

Innovation in times of a nation-wide crisis – the COVID-19 example

What translates innovation ambidexterity into superior firm performance during the COVID-19 crisis?

Master Thesis – Innovation & Entrepreneurship

Date of submission: 14-06-2021

Danou Wiggers, s1003861

Supervisor: Dr. C. V. Gelhard

Second examiner: Dr. K. Sidaoui

Radboud University



Abstract

The main objective of this research is to find out what translates innovation ambidexterity into superior firm performance during the COVID-19 crisis. Previous research has established a positive relationship between innovation ambidexterity and firm performance, but it has not yet focused on potential mediation effects. This research specifically focuses on enterprise agility and business model innovation (BMI). As the COVID-19 crisis intensifies, among other things, uncertainty and complexity, firms need to be able to make quick decisions and rapidly respond to changes in their business environment, as well as engage in BMI to keep up with their competitors. The assumption of full mediation is made, so the expectation is that the effect of innovation ambidexterity on firm performance is fully mediated by enterprise agility and BMI. This research empirically examines the extent to which innovation ambidexterity is positively associated with enterprise agility, enterprise agility is positively associated with BMI, and BMI is positively associated with firm performance. Additionally, this research explores the moderation effect of the COVID-19 crisis on these relationships. The consistent PLS-SEM analysis of data from 112 firms from De Liemers, a region within The Province of Gelderland, indicates that innovation ambidexterity is positively related to enterprise agility, and BMI is positively related to firm performance. However, the results also show that enterprise agility has no direct effect on BMI, and that the hypothesized relationships are not strengthened by the COVID-19 crisis. The intention of this research is to translate the challenges that firms are currently facing into learning opportunities for the future, which could help firms to anticipate on a potential next crisis by strengthening the capabilities that are considered necessary. At the end of this research, recommendations for future research are provided.

Content

Abstract.....	2
1. Introduction	5
2. Theoretical framework	10
2.1 Innovation ambidexterity.....	10
2.2 Enterprise agility.....	13
2.3 Business Model Innovation	14
2.4 Conceptual Framework	17
2.4.1 Innovation ambidexterity and enterprise agility	17
2.4.2 Enterprise agility and BMI	18
2.4.3 BMI and firm performance.....	20
2.4.4 Conceptual Model.....	21
3. Methodology.....	22
3.1 Methodological approach and data collection.....	22
3.2 Sample	22
3.3 Focus of the research.....	23
3.4 Data analysis.....	24
3.5 Measurement Constructs	25
3.6 Research ethics	29
4. Results	29
4.1 Descriptive statistics.....	29
4.2 Evaluation of the measurement model	30
4.3 Evaluation of the structural model	33
5. Discussion and implications	36
5.1 Discussion	36
5.2 Implications	39
6. Limitations and recommendations for future research	41
6.1 Limitations.....	41
6.2 Recommendations for future research	42
7. Conclusion	44
8. References	45
9. Appendices	53
Appendix 1: Online survey questions.....	53
Appendix 2: Descriptive statistics.....	65
Appendix 2.1 Respondent descriptive statistics.....	65

Appendix 2.2 Firm descriptive statistics.....	66
Appendix 3: Item loadings.....	67
Appendix 4: Cross-loadings (item-to-construct correlations).....	68

1. Introduction

Since early March 2020, firms worldwide are facing outstanding challenges due to the COVID-19 crisis (Clark, Davila, Regis, & Kraus, 2020; Breier et al., 2021). COVID-19 is referred to as a pandemic with large global effects, since it affects almost every country in some way (Brem, Viardot, & Nylund, 2021). The consequences of such a crisis can be the risk of economic recession, bankruptcy, and high levels of unemployment, caused by the imposed governmental measures, like social distancing, self-isolation and restraints on travelling (Clark et al., 2020; Fitriasisari, 2020; Nicola et al., 2020). In addition, governments have either asked or required the population to adjust their behavior in response to the crisis (Clark et al., 2020). The aim of these governmental measures is to prevent unemployment and preserve necessary economic activity. Little attention has been paid to future economic activity, since the focus is on preservation of the present activities (Kuckertz et al., 2020). However, in order for firms to manage this crisis, focus on future economic activity and letting go of the status quo is of high importance. Currently, a lot of firms are in need of considerable business model innovation (BMI) in order to survive this crisis (Ritter & Pedersen, 2020), which might also have an influence on how business will be done in the future (Breier et al., 2021).

Previous literature has already put emphasis on the role of innovation in times of a crisis (Filippetti & Archibugi, 2011; Brem et al., 2021). The fact that firms are coping with limited resources and time available to adjust their business in response to the COVID-19 crisis has led to a surge of innovative responses (Harris, Bhatti, Buckley, & Sharma, 2020). Not only the creation of new ideas, but also the diffusion of them to society is very important, since a broad diffusion is likely to translate into economic growth (Younes et al., 2020). However, the COVID-19 crisis did not only lead to a surge of innovative responses, it has also put pressure on existing innovation activities. Innovations that were supposed to be incremental are now forced to be implemented in a more radical way (Brem et al., 2021). In addition, these innovation processes are being achieved at high levels of speed, while in different circumstances they would have taken years (Brem et al., 2021).

An important driver of innovation is demand (Schmookler, 1966, as cited in Filippetti & Archibugi, 2011). During the COVID-19 crisis it has become apparent that an increase or decrease in demand is rather industry-specific. For example, demand in the food and medical industry has increased, while the manufacturing industry has faced a decrease (Nicola et al., 2020). This increase in demand can be explained by a boom in these specific industries, which

provides more encouraging conditions to innovate (Filippetti & Archibugi, 2011). In existing literature, different views exist on whether firms are likely to increase or decrease innovation in times of a crisis. When looking at the relationship between innovation and business cycles, previous researchers have hypothesized that, on the one hand, innovation is cyclical and firms are thus likely to reduce their innovation activities during economic recession (Filippetti & Archibugi, 2011). On the other hand, the authors hypothesize that innovation is counter-cyclical, which enables firms to innovate during economic recessions due to a productive business environment. Some firms feel the urge to innovate during times of crisis, while others are more resistant towards innovation (Filippetti & Archibugi, 2011). This resistance depends on several factors, like firm-specific characteristics, industry-specific dynamics, trends, and technological and profit opportunities (Filippetti & Archibugi, 2011). In their research, the authors provide arguments for innovation in times of recession as well as in a boom. Due to the fact that the value of existing products is likely to decrease in an economic recession, firms might be stimulated to radically innovate by means of introducing new products. On the other hand, the conditions in a boom and expanding markets might be more appealing to introduce new products. According to Archibugi, Filippetti, and Frenz (2013), firms reduce investment in innovation activities in times of economic recession, because of the uncertainty and riskiness of the returns. This means that firms are more likely to decrease their expenditures, while a crisis also provides new opportunities, and possibilities for restructuring their business. Different views on firms' innovation activities during fluctuating times stresses the importance of gaining a good understanding of innovation during the COVID-19 crisis. Hence, firms can be provided with direction on whether to innovate or not and what innovation strategy to proceed with.

When zooming in on innovation strategies, a distinction between explorative and exploitative innovation strategies can be made. For an explorative innovation strategy, firms need to invest resources to develop new knowledge, since these exploratory innovation activities are new-to-the-firm and more radical (Atuahene-Gima, 2005). With an exploitative innovation strategy on the other hand, resources to extend current knowledge need to be invested and the aim of this approach is to achieve greater efficiency to facilitate more incremental innovation (Atuahene-Gima, 2005). A firm's ability to balance both explorative and exploitative innovation at the same time is called innovation ambidexterity (Chang & Hughes, 2012), which is one of the main concepts of this research. In order for a firm to maintain an ambidextrous innovation strategy, it needs to be able to manage the tensions between exploration and exploitation (Chang & Hughes, 2012). The COVID-19 crisis also

causes tensions for firms, as it requires them to consider whether to reduce their innovation activities due to budget constraints, or take the crisis as an opportunity to excel by introducing new-to-the-firm innovations (Guderian, Bican, Riar, & Chattopadhyay, 2021).

This research particularly focuses on innovation ambidexterity in the context of the current COVID-19 crisis, since the ability to jointly pursue both explorative and exploitative innovation has turned out to have positive performance effects (He & Wong, 2004; Lubatkin, Simsek, Ling, & Veiga, 2006; Andriopoulos & Lewis, 2009; Chang & Hughes, 2012). Considering the COVID-19 crisis, an important question to be asked is whether ambidextrous innovation also has positive performance effects during this crisis. In order to be successful, firms need to efficiently manage the demands of their business today, while being able to adapt to environmental changes at the same time (Tushman & O'Reilly, 1996; Raisch & Birkinshaw, 2008). Therefore, the expectation is that firms with an ambidextrous innovation strategy are better able to manage the tensions caused by the crisis by balancing both the depletion of their current resources to save money, as well as their investments in radical innovation to outperform competitors. For this reason, the choice has been made to focus on this particular innovation strategy in this research.

Some preliminary evidence is available that suggests that it is not only innovation that is of importance during a crisis. It is very likely that firms need to have additional capabilities to translate their ambidextrous innovation strategy into superior firm performance during this crisis. Whether firms are able to successfully cope with a rapidly changing, uncertain environment, also depends on the level of enterprise agility (Overby, Bharadwaj, & Sambamurthy, 2006; Sherehiy, Karwowski, & Layer, 2007). Enterprise agility can be referred to as a firm's ability to anticipate on environmental changes and rapidly respond to these changes in an appropriate manner (Overby et al., 2006). As the speed at which innovation processes need to be achieved is increasing (Brem et al., 2021), high levels of agility are required. Therefore, firms need to enforce their agility capabilities in order to survive the crisis. A significant effect of innovation ambidexterity on enterprise agility has been found in prior research (Lee, Sambamurthy, Lim, & Wei, 2015). This effect indicates that ambidextrous organizations are likely to have higher degrees of agility, which enables them to adapt to market changes more quickly. This is exactly what is needed to survive a crisis like COVID-19. However, it might not be sufficient for firms to solely be agile. In order to appropriately implement the changes that are necessary to keep up with the dynamic environment, the firm might also need to add new activities or change the execution of its

current activities (Amit & Zott, 2012). This can be referred to as business model innovation (BMI). Previous research has established that enterprise agility is positively associated with BMI (Clauss, Abebe, Tangpong, & Hock, 2019).

“Business model innovation is any innovation that creates a new market or disrupts the competitive advantage of key competitors” (Euchner & Ganguly, 2014, p. 33), which makes BMI exactly the kind of agility that is needed during the COVID-19 crisis. An example of an agile firm in the Netherlands that has slightly adjusted their business model (BM) in response to this crisis is IKEA. Due to the tremendous changes in the business environment, IKEA needed to find a way to proceed with their day-to-day activities while having only limited resources available. This is where the company decided to change their BM and to build their day-to-day activities around the concept of Click and Collect (Ingka Group, 2020), which enabled them to still generate incomes even though the company had to close its stores. While most research has focused on the relationship between BMI and firm performance, Clauss et al. (2019) focused on the missing link between enterprise agility and BMI. As indicated by the IKEA example, BMI is highly valuable in unstable times. Putting this into the context of this research, one can assume that BMI has a positive influence on firm performance during the COVID-19 crisis (Amit & Zott, 2010). BMI supports firms in outperforming competition during the crisis by quickly adapting to the dynamic environment (Lindgardt, Reeves, Stalk Jr, & Deimler, 2013).

The abovementioned theory and assumptions make it both interesting and important to focus this research on firms with an ambidextrous innovation strategy in the context of the COVID-19 crisis. As previous research has not yet focused on what actually translates innovation ambidexterity into superior firm performance in times of crisis, the goal of this research is to bridge this gap in the literature by opening the black box between innovation ambidexterity and firm performance. Therefore, this research aims to answer the following research question: *What translates innovation ambidexterity into superior firm performance during the COVID-19 crisis?* In order to test the proposed hypotheses, a quantitative survey will be conducted and the results of the survey will be analysed by means of consistent Partial Least Squares Structural Equation Modeling (PLS-SEM). To accomplish this, an empirical study will be conducted across firms in De Liemers, a region within Gelderland, which is a province of the Netherlands. The choice has been made to conduct this research within this specific region, as especially small and medium-sized enterprises (SMEs) contribute to the growth of the regional economy (Beute, 2019). Previous research has established that SMEs are often mostly impacted by major crises (Runyan, 2006). More specifically, a study on the

effects of the COVID-19 crisis showed that SMEs are hit hardest by this specific crisis (Baker & Judge, 2020).

By opening the black box between innovation ambidexterity and firm performance, this research contributes to the theoretical foundation of this particular subject, which can be used for further research on a larger scale. Focus is laid on both enterprise agility and BMI, as it is expected that these two capabilities are necessary to manage the current crisis. This research is built upon the assumption that ambidextrous firms have a higher level of enterprise agility, and that enterprise agility, in turn, has an influence on BMI, which in turn has an influence on firm performance. The theoretical contribution of this research is that the assumption of a full mediation effect has been made. This means that no direct link between innovation ambidexterity and firm performance is expected. Therefore, the theoretical contribution of this research is to generate new knowledge on the relationship between innovation ambidexterity and firm performance by focussing on its mediators. One of the most important and distinctive elements of this research is the addition of the COVID-19 crisis as a moderation effect, which implies that the abovementioned relationships are stronger during the crisis.

