7743	
Resilience	Activities	12 (e-q)	0,8502	
Digital Capabilities	Sensing	5	0,8202	**0,9200**
Digital Capabilities	Seizing	6	0,9123	
Digital Capabilities	Reconfiguring	9	0,9121	
Digital Transf.	Prior (DT) activities	10	0,8535	**0,8925**
Digital Transf.	DT following COVID-19	11	0,8399	
Digital Transf.	Managerial abilities for DT	12 (a-d)	0,9094	
Evaluation of firms	Obstacles	13	0,6064	**0,9038**
Evaluation of firms	Future	14	0,9263	
Evaluation of firms	Adoption of digital solutions	8	0,9501	
Evaluation of firms	Operational impacts	7	0,7828	

Table 4: Reliability of the data: Cronbach's Alpha

The study included one dependent variable, which was examined both alone and in relation with two independent variables. Independent variables were used to investigate whether they improve overall resilience. Background variables were *industry* and *firm size*, independent variables were *digital capabilities,* and *digital transformation*, and dependent variable was *resilience.* Variables were handled as categorical variables, as the data was on ordinal scale.

Descriptive statistics (Table 5) highlight the main values of the data. As was highlighted in the previous chapter, the data is considered on ordinal scale, and therefore the appropriate parameters to describe data are mode, median, percentiles, minimum, maximum and quartiles (Heikkilä 2014). Further, applying descriptive statistics to Likert scale responses

may be challenging, as the average of "never" or "rarely" do not exactly mean anything and "rarely and half" may not have useful meaning (Sullivan & Artino 2013). Therefore, descriptive statistics in this research were used to describe the main parameters and the normal distribution of data, while it is recognized that the data description through these values may not be extremely useful. Mode value of the data describes the data point that occurs most often in the data set (e.g., Ross & Willson 2017). The value alone is not very useful for the further analysis, but highlights that most of the respondents agreed with the statements in the survey. For most of the variables, the mode value is two, which means that most of the respondents agreed with the given statements in the survey.

As the Table 5 describes, the data of each dependent variable follows quite well normal distribution, meaning that the histograms of them follow the bell curve: there are only small percentage of the answers on both tails and the bigger percentage on the inner part of the curve. The values of mean and median represent the center of the data, of which median is usually less influenced by the outliers. Median value describes the point in which half of the values are greater than the median value, and half of the data are less than the median value. (Ross & Willson 2017)

Descriptive Statistics					
	N	Mode	Median	Min.	Max.
Independent variables					
Background variables					
Industry	28	3	2	1	3
FirmSize	28	2	2	1	3
Explanatory variables					
Digital Capabilities	**28**	**2**	**2.667**	**1**	**5**
Sensing capabilities	28	2	2.6	1	5
Seizing capabilities	28	4	3.5	1	5
Reconfiguring capabilities	28	2	2	1	5
Digital Transformation	**28**	**2**	**2.786**	**1**	**5**

DT activities before C-19	27	2	2.667	1	5
DT activities following C-19	28	2	2.75	1	5
Managerial abilities for DT	28	3	2.875	1	5
Dependent variable					
Resilience	**28**	**2**	**2.178**	**1**	**5**
Impact of COVID-19	28	1	1.25	1	5
Strategical changes	28	2	2.25	1	5
Coping w/ disruptions in SC	28	2	2.125	1	5
Changes in activities	28	2	2.808	1	5

Table 5: Descriptive Statistics

Even though median value of data lightly implies that the data would follow normal distribution, it was also tested. Shapiro-Wilk's was used to test of normality of data, which also determines whether to use parametric or non-parametric tests in the data modelling and hypothesis testing. As the value of dependent variables for Shapiro-Wilk's was $p > 0.05$ and for skewness and kurtosis $p > 0.05$, the data was assumed to be normally distributed (Appendix 5). Additionally, dependent variables were visualized in histograms as well, which supported the conclusion about normally distributed data (Appendix 5).

5.3 Correlation of variables

Shapiro-Wilk's test pointed out normally-distributed data (Appendix 5). As the data in this research is considered being on ordinal scale, variables are ordinal and the sample size is relatively small, the appropriate and most suitable test for correlation is considered being Spearman's Rho or Kendall's Rank Correlation (e.g., Khamis 2008). The aim of the study was to research whether firms' digital capabilities have a relation to firms' resilience, and thus the relationship between firms' resilience and digital capabilities and digital transformation were tested. For this purpose, Spearman's Rho test of correlation was conducted to check the significant relationship of statements composing the variables (Table 6).

The results show that many statements have positive strong correlation (Table 6). Variable of *resilience* consists of statements 3a, 3b, 4 and 12b. Of these, the statement 12b (changes in daily activities firms have made as a results to COVID-19) has the greatest correlation with firms' *digital capabilities* (5. sensing, 6. seizing, 9. reconfiguring). Moreover, the correlation is strong between statements composing variable *digital capabilities* (5, 6, 9) and statements composing variable *digital transformation* (10, 11, 12a).

Statements	Resilience				DCs			Digital Transformation		
	3a	3b	4	12b	5	6	9	10	11	12a
3a. Impact of COVID-19	1.0000									
3b. Strategical changes	0.4198	1.0000								
4. Coping w/ disruptions in SC	-0.0528	0.0464	1.0000							
12b. Changes in activities	-0.0134	0.2833	0.0592	1.0000						
5. Sensing capabilities	0.0569	0.2420	0.2392	0.6761	1.0000					
6. Seizing capabilities	0.1013	0.2511	0.2467	0.6268	0.7446	1.0000				
9. Reconfiguring capabilities	-0.0087	0.1829	0.0533	0.5825	0.7304	0.5933	1.0000			
10. DT activities before C-19	-0.1313	0.1359	0.3076	0.6344	0.5184	0.4547	0.6080	1.0000		
11. DT activities following C-19	0.0037	0.1765	0.0124	0.3607	0.4082	0.3681	0.6656	0.5089	1.0000	
12a. Managerial abilities for DT	0.1384	0.2111	0.2523	0.6376	0.7596	0.7129	0.6312	0.4807	0.4442	1.0000

Table 6: Correlation matrix of variable statements

The correlation between these statements is logical, as organizational capabilities are considered as a central mean for organizations to execute digital transformation successfully. The better digital capabilities firms' have, the better ability firms' have to adapt new digital solution and transform their normal daily activities into digital ones. (Konopik, Jahn, Schuster, Hoßbach & Pflaum 2022).

5.4 Kruskal-Wallis H test

There are variation in opinions about which tests would be the most appropriate ones to analyse Likert scale data (e.g. Sullivan & Artino 2013; Morgan 2017). As the interest of this study is to examine the relationships between dependent variable and both independent variables separately, in other words, testing multiple groups of independent variables, Kruskal-Wallis H test, a non-parametric equivalent of analysis of variance (ANOVA), was conducted. Kruskal-Wallis H test can provide the same type of results as an analysis of variance, but based on the ranks, not the means of the responses. (Allen & Seaman 2007)

As the final sample size was relatively small, non-parametric test of Kruskal-Wallis H test was used to test whether there are statistically significant differences between two or more groups of background variables (industry, firm size) on a continuous or ordinal dependent variable. As the summary of results in Table 7 shows, the only statistically significant difference exists in changes in firms' activities (one of the items combining the variable *resilience*) between different industries (p=0.0402). This implies that industries have modified their activities differently to manage the crisis.

Kruskal-Wallis H test	
by Firm size	p-value
3a. Impact of COVID-19	0.4774
3b. Strategical changes	0.6560
4. Coping w/ disruptions in SC	0.5922
12b. Changes in activities	0.3539
5. Sensing capabilities	0.4246
6. Seizing capabilities	0.7413
9. Reconfiguring capabilities	0.3999
10. DT activities before C-19	0.6705
11. DT activities following C-19	0.5171
12a. Managerial abilities for DT	0.1866
by Industry	p-value
3a. Impact of COVID-19	0.1264
3b. Strategical changes	0.1333
4. Coping w/ disruptions in SC	0.0877
12b. Changes in activities	**0.0402***
5. Sensing capabilities	0.1060
6. Seizing capabilities	0.6321
9. Reconfiguring capabilities	0.3728
10. DT activities before C-19	0.3663
11. DT activities following C-19	0.1149
12a. Managerial abilities for DT	0.4775

Table 7: Kruskal-Wallis H test

However, Kruskal-Wallis H test does not provide further information about between which industries this difference exists. Further, some of the groups in the sample included only a few respondents, and thus it may not be very meaningful nor possible to compare the differences between industries and firm sizes reliably.

5.5 Ordinal Logistic Regression

To find out, what is the association of digital capabilities with resilience, regression analysis was conducted. Resilience was modelled with both main explanatory variables, *digital capabilities* and *digital transformation* to find out, how changes in firms' digital capabilities or digital transformation are associated with firms' overall resilience. Ordinal logistic regression assumes that the effect of an independent variable is constant for each increase in the level of the response, as logistic models does not assume a spacing between levels of response variables (e.g. Harrell 2015). Coefficients describe the changes and p-value determines whether coefficients are significantly different from the reference one (e.g., Kaakinen & Ellonen 2008; Harrell 2015). Original variable *resilience* was transformed into a new, binary dependent variable, based on the firms' agreement with statements (1= agree, 0 = disagree).

As table 8 summarizes, all statements comprising variables *digital capabilities* and *digital transformation* were tested separately in relation to resilience. The p-values of digital capabilities (0.012), especially of sensing (0.047) and seizing capabilities (0.023), and firms' managerial abilities for digital transformation (0.035) are statistically significantly and positively associated with firms' evaluated resilience.

Ordinal Logistic Regression					
			Resilience		
Independent variables	Obs	Coefficient	Stnd. Error	p-value	Sig.
Industry	28	-1.939662	.9071247	**0.032**	*
Firm size	28	.3086272	.8428681	0.714	
Digital Capabilities	28	1.958345	.7752187	**0.012**	*
5. Sensing capabilities	28	1.518215	.7638408	**0.047**	*
6. Seizing capabilities	28	1.556577	.6846506	**0.023**	*
9. Reconfiguring capabilities	28	.9474575	.6732797	0.159	
Digital Transformation	28	1.224921	.8218513	0.136	
10. DT activities before C-19	27	1.624463	.9028402	0.072	
11. DT activities following C-19	28	.2614395	.6951381	0.707	
12a. Managerial abilities for DT	28	1.797917	.8538881	**0.035**	*

*Table 8: Logistic regression: the relationship of different variables with resilience, * = p < 0.05*

Similarly to Kruskal-Wallis H test, also regression analysis implies that there are differences in resilience between different industries. To find out, what is an association of digital

capabilities and digital transformation with resilience in different industries and firm sizes, regression analysis was also conducted based on two background variables (Appendix 6). Regression analysis of digital capabilities and resilience based on industry and firm size exposed, that wholesale (p = 0.020) differs significantly from manufacturing and retail, and small firms (10-49 employees, p = 0.003) differ statistically significantly from micro firms and medium-sized firms.

6 Results

This chapter introduces the results of the survey and discusses them in the light of research questions, following the main themes of questionnaire. Overall tables of frequencies of responses in values (1-5) can be found in Appendices (Appendix 7). To conclude, the results of previous tests indicate positive correlation between the main variables, meaning that the variables appear to be statistically significantly related and thus the value of one variable (e.g., resilience) increases in association with the increase of the other variable (e.g., digital capabilities). Kruskal-Wallis H test concludes the differences between industries regarding their resilience factors.

The questions in the survey were divided into four groups: 1) background information, 2) resilience & the effects of COVID-19, 3) digital capabilities, and 4) digital transformation. First two questions in the survey were multiple choice questions related to firms' background information, thus defining respondents based on their industry and firm size. Other three groups of questions were close-ended questions and they included statements that were asked to assess on Likert scale (1-5). Altogether, 28 firms responded, hence the response rate was 6 %. Therefore, due to small sample size and low response rate, the results of the study need to be reviewed with caution.

Among 28 respondents, there were nine firms operating in manufacturing (32 %), 7 firms operating in retail (25 %), and 12 firms operating in wholesale (43 %). Most of the respondent firms (75 %, 21 firms) had 10-49 employees, three firms had less than ten employees (14 %), and four firms had the number of employees between 50-250 (11 %). Table 9 visualizes the distribution of firm size between industries: the sample does not

include any firm having 50-250 employees and operating in retail, just like there is no single firm with less than 10 employees operating in wholesale.

The distribution of sample between industries, by firm size (N=28)				
Firm Size	*Manufacturing*	*Retail*	*Wholesale*	Total
less than 10	1 **11.11%**	2 **28.57%**	1 **8.33%**	4 **14.29%**
10-49	5 **55.55%**	5 **71.43%**	11 **91.66%**	21 **75%**
50-250	3 **33.33%**	0 **0.00%**	0 **0.00%**	3 **10.71%**
Total	9 **100.00%**	7 **100.00%**	12 **100.00%**	28 **100.00%**

Table 9: Respondents in industries, by firm size

As the sample size in some groups was too small or did not exist at all, the comparisons of responses based on firms' size or industry were not considered meaningful nor reasonable. Small sample size may be one reason for Kruskal-Wallis H test providing statistical differences between groups. Due to small sample size, it is not meaningful to demonstrate all the answers based on these two groupings, but the most interesting findings will be briefly highlighted. As one of the objectives of the research was to consider COVID-19 as a case study from which some further recommendations could have been made, this objective was not fully reached due to unresponsiveness of firms.

6.1 Resilience of firms & the effect of COVID-19

Firm *resilience* was operationalized by using four statements measured on a five-point Likert scale (1 = strongly agree, 5 = strongly disagree). These statements measured, how COVID-19 has influenced firms and the industry, what have been firms' ability to cope with supply chain disruptions, and whether strategies have been revised or the changes in internal activities have been made. Resilience of firm was researched in statements 3 and 4. Results show that almost 90% of respondents agreed (either strongly agree or agree) that the

pandemic of COVID-19 has affected their industry, and 85 % of respondents agreed that COVID-19 has affected their firm somehow (Figure 5).
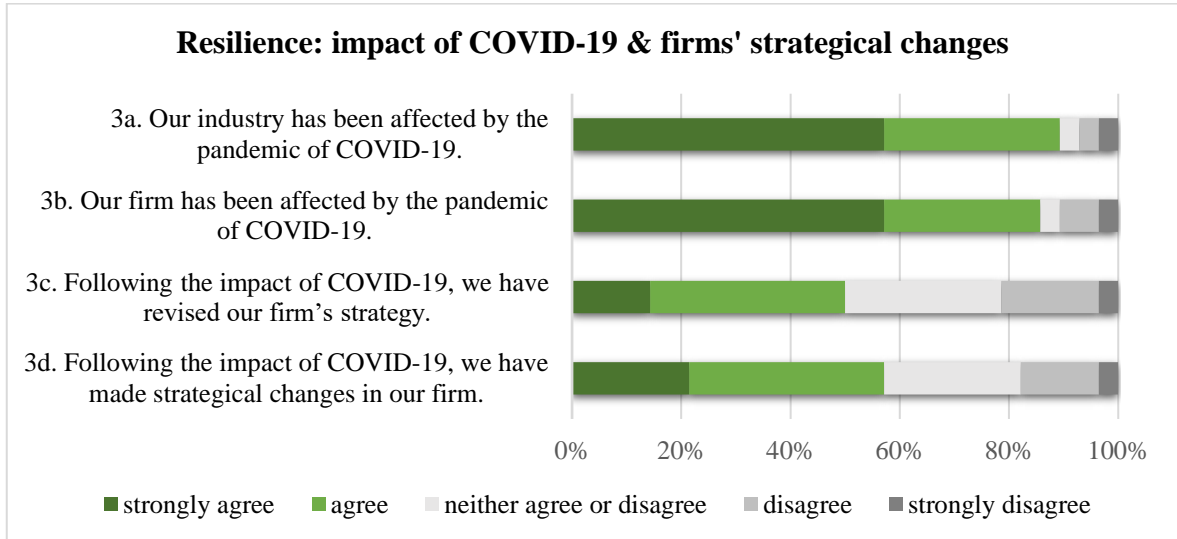

Figure 5: Firms' estimation of the impact of COVID-19 on them, their industry and strategy

As almost all of us have been experienced the impacts of COVID-19 at some level, it is not surprising that the results of the survey found similar assessments from firms, regarding themselves and their industries. Interestingly though, approximately only half of the firms agreed having revised their strategy somehow and a bit more than half of firms agreed having made some kind of strategical changes. Perhaps firms did not feel the need for revising their strategies that fundamentally, or their strategies and operations already included digital solutions and digitalization. This conclusion could be seen being logical, as Finland and Finnish firms have one of the highest levels of digitalization of enterprises in the EU and Finland ranks the 1st on the integration of digital technology by businesses among EU countries in 2021 (e.g., Brodny & Tutak 2021; Digital Society and Economy Index 2022). Additionally, when looking at the statements measuring digital transformation (chapter 6.2.), approximately half of the respondents assessed that their firm has utilized digital technologies already before to the pandemic, which is in line with the amount of firms who have not revised their strategy due to COVID-19.