The contribution of this research concerning firms in De Liemers can be considered two-fold. First, it aims to confirm that innovation is important in fluctuating times. Second, it helps firms to better understand how to translate their innovation strategy into superior performance by providing evidence that agility and BMI are the two core capabilities companies need to outperform their competitors in the current crisis. The latter also makes this research practically relevant, as the outcomes could provide direction to these firms. This research is therefore of the utmost importance for firms within De Liemers, as it provides insight into how firms are dealing with the COVID-19 crisis in this specific region by looking at their innovation strategies, and changes in their levels of enterprise agility, BMI, and performance over the past 1.5 year. In addition, it aims to translate the challenges that firms are currently facing into learning opportunities for the future. This could help firms in De Liemers to anticipate on a potential next crisis by strengthening the capabilities that are considered necessary to manage the current crisis. Since firms are currently facing enormous challenges due to the COVID-19 crisis, the context of this research is considered highly relevant.

This research first presents a theoretical framework in which innovation ambidexterity, enterprise agility and BMI are discussed. At the end of the theoretical framework, six hypotheses and the conceptual model are presented. Second, the methodology of this research

is discussed. In this section, the type of research, the methods that are used for gathering and analysing data, and the operationalization of the measurement constructs are outlined. Third, the results of the quantitative research are presented. And last, this research discusses these results in detail, followed by an answer on the research question, limitations, recommendations for future research, and a conclusion.

2. Theoretical framework

In the theoretical framework, a definition and description of innovation ambidexterity, enterprise agility and BMI, along with their potential relationships will be discussed. First, innovation ambidexterity will be emphasized. This will be done by giving a definition of innovation in general, describing the three different types of innovation strategies and zooming in on the concept of innovation ambidexterity. Second, enterprise agility will be defined and the outcomes, drivers and capabilities of enterprise agility will be highlighted. And last, a definition of BMI will be provided, along with the antecedents and outcomes of BMI. At the end of the theoretical framework, a conceptual framework will be provided along with the hypotheses on which this research is built.

2.1 Innovation ambidexterity

Innovating firms are forced to deal with a lot of challenges, ranging from understanding the needs of the market to being able to access financial resources (D'Este, Lammarino, Savona, & von Tunzelmann, 2012). In previous literature, the most commonly used definition of innovation is the definition by Schumpeter (1934, as cited in Goffin & Mitchell, 2017), consisting of the following five components: 1) the introduction of a product or service that is new-to-the-world or of increased quality compared to previous products available; 2) production methods that are novel to a particular industry; 3) the introduction of new markets; 4) making use of new ways of producing, purchasing and/or distributing; 5) different forms of competition, which require restructuring of an industry. Due to the fact that both customer demands as well as competition are increasing, firms need to be able to manage different types of innovation. The aforementioned definition of innovation emphasizes that not only the introduction of new products is important, but new services and BMs are also essential (Goffin & Mitchell, 2017).

Innovation can also be referred to as the development and implementation of an invention and describes the process of bringing new ideas to the market by means of implementing these ideas into the products, processes, or organizational methods of a firm

(Souto, 2015). The three main types of innovation can be recognized as product, process and organizational innovation (Souto, 2015). These three types of innovation contain different degrees of novelty, because the newness of an innovation is inherent to the innovation itself. This degree of novelty can be classified into incremental and radical innovation (Souto, 2015). While a radical innovation contains a high degree of novelty and breaks with a firm's existing products, processes and organizational methods, incremental innovation has a low degree of novelty and does not break with what is familiar to a firm. Incremental innovation refines these existing innovation types and is less costly and risky compared to radical innovation (Souto, 2015). When innovation is managed in the right way, it can be referred to as, among other things, a process, a strategy, a benchmark or a new-to-the-world process (Kuczmarski, 1996). In this research, the focus will be on innovation as a strategy.

A distinction can be made between three different types of innovation strategies: explorative, exploitative, and ambidextrous innovation strategies. While explorative innovation strategies put emphasis on experimentation, taking risks, being flexible, and discovering new competencies, exploitative innovation strategies focus on efficiency, implementation, and refinement of current competencies (March, 1991). In addition, exploratory innovation activities are new-to-the-firm and more radical, while exploitative innovation activities facilitate more incremental innovation (Atuahene-Gima, 2005). The benefits of both strategies have resulted in the following dilemma: how to exploit existing competencies without hampering the ability to explore new competencies (March, 1991). In terms of returns, the returns coming from an explorative innovation strategy are more variable, less certain and more long-term compared to the returns from an exploitation innovation strategy, which are more certain (March, 1991; He & Wong, 2004). Previous research focused on the importance of balancing exploration and exploitation and the benefits of executing both strategies at the same time (March, 1991; Benner & Tushman, 2003; He & Wong, 2004; Jansen, Van Den Bosch, & Volberda, 2006; Andriopoulos & Lewis, 2009; Lin, McDonough III, Lin, & Lin, 2013). In order to be successful, firms need to implement both an exploitative as well as an exploratory innovation strategy simultaneously (Tushman & O'Reilly, 1996), as this is the most appropriate way to initiate both incremental and radical innovation (March, 1991). In other words, firms need to be ambidextrous in order to outperform competitors.

Innovation ambidexterity can be referred to as a firm's ability to exploit existing competencies, while at the same time exploring new ones (e.g. Lubatkin et al., 2006; Cao, Gedajlovic, & Zhang, 2009). Or, the ability of a firm to efficiently manage the demands of

their business today, while being able to adapt to changes in their business environment at the same time (Raisch & Birkinshaw, 2008). Firms that only pursue an explorative innovation strategy are able to anticipate upon environmental changes and actively respond to these changes by introducing radical innovations. These firms might outperform their competitors and increase their performance by introducing these radical innovations, as it will be difficult for their competition to imitate them (Lubatkin et al., 2006). However, the disadvantage of this approach is that it involves taking risks, as it is difficult to estimate the benefits beforehand, and if these benefits even exist, it might take years to realize them. On the other hand, firms that have a major focus on exploitation, aim to adapt to changing external conditions by means of incremental innovations to existing competencies. Moreover, these firms focus on their existing customer base (Harry & Schroeder, 2000, as cited in Lubatkin et al., 2006). By primarily focusing on exploitation, firms will become ineffective at dealing with major changes in the business environment (Lubatkin et al., 2006), caused by, for example, the COVID-19 crisis. Therefore, major benefits of ambidexterity are that it enables firms to satisfy the needs of their existing customer base as well as targeting new customer groups, and to introduce both radical as well as incremental innovations at the same time (Lubatkin et al., 2006).

Structure, context and leadership are referred to as the main antecedents and driving forces of innovation ambidexterity (Raisch & Birkinshaw, 2008; Chang & Hughes, 2012). While explorative firms tend to have more organic structures and less standardized work, exploitative firms are frequently associated with mechanistic structures, including more standardized routines and procedures (He & Wong, 2004; Chang & Hughes, 2012). Whether a firm has a mechanistic or organic structure and whether a firm is able to put in place dual structures both have an influence on its ability to achieve structural ambidexterity.

Contextual characteristics refer to the concept of contextual ambidexterity, defined as “the behavioral capacity to simultaneously demonstrate alignment and adaptability across an entire business unit” (Gibson & Birkinshaw, 2004, p. 209). So, whether a firm is able to achieve ambidexterity also depends on the actions taken by individuals within the firm. Behavioral integration of the top management team has also been found to be an important factor that influences the ability of a firm to become ambidextrous (Lubatkin et al., 2006), which refers to the antecedent of leadership characteristics by Chang & Hughes (2012). Especially supportive and flexible leaders are drivers of innovation ambidexterity. The actions of the top management team can cause explorative and exploitative innovation strategies to appear (Lubatkin et al., 2006; Raisch & Birkinshaw, 2008; Chang & Hughes, 2012).

Important for this research is the previously established link between innovation ambidexterity and firm performance. The results of previous research indicate a positive effect of innovation ambidexterity on firm performance. These results show that, when both exploration and exploitation are at high levels, which indicates that firms are ambidextrous, the highest level of firm performance can be accomplished (see e.g. He & Wong, 2004; Birkinshaw & Gibson, 2004; Lubatkin et al., 2006; Raisch & Birkinshaw, 2008; Andriopoulos & Lewis, 2009; Chang & Hughes, 2012; Dranev, Izosimova & Meissner, 2020). The foundation of this research is the relationship between innovation ambidexterity and firm performance, as it aims to find out what the actual mediators are that translate an ambidextrous innovation strategy into superior performance. However, the assumption of full mediation has been made. In the next two sections, these two mediators, enterprise agility and BMI, will be discussed.

2.2 Enterprise agility

A necessary, basic ability for any firm is that it needs to be able to sense, perceive and anticipate changes in the operating environment (Zhang & Sharifi, 2000). This refers to the concept of enterprise agility, which can be defined as a firm's ability to anticipate on environmental changes and rapidly respond to these changes in an appropriate manner (Overby et al., 2006). Enterprise agility can be divided into two components, namely: sensing and response (Overby et al., 2006). Firms can be considered agile when scoring high on both the sensing and response capability, since a firm that is capable of sensing changes in the environment, also needs to be able to quickly respond to these changes. In addition, responses need to be appropriate and in line with the goals of the firm (Overby et al., 2006). Therefore, in some cases, it might be appropriate for a firm to not take any action. A firm can be considered agile if it contains the capabilities and abilities needed to deal with dynamic environments, and if it is able to turn the changing circumstances into advantages for firms (Zhang & Sharifi, 2000).

Both alertness to recognize opportunities and challenges, as well as the ability to respond are two competencies that are necessary for a firm to become agile (Alzoubi, Al-otoum, & Albataineh, 2011). Organizational dextrousness and the ability of an organization to respond quickly to environmental changes have become critical determinants of success (Overby et al., 2006; Harraf, Wanasika, Tate, & Talbott, 2015). Nowadays, firms need to operate in turbulent, highly competitive environments, while being exposed to both internal as well as external changes. Most of these changes can be regarded as continuous, but some

changes might be very radical and thus highly influence the ability of a firm to survive (Arteta & Giachetti, 2004). Since the current business environment is quite uncertain, rapidly changing, and contains high levels of rivalry, it requires firms to have quick sensibility and to be flexible (Harraf et al., 2015). However, both market power as well as the desirability to grow often impede a firm's ability to sense and respond to changes in the external environment, while being agile could have led to them outperforming their competitors (Harraf et al., 2015).

Enterprise agility concerns both operational as well as strategic issues. Firms need to be agile to deal with operational issues, caused by, for example, new regulations, laws or economic conditions. In addition, to be able to manage strategic issues like changes in customer preferences or unexpected moves from competitors, firms also need to be agile (Overby et al., 2006). Previous research has conceptualized enterprise agility into operational adjustment agility and market capitalizing agility (Lu & Ramamurthy, 2011). Operational adjustment agility refers to the ability of a firm to rapidly deal with market or demand changes in its internal activities, and market capitalizing agility is defined as the ability of a firm to rapidly respond to changes through adjusting products and services to changing customer needs (Lu & Ramamurthy, 2011).

Enterprise agility can be explained in terms of outcomes, drivers, capabilities and providers. Agility can be defined in terms of outcomes by emphasizing that agile firms have the ability to rapidly satisfy customer orders, introduce new products on a frequent bases, and quickly enter or leave strategic alliances (Gehani, 1995). Agility drivers are pressures from the environment that require a firm to innovate and change their day-to-day business activities to be able to maintain their competitive advantage (Zhang & Sharifi, 2000). The main drivers behind enterprise agility, are change (Yusuf, Sarhadi, & Gunasekaran, 1999); customer requirements; criteria for competition; markets; technological innovations and social factors (Tseng & Lin, 2011). Agility capabilities are needed for firms to sense, perceive and anticipate upon changes in the operating environment, and to turn these changes into advantages for the firm (Zhang & Sharifi, 2000). Four of these capabilities are responsiveness, competency, flexibility, and quickness (Zhang & Sharifi, 2000).

2.3 Business Model Innovation

Although a lot of literature on BMs exists, only few authors have given an explicit definition of a BM, since there seems to be no general agreement on the definition in existing literature (Zott, Amit, & Massa, 2011). A BM can be defined as a reflection of how a firm

creates and delivers value to its customer segment (Teece, 2010). An important element of a BM is the mission, which refers to the development of an overall understanding of the strategic goals, value proposition and vision of a firm (Alt & Zimmermann, 2001). The starting point of a BM is creating value for customers, so the BM is constructed in such a way, that it enables to deliver this value (Chesbrough & Rosenbloom, 2002). When a firm refines its BM by offering new products or services to customers that did not previously exist, the BM itself is subject to innovation. There can be referred to this refinement as business model innovation (BMI) (Mitchell & Coles, 2003).

BMI can be defined as a novel structure of what is done in a firm and how this is done (Souto, 2015). The aim of this new structure is to provide customers with a new value proposition. BMI is thus about creating value for both existing as well as new customer segments. It enables firms to outperform competitors by offering something different, since the concept is about solving customer problems and satisfying their needs (Mitchell & Coles, 2003; Souto, 2015). Firms aim to improve their current BMs not only by focusing on their products and services, but also on their processes and organization. When firms need to preserve their competitive advantage when operating in an industry with declining profits, this often requires for the implementation of a completely new BM (Sorescu, Frambach, Singh, Rangaswamy, & Bridges, 2011). Even though a BM might provide the opportunity to generate revenue streams, they might also be easily imitable. When this is the case, BMI might not lead to a competitive advantage for the firm (Sorescu et al., 2011).

The reason why not all firms engage in BMI is because they face critical barriers. The key facets of BMI are novelty, lock-in, complementarities, and efficiency (Amit & Zott, 2001). Novelty reflects the degree of BMI, lock-in refers to the activities that create either switching costs or incentives for customers to stay, complementarities increase the value of activities within the BM as they are reliant on each other, and efficiency refers to saving costs by, for example, the redesign of processes (Amit & Zott, 2012). However, these value drivers are often in conflict with the original structure of firm assets, which makes that most firms are hesitant about endangering the value of their existing assets (Chesbrough, 2010). In other words, the existing resources of a firm in combination with a new BM might devalue the activities of the new BM (Kim & Min, 2015). Even though firms might have the capability to recognize the right BMs, the implementation might be hindered by the conflicts between the emerging and the existing BM, or by the fact that the firm assets only support the existing BM (Chesbrough, 2010; Kim & Min, 2015). The way firms respond to environmental changes strongly depends on the way managers interpret these changes. If the existing BM of a firm is

successful, this might result in the manager being reluctant to change the BM and thus the way in which value is created (Debruyne, Frambach, & Moenaert, 2010). Moreover, previous investments of the firm have an influence on its flexibility in responding to changes in the environment (Sorescu et al., 2011). In order to overcome the critical barriers to BMI, both experimentation and effectuation, of which the latter refers to the emergence of goals from actions, are needed (Chesbrough, 2010).

Drivers of BMI can be either internal or external and can cause a firm to improve its existing BM or even create a completely new one (Sorescu et al., 2011). Technological evolution, changes in what customers deem as important and external crisis effects can be identified as external drivers of BMI (McGrath, 2010; Sood & Tellis, 2011; Lee, Shin, & Park, 2012). Technological evolutions can, among other things, cause the emergence of completely new markets and make it possible for firms to focus on new customer segments (Sood & Tellis, 2011). However, in order to keep up with these technological developments, firms need to engage in BMI. An important aspect of BMI is creating value for customers (Zott et al., 2011). If a BM does not create value for a customer, it also does not create value for the firm itself. Putting emphasis on value creation requires firms to take on an external focus rather than an internal focus (McGrath, 2010).

And last, external crisis effects, for example the effects of the COVID-19 crisis, have led to an acceleration of innovation (Harris et al., 2020). The result of this is that some firms outperform others by being able to develop better innovation strategies and competencies. These underperforming firms need to innovate their BMs to keep up with the effects of the crisis (Lee et al., 2012). When a firm stresses the importance of innovation in general, also referred to the firm having a high degree of innovativeness, this can be seen as an internal driver of BMI (Sorescu et al., 2011; Pucihar, Lenart, Kljajić Borštnar, Vidmar, & Marolt, 2019). Another internal driver is being customer-oriented, because when firms aim to improve their customers' journey, this might stimulate them to adjust their BM, or even create an entirely new one, to make this happen (Sorescu et al., 2011).

Previous literature on the outcomes of BMI has highlighted sustainability, value creation and competitive advantages as possible beneficial outcomes (Wirtz & Daiser, 2017; Pucihar et al., 2019). Another important outcome of BMI is performance. The relationship between BMI and firm performance has already been confirmed in the past (see e.g. Pucihar et al., 2019). However, this research will look into this relationship within the context of the COVID-19 crisis. The positive effect of BMI on firm performance highlights the importance of BMI for higher performance and outperforming competitors (Pucihar et al., 2019). As BMs

consist of several building blocks, BMI is likely to result in changes in several elements of the BM. Therefore, the outcomes of BMI are dependent on the interaction between all elements involved in the innovation process (Berends, Smits, Reymen, & Podoyntsina, 2016).

2.4 Conceptual Framework

2.4.1 Innovation ambidexterity and enterprise agility

The relationship between innovation ambidexterity and firm performance has been established in previous research. Firm success depends on a firm's ability to efficiently manage today's demands, while being able to adapt to the dynamic environment as well (Tushman & O'Reilly, 1996; Raisch & Birkinshaw, 2008). However, one can assume that not only innovation itself is important during the COVID-19 crisis. In order to cope with the rapidly changing and uncertain business environment, firms need to become agile as well, as agility enables them to quickly respond to these changes (Overby et al., 2006; Sherehiy et al., 2007). Innovation ambidexterity is referred to as a dynamic capability which enables firms to perform in unpredictable environments and thus increases their level of enterprise agility (O'Reilly & Tushman, 2008). Ambidextrous firms have a constant focus on satisfying customer needs, are capable of rapidly responding to external changes, and are better at creating strategic alliances and effectively collaborating with their partners (Rialti, Marzi, Silic, & Ciappei, 2018). For these reasons, the expectation is that ambidextrous firms have higher levels of market capitalizing agility, as this refers to the ability of a firm to rapidly respond to changes through adjusting products and services to changing customer needs. Additionally, ambidextrous firms are accompanied with organizational flexibility, are able to both achieve and maintain manufactural flexibility, and are better at coordinating dynamic firm processes (Rialti et al., 2018). Therefore, the assumption can be made that ambidextrous firms have higher levels of operational adjustment agility as well, since this refers to the ability of a firm to rapidly deal with market or demand changes in its internal activities (Lu & Ramamurthy, 2011).

Since the COVID-19 crisis speeds up the time available for achieving innovation processes (Brem et al., 2021), firms are challenged to respond as quickly as possible. Under high pressure, firms that are capable of managing existing resources as well as experimenting with new ones will have a competitive advantage. According to Lee et al. (2015), IT ambidexterity positively influences enterprise agility by facilitating operational ambidexterity. However, this research assumes that there is a direct relationship between innovation ambidexterity and enterprise agility, and that this relationship is even stronger during the

COVID-19 crisis. In uncertain times, firms need to find a balance between managing the demands of their business today, while, at the same time, being able to adapt to changes in their business environment. Only focussing on preservation of present activities and the existing customer base makes it difficult for firms to keep up with competitors that do let go of their status quo in order to manage this crisis as effectively as possible. On the other hand, by only paying attention to future economic activity and new customers, firms might run the risk of not being able to satisfy their current customer base. Firms thus need to be able to respond to this crisis by introducing radical as well as incremental innovations to satisfy as much customers as possible, because both types of innovation lead to different returns (short-term vs long-term).

This ambidextrous focus increases organizational flexibility, which is one of the characteristics of an agile firm. In order to react to or anticipate on changes in their business environment, firms need to be able to make quick decisions, as early as possible. As there is limited time and resources available (Harris et al., 2020), the pressure on firms is high, because they have to make rapid decisions to stay ahead of their competitors. Therefore, one can assume that the higher the degree of dynamism in the environment, in this case due to the COVID-19 crisis, the stronger the effect of innovation ambidexterity on enterprise agility. Since previous research (e.g. Lee et al., 2015; Rialti et al., 2018) has provided a strong indication that enterprise agility is one of the mediators that translates innovation ambidexterity into superior performance during the COVID-19 crisis, this research hypothesizes the following:

H1a: Innovation ambidexterity has a positive influence on enterprise agility

H1b: The relationship between innovation ambidexterity and enterprise agility is positively moderated by the COVID-19 crisis

2.4.2 Enterprise agility and BMI

The importance of both enterprise agility as well as BMI during this crisis has been highlighted by providing the IKEA example. As BMI makes it possible to create new markets or outperform competitors by disrupting their competitive advantages (Euchner & Ganguly, 2014), this is one of the things firms need during this crisis. In order to achieve successful BMI, firms need to respond quickly to environmental changes, as competitors might plan to do the same. Therefore, the higher the level of agility of a firm, the better able the firm is to engage in BMI. However, only recently, research has paid attention to enterprise agility as a determinant for BMI (Arbussa, Bikfalvi, & Marquès, 2017). In their research, Clauss et al.

(2019), established the missing link between enterprise agility and BMI. Previous research has considered enterprise agility to consist of strategic sensitivity, leadership unity and resource fluidity (Doz & Kosonen, 2010; Arbussa et al., 2017; Clauss et al., 2019).

First, strategic sensitivity enables firms to recognize opportunities for the implementation of new BMs and sense the need for innovation of their current BMs. Firms that have high levels of strategic sensitivity are thus better able to anticipate upon unmet needs and satisfy new customer demands, which allows them to create new value for customers through BMI.

Second, leadership unity refers to an executives' ability to make risky and fast decisions, and the level of managerial commitment. The way firms respond to changes in the environment is strongly dependent on the way executives interpret these changes. When translating a seized opportunity into new ways of value creation, a manager's capability to make appropriate decisions is of high importance. If the existing BM of a firm is successful, executives might be hesitant to change (Debruyne et al., 2010) and thus engage in risk-averse behavior. In order for firms to successfully engage in BMI, managers need to be able to make risky and fast decisions for which both time management as well as flexibility are critical.

Third, resource fluidity refers to a firm's capability to rapidly reallocate resources when new opportunities are identified (Doz & Kosonen, 2010). It is likely that firms need to restructure their business when innovating their BMs, which means that resources also have to be reallocated. BMI thus requires firms to be flexible and quick in the allocation of their resources. When resource fluidity increases, firms become more flexible and the modification of BMs becomes easier, which positively influences the degree to which a firm can engage in BMI.

These findings indicate that agile firms are more capable of BMI and thus, that enterprise agility is positively related to BMI (Clauss et al., 2019). Enterprise agility makes it possible for firms to rapidly change, while at the same time, maintaining their strengths (Clauss et al., 2019). Moreover, enterprise agility is the foundation needed for being able to innovate a firm's BM (Doz & Kosonen, 2010). Firms that lack agility are less capable of innovating their BM, as they lack capabilities to recognize opportunities for the implementation of new BMs, and they are less able to make quick decisions, and reallocate their resources.

One can assume that agile firms are more inclined to engage in BMI when operating in highly unstable environments. Because of the current crisis, customer demands are rapidly changing, firms are challenged by their competitors to engage in innovation activities, and

new market opportunities are created. As firms are highly pressured in dynamic environments to change their strategies and innovate their BMs, they need to be able to make quick and risky decisions. Therefore, the assumption can be made that the relationship between enterprise agility and BMI is positively moderated by the COVID-19 crisis. This crisis is likely to create both opportunities as well as an urgency for firms to respond to the rapidly changing business environment by means of BMI. This research assumes, after providing enough evidence to support this assumption, that enterprise agility has a positive influence on BMI. So, the higher the level of enterprise agility, the better able a firm is to innovate its BM. This abovementioned assumption leads to the following hypothesis:

H2a: Enterprise agility has a positive influence on BMI

H2b: The relationship between enterprise agility and BMI is positively moderated by the COVID-19 crisis

2.4.3 BMI and firm performance

Even though it is difficult to link BMI and firm performance, previous research has confirmed a positive influence of BMI on firm performance (Zott & Amit, 2008; Cucculelli & Bettinelli, 2015; Foss & Saebi, 2017; Heij, Volberda, & Van den Bosch, 2017; Pucihar et al. 2019). In their paper, Foss and Saebi (2017), review fifteen years of research on BMI from which they conclude that there are several reasons to undertake BMI. Amongst these reasons are the optimization of business processes, the introduction of new products, the creation of new markets, and increasing financial returns. BMI is highly valuable in unstable times and useful when dealing with disruptive environments (Lindgardt et al., 2013). In times of change, BMI is an appropriate alternative for firms to create value (Amit & Zott, 2010), which in turn, allows them to increase their performance by, for example, addressing new market needs. It enables firms to extend their revenue streams by realizing new ones that either substitute or complement the existing revenue streams (Clauss et al., 2019). Therefore, BMI allows firms to increase their economic returns. In addition, BMI allows firms to get the most out of their existing resources and capabilities, and to stay ahead of their competition, which is very valuable when taking the current crisis into consideration.