Moreover, over half of the firms consider that they have been able to cope with, adapt to, and provide a quick responses to supply chain disruptions, and continuously maintain a high level of situational awareness (Figure 6). Firms had especially positive assessments regarding their ability to cope with the changes caused by the disruptions in the supply chain. This is a positive finding, as especially global supply chains faced significant challenges

during COVID-19 (Harapko 2021). Therefore, it could be considered that firms have been proactive in their supply chain management, for example, by having multiple channels through which they operate or by systematically executing risk management and thus being aware of upcoming potential threats.
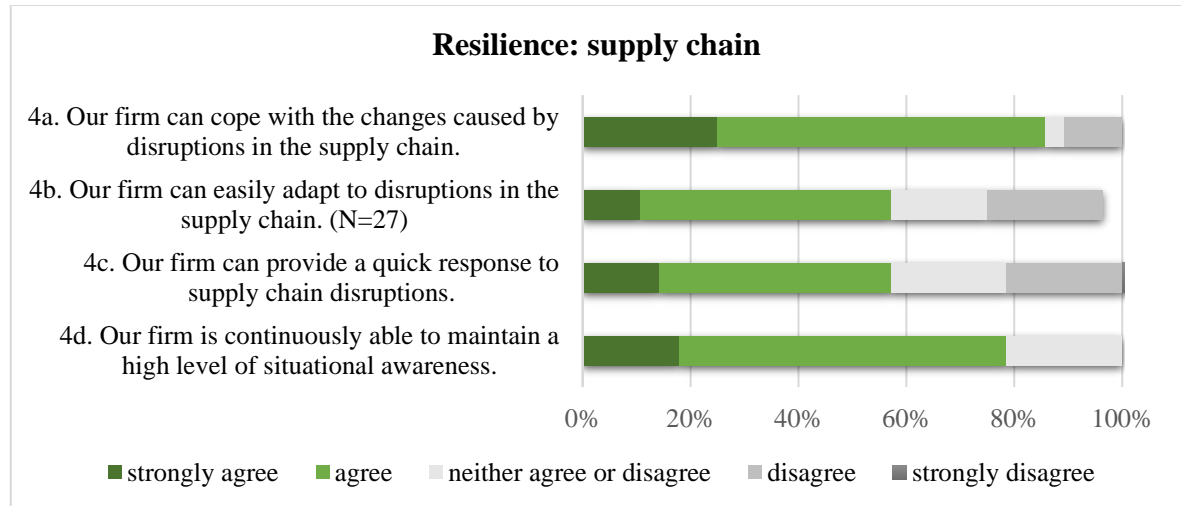
Figure 6: Resilience in supply chain

When asking about how firms' daily activities and ways of working have changed, most of the respondents agreed that the pandemic of COVID-19 has had effect on their daily operations at some level (Figure 7). As it has been discussed in the news (e.g., Helsingin Sanomat 2020), the amount of regular remote working increased as a result to the COVID-19 and new working methods were adopted more commonly as, for instance, the use of electronic workspaces and instant messaging services increased considerably from 2019 (e.g., Eurofound 2020, Keyriläinen 2021). Moreover, according to OECD (2021), business surveys worldwide have pointed out that up to 70% of SMEs have intensified their use of digital technologies due to COVID-19. This trend was revealed in this study too, as 71% of firms assessed that their amount of remote working has increased, and to support that, 89% of firms agreed that their use of video conference tools has increased as a result to COVID-19. Overall, it seems that firms assess that their overall level of adopting new digital solutions has not increased that much, since the most visible changes have been made in increasing the amount of remote work and in using video conference tools and applications, which support each other. Moreover, it seems that firms have coped with new circumstances by relying on their 'traditional' activities instead of utilizing technologies related to Industry 4.0., such as Internet of Things (IoT), Artificial Intelligence (AI), Augmented Reality (AR), robotics and Big Data (e.g., Vaidya, Ambad & Bhosle 2018). As can be seen from Figure 7,

firms assess that they have coped with implications of the pandemic by improving their visibility on the internet – being present and more active on social media & updating the home pages and websites more often. Approximately 20 % of respondents estimated that they have increased the use of IoT, AI, robotics or Big Data, which is visibly lower percentage than reported changes in other activities (at least 40%). This may be a result of firms having already applied basic digital technologies in their operations, and thus that significant changes was not needed in the processes when COVID-19 struck. It could be considered that firms were already resilient in terms of their ability to use digital tools, products and solutions, as they had been utilizing and adopting digital technologies already before the pandemic. Therefore, it could be considered that the pandemic just increased and made better use of existing products, for instance, increased remote working and the use of instant messaging tools. The solutions and tools were most likely already there, and COVID-19 just addressed the importance of them, as firms increased the use of the tools.
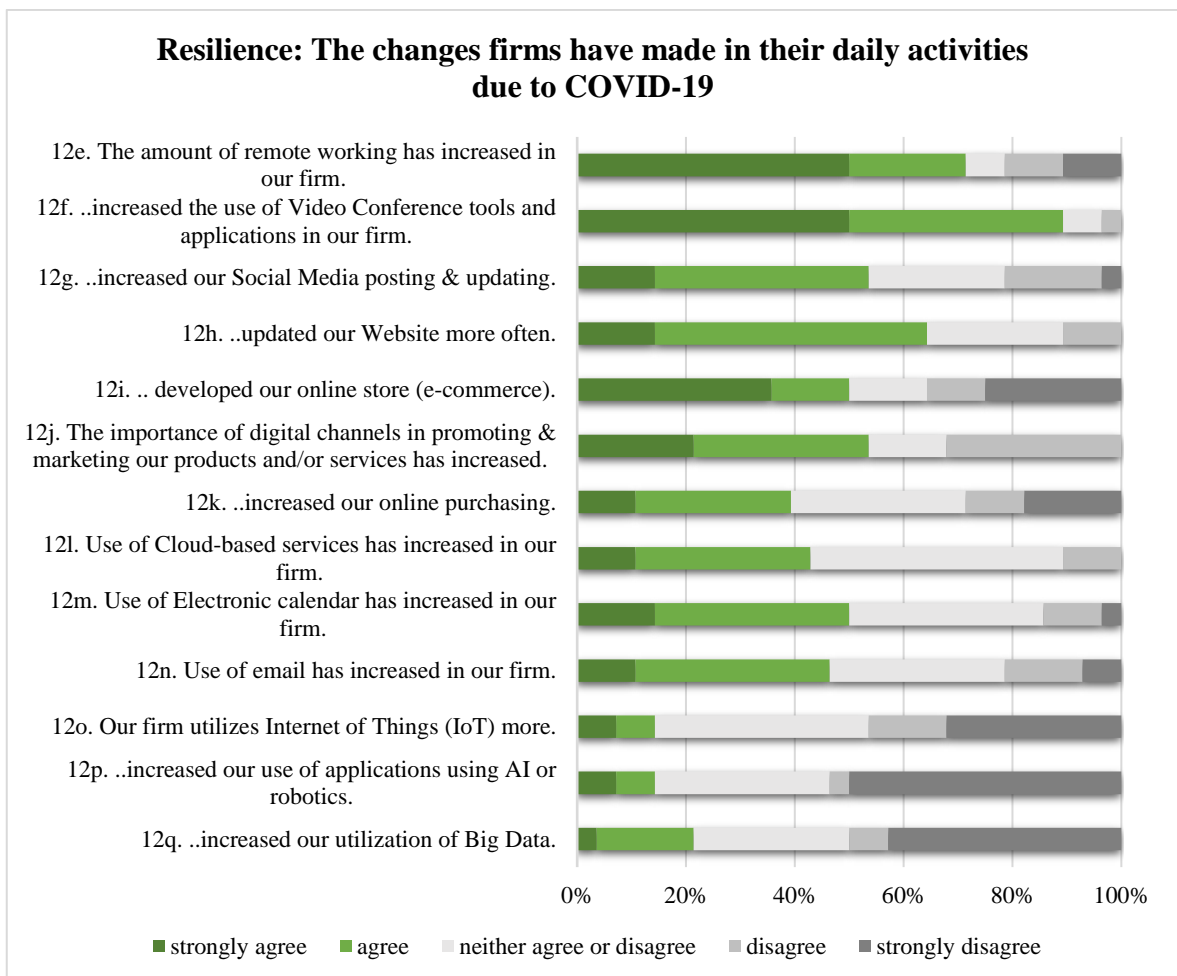

Figure 7: Changes in firms' daily activities due to COVID-19

6.2 The role of digital capabilities

The variable *digital capabilities* was formed by using three statements measured on a five-point Likert scale (1 = strongly agree, 5 = strongly disagree). These items 5-9 investigated the digital capabilities of firms, and the statements aimed to find out the scope of utilization of digital capabilities on different stages of the process. Following theory of DCs (e.g., Teece 2007; Maijanen & Jantunen 2016; Warner & Wäger 2019; Leeman et al. 2021; Ellström et al. 2022), statement 5 asked about identifying [sensing] new opportunities, statement 6 considered the seizing of opportunities, and statement 9 aimed to find out, if firm has managed to adopt new digital-related tools, products and/or services [reconfiguring] the business models.

Firms estimated that their reconfiguring abilities were the highest of the capabilities of sensing, seizing and reconfiguring (Figure 8). Over half of respondents agreed that the adoption of digital solutions have had positive impact for their firm to survive from the pandemic, as digital solutions have enabled firms to continue operations and tackle the challenges emerged. In other words, it seems that firms have been able to rebuild their assets and gain knowledge, which have enabled them to utilize new opportunities that were appeared during the pandemic. Moreover, over half of the respondents agreed that their firm had increased the use of technology (sensing capabilities).
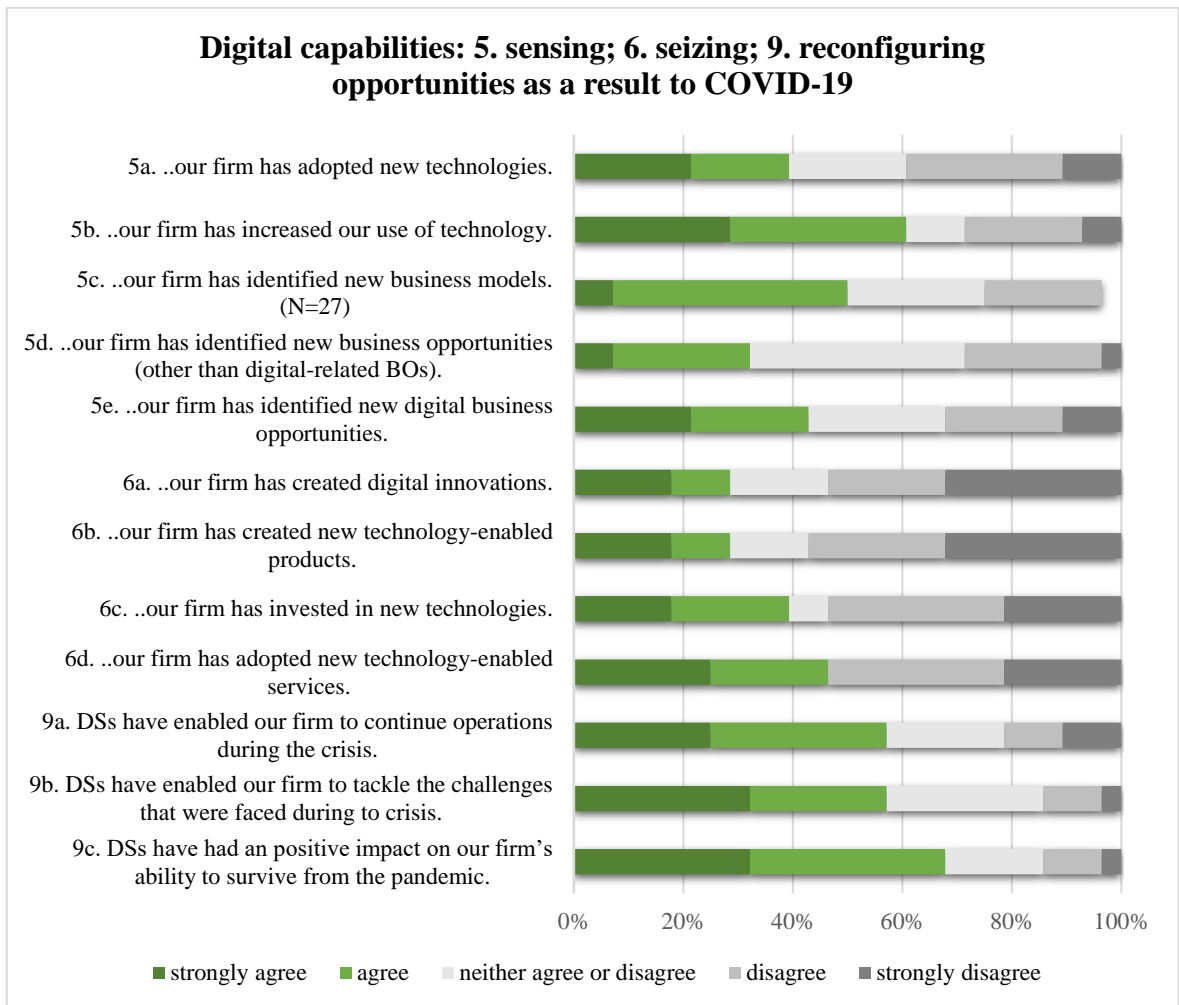
Figure 8: Firms' estimation about their digital capabilities

6.2.1 Role of digital capabilities for firms' resilience

These three above-mentioned questions were utilized to gather the answers for the main research question of this study:

RQ: What has been the role of digital capabilities to overcome the crisis of COVID-19?

Firms' assessments in the survey emphasize that all firms have been affected by the pandemic of COVID-19 somehow. As a response to the pandemic, it seems that firms have been capable of developing their assets and gaining new knowledge, which have enabled them to utilize new opportunities appeared during the pandemic. Thus, it seems that firms have exploited and developed their digital capabilities to respond the pandemic, and therefore it can be considered that digital capabilities have enabled firms to overcome the crisis of COVID-19.

Interestingly, approximately half of the firms assessed that they have not made strategical changes due to COVID-19, which is approximately same amount of respondents who had adopted digital solutions already before the pandemic. However, this is an observation from the results, and thus straightforward conclusions cannot be made about the relation of not-conducting strategic changes and having utilized digital technologies. Even so, this may imply that firms had already adopted basic digital technologies, and thus that significant changes were not needed during COVID-19. It could be considered that the pandemic just increased the use of existing tools: the solutions most likely already existed, and COVID-19 just addressed the importance of them. Moreover, many firms in crises want to focus on maintaining business continuity and securing core business by cutting costs, driving productivity, and implementing safety measures, which result to decrease on investments in innovation (Bar Am, Furstenthal, Jorge & Roth 2020). Even though this was not explicitly nor very widely examined in the research, hints about this same phenomenon may be found in this study. For example, only a third of firms had adopted or invested in new technologies, even though 60 % had increased their use of technology. Additionally, most firms have relied on more traditional (digital) activities, instead of exploiting digital technologies related to Industry 4.0.

The results of previous tests indicate that relatively strong positive correlation was found between variables digital capabilities and digital transformation (p=0.62292), as well as between resilience & digital capabilities (p=0.5984). Moderate correlation was found between resilience & digital transformation (p=0.3943). Kruskal-Wallis H test concluded that there are differences between industries regarding their resilience, and more specifically, in how firms have modified their activities due to COVID-19. Positive correlation between variables implies support for the hypotheses and thus the research questions of this research: it seems that by improving firms' digital capabilities – which are needed for the successful execution of digital transformation – firms' resilience increases. Previous studies (e.g., Zhang et al. 2021; Botha et al. 2022) have found out that digital transformation improves firms' resilience, and the results of this study specifically emphasizes the importance of digital capabilities for firms' resilience. Therefore, it can be considered that digital capabilities have had a positive role for firms' ability to overcome the crisis of COVID-19. For instance, as mentioned, firms have been capable of developing their resources, and gaining new knowledge, meaning that they have exploited and developed their digital capabilities to respond and make the most of the situations appeared during the pandemic,

and therefore it can be considered that digital capabilities have had a significant role in overcoming the crisis of COVID-19.

When comparing the results of firms in different industries and firm sizes (Appendix 6), regression analysis indicated that firms' operating in wholesale differ significantly from manufacturing and retail, and small firms (10-49 employees) differ statistically significantly from micro firms and medium-sized firms, in terms of the association of digital capabilities and resilience. Regarding the association of digital transformation and resilience between industries nor firm sizes, significant differences were not found. Due to overall small sample size, the results are advised to be considered with caution.

6.3 Digital Transformation

Statements 10, 11, and 12 (a-d) formed the second independent variable, *digital transformation,* and together these examined firms' levels of digital transformation and how technology is utilized in firms during the crisis. Just like previous ones, also these statements were surveyed on a five-point Likert scale (1 = strongly agree, 5 = strongly disagree). By analysing the results of statements 5, 6 and 12 (e-q) and combining the conclusions together with these three statements (10, 11, and 12 a-d), the results were found to the first sub-question of the paper:

RQ1: How is technology utilized in managing the crisis?

This sub-question was formed to support the main research question and to approach it from more practical perspective. The assumption regarding the first sub-question was – based on the studies (e.g., Eurofound 2021a; Yesner 2021; Caiazza et al. 2021), public discussion and news coverage, and personal observations – that firms have improved their usage of technology and firms' overall level of digitalization has increased. Statements 10 and 11 examined this expected change in digital transformation by asking firms to assess the situation in firms before the pandemic (statement 10), and then asking whether the overall level of digitalization, and the use and adoption of digital technologies have increased due to COVID-19. Items a-d of statement 12 examined firms' internal implementation of digitalization and managerial abilities to build and use digital technologies.

Figure 9 demonstrates the overall responses to the statements 10 and 11. Less than half of the firms in the survey had carried out digital transformation before the pandemic of COVID-19, and half of the respondents assessed that their firm had utilized digital technologies prior to the pandemic. Furthermore, considering the impact of COVID-19 for firms' digital transformation, 57 % of all respondents agreed that their firm has increased the number of electronically handled processes, and 68 % of all firms estimated that their overall level on digitalization has increased as a result to COVID-19. These assessments of firms can be considered logical in a bigger picture, as COVID-19 shut down the world, and people nor businesses could not meet in person. Therefore, to maintain their businesses active, the only option for firms was to communicate and operate by utilizing digital and electronically-handled tools. This naturally improved the overall level of digitalization in firms, meaning that firms became more technology-oriented as a result to COVID-19.
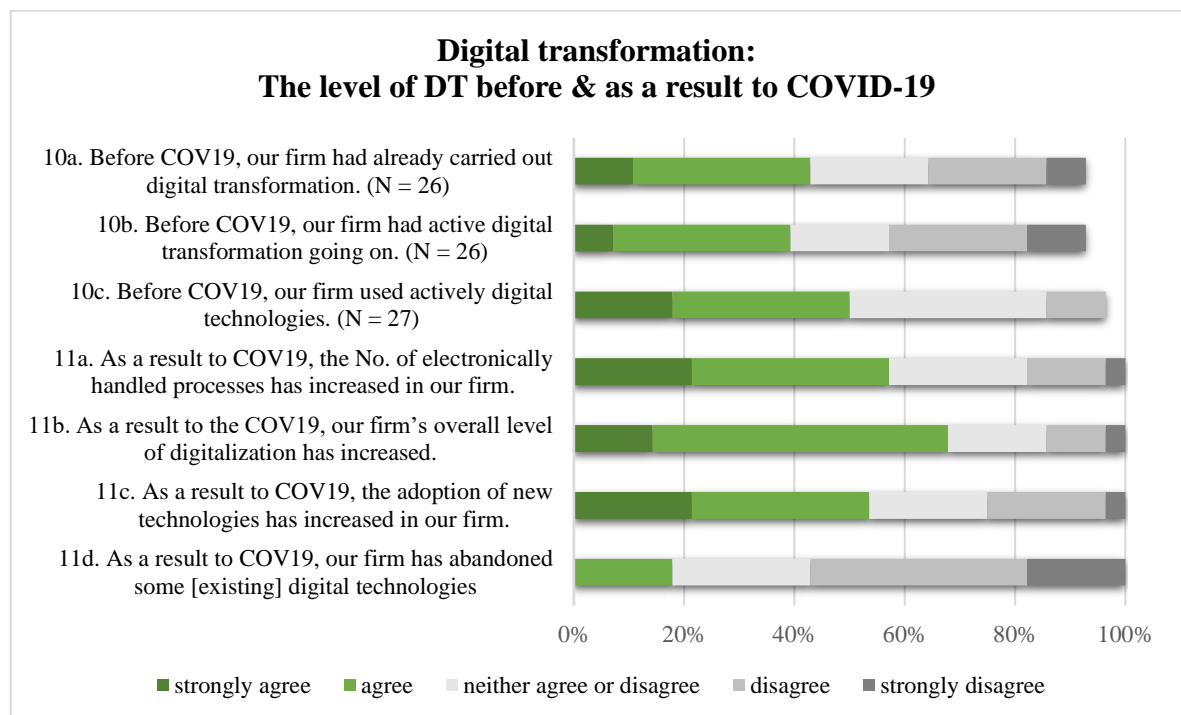
Figure 9: Digital Transformation – the level of DT before & as a result to COVID-19

According to OECD (2021), SMEs lag in digital adoption in general, but tend to digitalize some business functions first (e.g., general administration & marketing operations). It is considered that the smaller business, the less likely it is to adopt new digital business practices (OECD 2021). Interestingly, if comparing the results of this study based on firms' industry and firm size, it seems that micro-sized firms (the number of employees less than 10) were more active in using digital technologies already before the pandemic. However,

firms with the number of employees between 10–49 have increased their use of digital technologies and adoption of digital solutions more than micro-sized firms as a result to the pandemic. Further, based on the results of the survey, it seems that firms with 50-250 employees considered to have taken the greatest digital leap as a result to the pandemic. This research did not consider large firms, and thus it cannot be compared whether large firms have been more likely or capable of adopting digital practices than SMEs. However, considering just these three groups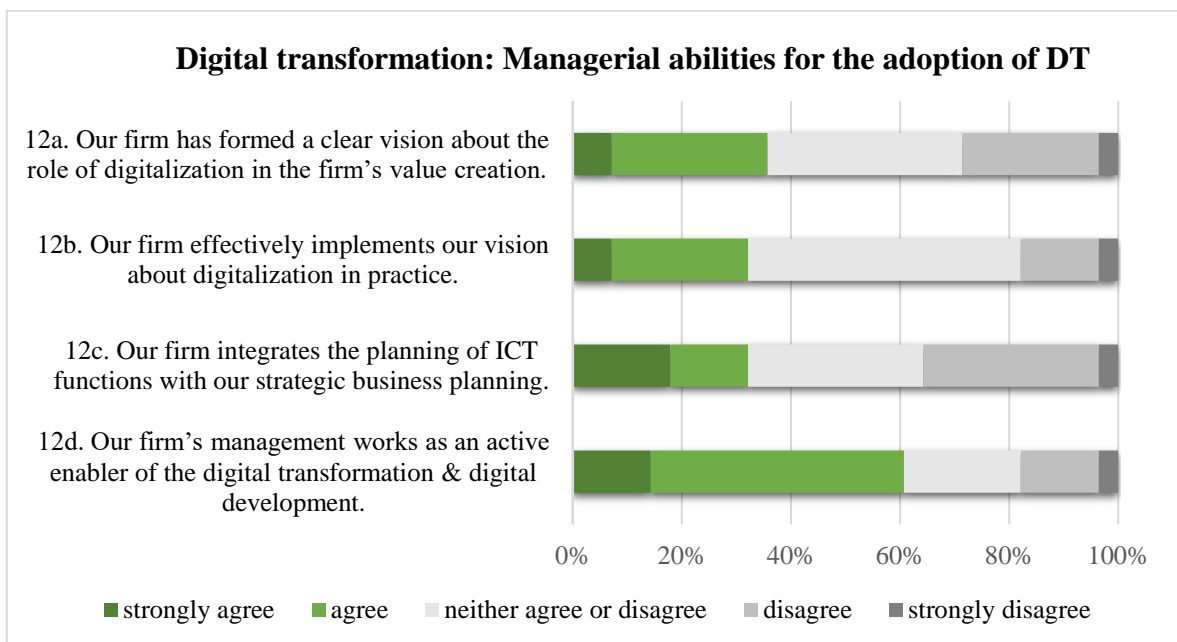 of firm sizes, the results seem to be following the conclusion of OECD (2021), as bigger firms have been more likely in adopting new digital business practices. Further, as all Finnish firms are quite fluent in using digital technologies (Brodny & Tutak 2021; Digital Society and Economy Index 2022), it is not surprising finding, that also Finnish micro-sized firms have been active in using digital technologies already before the pandemic, even though there cannot be made any further or explicit conclusions from that.

Considering, how COVID-19 has accelerated digital transformation in different industries, it seems that firms in manufacturing and wholesale have improved their use of digital technologies more than firms in retail. Further, retail firms' estimation about the increase in digitalization is lower than the estimation of firms operating in manufacturing and wholesale. However, wholesale and retail are often discussed together, as in OECD (2021), which highlights that there are cross-industry differences regarding the adoption of certain technologies, for instance wholesale and retail trade being more likely to adopt e-sales. As wholesale and retail seem to be often discussed together, the difference found in this research may not be that significant finding after all. Moreover, it would require more investigation and larger sample sizes to conclude definite and significant differences between these industries, which are often discussed together. Therefore, important to point out here is the sample sizes of groups, and thus most likely the comparison based on firm size or industry will not provide explicitly reliable conclusions.

Looking at the strategic planning of firms and how the adoption of digital transformation has been implemented into firms' operations, it seems that only a third of respondents have actively been planning and implementing digitalization, thus it seems that most of firms have not considered the role of digital transformation from the strategic perspective (Figure 10). Even so, over half of respondents assessed that the management actively enables firms' digital development. These results may be the outcome of the crisis appearing suddenly and

hitting firms and their operations rapidly almost overnight: firms did not have the possibility to plan and form a vision about digitalization before, and the adoption was implemented during the critical time of COVID-19. However, it seems that even though the vision was not formed, the management did assimilate its role and was able to support crucial digital transformation processes in firm, as critical changes were required in firms' ways of operating. It could be considered, that firms just focused on surviving, so the management supported digital development, and digital technologies were adopted due to their necessity, but there was no time for further consideration.

Digital transformation: Managerial abilities for the adoption of DT

12a. Our firm has formed a clear vision about the role of digitalization in the firm's value creation.

12b. Our firm effectively implements our vision about digitalization in practice.

12c. Our firm integrates the planning of ICT functions with our strategic business planning.

12d. Our firm's management works as an active enabler of the digital transformation & digital development.

■ strongly agree ■ agree ■ neither agree or disagree ■ disagree ■ strongly disagree

Figure 10: Strategic planning in the adoption of DT

To conclude the results of the statements 10, 11 and 12 (a-d), it seems that the pandemic of COVID-19 has speeded up the digitalization of operations, even though firms were heading towards digital transformation already before the pandemic. Despite firms' aims towards digitalizing operations and activities, it seems that COVID-19 was unexpected event that forced firms to make rapid decisions and adopt new technologies without profound planning regarding how to implement and integrate this change of operations into firms' business strategy. To make any final conclusions or to confirm this assessment, it would be necessary to study this possible phenomenon further by examining relevant literature and interviewing the management of firms specifically.

6.3.1 Utilization of technology

To find concrete answers to our sub-research question about how technology has been utilized in responding to the crisis, previously introduced statements 5, 6, and 12 (e-q) will be highlighted. As was concluded above, firms have increased their use of technology and improved their digitalization, and over half of the respondents agreed that their firm has increased the use of technology as a result to COVID-19. However, it may be possible that the decision for digitalization has been made rapidly for the firms' survival and thus further strategic planning and implementation is underway. As the literature review highlighted, SMEs adopt a different degrees of digital transformation, based on their contextual factors (Priyono et al. 2020), and especially small firms aim to survive by actively monitoring the environment and being proactive in their actions (Doern 2021).

The results of the statement seven (how firms' daily activities & ways of working have changed due to the pandemic) follow the findings of other studies, as the respondents agree that COVID-19 has had an effect on their daily operations at some level and remote working has increased remarkably in their firm. For example, according to Larja & Räisänen (2019), the most common digital tools used in firms, are home pages, social media, cloud services and net purchases. Following this, also the results of the survey found out, that firms have put their focus on the activities such as social media presence and website updates, while it seems that the overall level of adoption of 'modern' digital solutions (IoT, AI) have not increased that much. Along with increasing amount of remote working, the visible change was found in the increased use of video conference tools and applications, too.

Looking at the statements that formed the variable of *digital capabilities*, firms assessed that their reconfiguring abilities were the highest. Over half of respondents agreed that the adoption of digital solutions have had positive impact for their firm's survival in the pandemic, as digital solutions have enabled firms to continue operations and tackle the challenges. In other words, it seems that firms have been able to rebuild their assets and gain knowledge, which have enabled them to utilize new opportunities that were appeared during the pandemic. These observations seem to follow previous studies about firms' having adopted digital technologies to survive from the pandemic (e.g., Krauss et al. 2020; Zutshi et al. 2021; Cugno et al. 2022), as COVID-19 has effected daily operations and transformed previously normal working methods towards utilizing digitalization (e.g., Eurofound 2021a).

Therefore, as the literature have pointed out (e.g., Loureiro et al. 2021; Zhen et al. 2021), these changes have required firms to optimize and improve their digital competences and capabilities so that the transformation in working methods and internal processes could have been adopted successfully, and the business continuity has been ensured.
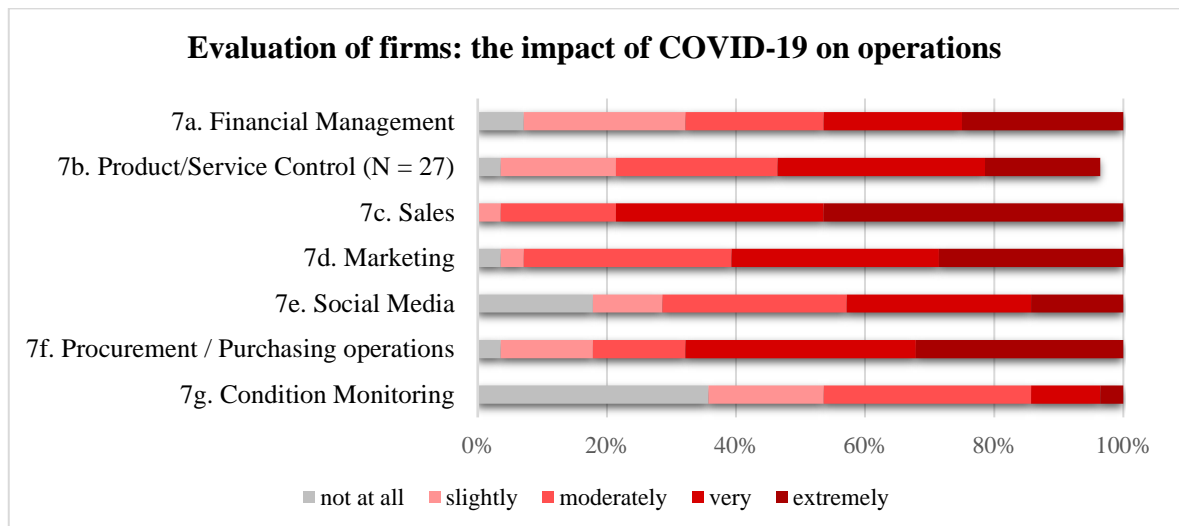
To answer the first sub-research question, it could be concluded that in the big picture, technology has been utilized for the survival during a rapid and unexpected event, and it has had a positive impact on firms' ability to manage the effects of the pandemic. In this research, comprehensive utilization of technology in firms practically means 1) the support for new ways of working (remote work, digital tools), 2) the establishment of new digital-related business opportunities, and 3) improvements in capabilities (ability to continue operations by adapting to new circumstances). Moreover, regarding the previous analysis about the role of digital capabilities for firms' resilience, this research emphasizes the importance of digital capabilities, and similar relationship was not found with digital transformation. On the other hand, digital capabilities are needed for executing digital transformation successfully, and thus it is reasonable to expect that also digital transformation can improve firms' resilience in crisis. Therefore, it is possible that the statements forming digital transformation were not truly applicable measuring digital transformation of firms.

6.4 General analysis of firms during COVID-19

The fourth category of statements in the survey was named as *Evaluation of firms.* This overall evaluation includes statements 7, 8, 13, and 14. These statements were handled and analysed apart from main variables and thus were not included in the main analyses, but these were seen providing interesting information about how respondents view and assess this challenging time of COVID-19. The statements examined the effects of COVID-19 on different sectors in firms (7), the impacts and requirements that the adoption of digital technologies has highlighted (8), the obstacles which may have reduced firms' digital transformation (13), and firms' opinions about whether digitalization & technology may help them to survive better in a future, during upcoming crises. By analysing the results of these statements and combining the conclusions together with previous analysis, the suggestions were found to the second sub-question of the paper, which aimed to raise discussion and consideration about how firms could prepare better for the similar event in the future:

RQ2: How could firms better utilize digital capabilities to react to similar crises in the future?

Overall, firms assess that all the operations suggested in the survey have been impacted on some level due to COVID-19 (Figure 11). Every firm estimated that the pandemic of COVID-19 has had the impact on their sales to some extent, and almost all firms reported impacts on their product/service control (93 %), marketing (93 %) and procurement/purchasing operations (93 %). The least effect was reported in condition monitoring (not at all = 35%). These findings are not surprising, as it is known that COVID-19 has had an impact on firms' operations (e.g., Kilimis et al. 2019). As the impact of COVID-19 has been the greatest on sales, marketing, and procurement/purchasing operations, firms most likely should carry out careful consideration and analysis regarding these operations. Perhaps firms could prepare for the future by investing in risk management and planning in general, and by conducting careful risk management on these operations specifically, and establishing some options and different paths regarding how to manage possible later shocks.

Evaluation of firms: the impact of COVID-19 on operations

7a. Financial Management	
7b. Product/Service Control (N = 27)	
7c. Sales	
7d. Marketing	
7e. Social Media	
7f. Procurement / Purchasing operations	
7g. Condition Monitoring	

■ not at all ■ slightly ■ moderately ■ very ■ extremely

Figure 11: Impact of COVID-19 on firms' operations

Almost 50 % of respondents agreed that adopting digital technologies (carrying out organizational change) has required managing organizational development, such as employee training and cultural change (Figure 12). The assessments from firms are coherent with previous studies (e.g., Eurofound 2021b) regarding the need to make enough organizational changes in habits and ways of working, to be able to capture the maximum benefits of the digital technologies (Parviainen et al. 2017). Thus, the findings can be seen

supporting previous studies. At this current crisis of COVID-19, it seems that people had to adopt the use of new tools overnight, without longer possibility for learning and training. Considering the future, it would be considered that if firms aimed to carry out organizational changes, they should plan the process carefully in order to be able to engage employees with the development. Resistance of change is one of the most crucial barriers that may complicate the development (Warner & Wäger 2019). Therefore, effective change-management is required, so that the change is perceived similarly by both the people that orchestrate the change and the people that are affected by the change, and thus change resistance can be avoided. The engagement of people would enable gathering the maximum benefits from the development, and thus it would ultimately has a positive impact on firms' productivity and performance, too. Therefore, any change in firms, digital transformation in this study, is suggested to be carried out with care, by systematically dealing with the transition: implementing strategies for effective change, controlling change and helping people to adapt to change.
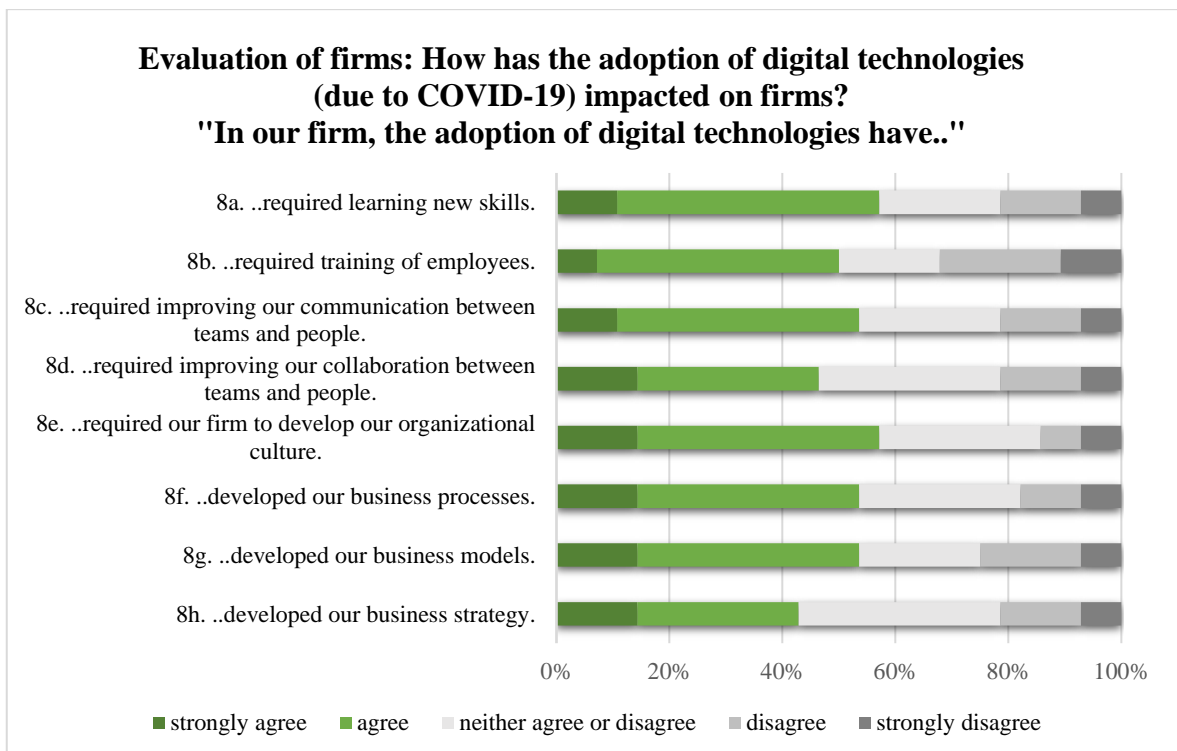

Figure 12: Digitalization & organizational development

The impacts of digitalization vary between industries and the effect is unique in each situation (Carvalho, Jeleniewicz, Franczak & Vanková 2021), and firms may face several obstacles in executing digitalization and digital transformation (e.g., Ellström et al. 2022).