Adopting new ways of doing business is a very important requirement for managing this crisis. Firms that do not engage in BMI run the risk of lagging behind, which will lead to them underperforming their competitors. Environmental dynamism is, among other things, characterized by changes in customer demands (Clauss et al., 2019). BMI is about creating value for customers, solving their problems and satisfying their needs (Mitchell & Coles,

2003; Souto, 2015; Zott et al., 2011), which makes it a powerful capability for firms during this crisis. When needing to survive in an environment where profits are declining due to increased pressure on economic activities, firms are often required to implement a completely new BM (Sorescu et al., 2011). The COVID-19 crisis has had quite a large effect on, for example, the food service industry. Due to the closing of restaurants, bars and cafes, the financial performance of firms within this industry has significantly decreased. In order to increase their firm performance, owners had to come up with alternatives to generate revenue streams. Therefore, a lot of firms within the food service industry have started delivery and pick-up services. Additionally, they have come up with original ideas, like drive-throughs and city walks from one restaurant to another. Therefore, one can assume that BMI enables firms to outperform their competitors during fluctuating times like these. As previous research has confirmed the positive influence of BMI on firm performance, it can be expected that, during the COVID-19 crisis, firms that highly emphasize BMI are outperforming firms that do not have such emphasis (Aspara, Hietanen, & Tikkanen, 2010). As the general agreement on BMI being key to firm performance is increasing (Zott et al, 2011) and BMI is considered the heart of firm performance (Cucculelli & Bettinelli, 2015), this research hypothesizes the following:

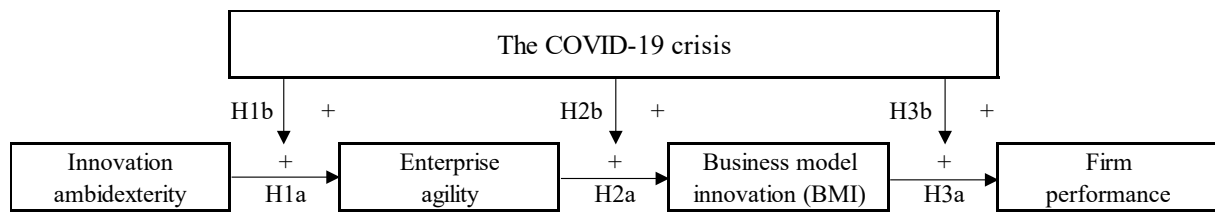
H3a: BMI has a positive influence on firm performance

H3b: The relationship between BMI and firm performance is positively moderated by the COVID-19 crisis

2.4.4 Conceptual Model

Based on the literature and hypotheses presented in this section, this research proposes the following conceptual model. The direct relationship between innovation ambidexterity and firm performance is left out of this model, as this research assumes that this relationship is fully mediated by enterprise agility and BMI. This conceptual model assumes that innovation ambidexterity has a positive influence on enterprise agility (H1a). In addition, the assumption is made that enterprise agility positively influences BMI (H2a), which, in turn, has a positive influence on firm performance (H3a). The COVID-19 crisis is added as a moderation effect here, as the expectation is that all the previous established relationships are stronger during this crisis (H1b, H2b and H3b). Thus, the main intended outcome of this model is that it shows the relationship between innovation ambidexterity and firm performance through full mediation. The model thereby assumes that it is enterprise agility and BMI that translate innovation ambidexterity into superior performance during the COVID-19 crisis.

Figure 1: Conceptual model



3. Methodology

In this section, the method that was used to conduct this research will be described. First, the type of research and the data collection method will be discussed. Second, this section will address the characteristics of the target sample and how this sample has been approached. Third, a detailed description of the data analysis method will be provided. Furthermore, the measurement constructs and the control variables of this research will be described. And last, the research ethics will be highlighted.

3.1 Methodological approach and data collection

A quantitative approach was used to test the aforementioned hypotheses. As this research aimed to open the black box between innovation ambidexterity and firm performance during the COVID-19 crisis by focussing on two core capabilities, enterprise agility and BMI, that were expected to translate innovation ambidexterity into superior performance, investigating an under-researched topic was the main goal of this research. This research looked into potential relationships and tried to connect concepts in order to understand cause-effects. In order to achieve the research goal, primary data was collected. This was done by conducting a field research in the form of a survey. Taking the research question into account, a quantitative approach was necessary to test the relationship between innovation ambidexterity and firm performance through full mediation. However, this research not only aimed to increase scientific understanding, it also wanted to contribute to a practical problem by providing guidance for firms.

3.2 Sample

An online survey was used to gather the necessary primary data for this research. The survey was built upon the measurement constructs identified later in this section and can be found in Appendix 1. This research was conducted in the Netherlands and the sample consisted of Dutch firms in a specific region, de Liemers. Around one thousand Dutch firms within this region were selected for the online survey. Firms from several sectors were included, which increased both the diversity of the sample and generalizability of the findings

(Von Delft, Kortmann, Gelhard, & Pisani, 2019). For the sample selection process, the chairmen of five business associations within the De Liemers were contacted with the question to distribute the online survey to their members. This can be considered as a form of snowball sampling, which is a method of convenience sampling (Naderifar, Goli, & Ghaljaie, 2017). This sampling method is particularly useful when the target sample is difficult to access for the researcher (Etikan, Alkassim, & Abubakar, 2016; Naderifar et al., 2017). The choice was made to use this particular approach in order to avoid having to contact firms through general email address, which reduces the likelihood of a response. In this way, specific employees and owners of a firm were approached and asked to fill out the survey. In addition, it was expected that respondents were more likely to fill in the survey when this was requested by the chairman of the business association. The respondents needed to have knowledge on both the firm as well as the topic of research. Therefore, a management position was required and they were asked for their job title and years of job experience within the firm. More than half of the respondents (52.68%) were CEO of their firm, and 83.93% had more than 5 years of job experience within the firm. These quality criteria showed that the respondents were suitable for participation in this research. The respondent descriptive statistics can be found in Appendix 2.1.

The possibility to go through the survey together with the researcher in an online video call was also offered, so that questions could be explained and elaborated on. However, none of the respondents made use of this offer. The gathering of the data by means of the quantitative survey resulted in 149 responses. From the initial sample, unfinished answers (31) or no permission to use the answers for this research (3) were filtered out. In addition, three respondents filled in the survey within one minute and answered all the questions with a neutral response. These answers were also filtered out to prevent the results from being affected by these neutral responses, as they were considered to neither be thrustful nor valid. This filtering process resulted in 112 responses being valid, which can be considered an appropriate sample size for the consistent PLS-SEM method that was used for the data analysis of this research (Peng & Lai, 2012; Hair, Black, Babin, & Anderson, 2019).

3.3 Focus of the research

De Liemers is a region within the Province of Gelderland and counted almost 10.000 firms in 2018 (Provincie Gelderland, 2018). For the last fifteen years, Gelderland has been considered to have the strongest economy of the Netherlands (Regio in Bedrijf, n.d.). De Liemers in particular is known for its diverse economic landscape. In 2018, the economy of

De Liemers showed a significant growth on a national level (Beute, 2019). Especially SMEs contribute to the growth of the regional economy. As stated in the introduction of this research, a study on the effects of the COVID-19 crisis showed that SMEs are hit hardest by the crisis (Baker & Judge, 2020). Findings of this study indicated that SMEs are vulnerable to interruption of cash flows, and lack both resources that support recovery as well as sufficient planning. Since SMEs are the driving force behind economic growth in De Liemers, it can be assumed that this region was largely impacted by the COVID-19 crisis, and therefore, an appropriate focus for this research in particular.

In addition, De Liemers has several extraordinary, specialized firms that are known for their high-quality products (Beute, 2019) and is considered to be very innovative, famous for its Logistics Valley and several innovation hubs in which research- and innovation projects are conducted (Pol, 2014; Smarthub Achterhoek, 2017). As the main topic of this research was innovation in times of a nation-wide crisis, conducting this research in an innovative region that is assumed to be highly impacted by the crisis, was deemed most appropriate.

3.4 Data analysis

The data gathered by the online survey was analysed by means of ADANCO, a quantitative software program that can be used to analyse primary or secondary data and test relationships between constructs. The consistent PLS-SEM approach was adopted to analyse the results of the survey. SEM can be used to examine a series of dependence relationships simultaneously (Hair et al., 2019). Scales from prior research were used. Consistent PLS-SEM was particularly suitable for this research, as it is applicable when different explanatory constructs and a small sample size are present (Hair, Sarstedt, Pieper, & Ringle, 2012). Both the measurement model, which specified the relationships between a construct and its items, and the structural model, which specified the relationships between the constructs, were constructed and assessed (Henseler, Hubona, & Ash Ray, 2016). When analysing the results, the measurement model was assessed first. “If “Mode A consistent” is used as the weighting scheme for all the constructs, ADANCO 2.0.1 performs a confirmatory factor analysis (Henseler, 2017, p. 14).” By means of this confirmatory factor analysis, the validity and reliability of the reflective measurement constructs were examined by checking for indicator loadings, approximate model fit, internal consistency, convergent validity and discriminant validity (Hair et al., 2019). After that, the structural model was evaluated by looking at the significance and relevance of the path coefficients (Von Delft et al., 2019). For estimating the moderation effect, the two-stage approach of Chin, Marcolin & Newsted (2003) was used.

3.5 Measurement Constructs

Innovation ambidexterity (IA) is a second-order construct, consisting of two first-order constructs, namely explorative innovation strategy and exploitative innovation strategy. Both first-order constructs were adopted from Lubatkin et al. (2006), and consist of six items each. Lubatkin et al. (2006) combined the measures of He and Wong (2004), and Benner and Tushman (2003). Respondents were asked to evaluate the innovation strategy of their firm during the past 1.5 year. The items were measured by means of a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) and can be found in Table 1.

Table 1: Innovation ambidexterity (Lubatkin et al., 2006)

Second-order construct	First-order constructs	Measurement Items
Innovation ambidexterity	Explorative innovation strategy	Assess the orientation of your firm during the past three years using a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree)
		1. Looks for novel technological ideas by thinking “outside the box”
		2. Bases its success on the ability to explore new technologies
		3. Creates products or services that are innovative to the firm
		4. Looks for creative ways to satisfy its customers’ needs
		5. Aggressively ventures into new market segments
	Exploitative innovation strategy	6. Actively targets new customer groups
		7. Commits to improving quality and lower cost
		8. Continuously improves the reliability of its products and services
		9. Increases the level of automation in its operations
		10. Constantly surveys existing customers’ satisfaction
		11. Fine-tunes what it offers to keep its current customers satisfied
		12. Penetrates more deeply into its existing customer base

Enterprise agility (EA) is a second-order construct, consisting of two first-order constructs, operational adjustment agility (OA) and market capitalizing agility (MA). Both OA and MA consist of three items and were adopted from Lu and Ramamurthy (2011). For their measurement construct, Lu and Ramamurthy (2011) combined the measures of Goldman, Nagel, and Preiss (1995) and Tsourveloudis, Valavanis, Gracanin, and Matijasevic (1999). Respondents were asked how well the firm performed the activities relative to their competitors. The items were measured by means of a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) and can be found in Table 2.

Table 2: Enterprise agility (Lu & Ramamurthy, 2011)

Second-order construct	First-order constructs	Measurement Items
Enterprise agility	Operational adjustment agility (OA)	Relative to your competitors, please indicate on a 1 (strongly disagree) to 7 (strongly agree) scale how well your organization performs or is positioned to perform the following activities:
		1. We fulfil demands for rapid-response, special requests of our customers whenever such demands arise; our customers have confidence in our ability
		2. We can quickly scale up or scale down our production/service levels to support fluctuations in demand from the market
	Market capitalizing agility (MA)	3. Whenever there is a disruption in supply from our suppliers we can quickly make necessary alternative arrangements and internal adjustments
		4. We are quick to make and implement appropriate decisions in the face of market/customer-changes
		5. We constantly look for ways to reinvent/reengineer our organization to better serve our market place
		6. We treat market-related changes and apparent chaos as opportunities to capitalize quickly

BMI is a second-order construct adopted from Von Delft et al. (2019) and refers to several business aspects changes. Von Delft et al. (2019) distinguish four first-order constructs, which they derived from Johnson, Christensen, and Kagermann (2008), that determine the BM construct together: customer value proposition (CVP), profit formula (PF), key resources (KR), and key processes (KP). Altogether, BMI was measured by means of twenty-four items. Respondents were asked to what extent the firm significantly changed the twenty-four items over the last 1.5 year. The items were measured by means of a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) and can be found in Table 3.

Table 3: BMI (Von Delft et al., 2019)

Second-order construct	First-order constructs	Measurement Items
BMI	CVP	Over the last 1.5 year we have significantly changed...
		1. ... our target customers and/or customer segments
		2. ... our way of satisfying important customer needs
		3. ... our product/service offering
		4. ... the design of our product/service offering
	PF	5. ... the price of our product/service offering
		6. ... our pricing and sales strategy
		7. ... our commercialization strategy (e.g. subscription fees, leasing, licensing)
		8. ... the cost structure of our product/service offering
		9. ... the calculation of strategically important costs
		10. ... our manufacturing/operations strategy (e.g. operational excellence projects)
		11. ... the cost structure of our operational processes
		12. ... our key performance indicators (e.g. ROI, ROA, inventory turns, or lead times)
	KR	13. ... the assets required to create and deliver our product/service offering
		14. ... the key resources that allow us to reach targeted markets
		15. ... technologies, components and parts of our product/service offering
		16. ... our brand
		17. ... our network of suppliers and partners
	KP	18. ... our distribution and sales processes
		19. ... the processes related to designing, making, and delivering our offering
		20. ... the process of product or service development
		21. ... the way we communicate and interact with our customer
		22. ... financial metrics (e.g. gross margins, unit margin, time to breakeven, credit items)
		23. ... operational metrics (e.g. end product quality, supplier quality, lead times)
		24. ... other metrics (e.g. performance demands, product development life cycles, brand parameters)

Table 3: BMI (Von Delft et al., 2019)

Firm performance (FP) is a five-item construct adopted from Clauss et al. (2019) and was measured as relative to other firms in the industry. The measurement of firm performance can be either objective, including indicators like return on assets and market share, or subjective, based on managerial assessment of the firm performance (Yang & Liu, 2012). These measures are most often linked to the strategies and goals of the firm and emphasize long-term benefits, while financial performance indicators, on the other hand, emphasize short-term benefits (Ittner & Larcker, 2000, as cited in Yang & Liu, 2012). Which measure is to be used, depends on the research question. As firm performance was not the main focus of this research and since it is difficult to gain access to the financial indicators of all firms participating in the survey of this research, the assumption was made that managerial assessment was the appropriate indicator of firm performance here. Clauss et al. (2019)

measured firm performance based on the work of Venkatraman and Ramanujam (1986). The items were measured by means of a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) and can be found in Table 4. Respondents were asked to assess their firm's performance based on the last 1.5 year.

Table 4: Firm performance (Clauss et al., 2019)

First-order construct	Measurement Items
Firm performance	<ol style="list-style-type: none"> 1. Relative to our competitors our financial performance was much better 2. Relative to our competitors, the market share of our organization was much better 3. Relative to our competitors, the sales growth of our organization was much better 4. Relative to our competitors, the product development of our organization was much better 5. Relative to our competitors, the development of our organization was much better

The context of this research was the current COVID-19 crisis. As it was expected that this crisis had an impact on all the relationships in the conceptual model, it was added as a moderation effect. To measure the effect of COVID-19 (C-19), a new four-item construct was developed, following the logic of environmental dynamism, a three-item construct derived from Lee et al. (2015). It stands for the high levels of unpredictability and rapid change that firms need to manage (Lee et al., 2015). These environmental changes might exert pressure on firms to engage in BMI (Von Delft et al., 2019). The four items were measured by means of a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) and can be found in Table 5.

Table 5: Moderation effect: The COVID-19 crisis (Lee et al., 2015)

First-order construct	Measurement Items
The COVID-19 crisis	<p>The COVID-19 crisis has led to major changes regarding...</p> <ol style="list-style-type: none"> 1. ... the actions of competitors in our major markets 2. ... technological changes in our industry 3. ... customers' product/service preferences 4. ... our own business

Control variables: this research controlled for firm age, firm size and firm sector (Lee et al., 2015; Von Delft et al., 2019). Firm age was measured by means of the years of existence of the firm, and firm size was measured by means of the number of employees. As firm age and firm size were metrically scaled, they were included in the analysis as reflective, interval scaled constructs. Firm sector was measured as a composite first-order construct

shaped by five groups (Benitez-Amado, Henseler & Castillo, 2017). These five groups were based on a frequency analysis for the firm sectors and subdivided as follows: the Service sector; the Manufacturing sector; the Finance, Insurance, and Real Estate sector; the Construction and Retail Trade sector; and Others. The latter was used as the reference group.

3.6 Research ethics

The general ethical guidelines were followed to conduct this research (see e.g. Walford, 2005; Yip, Han, & Sng, 2016). This implied, among other things, that participation in the survey was anonymous, no information that might be considered discriminating was asked for and participants in the survey were respected and treated equally. At the beginning of the survey, respondents were asked to give permission to use their answers for this research, while guaranteeing their privacy. When a respondent did not give permission, the survey immediately ended and the respondent was excluded from this research. In addition, the researcher informed the respondents that their answers were used for this research solely and were not used for other purposes. Survey participants had the freedom to withdraw from the survey at any time and confidentiality was guaranteed. At the end of the survey, participants that wanted to be informed about the results of this research were given the option to contact the researcher by email.

4. Results

In this section, the results of the quantitative survey will be presented. First, both the respondent and firm descriptive statistics will be discussed. Second, the measurement model of the consistent PLS-SEM analysis will be assessed. And last, the structural model of the consistent PLS-SEM analysis will be evaluated.

4.1 Descriptive statistics

More than half of the respondents (52.68%) were CEO of the firm, and most of the respondents found themselves in the category of more than five years of job experience within the firm (83.93%). The respondent descriptive statistics are presented in Appendix 2.1.

In addition, most respondents were employed within the Service sector (28.57%), and owned or worked for a firm that already existed for more than twenty years (53.57%). The firm size was measured by asking for the number of employees. Most of the respondents owned or worked for a firm with one to ten employees (56.25%). The firm descriptive statistics are presented in Appendix 2.2.

4.2 Evaluation of the measurement model

The measurement model was considered to be reflective, as the items were expected to be correlated, and when an item was discarded, it was expected that it did not change the meaning of the construct (Hair et al., 2019). The analysis of the first-order constructs showed an indication for discarding three items. Item five of firm performance (see Table 4) had to be discarded, because a Heywood case occurred. This means that the estimates would imply a negative variance of the measurement error (Henseler et al., 2016). In addition, item 12 of innovation ambidexterity (see Table 1) was discarded, as the item had a negative loading on its associated construct, namely exploitation. If outer loadings are greater than .70, they are considered reliable (Hair et al., 2019). Therefore, the loading of item 12 on its associated construct was far below threshold, which resulted in the decision to discard the item. Last, item 4 of enterprise agility (see Table 2) was discarded due to cross-loadings, which resulted in better internal consistency, as well as convergent and discriminant validity. As the model was considered to be reflective, the assumption was made that when the three items were discarded, it would not alter the meaning of their constructs¹.

The evaluation of the measurement model started with examining the item's outer loadings, which were considered reliable if greater than .70 (Hair et al., 2019). The consistent PLS-SEM analysis revealed some outer loadings that were below the recommended threshold of .70. The loadings of the reflective measurement model ranged from .36 to .76 for innovation ambidexterity, .54 to .77 for enterprise agility, .36 to .88 for BMI, .61 to .96 for firm performance, and .32 to .97 for the COVID-19 crisis (see Table 20, Appendix 3). If the outer loadings of reflective items are < .40, it could be recommendable to discard these items. However, only if the reliability of an item is low and if discarding this item results in a considerable increase of composite reliability (Henseler, Ringle, & Sinkovics, 2009). A separate analysis, which discards the three items with outer loadings < .40 (IA10, KP5 & C-19_1), showed no substantial increase of composite reliability. Therefore, the decision was made not to discard these measurement items.

Second, an evaluation of the overall fit of the saturated model was performed (Henseler et al., 2014; Benitez-Amado et al., 2017), which checks for the competence of the model by comparing the estimated covariance matrix with the model-implied covariance matrix (Henseler et al., 2014). Therefore, focus was laid on the standardized root mean squared residual (SRMR), unweighted least squares discrepancy (dULS), and geodesic

¹ A separate analysis including all the initial items showed that the resulting effects remained stable for all hypothesized relationships.

discrepancy (dG) (Henseler et al., 2014; Benitez-Amado et al., 2017). The results of this evaluation can be found in Table 6. In this table, HI95 refers to the 95%-quantile of the bootstrap discrepancies (Benitez-Amado et al., 2017). All values should be below the 95%-quantile of these discrepancies. SRMR is the measure of approximate model fit. If SRMR is < .08, the approximate model fit is considered to be sufficient (Henseler et al., 2016). However, for the model of this research, the value of SRMR was .096, which was slightly above threshold. Since there was no significant difference, the value was accepted. dULS and dG are the measures of exact model fit. As can be seen in Table 6, the value of dULS was above the 95%-quantile of the bootstrap discrepancies, while dG was below the 95%-quantile.

Table 6: Results of the saturated model fit evaluation

Discrepancy	Overall fit of the saturated model		
	Value	HI95	Conclusion
SRMR	.096	.084	Slightly supported
dULS	13.66	10.40	Not supported
dG	6.11	9.05	Supported

After the evaluation of the saturated model fit, the reliability and validity of the first-order constructs were examined. Since the measurement constructs was based on reflective measurements, the internal consistency, convergent validity, and discriminant validity needed to be examined (Hair et al., 2019). Internal consistency was represented by Dijkstra-Henseler's rho, which is the common measure of reliability for consistent PLS (Henseler et al., 2016). As can be seen in Table 7, only two constructs, exploitative innovation strategy and market capitalizing agility, were found to be slightly below the recommended threshold of .70.

Table 7: Results of internal consistency evaluation

Construct	Dijkstra-Henseler's rho (ρ_A)
Explorative	.76
Exploitative	.66
OA	.70
MA	.65
CVP	.86
PF	.88
KR	.81
KP	.87
Firm performance	.90
The COVID-19 crisis	.86

Notes: OA = operational adjustment agility; MA = market capitalizing agility; CVP = customer value proposition; PF = profit formula; KR = key resources; KP = key processes

To determine convergent validity of the measurement model, Average Variance Extracted (AVE) was used. The AVE should be at least .50 (Fornell & Larcker, 1981; Hair et al., 2019). As can be seen in Table 8, only the AVEs of CVP, PF, firm performance and the COVID-19 crisis exceeded the recommended threshold. The AVEs of OA, MA, KR and KP came close to the recommended threshold, but the AVEs of both explorative and exploitative innovation strategy were far below threshold.

Table 8: Results of convergent validity evaluation

Construct	Average Variance Extracted (AVE)
Explorative	.33
Exploitative	.27
OA	.43
MA	.48
CVP	.52
PF	.50
KR	.46
KP	.45
Firm performance	.62
The COVID-19 crisis	.50

Notes: OA = operational adjustment agility; MA = market capitalizing agility; CVP = customer value proposition; PF = profit formula; KR = key resources; KP = key processes

Last, discriminant validity was determined by examining the heterotrait/monotrait ratio of correlations (HTMT), the Fornell-Larcker criterion (Fornell & Larcker, 1981), and by evaluating the cross-loadings. HTMT should be significantly smaller than one (Henseler et al., 2016). More specifically, HTMT < .85 or HTMT < .90 (Hair et al., 2019), which was the case for almost all constructs except three (see Table 9).

Table 9: Results of HTMT evaluation

Construct	Explorative	Exploitative	OA	MA	CVP	PF	KR	KP	Firm performance	The COVID-19 crisis
Explorative										
Exploitative	.52									
OA	.37	.36								
MA	.80	.57	.66							
CVP	.57	.25	.32	.52						
PF	.44	.36	.18	.37	.77					
KR	.60	.26	.37	.48	.91	.85				
KP	.31	.29	.13	.23	.75	.87	.83			
Firm performance	.40	.30	.18	.13	.39	.37	.36	.37		
The COVID-19 crisis	.37	.33	.28	.33	.47	.38	.43	.42	.10	

Notes: OA = operational adjustment agility; MA = market capitalizing agility; CVP = customer value proposition; PF = profit formula; KR = key resources; KP = key processes

In addition, according to the Fornell-Larcker criterion, the correlation of a construct with other constructs should be lower than the AVEs square root (Fornell & Larcker, 1981). As can be seen in Table 10, the correlation of market capitalizing agility with both explorative and exploitative innovation strategies was higher than the AVEs square root. The correlation of CVP and KR with the explorative construct was also higher than the AVEs square root. In addition, not enough discriminant validity was present between the first-order constructs of BMI (CVP, PF, KR and KP).

Table 10: Results of Fornell-Larcker criterion evaluation

Construct	Explorative	Exploitative	OA	MA	CVP	PF	KR	KP	Firm performance	The COVID-19 crisis	Firm age	Firm size	Firm sector
Explorative	.33												
Exploitative	.29	.27											
OA	.15	.11	.43										
MA	.61	.32	.40	.48									
CVP	.36	.06	.10	.30	.52								
PF	.22	.13	.04	.14	.57	.50							
KR	.38	.07	.14	.23	.84	.72	.46						
KP	.12	.10	.02	.06	.55	.70	.67	.45					
Firm performance	.18	.09	.04	.02	.17	.14	.13	.15	.62				
The COVID-19 crisis	.15	.11	.09	.12	.25	.16	.21	.19	.02	.50			
Firm age	.00	.01	.04	.09	.03	.00	.00	.00	.04	.01	1.00		
Firm size	.01	.02	.07	.01	.01	.01	.05	.03	.07	.00	.22	1.00	
Firm sector	.13	.02	.04	.13	.10	.10	.11	.10	.02	.02	.01	.01	1.00

Notes: The value on the diagonal row represents the square root of AVE; OA = operational adjustment agility; MA = market capitalizing agility; CVP = customer value proposition; PF = profit formula; KR = key resources; KP = key processes

Last, each item's loading was higher on its corresponding construct compared to any other construct, except for seven items (see Table 21, Appendix 4). However, the cross-loadings were very small and within an acceptable range. A separate analysis, which discards the seven items with cross-loadings, showed a decrease in both composite reliability for almost all constructs, as well as discriminant validity according to the Fornell-Larcker criterion. Therefore, the decision was made not to discard any of these items based on their cross-loadings.