Therefore, the survey aimed to find out possible reasons that hinder firms' aspirations to conduct digital transformation. Suggested obstacles are also recognized by European Central Bank (Elding & Morris 2018), and thus the list of obstacles was considered relevant for this research as well. All obstacles were pointed out in the research, by at least few firms. Over half of the respondents estimated that firm's resources are the biggest obstacle that delay their advancement (Figure 13), and almost 40 % respondents assessed that obstacles related to financing hinder their digitalization plans. A bit over 30% of firms also estimated that their firm lacks knowledge or competences to utilize digital technologies or their customers have not been ready for using digital technologies. Only few considered regulation or partners' inability to use digital technologies as obstacles. This may reflect that in general, Finnish firms are well-digitalized and people fluent in using digital tools, and Finnish regulations more likely support digitalization than hinder the transformation.
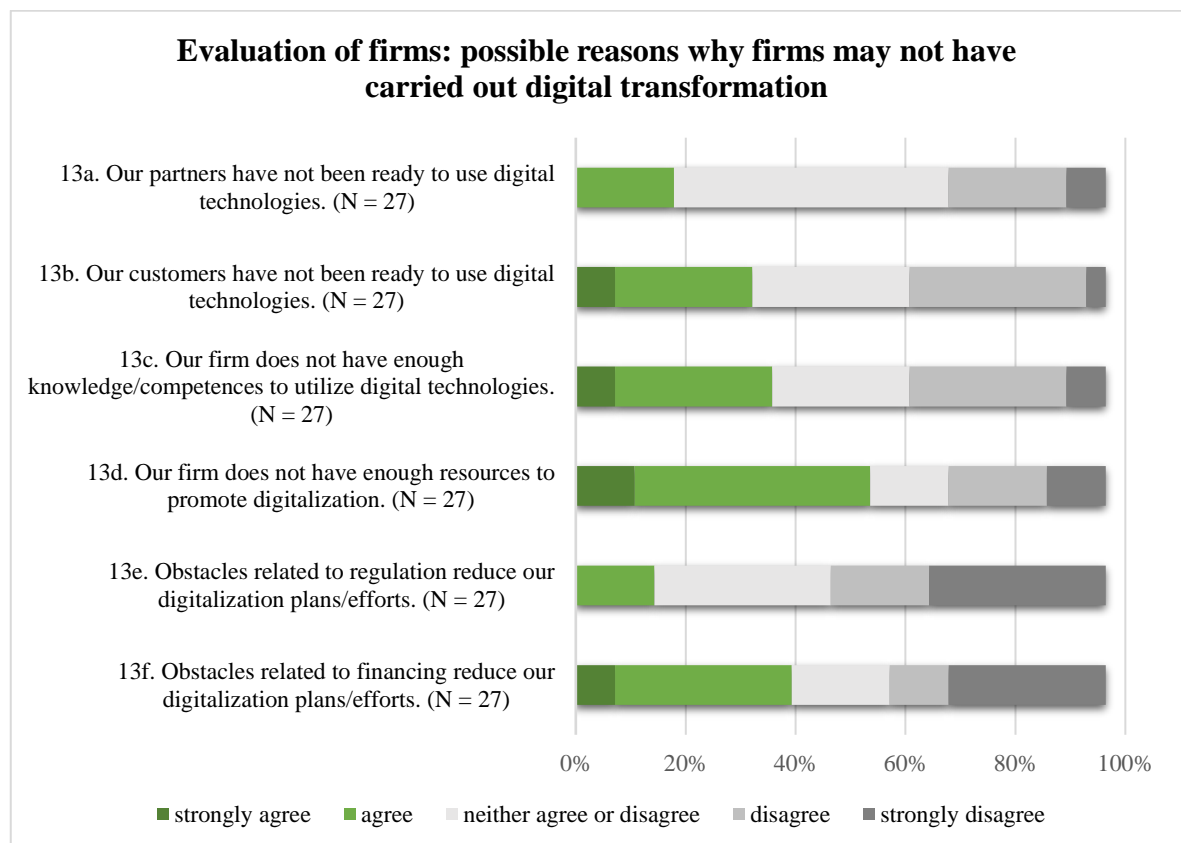

Figure 13: Barriers for digital transformation in firms

The final question in the survey examined firms' views about how digital transformation and their digital capabilities may help them to survive in the next crisis (Figure 14). Approximately 70 % of respondents think that the adoption of digital technologies and firms'

increased digital knowledge and competences will help them to tackle the next crisis. These assessments from firms could highlight that firms have understood the benefits that digital tools provided to them during COVID-19, and pointed out the possibilities digitalization may provide to firms in terms of business continuity and productivity. Moreover, as mentioned earlier in the paper, firms expect that the rapid changes in business environment will be considered as a so-called "new normal" later (LaBerge et al. 2020). Therefore, firms are already making the kinds of investments on their operations that ensure the changes will stick, and thus firms would be capable of keep operating in this new type of world (LaBerge et al. 2020).

Following this analysis, it is possible that also firms in this study have come to a conclusion that there is no returning to the time before the pandemic, in terms of how firms used to operate. Therefore, firms in this study may believe that digitalization will be increasing even more in a future, and becoming a crucial part of companies' success, and thus there is no other option than aiming to take full advantage of the solutions and building the business that align with digital solutions better. As LaBerge et al. (2020) found out, most firms have recognized the strategic importance of technology and its role as a critical component for the business, not just a solution for cost-efficiency. Considering this study, while digital capabilities seem to enhance the survival of firms by strengthening their resilience, continuing the improvements on digital capabilities can also be considered further improving firms' long-term business sustainability in a constantly changing world. For example, as LaBerge et al. (2020) points out, firms who have executed successful responses to the crisis report a range of capabilities that others don't: for example, they have been faster in experimenting and innovating, they have been able to fill their gaps for technology talent, and they have exploited more advanced technologies. Perhaps, also firms in this research have perceived the advantages and opportunities that digitalization has brought, and thus they positively view the role of digitalization for their survival in the next crisis.
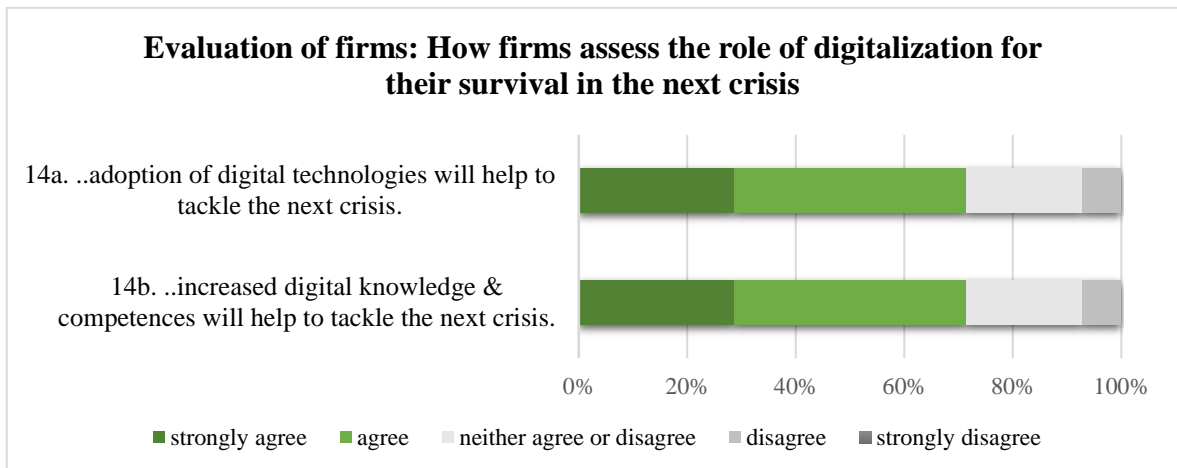
Evaluation of firms: How firms assess the role of digitalization for their survival in the next crisis

14a. ..adoption of digital technologies will help to tackle the next crisis.	
14b. ..increased digital knowledge & competences will help to tackle the next crisis.	

0%   20%   40%   60%   80%   100%

■ strongly agree   ■ agree   neither agree or disagree   disagree   ■ strongly disagree

Figure 14: The role of digitalization in a future

Overall, it could be considered that, in order to take full advantage of digital solutions in similar situation in a future, firms should invest in the related resources more, meaning the investments in purchasing appropriate tools, training of employees and improving organizational processes, for example. The lack of resources was highlighted as the main obstacle for firms to adopt digital solutions in this research, yet it was not specified, whether the lack of resources was related, for instance, to people, processes or financials. Therefore, this would require further research.

Based on the above-handled statements and the results for the other research questions, the conclusions for the second sub-research question (*how could firms better utilize digital capabilities to react to similar crises in the future*) were gathered. Overall, it is suggested that firms should better recognize their strengths and shortages regarding their digital capabilities, so that digital transformation could be more carefully planned and digitalization could be better implemented and integrated as a solid part of their operations. Considering digitally-based dynamic capabilities, the activities of sensing, seizing and reconfiguring (Warner & Wäger 2019), and the results of the survey, few suggestions are provided. First, the results of the survey pointed out, that firms' seizing capabilities required development the most. Therefore, it is suggested that firms should aim to improve their seizing capabilities to be able to take full advantage of the changes in consumer demands and market needs in a future, and to be able to react to similar crises better in a future. Improvements in digital seizing capabilities could mean, for example, that when needed, firms would be able to more rapidly take practical actions: to allocate resources to new projects and technologies, and take and redirect their strategic actions more quickly (Warner & Wäger 2019). Existing

studies suggest strategic agility, balancing digital portfolios, and rapid prototyping being some of the seizing capabilities that firms could focus on improving (Warner & Wäger 2019). However, this study did not examine more specifically, what kind of seizing capabilities firms are lacking, and thus this could be one optional path for future research. Moreover, as was found out, firms have made changes in their operations by adopting more digital technologies, which could imply that firms have accepted the change and redirection on some level at least. Therefore, it can be considered that despite lacking behind sensing and reconfiguring capabilities, firms do show some positive levels of seizing capabilities.

Based on the results of the survey, firms have been able to recognize and pulse the market accurately and on time, regarding the need to increase the level of digitalization. Firms have been able to identify the needs and to react to the demand by increasing their use of technology quickly. Having been able to take these actions could imply, that firms have been able to exploit their sensing capabilities, and those have been relatively good already. Naturally, this uncertain time of COVID-19 have most likely improved the sensing capabilities further too, as firms have been required to constantly monitor and explore the upcoming market changes. Moreover, most firms assessed that they have been able to transform their businesses to maintain the relevance to customers and operations active. Therefore, improvements have been made and the practices and processes were transformed more digitalized, which have developed digital reconfiguring capabilities of firms. Further, having taken these actions could imply that firms have been able to integrate digital technology into all areas of business, rebuild their assets and gain digital knowledge, which have enabled them to utilize new opportunities appeared during the pandemic, for example, changing the way of operating and delivering the value to customers. Digital reconfiguring capabilities enable firms to enact a digital strategy and to take advantage of strategic change (Warner & Wäger 2019), and thus it seems that firms in this study in general, have been able to achieve strategic development by making use of their digital capabilities.

Furthermore, as was concluded earlier in this research, firms have exploited technology in general to support new ways of working, to establish new digital-related business opportunities, and to improve capabilities that enable firms continue operations in new circumstances. These conclusions to the first sub-research question can be seen being directly related to this second sub-research question. For example, firms could better recognize their strengths and shortages regarding their digital capabilities, so that different

stages of digital capabilities could be executed more efficiently. Moreover, reactions to market demand would be faster and people could execute new ways of working more efficiently with new tools and solutions, if digital seizing capabilities were improved. For instance, by improving digital seizing capabilities, the allocation of resources to new projects and technologies could be executed more quickly, and strategic actions would be taken and redirected faster. Overall, new digital-related business opportunities could be recognized and exploited more efficiently and rapidly, if firms were more digitally-oriented in the first place, and thus digital transformation and digitalization aspirations would be implemented and integrated earlier and more carefully and comprehensively, becoming as a solid and tight part of the operations. Improving firms' digital capabilities would enable firms to better shuttle in uncertain situations, as better digital capabilities could increase firms' flexibility, and ability to exploit data and information would enable better understanding and responding to the consumer needs.

Overall, digital transformation would enable firms becoming more digitally mature, and thus more resilient in similar crisis in a future. Digital capabilities could be better utilized in similar situation in a future by integrating digitalization in firm's operations better in advance, and ensuring that people would be better prepared and capable of using digital tools. Ultimately, improving firm's digital capabilities could lead to increased productivity and competitiveness, as fluent use of digital tools would improve firms' flexibility in ways of operating, professionals would be able to focus on their expertise to respond to the customer needs, and more innovative products and services could be established with the help of digital technologies.

7 Discussion & conclusions

This final chapter starts by answering the research questions one by one, and discussing the main findings and results of the study. Theoretical and practical implications of the research are discussed based on the main findings. After that, the research is evaluated in terms of the validity and reliability, and its limitations are analyzed. Finally, future research paths are proposed and discussed.

This thesis aimed to examine the relationship between firms' digital capabilities and resilience during the pandemic of COVID-19. The topic of this research was formed from the current situation in the global operating environment, in which resilience plays significant role. Resilience was analysed though digitalization because in the 2020s, technology is becoming embedded in everything (e.g., Sitra 2019) and rapid and sustained technological change is certain (Project Management Institute 2022).

The study consisted of theoretical and empirical parts. Theoretical part included the literature review, which highlighted gaps in research, for instance regarding the relationship of organizational resilience and digital maturity of specific industries (Botha et al. 2022), and in the usage of digital technologies for coping with the consequences of extreme events (Papadopoulos et al. 2020). The empirical part of the study was conducted as a quantitative research for Finnish SMEs operating in three different industries. The research data was collected through an online survey, and the data was analysed in Stata by conducting statistical tests. Case study approach was exploited to understand the phenomenon in a real-life context.

The objective of this research was to empirically investigate specific industries: what has been the role of digital capabilities in firms' resilience during the times of crisis, and how digitalization has enabled firms to respond to the uncertain situations. It was in the interest of this study to examine, how and what kind of digital capabilities have supported Finnish SMEs to tackle and survive through the pandemic of COVID-19. Based on the objectives, one research question was formed:

RQ: What has been the role of digital capabilities to overcome the crisis of COVID-19?

To support the main research question and to approach it from more practical perspective, two sub questions were formed:

RQ1: How is technology utilized in responding to/managing the crisis?
RQ2: How could firms better utilize digital capabilities to react to similar crises in the future?

To answer these research questions, the overall strategy was to conduct a survey to Finnish SMEs operating in three specific industries. Online survey for SMEs included a questionnaire with 14 statements divided in three separate themes. The survey aimed to investigate the relationship between firms' resilience and digital capabilities in times of

crisis, and how firms itself assess and analyze their digital transformations and digital competences that have enabled them to survive from the pandemic. Respondents were asked to assess statements on Likert scale 1-5. The survey was open 14 days in August and target firms were contacted via email, which included an invitation to participate the study. The collected data were then concluded in terms of the main variables (resilience, digital capabilities, digital transformation), and the relationship of variables were studied by using correlation and Kruskal-Wallis H test and regression analysis. The sample selected for this study represented SMEs operating in three different industries (manufacturing, wholesale and retail). SMEs was chosen due to their importance for Finnish economy and the interest was to focus on the traditional industries. The database of Amadeus was utilized in the search of firms, and the software of Stata was used for statistical testing. Delimiting the study focusing on these three industries only was planned decision, but can be considered as a limitation of the study, since these three industries do not represent all Finnish SMEs.

7.1 Main findings

The objective of the research was to examine, whether firms' digital capabilities have had a positive impact on their resilience. The findings of this research support the previous research as similar outcomes were discovered. For instance, and specifically regarding the research question (*what is the role of digital capabilities to overcome the crisis of COVID-19),* it was discovered that digital capabilities positively correlate and are associated with firms' resilience. Moreover, it seems that firms in different industries adapt to unexpected situations in differently. Based on the results of the survey, it seems that firms have been able to recognize the changing market needs on time, and transform their businesses to fit to circumstances that have required increasing firms' digitalization. Thus, it can be concluded that digital capabilities have had a significant role for firms to manage and overcome the crisis, and digital capabilities have improved firms' resilience in COVID-19.

Considering the first sub-research question *(how is technology utilized in managing the crisis),* and based on firms' assessments, technology has been utilized to survive from the rapid and unexpected event, and it has had a positive impact on firms' ability to manage the effects of the pandemic. In the extent of this study, comprehensive utilization of technology in firms practically means 1) supporting new ways of working, 2) establishing new digital-

related business opportunities, and 3) improving capabilities (ensuring the ability to continue operations by adapting to new circumstances). As mentioned, survey results found out, that firms have been able to recognize and pulse the market accurately and on time (sensing capabilities), and firms have been able transform their businesses to maintain the relevance to customers and operations active (reconfiguring capabilities). However, the research also highlighted that particularly firms' seizing capabilities should be developed further. Therefore, the second sub-research question (*how could firms better utilize digital capabilities to react to similar crises in the future*) provided suggestions from the perspective of seizing capabilities specifically, so that firms would be able to take full advantage of the similar changes in consumer demands and market needs in a future.

Overall, this study suggests that firms should better recognize their strengths and shortages regarding their digital capabilities, so that digital transformation could be more carefully planned, and digitalization could be better implemented and integrated as a solid part of firms' operations. Considering specifically seizing capabilities, it is suggested that firms should analyze their seizing capabilities further, to recognize the potential scarcities where the improvements are needed. By improving digital seizing capabilities, the allocation of resources to new projects and technologies could be executed more quickly, and strategic actions would be taken and redirected faster. Overall, new digital-related business opportunities could be recognized and exploited more efficiently and rapidly, if firms were more digitally-oriented in the first place, and thus digital transformation and digitalization aspirations could be implemented and integrated earlier and more carefully and comprehensively, becoming as a solid and tight part of the operations. Improving firms' digital capabilities would enable firms to better shuttle in uncertain situations, as better digital capabilities could increase firms' flexibility, and ability to exploit data and information would enable firms to better understand and respond to the consumer needs. Embracing digital capabilities more extensively and transforming the business more digital would enable firms becoming more digitally mature, and thus more resilient in similar crisis in a future.

7.2 Theoretical Implications

Even though the sample in this study was small, the results exposed similar findings than in the existing research. For example, the findings of this study, based on the firms' assessments in the survey, are supported by the previous research regarding firms' adoption of digital technologies to survive from the pandemic (e.g., Krauss et al. 2020; Zutshi et al. 2021; Cugno et al. 2022): the pandemic of COVID-19 has had an effect on firms' daily operations and it has transformed previously normal working methods towards leaning on digitalization more firmly (e.g., Eurofound 2021a). Firms assessed, similarly to existing literature (e.g., Loureiro et al. 2021; Zhen et al. 2021), that the changes had required them to optimize and improve their internal competences and capabilities so that the transformation could had been adopted successfully. As a conclusion, considering the relation found between the results of this research and previous studies, this thesis can be considered as a complementary study for the existing literature and providing support for the current research. It could be considered that the findings of this research have been able to extent the knowledge related to digital capabilities and what is their relevance for firms' resilience. The results indicate differences in the association of digital capabilities with resilience between industries and firm sizes, and the findings can be considered complementing current state of research, as the results may help to understand better, how resilience is and could be maintained or developed in the crisis situation, and how digital transformation is associated with it.

7.3 Practical Implications

In addition to the theoretical implications discussed above, it can be considered this study has practical implications, too. First, this thesis found out positive correlation between firms' digital capabilities and resilience. This may help firms to better understand the importance of investing in and improving digital capabilities: having stronger knowledge and competences could help firms to better survive in the next crisis. Related to that, other significant implication of this study is provided suggestions for firms regarding the exploitation of digital capabilities. The suggestions provided in this thesis to better analyse and improve digital capabilities, especially seizing capabilities, may help firms to better understand the importance of digital capabilities for their productivity and resilience, and

thus enhance firms to evaluate their own capabilities more carefully and comprehensively. Lastly, this study concluded three main ways firms exploit technology in managing the crisis. These findings may better help firms understanding the opportunities of exploiting technology both overall, and in crisis.

7.4 Validity & Reliability

The research process and, for instance, the sampling, have been explained and documented, and thus, for example, literature review process and the search of firms can be replicated similarly. Therefore, the research is considered valid. The internal consistency of the survey questions was tested to make sure that the statements measure the same variable, and the reliability of them was reported acceptable. However, it is possible that the respondents have understood the questions differently and assessed the statements from different perspective, which may hinder the validity of the research. Moreover, the main obstacles for reliability are small size and low response rate of the study, and thus the results of the study need to be read with caution, and reliability of the study cannot be confirmed. Furthermore, the results of the survey do support previous literature about the relation of digital capabilities and resilience. Additionally, the study found out similar results about firms' use of technology during COVID-19 as earlier studies have concluded.

7.5 Limitations

This thesis is not complete without a set of limitations, and the main limitation of this research is considered being a low response rate in the survey. As the final sample size ended up small, the results of the study need to be read with caution. Additionally, firms considered in the research were limited focusing on SMEs operating in the manufacturing, retail and wholesale only, which can be considered as a limitation for the study as well, since these three industries do not represent all SMEs. However, this was planned and appropriate delimitation, taking into account the number of Finnish SMEs operating in these industries.

Small sample size had on impact on the applicable data analysis method, and a narrow group of firms made it challenging to determine whether some particular outcome in the survey was a true finding or just a result of high variability in responses, as smaller sample size does

not comprehensively represent the assessments and results of the entire population. Moreover, some groups of firms, based on their size and industry, could not be analysed or compared, as there were not enough respondents.

Moreover, a survey as a chosen research method can be considered being one limitation in the research as well, specifically now, when there was only small number of respondents participating the survey. Further, internet survey did not allow respondents to ask specifying questions from the author regarding the statements during responding. On the other hand, survey was chosen as a research method, because it enabled gathering information about the relationship between resilience and firms' digital capabilities. Moreover, survey was chosen because it allowed to potentially gather larger sample of responses and thus the results could have been more generalizable and the research could have provided some valuable information about Finnish SMEs resilience.

Another limitation of this research is that this is a case study. As this study considered only the pandemic of COVID-19, the findings may not be generalized to other crises, because the effects of this current shock may be unique. The last limitation recognized is the current point in time. Even though the pandemic of COVID-19 still exists, new crisis has emerged. This new crisis has possibly affected firms' operations, and therefore their views and answers may have been influenced by the current situation.

7.6 Future research

Limitations mentioned above enable proposing alternative directions for future studies. For example, this same topic could be studied in the light of new emerged crisis. Related to research methods, to complement the topic and results of this study, it could be valuable to conduct a two-phase mixed methods research design, with first surveying larger group of firms, followed by interviews with firm representatives. Moreover, as the greatest obstacle for firms was related to their resources, one interesting suggestion for future research could be investigating SMEs in specific industries, their greatest resource-related obstacles for carrying out digital transformation, and what solutions could be found to tackle them. In addition to these alternatives, the topic of this research can be utilized in proposing research directions for the future. For example, this research examined SMEs operating in manufacturing, retail, and wholesale, and thus the future research could be expanded to other

industries as well. Moreover, as it was found out, firms could improve their seizing capabilities further. As this study did not identify the specific seizing capabilities that firms should improve specifically, this could be one optional path for future research too.

References

Abidi, N., El-Herradi, M. & Sakha, S. (2022). Digitalization and Resilience: Firm-level Evidence during the COVID-19. IMF Working Paper WP/22/34, Washington DC: *International Monetary Fund*.

Aldianto, L., Anggadwita, G., Permatasari, A., Mirzanti, I. R., Williamson, I. O. (2021). Toward a Business Resilience Framework for Startups. *Sustainability*, Vol. 13, 3132. Available at: https://doi.org/10.3390/su13063132

Ali I., Arslan A., Chowdhury M., Khan Z., Tarba S.Y. (2022). Reimagining global food value chains through effective resilience to COVID-19 shocks and similar future events: A dynamic capability perspective. *Journal of Business Research*. Vol. 141, March 2022, pp. 1-12. DOI: 10.1016/j.jbusres.2021.12.006

Allen, I. E. & Seaman, C. A. (2007). Likert Scales and Data Analyses. *Quality Progress*. Vol. 40(7), pp. 64-65.

Alonso, D. A., Kok, S. K., Bressan, A., O'Shea, M., Sakellarios, N., Koresis, A., Solis, M. A. B. & Santoni, L. J. (2020). COVID-19, aftermath, impacts, and hospitality firms: An international perspective. *International Journal of Hospitality Management.* Vol. 91, 102654. https://doi.org/10.1016/j.ijhm.2020.102654.

Ambrosini, V., Bowman, C. & Collier, N. (2009). Dynamic capabilities: An exploration of how firms renew their resource base. *British Journal of Management*, 20(S1), pp. 9-24, 10.1111/j.1467-8551.2008.00610.x

Ambulkar, S., Blackhurst, J. & Grawe, S. (2015). Firm's resilience to supply chain disruptions: Scale development and empirical examination. *Journal of Operations Management.* Vol. 33–34, pp. 111–122. http://dx.doi.org/10.1016/j.jom.2014.11.002

Anwar, A., Coviello, N. & Rouziou, M. (2021). Weathering a Crisis: A Multi-Level Analysis of Resilience in Young Ventures. *Entrepreneurship Theory and Practice*. September 2021, pp. 1–29, DOI: 10.1177/10422587211046545

Apedo-Amah, M. C., Avdiu, B., Cirera, X., Cruz, M., Davies, E., Grover, A., Iacovone, L., Kilinc, U., Medvedev, D., Maduko, F. O., Poupakis, S., Torres, J. & Tran, T. T. (2020).

Unmasking the Impact of COVID-19 on Businesses: Firm Level Evidence from Across the World. *Policy Research Working Paper*. No. 9434. World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/34626

Baía, E. P. & Ferreira, J. J. M. (2019). Dynamic capabilities and performance: How has the relationship been assessed? *Journal of Management & Organization*, pp. 1-30, DOI: https://doi.org/10.1017/jmo.2019.88

Baig, A., Hall, B., Jenkins, P., Lamarre, E. & McCarthy, B. (2020). The COVID-19 recovery will be digital: A plan for the first 90 days. *McKinsey & Company.* Article. 14.5.2020. [Accessed 25.7.2022.] Available at: https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/the-covid-19-recovery-will-be-digital-a-plan-for-the-first-90-days

Balnaves, M. & Caputi, P. (2001). Introduction to Quantitative Research Methods: an Investigative Approach. *London: SAGE.* Print.

Bank of Finland Bulletin. (2022). Russia's war in Ukraine is stifling Finland's economic recovery. *Bank of Finland Bulletin*, 2/2022. 8.7.2022. [Accessed 15.9.2022] Available at: https://www.bofbulletin.fi/en/2022/2/russia-s-war-in-ukraine-is-stifling-finland-s-economic-recovery/

Bar Am, J., Furstenthal, L., Jorge, F. & Roth, E. (2020). Innovation in a crisis: Why it is more critical than ever. *McKinsey & Company.* Article. 17.6.2020. Available at: https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/innovation-in-a-crisis-why-it-is-more-critical-than-ever

Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management.* 36(1), pp: 256-280. DOI: https://doi.org/10.1177/0149206309350776

Bartlett-Bragg, A. (2017). Digital Capabilities: Where people and technology intersect. *Proceedings of EDULEARN17 Conference.* DOI: 10.21125/edulearn.2017.1004.

Battisti, M. & Deakins, D. (2017). The relationship between dynamic capabilities, the firm's resource base and performance in a post-disaster environment. *International Small Business Journal: Researching Entrepreneurship.* 35(1), pp. 78–98. DOI: 10.1177/0266242615611471

BDO (2020). COVID-19 IS ACCELERATING THE RISE OF THE DIGITAL ECONOMY – Digital Transformation in the Pandemic & Post-Pandemic Era. *BDO United States.* May 2020. [Accessed 25.7.2022.] Available at: https://www.bdo.com/getattachment/07e769aa-5755-4151-9b52-4eeccfe61710/attachment.aspx?ADV_DTS_COVID-19-is-Accelerating-the-Rise-of-the-Digital-Economy_Web.pdf

Bharadwaj, A. (2000) A RESOURCE-BASED PERSPECTIVE ON INFORMATION TECHNOLOGY CAPABILITY AND FIRM PERFORMANCE: AN EMPIRICAL INVESTIGATION. *MIS Quarterly.* 24(1), pp. 169-196.

Bharadwaj, A., El Sawy, O.A., Pavlou, P.A., and Venkatraman, A. (2013). Digital business strategy: towards a next generation of insights. *MIS Quarterly.* 37(2), pp. 471–482.

Bishop, P. A. & Herron, R. L. (2015). Use and Misuse of the Likert Item Responses and Other Ordinal Measures. *Int J Exerc Sci.* 8(3), pp. 297–302.

Boone, H. N. & Boone, D. A. (2012). Analyzing Likert Data. *Journal of Extension,* 50(2). http://www.joe.org/joe/2012april/tt2p.shtml[8/20/2012.

Botha, E., Walker, B., Wordsworth, R. & Balzarova, M. (2022) Fortune favours the digitally mature: the impact of digital maturity on the organizational resilience of SME retailers during COVID-19. *International Journal of Retail & Distribution Management.* 50(8/9), pp. 1182-1204. DOI 10.1108/IJRDM-10-2021-0514

Brown, R., Kalafsky, R. V., Mawson, S. & Davies, L. (2020). Shocks, uncertainty and regional resilience: The case of Brexit and Scottish SMEs. *Local Economy.* 35(7), pp. 655–675. DOI: 10.1177/0269094220979261

Bullough, A., Renko, M. & Myatt, T. (2014). Danger Zone Entrepreneurs: The Importance of Resilience and Self-Efficacy for Entrepreneurial Intentions. *Entrepreneurship Theory and Practice.* 38(3), pp. 473-499. doi:10.1111/etap.12006

Brodny. J. & Tutak, M. (2021). Assessing the level of digitalization and robotization in the enterprises of the European Union Member States. PLOS ONE. 16(7): e0254993. 22.7.2021. Available at: https://doi.org/10.1371/journal.pone.0254993

Caballero-Morales, S. O. (2021). Innovation as recovery strategy for SMEs in emerging economies during the COVID-19 pandemic. *Research in International Business and Finance*. Vol. 57. https://doi.org/10.1016/j.ribaf.2021.101396

Caiazza R., Phan P., Lehmann E. & Etzkowitz H. (2021). An absorptive capacity-based systems view of Covid-19 in the small business economy. *International Entrepreneurship and Management Journal*. 17(3), pp. 1419-1439. https://doi.org/10.1007/s11365-021-00753-7

Carvalho, L. C., Jeleniewicz, M., Franczak, P. & Vanková, Ž. (2021). Business Models for Digital Economy: Good Practices and Success Stories. *IGI Global: Handbook of Research on Multidisciplinary Approaches to Entrepreneurship, Innovation, and ICTs*. Book Chapter. DOI: 10.4018/978-1-7998-4099-2.ch001

Chakrabartty, S. N. (2014). Scoring and Analysis of Likert Scale: Few Approaches. *Journal of Knowledge Management and Information Technology*. 1(2), pp. 31-44.

Clampit, J. A., Lorenz, M. P., Gamble, J. E. & Lee, J. (2021). Performance stability among small and medium-sized enterprises during COVID-19: A test of the efficacy of dynamic capabilities. *International Small Business Journal: Researching Entrepreneurship*. 40(3), pp. 403-419. DOI: 10.1177/02662426211033270

Clark, D. (2021). Number of SMEs in the European Union 2008-2021, by size. *Statista*. 7.7.2021. [Accessed: 9.4.2022] Available at: https://www.statista.com/statistics/878412/number-of-smes-in-europe-by-size/

Conz, E., & Magnani, G. (2020). A dynamic perspective on the resilience of firms: A systematic literature review and a framework for future research. *European Management Journal*. 38(3), pp. 400–412. https://doi.org/10.1016/j.emj.2019.12.004

Cugno M., Castagnoli R., Büchi G., Pini M. (2022). Industry 4.0 and production recovery in the covid era. *Technovation*. Vol. 114. DOI: 10.1016/j.technovation.2021.102443

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A. & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*. 11(100). http://www.biomedcentral.com/1471-2288/11/100

Dąbrowska, J., Almpanopoulou, A., Brem, A., Chesbrough, H., Cucino, V., Di Minin, A., Giones, F., Hakala, H., Marullo, C., Mention, A-L., Mortara, L., Nørskov, S., Nylund, P.A., Oddo, C.A., Radziwon, A. & Ritala, P. (2022). Digital transformation, for better or worse: a critical multi-level research agenda. *R&D Management.* https://doi.org/10.1111/radm.12531

Dancey, C. P. & Reidy, J. (2004). Statistics Without Maths for Psychology: using SPSS for windows. London, England: Prentice-Hall; 2004.

Denyer, D., & Tranfield, D. (2009). Producing a systematic review. In D. A. Buchanan & A. Bryman (Eds.), The SAGE handbook of organizational research methods. *The Sage Handbook of Organizational Research Methods*. Retrieved from https://www.mendeley.com/catalogue/0ff0533c-01f2-338e-a1a9-6f60a28fa801/?utm_source=desktop&utm_medium=1.19.4&utm_campaign=open_catalog &userDocumentId=%7B8b821bd1-4e6e-4cce-8efd-130b29a0bf5b%7D

Dias, Á. L., Cunha, I., Pereira, L., Costa, R. L. & Gonçalves, R. (2022). Revisiting Small- and Medium-Sized Enterprises' Innovation and Resilience during COVID-19: The Tourism Sector. *Journal of Open Innovation: Technology, Market, and Complexity*. 8(1), 11. DOI: 10.3390/joitmc8010011

Digital Society and Economy Index. (2022). Digital Economy and Society Index (DESI) 2022: Finland. *European Commission.* [Accessed 5.10.2022] Available at: https://digital-strategy.ec.europa.eu/en/policies/desi-finland

Doern, R., Williams, N. & Vorley, T. (2019). Special issue on entrepreneurship and crises: business as usual? An introduction and review of the literature. *ENTREPRENEURSHIP & REGIONAL DEVELOPMENT,* Vol. 31, NOS. 5–6, pp. 400–412. https://doi.org/10.1080/08985626.2018.1541590

Doern, R. (2021). Knocked down but not out and fighting to go the distance: Small business responses to an unfolding crisis in the initial impact period. *Journal of Business Venturing Insights.* Vol. 15. DOI: 10.1016/j.jbvi.2020.e00221

Dolz, C., Iborra, M. & Safón, V. (2019). Improving the likelihood of SME survival during financial and economic crises: The importance of TMTs and family ownership for

ambidexterity. *BRQ Business Research Quarterly*. 22(2), pp. 119–136. DOI: 10.1016/j.brq.2018.09.004

Duchek, S. (2020) Organizational resilience: a capability-based conceptualization. *Business Research.* 13(1), pp. 215-246. DOI: 10.1007/s40685-019-0085-7

Duchek, S., Raetze, S. & Scheuch, I. (2020). The role of diversity in organizational resilience: a theoretical framework. *Business Research.* Vol. 13, pp. 387–423. https://doi.org/10.1007/s40685-019-0084-8

Eggers, F. (2020). Masters of disasters? Challenges and opportunities for SMEs in times of crisis. *Journal of Business Research*. 116, pp. 199–208.

Eisenhardt, K. M. & Martin, J. A. (2000). Dynamic Capabilities: What are they? *Strategic Management Journal.* Vol. 21, pp. 1105-1121.