4.3 Evaluation of the structural model

After the evaluation of the measurement model, the structural model was assessed by looking at the significance and relevance of the path coefficients. In order to obtain the significance levels of the model parameters, bootstrapping was applied (Benitez-Amado et al., 2017). For the analysis of the second-order constructs and the interaction terms, a replicative

two-stage approach was used (Chin et al., 2003). The results of the consistent PLS-SEM analysis can be found in Figure 2.

First, the explanatory power of the model was assessed by examining the explained variance (R^2) of all endogenous variables for the model with the interaction term. The adjusted R^2 takes model complexity and sample size into consideration (Henseler et al., 2016). As can be seen in Table 11, the model explained 43% of the variance in enterprise agility, 36% of the variance in BMI, and 27% of the variance in firm performance, which can be considered sufficient.

Table 11: R-Squared model with interaction

Construct	R^2	Adjusted R^2
Enterprise agility	.43	.39
BMI	.36	.32
Firm performance	.27	.21

Second, the standardized coefficients (Beta) were evaluated. These coefficients should exceed the threshold of .20 and should have a p-value below .5 (Benitez-Amado & Ray, 2012; Benitez-Amado et al., 2017). As can be seen in Table 12, the Beta coefficients for H1a, H2a and H3a ranged from .11 to .51. The p-values for H1a and H3a were significant, but the p-value for H2a was not significant. The Beta coefficients for H1b, H2b and H3b ranged from .05 to .15 and the p-values were above .05. Therefore, the conclusion was reached that only H1a and H3a were supported. For the interpretation of the substantiality of the effects, focus was laid on Cohen's F^2 , which refers to the effect size of each relationship (Benitez-Amado et al., 2017). As can be seen in Table 12, the F^2 value of H1a indicated a large effect size ($F^2 > .35$), and the F^2 values of H3a, H1b and H3b indicated a weak effect size ($F^2 > .02$) (Cohen, 1988, as cited in Hair et al., 2019). For H2a and H2b, there was no effect at all ($F^2 < .02$).

Table 12: Results of consistent PLS-SEM

Path		Beta	Cohen's F ²	p-value*
H1a	IA – EA	.51	.37	<.001
H2a	EA – BMI	.11	.01	.283
H3a	BMI – FP	.33	.09	<.001
H1b	IA x C-19 – EA	.15	.03	.067
H2b	EA x C-19 – BMI	.05	.00	.616
H3b	BMI x C-19 – FP	.15	.03	.181
Moderation	C-19 – EA	.07	.01	.456
Moderation	C-19 – BMI	.29	.16	.001
Moderation	C-19 – FP	-.08	.00	.473
CV	Firm age – EA	-.14	.03	.053
CV	Firm age – BMI	-.05	.00	.564
CV	Firm age – FP	.14	.02	.178
CV	Firm size – EA	-.18	.04	.058
CV	Firm size – BMI	.14	.02	.109
CV	Firm size – FP	.12	.01	.178
CV	Firm sector – EA	-.15	.04	.054
CV	Firm sector – BMI	-.19	.05	.051
CV	Firm sector – FP	.01	.00	.906

* All p-values are two-tailed and based on standard bootstrap results

Notes: IA = innovation ambidexterity; EA = enterprise agility; BMI = business model innovation; FP = firm performance; C-19 = The COVID-19 crisis

In addition, there was also controlled for potential direct effects between innovation ambidexterity and BMI, innovation ambidexterity and firm performance, and enterprise agility and firm performance. Table 13 presents the direct paths between the constructs, excluding the hypothesized relationships.

Table 13: Direct paths

Path (direct)	Beta	p-value direct path
IA – BMI	.22	.055
IA – FP	.23	.052
EA – FP	-.01	.912

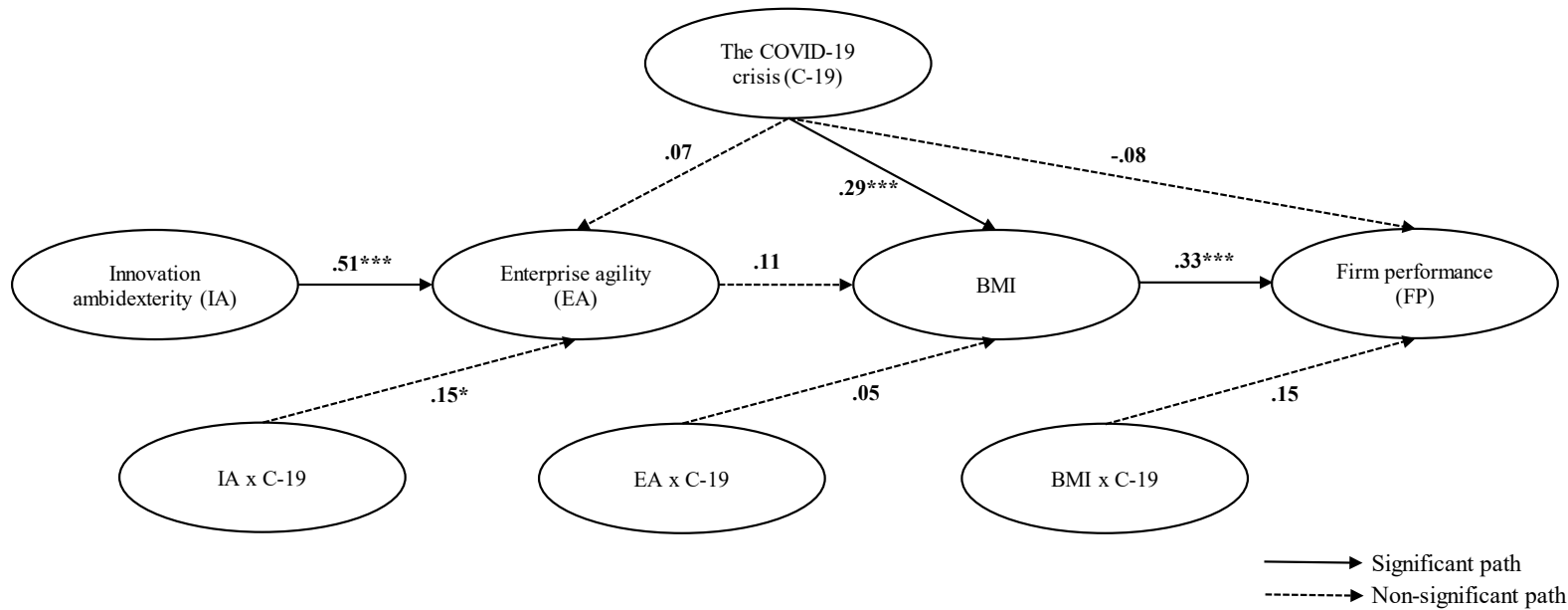
* All p-values are two-tailed and based on standard bootstrap results

Last, the overall fit of the estimated model needed to be examined, which is a combination of both the measurement and the structural model (Benitez-Amado et al., 2017). In Table 14, the estimated model with the interaction term is presented. As can be seen in the table, the estimated model suggested good overall fit for the proposed theory and should not be rejected based on an alpha level of .05 (Benitez-Amado et al., 2017).

Table 14: Estimated model fit with interaction

Discrepancy	Overall fit of the estimated model		
	Value	HI95	Conclusion
SRMR	.03	.04	Supported
dULS	.05	.10	Supported
dG	.02	.06	Supported

Figure 2: Results of consistent PLS-SEM²



Notes: * $p \leq 0.10$; ** $p \leq 0.05$; *** $p \leq 0.01$. All p-values are two-tailed. N = 112.

5. Discussion and implications

In this section, the results of this research will be interpreted and discussed. Furthermore, the contribution to existing knowledge and the practical implications will be outlined.

5.1 Discussion

As a result of the COVID-19 crisis, firms are facing outstanding challenges. In order for firms to move along with their day-to-day business activities without facing the risk of bankruptcy, it was considered necessary to examine the capabilities needed for firms to manage this crisis. Prior research already pointed out the importance of innovation in times of a crisis (Filippetti & Archibugi, 2011; Brem et al., 2021). The main goal of this research was to examine innovation during the COVID-19 crisis. The foundation of this research was the confirmed relationship between innovation ambidexterity and firm performance. This

² The direct effects between innovation ambidexterity and BMI, innovation ambidexterity and firm performance, and enterprise agility and firm performance were not included in this figure. These direct effects can be found in Table 13.

research contributed to current literature on the outcomes of innovation ambidexterity, which was still quite rare, by empirically examining what actually translates innovation ambidexterity into superior firm performance during the COVID-19 crisis. The findings showed that the relationship between innovation ambidexterity and firm performance was not fully mediated by enterprise agility and BMI, as no direct link between enterprise agility and BMI was established. This could potentially indicate that enterprise agility is one of the capabilities firms need to achieve superior firm performance, as the direct effect between innovation ambidexterity and enterprise agility was significant, but additional capabilities are needed to accomplish full mediation between innovation ambidexterity and firm performance.

The findings of this research indicated that innovation ambidexterity preceded enterprise agility in the pursuit of superior firm performance. An ambidextrous innovation strategy enables firms to balance both explorative and exploitative innovation at the same time (Tushman & O'Reilly, 1996), which increases their ability to cope with the rapidly changing, unpredictable business environment. Additionally, it enables firms to satisfy the needs of their existing customer base, while, at the same time, targeting new customer groups by introducing both radical as well as incremental innovations (Lubatkin et al., 2006). Agility refers to the ability of a firm to rapidly respond to market or demand changes by adjusting to changing customer needs (Rialti et al., 2018). Previous research already provided a strong indication for a direct relationship between innovation ambidexterity and enterprise agility (e.g. Lee et al., 2015; Rialti et al., 2018). The results of this research confirmed this. Therefore, evidence was found to support H1a. Firms with an ambidextrous innovation strategy were thus found to have higher levels of agility, which could be explained by their constant focus on satisfying customer needs and their ability to rapidly respond to external changes (Rialti et al., 2018). In addition, the assumption was made that the relationship between innovation ambidexterity and enterprise agility was stronger during the COVID-19 crisis. In times of crisis, it was considered to be even more important for firms to exploit their existing resources, while at the same time experimenting with new ones. However, no evidence was found to support H1b, which means that the hypothesized relationship was not found to be stronger during the COVID-19 crisis.

Second, the findings of this research showed that higher levels of enterprise agility did not increase engagement in BMI. As enterprise agility enables firms to anticipate upon unmet needs and satisfy new customer demands (Clauss et al., 2019), the expectation was that this capability allowed them to also create new value for customers by engaging in BMI. The way firms respond to changes in their business environment is strongly dependent on the way

managers interpret these changes (Debruyne et al., 2010). In addition, responses need to be appropriate and in line with the goals of the firm. Therefore, in some cases, it might be appropriate for a firm to not take any action (Overby et al., 2006). Agile firms are considered highly capable of rapidly reallocating their resources when identifying new opportunities (Doz & Kosonen, 2010). In order for firms to innovate their BMs, restructuring their business and reallocating resources is required. Mostly SMEs participated in this research, which could have influenced the results. The resource base of a firm can be considered a key necessity to effectively react to moves from competitors (Doz & Kosonen, 2010). In general, SMEs are likely to have less resources compared to larger firms. It could be that the participating SMEs are capable of rapidly reallocating their resources, and thus, are agile, but are in considerable need of more resources to be able to increase their level of BMI. The findings of this research are not in line with the findings of Clauss et al. (2019), who established a link between enterprise agility and BMI. Another explanation for the missing link between enterprise agility and BMI could be the possibility of an indirect effect. This would mean that the relationship between enterprise agility and BMI is mediated by an additional organizational capability. As no evidence was found that supports the link between enterprise agility and BMI, H2a and H2b were not accepted.

The findings of this research further showed that BMI was an important driver of firm performance. By means of BMI, firms could address new market needs, target new customers, or extend their revenue streams, which, in turn, allows them to increase their economic returns (Clauss et al., 2019). In addition, BMI could help firms to successfully introduce new products and optimize their business processes. Evidence was thus found to support H3a. From these results can be concluded that the more a firm engages in BMI, the better its performance is, which is in line with the results of previous studies on this relationship (Zott & Amit, 2008; Cucculelli & Bettinelli, 2015; Foss & Saebi, 2017; Heij et al., 2017; Pucihar et al. 2019). However, the expectation was that BMI would be an even more important driver of firm performance during the COVID-19 crisis. In times of change, BMI was considered to be an appropriate alternative for firms to create value (Amit & Zott, 2010). In addition, BMI allows firms to optimize their existing resources and capabilities and stay ahead of their competition, which was considered to be necessary to increase firm performance during the COVID-19 crisis. However, no evidence was found to support H3b. A possible explanation for this result could be the imitation of BMs by competitors during the crisis. As indicated by the example on the food service industry, BMI is very valuable in unstable times. However, one could not prevent other firms from doing the same. Therefore, it could be that firms are

implementing new BMs, but are not able to outperform their competitors, as they, in turn, also implement the same BM.

The addition of the COVID-19 crisis as a moderation effect distinguished this research from previous research on innovation. The results of the consistent PLS-SEM analysis showed that the COVID-19 crisis had a moderate, positive effect on BMI when enterprise agility was average. This result implied that the more crisis there is, the more firms engage in BMI. As BMI is about creating value for customers, solving their problems and satisfying their needs (Mitchell & Coles, 2003; Souto, 2015; Zott et al., 2011), it is a powerful capability for firms in times during the COVID-19 crisis.

However, the focus of this research was laid on the interaction effects between innovation ambidexterity and the COVID-19 crisis on enterprise agility (H1b), the interaction effect between enterprise agility and the COVID-19 crisis on BMI (H2b), and the interaction effect between BMI and the COVID-19 crisis on firm performance (H3b). As no evidence was found to support H1b, H2b and H3b, it was not possible to draw any conclusions from the hypothesized relationships during the COVID-19 crisis. The fact that a lot of firms might not have seen this crisis coming or did not anticipate on a possible event like this crisis, could have something to do with these results. Until now, focus was laid on preservation of the present activities, while little attention has been paid to future economic activity (Kuckertz et al., 2020). It could be that firms were more hesitant to respond to the changes in their business environment, as they might have thought of this crisis as something temporary. This could mean that these firms did not see the necessity of responding to the external effects caused by the COVID-19 crisis. However, in order for firms to manage this crisis, focus on future economic activity and letting go of the status quo is of the utmost importance.

5.2 Implications

This research explored which firm capabilities were needed to translate innovation ambidexterity into superior firm performance during the COVID-19 crisis. Therefore, this research provided guidance for future research as well as for managers of firms in De Liemers. From a theoretical point of view, this research contributed to the theoretical understanding of the relations among innovation ambidexterity, enterprise agility, BMI, and firm performance. The findings of this research showed that the effect between innovation ambidexterity and firm performance was indirect, considering enterprise agility and BMI as two possible mediators. As previous research not yet focused on what actually translated innovation ambidexterity into superior firm performance, this research was, to the best of the

researcher's knowledge, the first attempt to open the black box between innovation ambidexterity and firm performance. More importantly, this research looked beyond the direct effects of innovation ambidexterity on enterprise agility, enterprise agility on BMI, and BMI on firm performance. It also considered the moderation effect of the COVID-19 crisis on the hypothesized relationships. The expectation of this research was that innovation ambidexterity preceded enterprise agility in pursuing superior firm performance. This research confirmed this expectation by providing evidence that a significant, direct link between innovation ambidexterity and enterprise agility existed. It thereby contributed to the limited literature on the outcomes of innovation ambidexterity. Last, this research contributed to prior research on BMI by providing evidence for a direct effect of BMI on firm performance. According to Foss and Saebi (2017), not a lot of research on the direct link between BMI and performance was conducted, because linking BMI and performance is quite complex. Since BMs consist of several building blocks, it might be that BMI affects multiple blocks at the same time, which results in multiple links between BMI and performance. It is possible that these links are intertwined, which makes it difficult to measure the exact outcomes of BMI. Even though it is difficult to link BMI and performance, this research was able to confirm this link.

From a managerial point of view, this research provides several important practical implications for managers in De Liemers. In order to achieve superior firm performance, it is recommended for managers in De Liemers to implement an ambidextrous innovation strategy, as this allows them to increase their levels of enterprise agility. Exploiting existing resources, while, at the same time, exploring new ones, enables managers to sense, perceive and anticipate upon changes in their operating environment (Zhang & Sharifi, 2000). It therefore strengthens the ability of a firm to react to rapidly emerging, unpredictable circumstances. An important antecedent of enterprise agility is leadership unity (Doz & Kosonen, 2010; Arbussa et al., 2017; Clauss et al., 2019). Therefore, in order for a firm to be agile, managers need to have high levels of managerial commitment, be flexible, and be able to make risky and fast decisions. In addition, by means of this research, practitioners gain insight into the valuableness of BMI in increasing firm performance. BMI is about creating value for existing as well as new customers and provides firms with the opportunity to outperform their competitors by offering something different (Mitchell & Coles, 2003; Souto, 2015). Due to the fact that customer preferences are constantly changing nowadays, managers in De Liemers need to be able to innovate the BM of their firm in order to keep satisfying customer needs. More importantly, this research gained insight into the increase of BMI during the COVID-19 crisis when enterprise agility was average. As provided by the IKEA example, BMI enables

firms to proceed with their day-to-day activities while dealing with rapid, unexpected changes in their operating environment. Therefore, BMI enables firms to still generate income during the crisis. In conclusion, this research created some learning opportunities for firms in De Liemers by providing evidence that firms with an ambidextrous innovation strategy have higher levels of enterprise agility, and BMI is an important driver of firm performance.

6. Limitations and recommendations for future research

In this section, a critical reflection on the limitations of this research will be provided. In addition, recommendations for future research on this topic will be discussed.

6.1 Limitations

As accounts for every research, a few considerations should be taken into account. First, firm performance was evaluated by subjective managerial assessments. It might be necessary to conduct further research with objective firm performance measurement, including indicators like return on assets and market share, to increase the meaning and generalizability of the results.

Second, due to the fact that respondents were approached by e-mail, and limited time and resources were available for this research, the sample size was limited. Even though consistent PLS-SEM is considered appropriate for small sample sizes, future research should make use of a larger sample to produce more accurate and representative results.

Third, as the COVID-19 crisis is a very recent, ongoing event, the outcomes of the crisis for firms are hard to predict. Literature on the COVID-19 crisis is very limited and previous research did not include a measurement scale for this construct. Therefore, a measurement scale for the COVID-19 crisis had to be developed for this research. For the other constructs, the reliability and validity of the measurement items was proven in previous literature, but this was not the case for the COVID-19 crisis construct. As the interaction effects in this research (H1b, H2b, and H3b) were not found to be significant, this might have something to do with the development of the COVID-19 crisis scale. Even though the reliability and validity of this construct were considered to be sufficient for this research, it might be necessary to develop a new scale to measure the COVID-19 crisis in future research. Additionally, every crisis has different effects, consequences and outcomes, which makes the results difficult to generalize.

Fourth, the measurement model of the consistent PLS-SEM procedure did not satisfy all requirements. This might have something to do with the complexity of the model and the

small sample size. In addition, the survey questions were translated from English to Dutch and the fact that not all respondents might be familiar with the main concepts of this research, especially innovation ambidexterity, enterprise agility and BMI, could have led to different interpretations of the questions. Although a management position was required for participation in the survey to assure sufficient knowledge of the concepts, it was not possible to completely rule out different interpretations of the questions.

Another limitation relates to the generalizability of the results of this research. As the data for this research was collected by means of business associations in De Liemers, it can be assumed that only firms within this region have filled in the online survey. Therefore, this research is expected to be region-specific, which makes it more difficult to generalize the results, as it cannot be assured that the results also account for firms outside this region. In addition, mostly SMEs participated in this research, so it is possible that the results of this research only applied to SMEs. Even though the decision to make this research region-specific was well considered, future research should broaden the scope of this research and take into account other regions as well.

And last, there might be a small indication for common method bias, which can be caused by the measurement method used in a PLS-SEM analysis. If the survey influenced the answers of different respondents in a particular direction, this can cause the items to share a certain amount of common variance. Especially the first-order constructs of BMI were found to be highly correlated. This might have something to do with the measurement method of this research. The survey was designed in such a way that the questions of the dependent variable (innovation ambidexterity) were asked first, followed by the questions on the independent variables (enterprise agility, BMI, and firm performance), and the mediator (the COVID-19 crisis). All questions were asked in a matrix form. For BMI in particular, the matrix question turned out to be very long, since the second-order construct consisted of twenty-four items. This particular survey design might have influenced the answers provided by the respondents into a particular direction, as the four first-order constructs of BMI (CVP, PF, KR, and KP) were measured within one matrix, consisting of twenty-four statements. The length of the matrix questions could also have led to lack of focus by participants. It is of great importance that future research will take the limitations of this research into account.

6.2 Recommendations for future research

Taking the limitations of this research into account, it is necessary for future research to gain more insight into the topics of this research. First of all, it would be valuable to repeat

this research with a larger sample. The focus should be on recruiting firms within several regions in the Netherlands, or even outside the Netherlands, to check whether the results of this research also apply for firms outside De Liemers. Additionally, this research could also be performed within the context of another crisis, to see whether the results of this research, which specifically focused on the COVID-19 crisis, also apply to other crises. It would also be valuable to replicate this research within a few years, as it is expected that the effects, consequences and outcomes of the COVID-19 crisis will be made explicit by then. This would also result in more appropriate measurement scales for the COVID-19 crisis. As was acknowledged in the limitation section, it would be necessary to conduct further research with objective firm performance measurement to increase the meaning and generalizability of the results, as subjective managerial assessments are more difficult to generalize.

This research was intentionally limited to the mediation effect of enterprise agility and BMI on the relationship between innovation ambidexterity and enterprise agility. However, as no evidence was found to support the relationship between enterprise agility and BMI, the expectation is that there are other organizational capabilities needed to translate an ambidextrous innovation strategy into superior firm performance. Future research should thus consider exploring possible additional firm capabilities. In addition, only recently, research has paid attention to enterprise agility as a determinant for BMI, so future research should dive deeper into this link. Another recommendation for future research is to take into account the measurement method, and more specifically the design of this method. This could be beneficial for reducing the occurrence of a potential common method bias.

7. Conclusion

The aim of this research was to answer the following research question by means of the collected data: *What translates innovation ambidexterity into superior firm performance during the COVID-19 crisis?*

The assumption of full mediation between innovation ambidexterity and firm performance was not confirmed by this research. The findings of this research showed that innovation ambidexterity preceded enterprise agility in the pursuit of superior firm performance, and that BMI is an important driver for firm performance. However, no empirical data was found to support the direct link enterprise agility and BMI. The expectation is that an additional organizational capability is needed to establish the missing link between enterprise agility and BMI in this research. This would imply that the relationship between enterprise agility and BMI is mediated by an additional capability. The results of this research also indicated that the hypothesized relationships were not stronger in times of the COVID-19 crisis.

The main contribution of this research was two-fold: this research contributed to the limited literature on the outcomes of innovation ambidexterity by focusing on the potential mediators that translate innovation ambidexterity into superior firm performance. Second, it helped firms in De Liemers to better understand how to translate their innovation strategy into superior performance by providing evidence that an ambidextrous innovation strategy increases their level of agility, and higher levels of BMI increase firm performance. However, the results indicated that the possibility of an additional mediator between enterprise agility and BMI existed. The results obtained from these research are considered to be reliable and promising, but additional research is needed to more extensively explore the hypothesized relationships in this research. Future research should focus on other potential capabilities firms need, that were not included in this research. Additionally, future research could focus on the context of another crisis, to see whether the interaction effects of this research do apply to another crisis.

To summarize the implications of this research, it was, to the best of the researcher's knowledge, the first attempt to open the black box between innovation ambidexterity and firm performance. In addition, it theoretically emphasized the importance of innovation during the COVID-19 crisis, which might help firms in De Liemers, and hopefully in other regions, to outperform their competition in the current crisis, and maybe even in future crises.

8. References

- Alt, R., & Zimmermann, H.-D. (2001). Introduction to Special Section on Business Models. *Electronic Markets*, 11(1), 3-9.
- Alzoubi, A. E., Al-otoum, F. J., & Albataineh, A. K. (2011). Factors Associated affecting Organization Agility on Product Development. *International Journal of Research and Reviews in Applied Sciences*, 9, 503-515.
- Amit, R. H., & Zott, C. (2010). Business Model Innovation: Creating Value in Times of Change. *IESE Business School Working Paper*, 870.
- Amit, R., & Zott, C. (2001). Value creation in E-business. *Strategic Management Journal*, 22(6-7), 493-520.
- Amit, R., & Zott, C. (2012). Creating value through business model innovation. . *MIT Sloan Management Review*, 53(3), 41-49.
- Andriopoulos, C., & Lewis, M. W. (2009). Exploitation-Exploration Tensions and Organizational Ambidexterity: Managing Paradoxes of Innovation. *Organization Science*, 20(4) , 696-717.
- Arbussa, A., Bikfalvi, A., & Marquès, P. (2017). Strategic agility-driven business model renewal: the case of an SME. *Management Decision*, 55(2), 271-293.
- Archibugi, D., Filippetti, A., & Frenz, M. (2013). The impact of the economic crisis on innovation: Evidence from Europe. *Technological Forecasting and Social Change*, 80(7), 1247-1260.
- Arteta, B. M., & Giachetti, R. E. (2004). A measure of agility as the complexity of the enterprise system. *Robotics and Computer-Integrated Manufacturing*, 20(6), 495-503.
- Aspara, J., Hietanen, J., & Tikkanen, H. (2010). Business model innovation vs replication: financial performance implications of strategic emphases. *Journal of Strategic Marketing*, 18(1), 39-56.
- Atuahene-Gima, K. (2005). Resolving the Capability–Rigidity Paradox in New Product Innovation. *Journal of Marketing*, 69, 61-83.
- Baker, T., & Judge, K. (2020). How to Help Small Businesses Survive COVID-19. *Columbia Law and Economics Working Paper*, vol. 620.
- Benitez-Amado, J., & Ray, G. (2012). Introducing IT-Enabled Business Flexibility and IT Integration in the Acquirer's M&A Performance Equation. *Proceedings of the 33rd International Conference on Information Systems*, (pp. 1-21). Orlando, Florida, USA.
- Benitez-Amado, J., Henseler, J., & Castillo, A. (2017). *Development and Update of Guidelines to Perform and Report Partial Least Squares Path Modeling in Information Systems Research*. Pacific Asia Conference on Information Systems (PACIS), Langkawi Island, Malaysia.
- Benner, M. J., & Tushman, M. L. (2003). Exploitation, exploration, and process management: The productivity dilemma revisited. *Academy of Management Review*, 28(2), 238-256.