Elding, C. & Morris, R. (2018). Digitalisation and its impact on the economy: insights from a survey of large companies. *European Central Bank.* Published as part of the ECB Economic Bulletin, Issue 7/2018. Available at: https://www.ecb.europa.eu/pub/economic-bulletin/focus/2018/html/ecb.ebbox201807_04.en.html

Ellström, D., Holtström, J., Berg, E. and Josefsson, C. (2022). Dynamic capabilities for digital transformation. *Journal of Strategy and Management*. 15(2), pp. 272-286. https://doi.org/10.1108/JSMA-04-2021-0089

Euro & talous. (2019). Suomen talouskasvu hidastuu – taustalla kansainvälisiä ja kotimaisia syitä. Suomen Pankki: *Euro & talous*, 3/2019. 11.6.2019. [Accessed 15.9.2022] Available at: https://www.eurojatalous.fi/fi/2019/3/helppolukuinen-yhteenveto-suomen-talouskasvu-hidastuu-taustalla-kansainvalisia-ja-kotimaisia-syita/

Euro & talous. (2021). Talous kasvaa koronan varjossa. Suomen Pankki: *Euro & talous,* 5/2021. 17.12.2021. [Accessed 15.9.2022] Available: https://www.eurojatalous.fi/fi/2021/5/talous-kasvaa-koronan-varjossa/

Eurofound. (2020). Living, working and COVID-19. COVID-19 series. *Publications Office of the European Union, Luxembourg*. 28.9.2020. Updated: 6.11.2020. [Accessed 11.9.2022] Available at: https://www.eurofound.europa.eu/publications/report/2020/living-working-and-covid-19

Eurofound. (2021a). COVID-19 and digitalization. *Eurofound*. Research Digest. 15.12.2021. [Accessed 15.9.2022] Available at: https://www.eurofound.europa.eu/data/digitalisation/research-digests/covid-19-and-digitalisation

Eurofound. (2021b) How best to assist companies in their adaptation to the digital age? *Eurofound.* Policy Pointer. 15.12.2021. [Accessed 15.9.2022] Available at: https://www.eurofound.europa.eu/data/digitalisation/policy-pointers/how-best-to-assist-companies-in-their-adaptation-to-the-digital-age

Ferguson, L. (2004). External Validity, Generalizability, and Knowledge Utilization. *Journal of Nursing Scholarship.* 36(1), pp. 16–22.

Finnish Government. (2020). Government, in cooperation with the President of the Republic, declares a state of emergency in Finland over coronavirus outbreak. *Finnish Government.* 16.3.2020. Press Release. [Accessed 15.10.2022] Available at: https://valtioneuvosto.fi/en/-/10616/hallitus-totesi-suomen-olevan-poikkeusoloissa-koronavirustilanteen-vuoksi?languageId=en_US

Gamage, S. K. N., Ekanayake, EMS., Abeyrathne, GAKNJ., Prasanna, RPIR., Jayasundara, JMSB. & Rajapakshe, PSK. (2020). A Review of Global Challenges and Survival Strategies of Small and Medium Enterprises (SMEs). *Economies*. 8(79). doi:10.3390/economies8040079

Gandhi, P., Khanna, S. & Ramaswamy, S. (2016). Which Industries Are the Most Digital (and Why)? *Harvard Business Review.* 1.4.2016. [Accessed 5.10.2022] Available at: https://hbr.org/2016/04/a-chart-that-shows-which-industries-are-the-most-digital-and-why

Guerra, R. M. de A., & Camargo, M. E. (2016). The role of technological capability in the internationalization of the company and new product success: a systematic literature review. *Internext*, 11(1), pp. 49–62. https://doi.org/10.18568/1980-4865.11149-62

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). DOI: 10.1186/s11782-020-00087-1

Gursoy, D. & Chi, C. G. (2020). Effects of COVID-19 pandemic on hospitality industry: review of the current situations and a research agenda. *Journal of Hospitality Marketing & Management.* 29(5), pp. 527–529. https://doi.org/10.1080/19368623.2020.1788231

Harapko, S. (2021). How COVID-19 impacted supply chains and what comes next. *Ernst & Young.* 18.2.2021. [Accessed 5.10.2022] Available at: https://www.ey.com/en_fi/supply-chain/how-covid-19-impacted-supply-chains-and-what-comes-next

Harrell, F. E. (2015). Regression Modeling Strategies: With Applications to Linear Models, Logistic and Ordinal Regression, and Survival Analysis. *Springer Cham.* 2nd edition. https://doi.org/10.1007/978-3-319-19425-7

He, Z., Huang, H., Choi, H. & Bilgihan, A. (2021). Building organizational resilience with digital transformation. *Journal of Service Management.* DOI: 10.1108/JOSM-06-2021-0216

Heale, R. & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evid Based Nurs.* 18(3), pp. 66-67. http://dx.doi.org/10.1136/eb-2015-102129

Heather, L., Colquhoun, H., Levac, D., O'Brien, K. K., Straus, S., Tricco, A. C., Perrier, L., Kastner, M. & Moher, D. (2014). Scoping reviews: Time for clarity in definition, methods and reporting. *Journal of Clinical Epidemiology.* 67(12), pp. 1291–1294. doi:10.1016/j.jclinepi.2014.03.013.

Hegarty, A. (2021). How digital transformation can build more resilient businesses. *World Economic Forum.* 22.10.2021. [Accessed 2.5.2022] Available at: https://www.weforum.org/agenda/2021/10/digital-transformation-business-resilience-cyber/

Heikkilä, T. (2014). Tilastollinen tutkimus. 9th ed. *Edita Publishing Oy, Helsinki 2014.*

Helfat, C. E. & Peteraf, M. A. (2009). Understanding dynamic capabilities: progress along a developmental path. *Strategic Organization.* 7(1), pp. 91–102. https://doi.org/10.1177/1476127008100133

Helsingin Sanomat. (2020). Tilastokeskus: Säännöllinen kotona työskentely kaksinkertaistui vuonna 2020. *Helsingin Sanomat.* 28.12.2020. [Accessed 11.9.2022] Available at: https://www.hs.fi/talous/art-2000007706913.html

Hildebrand, D. K., Laing, J. D. & Rosenthal, H. (1970). Analysis of Ordinal Data. *SAGE Publications Inc.* https://dx.doi.org/10.4135/9781412983310.n1

Hirsjärvi, S., Remes, P. & Sajavaara, P. (2009). Tutki ja kirjoita. Helsinki: Tammi.

Huang, A. & Farboudi Jahromi, M. (2021). Resilience building in service firms during and post COVID-19. *Service Industries Journal.* 41(1-2), pp. 138–167. DOI: 10.1080/02642069.2020.1862092

Hutchinson, Fergie, Fleck, Jouflas & Parry (2021). Flexing the Leadership Muscle: An International Study of Entrepreneurial Resilience in Rural Communities During the COVID-19 Pandemic. *Journal of Small Business Strategy.* 31(4), pp. 100–112. https://doi.org/10.53703/001c.29484

Iammarino, S., Padilla-Pérez, R. & Von Tunzelmann, N. (2008). Technological Capabilities and Global–Local Interactions: The Electronics Industry in Two Mexican Regions. *World Development.* 36(10), pp. 1980–2003. doi:10.1016/j.worlddev.2007.10.022

International Finance Corporation (2021). How Firms are Responding and Adapting During COVID-19 and Recovery: Opportunities for Accelerated Inclusion in Emerging Markets. *International Finance Corporation, Washington, DC.* Available at: https://openknowledge.worldbank.org/handle/10986/36265

International Monetary Fund (2021). Policy Responses to COVID-19. *International Monetary Fund.* Last updated: 2.7.2021. Accessed 25.7.2022. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#F

Jamieson, S. (2004). Likert scales: how to (ab)use them. *Medical Education.* 38(12), pp. 1217-1218. DOI:10.1111/j.1365-2929.2004.02012.x.

Jantunen, A., Ellonen, H. & Johansson, A. (2012). Beyond appearances – Do dynamic capabilities of innovative firms actually differ? *European Management Journal.* 30(2), pp. 141-155. DOI: 10.1016/j.emj.2011.10.005

Joshi, A., Kale, S., Chandel, S. & Pal, D. K. (2015). Likert Scale: Explored and Explained. *British Journal of Applied Science & Technology.* 7(4), pp. 396-403.

Kaakinen, M. & Ellonen, N. (2008). Regressioanalyysi. In book *Kvantitatiivisen tutkimuksen verkkokäsikirja. Tampere: Yhteiskuntatieteellinen tietoarkisto* [ylläpitäjä ja tuottaja]. [Accessed 15.9.2022] Available at: https://www.fsd.tuni.fi/fi/palvelut/menetelmaopetus/kvanti/regressio/analyysi/

Karttunen, E., Pynnönen, M., Treves, L. & Hallikas, J. (2021). Capabilities for the internet of things enabled product-service system business models. *Technology Analysis & Strategic Management*, DOI: 10.1080/09537325.2021.2012143

Keyriläinen, M. (2021). Working Life Barometer 2020. *Ministry of Economic Affairs and Employment of Finland.* Publications of the Ministry of Economic Affairs and Employment 2021:36. Available at: http://urn.fi/URN:ISBN:978-952-327-804-2

Khai, K. G., Onn, Y. W., Zulkifli, R. Bt., Kandasamy, S. & Ahmad, A. Bt. (2020). The necessity to digitalize SMEs business model during the COVID-19 pandemic period to remain sustainable in Malaysia. *Journal of Education and Social Sciences*. 16(1).

Khamis, H. (2008). Measures of Association: How to Choose? *Journal of Diagnostic Medical Sonography.* 24(3), 155-162. https://doi.org/10.1177/8756479308317

Khan, S. U. (2022). Financing constraints and firm-level responses to the COVID-19 pandemic: International evidence. *Research in International Business and Finance.* Vol. 59, January 2022, 101545. https://doi.org/10.1016/j.ribaf.2021.101545

Kilimis, P., Zou, W., Lehmann, M. & Berger, U. (2019). A Survey on Digitalization for SMEs in Brandenburg, Germany. *IFAC PapersOnLine*. 52(13), pp. 2140–2145. https://doi.org/10.1016/j.ifacol.2019.11.522

Kim-Cohen, J. & Turkewitz, R. (2012). Resilience and measured gene-environment interactions. *Development and Psychopathology*. Vol. 24, pp. 1297–1306.

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

Konopik, J., Jahn, C., Schuster, T., Hoßbach, N. & Pflaum, A. (2022). Mastering the digital transformation through organizational capabilities: A conceptual framework. *Digital Business*, 2(2), 100019. https://doi.org/10.1016/j.digbus.2021.100019.

Korber, S. & McNaughton, R. B. (2018). Resilience and entrepreneurship: a systematic literature review. *International Journal of Entrepreneurial Behavior & Research*. 24(7), pp. 1129-1154. https://doi.org/10.1108/IJEBR-10-2016-0356

Korhonen, J. J. & Gill, A. Q. (2018). Digital Capability Dissected. *In book: Australasian Conference on Information Systems*. January 2018, Sydney. DOI: 10.5130/acis2018.ap

Kraus, S., Clauss, T., Breier, M., Gast, J., Zardini, A. &Tiberius, V. (2020). The economics of COVID-19: initial empirical evidence on how family firms in five European countries cope with the corona crisis. *International Journal of Entrepreneurial Behaviour and Research*. 26(5), pp. 1067–1092. DOI: 10.1108/IJEBR-04-2020-0214

Kump, B., Engelmann, A., Keßler, A., & Schweiger, C. (2019). Toward a dynamic capabilities scale: Measuring organizational sensing, seizing, and transforming capacities. *Industrial and Corporate Change*, 28 (5), pp. 1149-1172.

Kyläheiko, K., Jantunen, A., Puumalainen, K., Saarenketo, S. & Tuppura, A. (2011). Innovation and internationalization as growth strategies: The role of technological capabilities and appropriability. *International Business Review*. 20(5), pp. 508-520. https://doi.org/10.1016/j.ibusrev.2010.09.004

LaBerge, L., O'Toole, C., Schneider, J. & Smaje, K. (2020). How COVID-19 has pushed companies over the technology tipping point—and transformed business forever. *McKinsey & Company*. Survey. 5.10.2020. Available at: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever

Larja, L. & Räisänen, H. (2019). Yritysten digitalisaatio ja kasvu: Pk-yritysbarometrin näkökulmia. *Työ- ja elinkeinoministeriö*. TEM-analyyseja 93/2019. Available at: http://urn.fi/URN:ISBN:978-952-327-448-8

Leclezio, L., Jansen, A., Whittemore, V. H. & de Vries, P. J. (2015). Pilot Validation of the Tuberous Sclerosis-Associated Neuropsychiatric Disorders (TAND) Checklist. *Pediatric Neurology,* 52(1) , pp. 16–24. DOI: https://doi.org/10.1016/j.pediatrneurol.2014.10.006

Leeman, N., Kanbach, D. & Stubner, S. (2021). Breaking the Paradigm of Sensing, Seizing, and Transforming – Evidence from Axel Springer. *Journal of Business Strategies,* 38, pp. 95-124. DOI:10.54155/jbs.38.2.95-124

Lorenzo, J. R. F., Rubio, M. T. M. & Garcés, S. A. (2018). The competitive advantage in business, capabilities and strategy. What general performance factors are found in the Spanish wine industry? *Wine Economics and Policy*. 7(2), pp. 94–108. DOI: 10.1016/j.wep.2018.04.001

Loureiro, R., Ferreira, J. J. M. & Simões, J. (2021). Approaches to measuring dynamic capabilities: Theoretical insights and the research agenda. *Journal of Engineering and Technology Management*, Vol. 62. https://doi.org/10.1016/j.jengtecman.2021.101657

Lu, Y. & Ramamurthy, K. R. (2011). UNDERSTANDING THE LINK BETWEEN INFORMATION TECHNOLOGY CAPABILITY AND ORGANIZATIONAL AGILITY: AN EMPIRICAL EXAMINATION. *MIS Quarterly*. 35(4), pp. 931-954. https://doi.org/10.2307/41409967

Macpherson, A. & Holt, R. (2007). Knowledge, learning and small firm growth: A systematic review of the evidence. *Research Policy*, 36(2), pp. 172–192. https://doi.org/10.1016/j.respol.2006.10.001

Maijanen, P. & Jantunen, A. (2016). Dynamics of dynamic capabilities – the case of public broadcasting. *Int. J. Business Excellence*, 9(2), pp. 135–155.

Makkonen, H., Pohjola, M., Olkkonen, R. & Koponen, A. (2014). Dynamic capabilities and firm performance in a financial crisis. *Journal of Business Research,* 67, pp. 2707-2719. https://doi.org/10.1016/j.jbusres.2013.03.020

Mangiafico, S. S. (2019). How should we analyze Likert item data? *Journal of the NACAA*. 12(2). Available at: https://www.nacaa.com/file.ashx?id=c1f53033-a29a-4b7b-b9f0-a00b1fe3ff74

Mashingaidze M., Phiri M. A., Bomani M. (2021). Strategy formulation amongst small and medium manufacturing enterprises: An emerging market case study. *Journal of Governance and Regulation,* 10(1), pp. 158-166. DOI: 10.22495/JGRV10I1ART15

Mata, F. J., Fuerst, W. L. & Barney, J. B. (1995). Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis. *MIS Quarterly*. 19(4), pp. 487-505. https://doi.org/10.2307/249630

McKillup, S. (2006). Statistics explained: an introductory guide for life scientists. *Cambridge: Cambridge University Press*, 2006. Print.

Mergel, I., Edelmann, N. & Haug, N. (2016). Toward a Theory of Digital Transformation. *Conference: European Group of Public administration (EGPA) Annual Conference,* Conference paper. Available at: https://www.researchgate.net/publication/307210631_Toward_a_Theory_of_Digital_Transformation

Metsämuuronen, J. (2009) Tutkimuksen tekemisen perusteet ihmistieteissä: tutkijalaitos. 4. laitos. *Helsinki: International Methelp*.

Mishra. P., Pandey. C. M., Singh, U. & Gupta, A. (2018). Scales of measurement and presentation of statistical data. *Ann Card Anaesth*, 21(4), pp. 419-422. https://doi: 10.4103/aca.ACA_131_18.

Mithani, M.A. & Kocoglu, I. (2020). Human and organizational responses to extreme threats: a comparative developmental approach. *Management Decision*, 58(10), pp. 2077-2097. https://doi.org/10.1108/MD-08-2020-1086

Morgan, C. (2017). Use of proper statistical techniques for research studies with small samples. *American Journal of Physiology, Lung Cellular & Molecular Physiology*. 313(5), pp. L873-L877. doi: 10.1152/ajplung.00238.2017

Murdoch, M., Simon, A. B., Polusny, M. A., Bangerter, A. K., Grill, J. P., Noorbaloochi, S. & Partin, M.R. (2014). Impact of different privacy conditions and incentives on survey response rate, participant representativeness, and disclosure of sensitive information: a randomized controlled trial. *BMC Med Res Methodol,* 14(90). https://doi: 10.1186/1471-2288-14-90.

Neise, T., Verfürth, P. & Franz, M. (2021). Rapid responding to the COVID-19 crisis: Assessing the resilience in the German restaurant and bar industry. *International Journal of Hospitality Management.* 96, 102960. DOI: 10.1016/j.ijhm.2021.102960

North, K. & Varvakis, G. (2016). Competitive Strategies for Small and Medium Enterprises. *Springer, Cham.* pp. 19-37. Available at: https://doi.org/10.1007/978-3-319-27303-7

Novak, J., Purta, M., Marciniak, T., Ignatowicz, K., Rozenbaum, K. & Yearwood, K. (2018). The rise of Digital Challengers - How digitization can become the next growth engine for Central and Eastern Europe. *McKinsey & Company.* [Accessed 5.10.2022] Available at:
https://www.mckinsey.com/~/media/mckinsey/featured%20insights/europe/central%20and%20eastern%20europe%20needs%20a%20new%20engine%20for%20growth/the-rise-of-digital-challengers.ashx

Nyström, T. (2021). Korona kiihdytti digitalisaatiota: teknologia luo raamit strategian toimeenpanolle. *Directors' Institute Finland.* 29.4.2021. Article. [Accessed 15.10.2022] Available at: https://dif.fi/teema-artikkelit/korona-kiihdytti-digitalisaatiota/

OECD. (2005). OECD SME and Entrepreneurship Outlook 2005. *Organisation for Economic Co-operation and Development.* pp. 18. [Accessed 9.4.2021] Available at: https://read.oecd-ilibrary.org/industry-and-services/oecd-sme-and-entrepreneurship-outlook-2005-edition_9789264009257-en#page18

OECD. (2020a). Trade Finance in Times of Crisis – Responses from Export Credit Agencies. *Organisation for Economic Co-operation and Development.* 25.5.2020. [Accessed 5.10.2022] Available at: https://read.oecd-ilibrary.org/view/?ref=133_133585-2fn7mgokm1&title=Trade-Finance-in-Times-of-Crisis-Responses-from-Export-Credit-Agencies

OECD. (2020b). Coronavirus (COVID-19): SME policy responses. *Organisation for Economic Co-operation and Development.* Updated 15.7.2020. [Accessed 20.2.2022.] Available at: https://www.oecd.org/coronavirus/policy-responses/coronavirus-covid-19-sme-policy-responses-04440101/

OECD. (2021) The Digital Transformation of SMEs. *OECD iLibrary*. 3.2.2021. [Accessed 11.9.2022]. https://doi.org/10.1787/bdb9256a-en

OECD. (2022). Financing SMEs and Entrepreneurs 2022: An OECD Scoreboard. *Organisation for Economic Cooperation and Development (OECD)*. Annual ISSN: 23065265 (online). 29.3.2022. [Accessed 26.7.2022] Available at: https://doi.org/10.1787/23065265

Olsen, C. and St George, D. M. (2004) Cross-Sectional Study Design and Data Analysis. *College Entrance Examination Board, New York*. Available at: http://cdn.physioblasts.org/f/public/1355667773_1_FT0_4297_module_05.pdf

Pal, R., Torstensson, H. & Mattila, H. (2014). Antecedents of organizational resilience in economic crises—an empirical study of Swedish textile and clothing SMEs. *International Journal of Production Economics,* Vol. 147, Part B, January 2014, pp. 410-428. https://doi.org/10.1016/j.ijpe.2013.02.031

Papadopoulos, T., Baltas, K. & Balta, M. E. (2020). The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice. *International Journal of Information Management,* 55(4), pp. 102192.

Parnell, J.A. (2021). An ounce of prevention: What promotes crisis readiness and how does it drive firm performance? *American Business Review,* 24(1), pp. 90-113.

Parviainen, P., Tihinen, M., Kääriäinen, J. & Teppola, S. (2017). Tackling the digitalization challenge: how to benefit from digitalization in practice. *International Journal of Information Systems and Project Management*, 5(1), pp. 63-77

Peschl, A. & Schüth, N. J. (2022). Facing digital transformation with resilience – operational measures to strengthen the openness towards change. *Procedia Computer Science*. Vol. 200, pp. 1237-1243. https://doi.org/10.1016/j.procs.2022.01.324.

Peters, M. D. J., Godfrey, C. M., Khalil, H., McInerney, P., Parker, D. & Soares, C. B. (2015). Guidance for conducting systematic scoping reviews. *Int. J. Evid. Based Healthc*. 13(3): 141-146. doi:10.1097/XEB.0000000000000050.

Pietrzak, R. H. & Southwick S. M. (2011). Psychological resilience in OEF-OIF Veterans: Application of a novel classification approach and examination of demographic and psychosocial correlates. *Journal of Affect Disorders*, 133(3), pp. 560–568.

Portuguez Castro, M. and Gómez Zermeño, M.G. (2021). Being an entrepreneur post-COVID-19 – resilience in times of crisis: a systematic literature review. *Journal of Entrepreneurship in Emerging Economies,* 13(4), pp. 721-746. https://doi.org/10.1108/JEEE-07-2020-0246

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(104). doi:10.3390/joitmc6040104

Project Management Institute. (2022). Global Megatrends 2022. *Project Management Institute, Inc.* [Accessed 20.9.2022] Available at: https://www.pmi.org/-/media/pmi/documents/public/pdf/learning/thought-leadership/pmi-megatrends-2022.pdf?v=2991b894-7efb-411c-a780-50968d45a959&sc_lang_temp=en

Punch, K. F. (2003). Survey Research: The Basics. *London: SAGE Publications, Limited, 2003.* Print.

Rêgo, B. S., Jayantilal, S., Ferreira, J. J. & Carayannis, E. G. (2021). Digital Transformation and Strategic Management: a Systematic Review of the Literature. *Journal of the Knowledge Economy (2021).* https://doi.org/10.1007/s13132-021-00853-3

Ross, P. T. & Bibler Zaidi, N. L. (2019). Limited by our limitations. *Perspect. Med. Educ.* 8(4), pp. 261-264. doi: 10.1007/s40037-019-00530-x.

Saad, M. H., Hagelaar, G., van der Velde, G. & Omta, S. W. F. (2021). Conceptualization of SMEs' business resilience: A systematic literature review. *Cogent Business and Management*. 8(1), 1938347. DOI: 10.1080/23311975.2021.1938347

Salisu, Y. & Bakar L. J. A. (2019). Technological Capability, Innovativeness and the Performance of Manufacturing Small and Medium Enterprises (SMEs) in Developing Economies of Africa. *IOSR Journal of Business and Management,* 21(1), Ver. I (January. 2019), pp. 56-61. DOI: 10.9790/487X-2101015661

Schoemaker, P.J.H., Heaton, S., & Teece, D. (2018). Innovation, dynamic capabilities, and leadership. *California Management Review*, 61(1), 15-42.

Sebo, P., Maisonneuve, H., Cerutti, B., Fournier, J.P., Senn, N., Haller, D.M. (2017). Rates, Delays, and Completeness of General Practitioners' Responses to a Postal Versus Web-Based Survey: A Randomized Trial. *J Med Internet Res.,* 19(3), pp. 1–10. https://doi: 10.2196/jmir.6308 Journal of medical Internet research,

Setia, P., Venkatesh, V., and Joglekar, S. (2013). Leveraging digital technologies: how information quality leads to localized capabilities and customer service performance. *MIS Quarterly*, 37, 2, 565–590.

Sitra. (2019). Here they are: the most important trends of the 2020s. *The Finnish Innovation Fund Sitra*. 31.12.2019. [Accessed 20.9.2022] Available at: https://www.sitra.fi/en/news/here-they-are-the-most-important-trends-of-the-2020s/

Statistics Finland (2022). Number of enterprise openings grew by 1,1 percent in the third quarter of 2021 from one year ago. https://www.stat.fi/til/aly/2021/03/aly_2021_03_2022-01-18_tie_001_en.html

Official Statistics of Finland (OSF). (2022) Enterprise openings and closures [e-publication]. ISSN=1799-2346. 3rd Quarter 2021. *Helsinki: Statistics Finland*. 18.1.2022. [Accessed 25.7.2022] Available at: https://www.stat.fi/til/aly/2021/03/aly_2021_03_2022-01-18_tie_001_en.html

Stevens, S. S. (1946). On the Theory of Scales of Measurement. *Science,* 103(2684), pp. 677-680. DOI: 10.1126/science.103.2684.677.

Strusani, D. & Houngbonon, G. V. (2020). The Impact of COVID-19 on Disruptive Technology Adoption in Emerging Markets. Report Chapter. *International Finance Corporation, Washington, DC.* Available at: https://openknowledge.worldbank.org/handle/10986/36265

Sukamolson, S. (2007). Fundamentals of quantitative research. *Language Institute Chulalongkorn University*, 1(3), pp. 1-20.

Sullivan, G. M. & Artino, A. R. (2013). Analyzing and Interpreting Data From Likert-Type Scales. *Journal of Graduate Medical Education*, 5(4), pp. 541–542. https://doi.org/10.4300/JGME-5-4-18

Sullivan-Taylor, B. & Branicki, L. (2011). Creating resilient SMEs: Why one size might not fit all. *International Journal of Production Research*. 49(18), pp. 5565–5579. DOI: 10.1080/00207543.2011.563837.

Suomen Teollisuussijoitus. (2020). About Tesi. *Suomen Teollisuussijoitus Oy.* [Accessed 5.10.2022] Available at: https://www.tesi.fi/tietoa-tesista/

Suomen Yrittäjät, Finnvera Oyj & työ- ja elinkeinoministeriö. (2022). PK-Yritysbarometri – kevät 2022. *Suomen Yrittäjät.* 14.2.2022. [Accessed 17.2.2022] Available at: https://www.yrittajat.fi/wp-content/uploads/2022/02/SY_pk-barometri_kevat2022.pdf

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 48, pp. 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Tavakol, M. & Dennick, R. (2018). Making sense of Cronbach's alpha. *International Journal of Medical Education*. Vol. 2, pp. 53–55. doi: 10.5116/ijme.4dfb.8dfd

Teece, D. J. & Pisano, G. P. (1994). The Dynamic Capabilities of Firms: An Introduction. *Industrial and Corporate Change,* 3(3), pp. 537-556. DOI: 10.1093/icc/3.3.537-a

Teece, D. J., Pisano, G. & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal,* 18(7), pp. 509–533.

Teece, D. J. (2014). The Foundations of Enterprise Performance: Dynamic and Ordinary Capabilities in an (Economic) Theory of Firms. *Academy of Management Perspectives,* 28(4), pp. 328-352. https://doi.org/10.5465/amp.2013.0116

Teece, D. J. (2019). A capability theory of the firm: an economics and (Strategic) management perspective. *New Zealand Economic Papers*, 53(1), pp. 1-43. https://doi.org/10.1080/00779954.2017.1371208

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), pp. 1319-1350.

Teece, D. J. (2000). Strategies for Managing Knowledge Assets: The Role of Firm Structure and Industrial Context. *Long Range Planning*, 33(1), pp. 35-54.

Teece, D. J. and Linden, G. (2017). Business Models, Value Capture, and the Digital Enterprise. *Journal of Organization Design*, 6(1), pp. 1-14

TESI. (2020a). Survey: Finnish SME's more resilient than anticipated during the COVID-19 crisis. *TESI (Finnish Industry Investment Ltd).* 8.12.2020. [Accessed 14.6.2022] Available at: https://www.tesi.fi/en/news-item/survey-finnish-smes-more-resilient-than-anticipated-during-the-covid-19-crisis/

TESI. (2020b). Impact of coronavirus on Finnish SMEs: Spur to transformation and renewed appetite for growth. *TESI (Finnish Industry Investment Ltd).* 27.4.2021. [Accessed 20.10.2022] Available at: https://www.tesi.fi/en/news-item/impact-of-coronavirus-on-finnish-smes-spur-to-transformation-and-renewed-appetite-for-growth/

The World Bank. (2021). How COVID-19 is Affecting Companies Around the World. 17.2.2021. [Accessed 20.2.2022] Available at: https://www.worldbank.org/en/news/infographic/2021/02/17/how-covid-19is-affecting-companies-around-the-world

The World Bank. (2022). Small and Medium Enterprises (SMEs) Finance - Improving SMEs' access to finance and finding innovative solutions to unlock sources of capital. [Accessed 20.2.2022] Available at: https://www.worldbank.org/en/topic/smefinance

The World Bank Live. (2022). The Digital Revolution: Fostering Inclusion and Resilient Growth. *The World Bank Group.* WBG-IMF Spring Meetings 2022. 20.4.2022. [Accessed 15.9.2022] Available at: https://live.worldbank.org/sm22/digitaltransformations#resources

Tranfield, D., Denyer, D. & Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management,* 14(3), pp. 207–222. doi: 10.1111/1467-8551.00375.

Tsai, K-H. (2004). The impact of technological capability on firm performance in Taiwan's electronics industry. *Journal of High Technology Management Research*, 15(2), pp. 183-195. DOI:10.1016/j.hitech.2004.03.002

Tulevaisuusvaliokunta. (2020). Koronapandemian hyvät ja huonot seuraukset lyhyellä ja pitkällä aikavälillä. *Eduskunnan tulevaisuusvaliokunnan julkaisu 1/2020*. Available at: https://www.eduskunta.fi/FI/naineduskuntatoimii/julkaisut/Documents/tuvj_1+2020.pdf

Tutz, G. (2021). Hierarchical Models for the Analysis of Likert Scales in Regression and Item Response Analysis. *International Statistical Review,* 89(1), pp. 18–35. doi:10.1111/insr.12396

Uhl, A., Born, M., Koschmider, A., Janasz, T. (2014). Digital Capability Framework: A Toolset to Become a Digital Enterprise. *In Digital Enterprise Transformation: A Business-driven Approach to Leveraging Innovative IT; Uhl, A., Gollenia, L.A., Eds*. Routledge: London, UK, 2014; pp. 27–60.

Vaidya, S., Ambad, P. & Bhosle, S. (2018) Industry 4.0 – A Glimpse. *Procedia Manufacturing*, Vol. 20, 2018, pp. 233-238. https://doi.org/10.1016/j.promfg.2018.02.034.

Varanka, J., Packalen, P., Voipio-Pulkki, L-M., Määttä, S., Pohjola, P., Salminen, M., Railavo, J., Berghäll, J., Rikama, S., Nederström, H. & Hiitola, J. (2022). COVID-19 - kriisin yhteiskunnalliset vaikutukset Suomessa: Keskipitkän aikavälin arvioita. *Valtioneuvoston julkaisuja 2022:14*. Available at: http://urn.fi/URN:ISBN:978-952-383-708-9

Vehkalahti, K. (2014). Kyselytutkimuksen mittarit ja menetelmät. *Finn Lectura.* https://doi.org/10.31885/9789515149817

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*. Vol. 122, pp. 889-901.

Vogus, T. J. & Sutcliffe, K. M. (2007). Organizational Resilience: Towards a Theory and Research Agenda. *Conference: Proceedings of the IEEE International Conference on Systems, Man and Cybernetics*. DOI:10.1109/ICSMC.2007.4414160

Wang, C. L. & Ahmed, P. K. (2007). Dynamic Capabilities: A Review and Research Agenda. *International Journal of Management Reviews*, 9(1). DOI: 10.1111/j.1468-2370.2007.00201.x

Warner, K.S.R. and Wäger, M. (2019). Building dynamic capabilities for digital transformation: an ongoing process of strategic renewal. *Long Range Planning*, 52(3), pp. 326-349.

Webster, J., & Watson, R. T. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly,* 26(2), xiii–xxiii. Available at: http://www.jstor.org/stable/4132319

WHO. (2022). A Timeline of WHO's COVID-19 Response in the WHO European Region: a living document (version 3.0, from 31 December 2019 to 31 December 2021). Copenhagen: *WHO Regional Office for Europe*; 2022. Licence: CC BY-NC-SA 3.0 IGO.

Wieczorek-Kosmala, M. (2022). A study of the tourism industry's cash-driven resilience capabilities for responding to the COVID-19 shock. *Tourism Management,* Vol. 88:104396

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 24(10), pp. 991-995.

World Economic Forum. (2018). The Global Risks Report 2018, 13th Edition. *The World Economic Forum.* Available at: https://www3.weforum.org/docs/WEF_GRR18_Report.pdf

Wright, K. B. (2005). Researching Internet-Based Populations: Advantages and Disadvantages of Online Survey Research, Online Questionnaire Authoring Software Packages, and Web Survey Services. *Journal of Computer-Mediated Communication*, 10(3), 1.4.2005, JCMC1034, https://doi.org/10.1111/j.1083-6101.2005.tb00259.x

Yesner, R. (2021). Building digital capabilities to withstand future challenges, from cyberattacks to severe weather events. *AWS Public Sector Blog.* 5.8.2021. [Accessed 2.5.2022] Available at: https://aws.amazon.com/blogs/publicsector/building-digital-capabilities-withstand-future-challenges-cyberattacks-severe-weather-events/

Yoo, Y., Lyytinen, K., Boland, R., Berente, N., Gaskin, J., Schutz, D. & Srinivasan, N. (2010). The Next Wave of Digital Innovation: Opportunities and Challenges. *A Report on the Research Workshop 'Digital Challenges in Innovation Research'*, 8.6.2010. Available at: http://dx.doi.org/10.2139/ssrn.16221

Zahra, S. A., Petricevic, O. & Luo, Y. (2022). Toward an action-based view of dynamic capabilities for international business. *Journal of International Business Studies,* 53, pp. 583–600. https://doi.org/10.1057/s41267-021-00487-2

Zhen, Z., Yousaf, Z., Radulescu, M. & Yasir, M. (2021). Nexus of Digital Organizational Culture, Capabilities, Organizational Readiness, and Innovation: Investigation of SMEs Operating in the Digital Economy. *Sustainability,* 13(2), 720. https://doi.org/10.3390/su13020720

Zhang, J., Long, J., von Schaewen, A. M. E. (2021). How Does Digital Transformation Improve Organizational Resilience?—Findings from PLS-SEM and fsQCA. *Sustainability,* 13(11487) https://doi.org/10.3390/su132011487

Zighan, S., Abualqumboz, M., Dwaikat, N. & Alkalha, Z. (2021). The role of entrepreneurial orientation in developing SMEs resilience capabilities throughout COVID-19. *International Journal of Entrepreneurship and Innovation.* 1-13. DOI: 10.1177/14657503211046849

Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13, pp. 339-351.

Zutshi, A., Mendy, J., Sharma, G. D., Thomas, A. & Sarker, T. (2021). From Challenges to Creativity: Enhancing SMEs' Resilience in the Context of COVID-19. *Sustainability,* 13(12), 6542. https://doi.org/10.3390/su13126542

Appendices

Appendix 1: The process for inclusion of results of literature review

Inclusion criteria in five cycles:
Total No. of articles in Scopus based on **keywords & language** [English]:   *'strategic response' AND 'management' AND 'resilience' AND 'capabilities' AND 'SME' AND 'crisis'*   **713 results**
Total No. of articles in Scopus based on keywords, language [English] & **subject area:**   *Business, Management & Accounting*   *Economics, Econometrics, Finance*   **525 results**
Total No. of articles in Scopus based on keywords, language [English], subject area & **document type:**   *Articles, reviews, conference papers*   **447 results**
Total No. of articles in Scopus based on keywords, language [English], subject area, document type & **exact keywords:**   *Resilience, Organizational Resilience, Strategy, Strategic Planning, Strategic Management, Strategic Agility, Flexibility, Crisis Response, Entrepreneurial Orientation, Dynamic Capabilities, Digital Transformation, Disaster, Uncertainty, Uncertainty Analysis, Entrepreneurship, SME, SMEs, Small and Medium-sized Enterprise, Small And Medium Enterprise, Small And Medium Enterprises*   **194 results**
Total No. of articles in Scopus based on keywords, language [English], subject area, document type, exact keywords **with open access**:   **79 results**

Appendix 2: Exclusion criteria of studies for the literature review

The process of analysis of included studies & their exclusion
Total No. of articles included for closer consideration: **79 results**

Classification of studies through reading the titles, abstracts and conclusions:			
primary	secondary	peripheral or conceptual	not relevant
22	**8**	**21**	**28**

Closer reading of articles classified as primary, secondary or conceptual: 51 studies

Appendix 3: Survey questionnaire

*" * " refers that the question is obligatory.*

Research Questions driving the questionnaire:

RQ: What has been the role of digital capabilities to overcome the crisis of COVID-19?

RQ1: How is technology utilized in managing the crisis?

RQ2: How could firms better utilize digital capabilities to react to similar crises in the future?

Themes in the survey & questionnaire

Background information of firm

1. Industry in which a firm operates *

    - Manufacturing

    - Retail

    - Wholesale

2. Firm size (number of employees, 1-250) *

    - less than 10

    - 10 – 49

    - 50 – 250

Resilience of firms / the effects of COVID-19 (using Likert scale 1-5)

3. Please select the option that describes your firm's situation the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

    - Our industry has been affected by the pandemic of COVID-19

    - Our firm has been affected by the pandemic of COVID-19

    - Following the impact of COVID-19, we have revised our firm's strategy

    - Following the impact of COVID-19, we have made strategical changes in our firm

4. Please assess, how well your firm is able to respond and adapt to disruptions in the supply chain (disruptions caused by COVID-19 pandemic)? (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

    - Our firm can cope with the changes caused by disruptions in the supply chain

- Our firm can easily adapt to disruptions in the supply chain

- Our firm can provide a quick response to supply chain disruptions

- Our firm is continuously able to maintain a high level of situational awareness

Digital capabilities

5. Please select the option that matches your firm's situation the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- To tackle the crisis, our firm has adopted new technologies

- To tackle the crisis, our firm has increased our use of technology

- As a result to COVID-19, our firm has identified new business models

- As a result to COVID-19, our firm has identified new business opportunities (other than digital-related business opportunities)

- As a result to COVID-19, our firm has identified new digital business opportunities

6. Please select the option that matches your firm's situation the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- As a result to the COVID-19, our firm has created digital innovations

- As a result to the COVID-19, our firm has created new technology-enabled products

- As a result to the COVID-19, our firm has invested in new technologies

- As a result to the COVID-19, our firm has adopted new technology-enabled services

7. Please assess, how COVID-19 has affected the following sectors in your firm (*extremely, very, moderately, slightly, not at all*)

- Financial Management

- Product/Service Control

- Sales

- Marketing

- Social Media

- Procurement / Purchasing operations

- Condition Monitoring (e.g., digital monitoring of the device/equipment base)

8. Please select the option that matches your opinion about your firm's situation the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- Adopting digital solutions (e.g., tools, products or services) have required learning new skills

- Adopting digital solutions (e.g., tools, products or services) have required training of employees

- Adopting digital solutions (e.g., tools, products or services) have required improving our communication between teams and people

- Adopting digital solutions (e.g., tools, products or services) have required improving our collaboration between teams and people

- Adopting digital solutions (e.g., tools, products or services) have required our firm to develop our organizational culture

- Adopting digital solutions (e.g., tools, products or services) have developed our business processes

- Adopting digital solutions (e.g., tools, products or services) have developed our business models

- Adopting digital solutions (e.g., tools, products or services) have developed our business strategy

9. Please select the option that matches your opinion about your firm's situation the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- Adopting digital solutions (e.g., tools, products or services) have enabled our firm to continue operations during the crisis

- Adopting digital solutions (e.g., tools, products or services) have enabled our firm to tackle the challenges that were faced during to crisis

- Adopting digital solutions (e.g., tools, products or services) have had an positive impact on our firm's ability to survive from the pandemic

Digital Transformation

10. Please select the option that matches your firm's situation the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- Before COVID-19, our firm had already carried out digital transformation

- Before COVID-19, our firm had active digital transformation going on

- Before COVID-19, our firm used actively digital technologies

11. Please select the option that matches your firm's situation the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- As a result to COVID-19, the number of the electronically handled processes has increased in our firm

- As a result to the COVID-19, our firm's overall level of digitalization has increased

- As a result to the COVID-19, the adoption of digital technologies has increased in our firm

- As a result to COVID-19, our firm has abandoned some [existing] digital technologies (e.g., due to low usage, lack of funding etc)

12. Please assess your firm through the following statements & estimate them in the light of COVID-19 (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- Our firm has formed a clear vision about the role of digitalization in the firm's value creation

- Our firm effectively implements our vision about digitalization in practice

- Our firm integrates the planning of ICT functions with our strategic business planning

- Our firm's management works as an active enabler of the digital transformation & digital development

- The amount of remote working has increased in our firm

- We have increased the use of Video Conference tools and applications in our firm

- We have increased our Social Media posting & updating

- We have updated our Website more often

- We have developed our online store (e-commerce)

- The importance of digital channels in promoting & marketing our products and/or services has increased

- Our firm has increased our online purchasing

- Use of Cloud-based services has increased in our firm

- Use of Electronic calendar has increased in our firm

- Use of email has increased in our firm

- Our firm utilizes Internet of Things (IoT) more

- We have increased our use of applications using artificial intelligence (AI) or robotics

- Our firm has increased our utilization of Big Data

13. Please assess the next statements which consider the reasons that have prevented your firm in increasing your level of digitalization (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- Our partners have not been ready to use digital technologies

- Our customers have not been ready to use digital technologies

- Our firm does not have enough knowledge and/or competences to utilize digital technologies

- Our firm does not have enough resources to promote digitalization

- Obstacles related to regulation reduce our digitalization plans and/or efforts

- Obstacles related to financing reduce our digitalization plans and/or efforts

14. Please select the option that matches your opinion the best (*strongly agree, agree, neither agree or disagree, disagree, strongly disagree*)

- I believe that the adoption of digital technologies will help our firm to tackle the next crisis

- I believe that increased digital knowledge and competences in our firm will help us to tackle the next crisis

Appendix 4: Sampling strategy

Population:	SMEs in Finland, 1-250 employees (in 2020; Suomen Yrittäjät et al. 2022): Approx. 295 000 firms (excluding agriculture, forestry and fisheries)
Search process for the sample of firms Search done in the database of Amadeus, 27.7.2022	
All active companies & companies with unknown situation in Finland	318 502 firms
Limited to firm size:	Only medium and small-sized companies found 310 950 firms
Limited to industry:	All manufacturing, retail and wholesale found 55 672 firms
Limited to region:	Firms located in Helsinki, Espoo or Vantaa found 12 150 firms
Results exported from the database to Excel	
List of firms filtered in Excel, based on three aspects:	• Firms with less than ten employees excluded • Last year of operation between 2019-2021 • A firm has contact information available in the results **Resulted 496 firms**
Firms contacted via email, the survey included	

Appendix 5: Tests of data

Normal distribution & linearity of data

Variable	Cronbach's Alpha	Shapiro-Wilk W test	Skewness & Kurtosis
Industry	-	1,0000	0,0003
FirmSize	-	1,0000	0,2660
Resilience	0,6726	0,1911	0,0553
DigCapab	0,9200	0,8039	0,6930
DT	0,8472	0,9836	0,9716
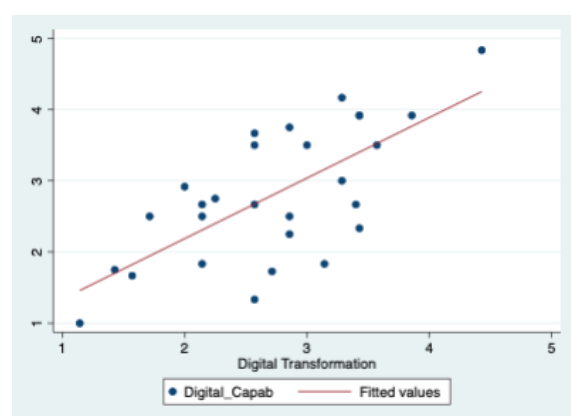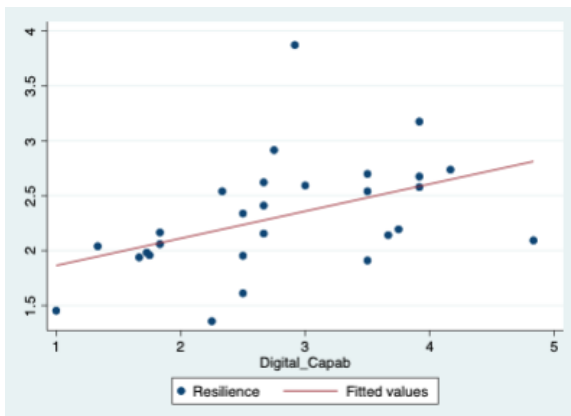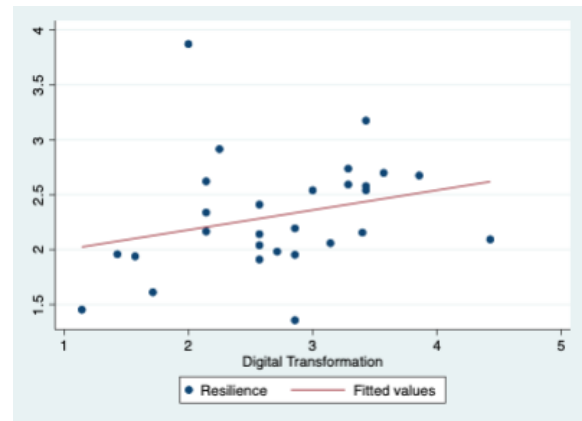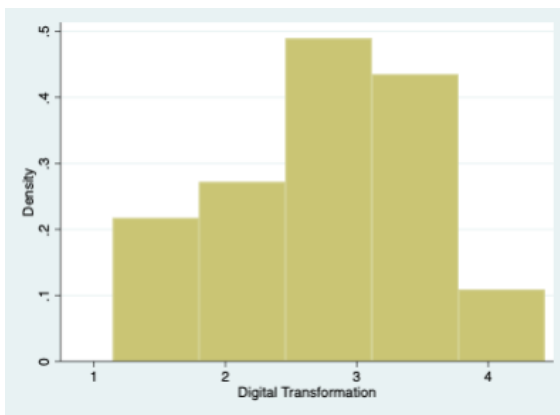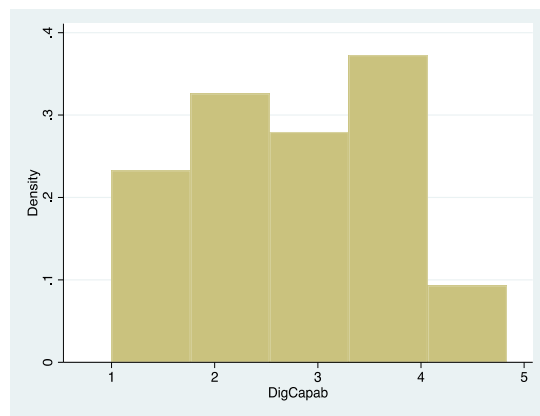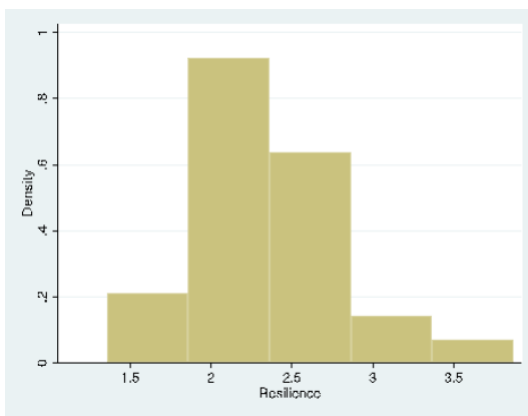
Appendix 6: Comparison of industries & firm sizes

1. Comparison of industries and firm sizes: regression analysis between *Digital Capabilities & Resilience*

Ordinal Logistic Regression					
		Resilience			
Digital Capabilities	Obs	Coefficient	Stnd. Error	p-value	Sig.
By Industry					
Manufacturing	9	-5.112958	3.99281	0.200	
Retail	7	.3411287	3.06653	0.911	
Wholesale	12	-6.271687	2.698735	0.020	*
By Firm size					
less than 10	3	-1.903384	4.174435	0.648	
10-49	21	-4.171444	1.413447	0.003	*
50-250	4	-7.451751	5.843023	0.202	

2. Comparison of industries and firm sizes: regression analysis between *Digital Transformation & Resilience*

Ordinal Logistic Regression					
		Resilience			
Digital Transformation	Obs	Coefficient	Stnd. Error	p-value	Sig.
By Industry					
Manufacturing	9	3.862367	3.742224	0.302	
Retail	7	-6.95158	3.689146	0.060	
Wholesale	12	-.0283939	2.271983	0.990	
By Firm size					
less than 10	3	-6.114374	5.342057	0.252	
10-49	21	-2.420892	1.28615	0.060	
50-250	4	7.634897	6.960054	0.273	

Appendix 7: Frequencies of statements

Items (statements)	strongly agree	agree	neither agree or disagree	disagree	strongly disagree	total
Resilience						
3a. Our industry has been affected by the pandemic of COVID-19.	16	9	1	1	1	28
3b. Our firm has been affected by the pandemic of COVID-19.	16	8	1	2	1	28
3c. Following the impact of COVID-19, we have revised our firm's strategy.	4	10	8	5	1	28
3d. Following the impact of COVID-19, we have made strategical changes in our firm.	6	10	7	4	1	28
4a. Our firm can cope with the changes caused by disruptions in the supply chain.	7	17	1	3	0	28
4b. Our firm can easily adapt to disruptions in the supply chain.	3	13	5	6	1	28
4c. Our firm can provide a quick response to supply chain disruptions.	4	12	6	6	0	28
4d. Our firm is continuously able to maintain a high level of situational awareness.	5	17	6	0	0	28
Digital Capabilities						
5a. To tackle the crisis, our firm has adopted new technologies.	6	5	6	8	3	28
5b. To tackle the crisis, our firm has increased our use of technology.	8	9	3	6	2	28
5c. As a result to COVID-19, our firm has identified new business models. (N = 27)	2	12	7	6	0	27
5d. As a result to COVID-19, our firm has identified new business	2	7	11	7	1	28

opportunities (other than digital-related business opportunities).						
5e. As a result to COVID-19, our firm has identified new digital business opportunities.	6	6	7	6	3	28
6a. As a result to the COVID-19, our firm has created digital innovations.	5	3	5	6	9	28
6b. As a result to the COVID-19, our firm has created new technology-enabled products.	5	3	4	7	9	28
6c. As a result to the COVID-19, our firm has invested in new technologies.	5	6	2	9	6	28
6d. As a result to the COVID-19, our firm has adopted new technology-enabled services.	7	6	0	9	6	28
9a. Adopting digital solutions (e.g., tools, products or services) have enabled our firm to continue operations during the crisis.	7	9	6	3	3	28
9b. Adopting digital solutions (e.g., tools, products or services) have enabled our firm to tackle the challenges that were faced during to crisis.	9	7	8	3	1	28
9c. Adopting digital solutions (e.g., tools, products or services) have had an positive impact on our firm's ability to survive from the pandemic.	9	10	5	3	1	28
Digital Transformation						
10a. Before COVID-19, our firm had already carried out digital transformation. (N = 26)	3	9	6	6	2	26
10b. Before COVID-19, our firm had active digital transformation going on. (N = 26)	2	9	5	7	3	26
10c. Before COVID-19, our firm used actively digital technologies. (N = 27)	5	9	10	3	0	27

11a. As a result to COVID-19, the number of the electronically handled processes has increased in our firm.	6	10	7	4	1	28
11b. As a result to the COVID-19, our firm's overall level of digitalization has increased.	4	15	5	3	1	28
11c. As a result to COVID-19, the adoption of new technologies has increased in our firm.	6	9	6	6	1	28
11d. As a result to COVID-19, our firm has abandoned some [existing] digital technologies (e.g., due to low usage, lack of funding etc).	0	5	7	11	5	28
12a. Our firm has formed a clear vision about the role of digitalization in the firm's value creation.	2	8	10	7	1	28
12b. Our firm effectively implements our vision about digitalization in practice.	2	7	14	4	1	28
12c. Our firm integrates the planning of ICT functions with our strategic business planning.	5	4	9	9	1	28
12d. Our firm's management works as an active enabler of the digital transformation & digital development.	4	13	6	4	1	28
Evaluation of firms						
7a. Financial Management	7	6	6	7	2	28
7b. Product/Service Control (N = 27)	5	9	7	5	1	27
7c. Sales	13	9	5	1	0	28
7d. Marketing	8	9	9	1	1	28
7e. Social Media	4	8	8	3	5	28
7f. Procurement / Purchasing operations	9	10	4	4	1	28

7g. Condition Monitoring	1	3	9	5	10	28
8a. Adopting digital solutions (e.g., tools, products or services) have required learning new skills.	3	13	6	4	2	28
8b. Adopting digital solutions (e.g., tools, products or services) have required training of employees.	2	12	5	6	3	28
8c. Adopting digital solutions (e.g., tools, products or services) have required improving our communication between teams and people.	3	12	7	4	2	28
8d. Adopting digital solutions (e.g., tools, products or services) have required improving our collaboration between teams and people.	4	9	9	4	2	28
8e. Adopting digital solutions (e.g., tools, products or services) have required our firm to develop our organizational culture.	4	12	8	2	2	28
8f. Adopting digital solutions (e.g., tools, products or services) have developed our business processes.	4	11	8	3	2	28
8g. Adopting digital solutions (e.g., tools, products or services) have developed our business models.	4	11	6	5	2	28
8h. Adopting digital solutions (e.g., tools, products or services) have developed our business strategy.	4	8	10	4	2	28
12e. The amount of remote working has increased in our firm.	14	6	2	3	3	28
12f. We have increased the use of Video Conference tools and applications in our firm.	14	11	2	1	0	28
12g. We have increased our Social Media posting & updating.	4	11	7	5	1	28

12h. We have updated our Website more often.	4	14	7	3	0	28
12i. We have developed our online store (e-commerce).	10	4	4	3	7	28
12j. The importance of digital channels in promoting & marketing our products and/or services has increased.	6	9	4	9	0	28
12k. Our firm has increased our online purchasing.	3	8	9	3	5	28
12l. Use of Cloud-based services has increased in our firm.	3	9	13	3	0	28
12m. Use of Electronic calendar has increased in our firm.	4	10	10	3	1	28
12n. Use of email has increased in our firm.	3	10	9	4	2	28
12o. Our firm utilizes Internet of Things (IoT) more.	2	2	11	4	9	28
12p. We have increased our use of applications using artificial intelligence (AI) or robotics.	2	2	9	1	14	28
12q. Our firm has increased our utilization of Big Data.	1	5	8	2	12	28
13a. Our partners have not been ready to use digital technologies. (N = 27)	0	5	14	6	2	27
13b. Our customers have not been ready to use digital technologies. (N = 27)	2	7	8	9	1	27
13c. Our firm does not have enough knowledge and/or competences to utilize digital technologies. (N = 27)	2	8	7	8	2	27
13d. Our firm does not have enough resources to promote digitalization. (N = 27)	3	12	4	5	3	27
13e. Obstacles related to regulation reduce our	0	4	9	5	9	27

digitalization plans and/or efforts. (N = 27)						
13f. Obstacles related to financing reduce our digitalization plans and/or efforts. (N = 27)	2	9	5	3	8	27
14a. I believe the adoption of digital technologies will help our firm to tackle the next crisis.	8	12	6	2	0	28
14b. I believe that increased digital knowledge and competences in our firm will help us to tackle the next crisis.	8	12	6	2	0	28