- Berends, H., Smits, A., Reymen, I., & Podoynitsyna, K. (2016). Learning while (re)configuring: Business model innovation processes in established firms. *Strategic Organization*, 14(3), 181-219.
- Beute, M. (2019, January 16). *Economische Analyse Regio De Liemers*. Serveon beleid en advies.
- Birkinshaw, J., & Gibson, C. (2004). Building Ambidexterity Into an Organization. *MIT Sloan management review*, 45(4), 47-55.
- Breier, M., Kallmuenzer, A., Clauss, T., Gast, J., Kraus, S., & Tiberius, V. (2021). The role of business model innovation in the hospitality industry during the COVID-19 crisis . *International Journal of Hospitality Management*, 92.
- Brem, A., Viardot, E., & Nylund, P. A. (2021). Implications of the coronavirus (COVID-19) outbreak for innovation: Which technologies will improve our lives? *Technological Forecasting and Social Change*, 163.
- Cao, Q., Gedajlovic, E., & Zhang, H. (2009). Unpacking Organizational Ambidexterity: Dimensions, Contingencies, and Synergistic Effects. . *Organization Science*, 20(4), 781-796.
- Chang, Y.-Y., & Hughes, M. (2012). Drivers of innovation ambidexterity in small- to medium-sized firms. *European Management Journal*, 30(1), 1-17.
- Chesbrough, H. (2010). Business Model Innovation: Opportunities and Barriers. *Long Range Planning*, 43(2-3), 354-363.
- Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change*, 11(3), 529-555.
- Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. *Information Systems Research*, 14(2), 189-217.
- Clark, C., Davila, A., Regis, M., & Kraus, S. (2020). Predictors of COVID-19 voluntary compliance behaviors: An international investigation. *Global Transitions*, 2, 76-82.
- Clauss, T., Abebe, M., Tangpong, C., & Hock, M. (2019). Strategic Agility, Business Model Innovation, and Firm Performance: An Empirical Investigation. *IEEE Transactions on Engineering Management*.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences (2nd edition)*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Cucculelli, M., & Bettinelli, C. (2015). Business models, intangibles and firm performance: evidence on corporate entrepreneurship from Italian manufacturing SMEs. *Small Business Economics*, 45(2), 329-350.

- D'Este, P., Lammarino, S., Savona, M., & von Tunzelmann, N. (2012). What hampers innovation? Revealed barriers versus deterring barriers. *Research Policy*, 41(2), 482-488.
- Debruyne, M., Frambach, R. T., & Moenaert, R. (2010). Using the Weapons You Have: The Role of Resources and Competitor Orientation as Enablers and Inhibitors of Competitive Reaction to New Products. *Journal of Product Innovation Management*, 27(2), 161-178.
- Doz, Y. L., & Kosonen, M. (2010). Embedding Strategic Agility: A Leadership Agenda for Accelerating Business Model Renewal. *Long Range Planning*, 43(2-3), 370-382.
- Dranev, Y., Izosimova, A., & Meissner, D. (2020). Organizational Ambidexterity and Performance: Assessment Approaches and Empirical Evidence. *Journal of the Knowledge Economy*, 11(2), 676-691.
- Etikan, I., Alkassim, R., & Abubakar, S. (2016). Comparison of Snowball Sampling and Sequential Sampling Technique. *Biometrics & Biostatistics International Journal*, 3(1), 6-7.
- Euchner, J., & Ganguly, A. (2014). Business Model Innovation in Practice. *Research-Technology Management*, 57(6), 33-39.
- Filippetti, A., & Archibugi, D. (2011). Innovation in times of crisis: National Systems of Innovation, structure, and demand. *Research Policy*, 40(2), 179-192.
- Fitriasari, F. (2020). How do Small and Medium Enterprise (SME) survive the COVID-19 outbreak? *Jurnal Inovasi Ekonomi*, 5(2), 53-62.
- Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1), 39-50.
- Foss, N. J., & Saebi, T. (2017). Fifteen Years of Research on Business Model Innovation: How Far Have We Come, and Where Should We Go? *Journal of Management*, 43(1), 200-227.
- Gehani, R. R. (1995). Time-based management of technology: A taxonomic integration of tactical and strategic roles. *Journal of Operations and Production Management*, 15(2), 19-35.
- Gibson, C. B., & Birkinshaw, J. (2004). The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity. *Academy of Management Journal*, 47(2), 209-226.
- Goffin, K., & Mitchell, R. (2017). *Innovation Management: Effective Strategy and Implementation*. London: PALGRAVE.
- Goldman, S. L., Nagel, R. N., & Preiss, K. (1995). *Agile Competitors and Virtual Organizations: Strategies for Enriching the Customer*. New York: Van Nostrand Reinold.
- Guderian, C. C., Bican, P. M., Riar, F. J., & Chattopadhyay, S. (2021). Innovation management in crisis: patent analytics as a response to the COVID-19 pandemic.

Special Issue: Providing solutions in emergencies: R&D and innovation management during Covid-19, 51(2), 223-239.

- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis (8th edition)*. Andover, Hampshire: Cengage Learning EMEA.
- Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The Use of Partial Least Squares Structural Equation Modeling in Strategic Management Research: A Review of Past Practices and Recommendations for Future Applications. *Long Range Planning, 45*(5-6), 320-340.
- Harraf, A., Wanasika, I., Tate, K., & Talbott, K. (2015). Organizational Agility. *The Journal of Applied Business Research, 31*(2), 675-686.
- Harris, M., Bhatti, Y., Buckley, J., & Sharma, D. (2020). Fast and frugal innovations in response to the COVID-19 pandemic. *Nature Medicine, 26*, 814-817.
- He, Z.-L., & Wong, P.-K. (2004). Exploration vs. Exploitation: An Empirical Test of the Ambidexterity Hypothesis. *Organization Science, 15*(4), 481-494.
- Heij, C. V., Volberda, H. W., & Van den Bosch, F. A. (2017). How does business model innovation influence firm performance: The effect of environmental dynamism. *Academy of Management Proceedings, 2014*(1).
- Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., . . . Calantone, R. J. (2014). Common Beliefs and Reality about PLS: Comments on Ronkko and Evermann (2013). *Organizational Research Methods, 17*(2), 182-209.
- Henseler, J., Hubona, G., & Ash Ray, P. (2016). Using PLS path modeling in new technology research: updated guidelines. *Industrial Management & Data Systems, 116*(1), 2-20.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In R. R. Sinkovics, & P. N. Ghauri (Ed.) *New Challenges to International Marketing (Advances in International Marketing, Vol. 20)*, (pp. 277-319). Bingley: Emerald Group Publishing Limited.
- Ingka Group. (2020, n.d. n.d.). *Our coronavirus response: Living up to our values*. Retrieved from Ingka Group: <https://www.ingka.com/coronavirus-covid-19-information/>
- Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2006). Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators. *Management Science, 52*(11), 1661-1674.
- Johnson, M. W., Christensen, C. M., & Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review, 86*(12), 57-68
- Kim, S. K., & Min, S. (2015). Business Model Innovation Performance: When does Adding a New Business Model Benefit an Incumbent? *Strategic Entrepreneurship Journal, 9*(1), 34-57.
- Kuckertz, A., Brändle, L., Gaudig, A., Hinderer, S., Reyes, C. A., Prochotta, A., . . . Berger, E. S. (2020). Startups in times of crisis – A rapid response to the COVID-19 pandemic. *Journal of Business Venturing Insights, 13*.

- Kuczmarski, T. D. (1996). What is innovation? The art of welcoming risk. *Journal of Consumer Marketing*, 13(5), 7-11.
- Lee, O.-K. D., Sambamurthy, V., Lim, K. H., & Wei, K. K. (2015). How Does IT Ambidexterity Impact Organizational Agility? *Information Systems Research*, 26(2), 398-417.
- Lee, Y., Shin, J., & Park, Y. (2012). The changing pattern of SME's innovativeness through business model globalization. *Technological Forecasting and Social Change*, 79(5), 832-842.
- Lin, H.-E., McDonough III, E. F., Lin, S.-J., & Lin, C. Y.-Y. (2013). Managing the Exploitation/Exploration Paradox: The Role of a Learning Capability and Innovation Ambidexterity. *Journal of Product Innovation Management*, 30(2), 262-278.
- Lindgardt, Z., Reeves, M., Stalk Jr, G., & Deimler, M. (2013). Business Model Innovation: When the Game Gets Tough, Change the Game. In M. S. Deimler, R. Lesser, D. R. Rhodes, & J. Sinha, *Own the Future: 50 Ways to Win from the Boston Consulting Group* (pp. 291-298). Hoboken, New Jersey: John Wiley & Sons, Inc.
- Lu, Y., & Ramamurthy, K. (2011). Understanding the Link Between Information Technology Capability and Organizational Agility: An Empirical Examination. *MIS Quarterly*, 35(4), 931-954.
- Lubatkin, M. H., Simsek, Z., Ling, Y., & Veiga, J. F. (2006). Ambidexterity and Performance in Small-to Medium-Sized Firms: The Pivotal Role of Top Management Team Behavioral Integration. *Journal of Management*, 32(5), 646-672.
- March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science*, 2(1), 71-87.
- McGrath, R. G. (2010). Business Models: A Discovery Driven Approach. *Long Range Planning*, 43(2-3), 247-261.
- Mitchell, D., & Coles, C. (2003). The ultimate competitive advantage of continuing business model innovation. *Journal of Business Strategy*, 24(5), 15-21.
- Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research. *Strides in Development of Medical Education*, 1-6.
- Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., . . . Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185-193.
- O'Reilly, C. A., & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: resolving the innovator's dilemma. *Research in Organizational Behavior*, 28, 185-206.
- Overby, E., Bharadwaj, A., & Sambamurthy, V. (2006). Enterprise agility and the enabling role of information technology. *European Journal of Information Systems*, 15(2), 120-131.

- Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of Operations Management*, 30(6), 467-480.
- Pol, G. (2014, May 8). *De Liemers als belangrijkste schakel in Logistics Valley*. Retrieved from De Liemers helemaal goed: <https://www.deliemershelemaalgoed.nl/werken/blog-bizznizz-not-as-usual/de-liemers-als-belangrijke-schakel-in-logistics-valley#.YLk8EagzY2y>
- Provincie Gelderland. (2018, n.d. n.d.). *Onderwijs en arbeidsmarkt in cijfers Regio de Liemers*. Retrieved from www.gelderland.nl: https://www.gelderland.nl/bestanden/Documenten/Gelderland/06Werk-en-ondernehmen/181121_OenA_Regio_De_Liemers_en_Gelderland_2018_web.pdf#:~:text=De%20vele%20kantoor%2D%20en%20bedrijfsterreinen,in%20de%20regio%20De%20Liemers.
- Pucihar, A., Lenart, G., Kljajić Borštnar, M., Vidmar, D., & Marolt, M. (2019). Drivers and Outcomes of Business Model Innovation—Micro, Small and Medium-Sized Enterprises Perspective. *Sustainability*, 11(2), 1-17.
- Raisch, S., & Birkinshaw, J. (2008). Organizational Ambidexterity: Antecedents, Outcomes, and Moderators. *Journal of Management*, 34(3), 375-409.
- Regio in Bedrijf. (n.d.). *Gelderland al 15 jaar sterkste economische regio van Nederland*. Retrieved from Regio in Bedrijf: <https://www.regioinbedrijf.nl/economie-gelderland/#:~:text=Gelderland%20al%2015%20jaar%20sterkste%20economische%20regio%20van%20Nederland&text=Hoogwaardige%20technische%20maakindustrie%2C%20zeer%20gespecialiseerde,in%20deze%20regio%20vol%20diversiteit>
- Rialti, R., Marzi, G., Silic, M., & Ciappei, C. (2018). Ambidextrous organization and agility in big data era: The role of business process management systems. *Business Process Management Journal*, 24(5), 1091-1109.
- Ritter, T., & Pedersen, C. L. (2020). Analyzing the impact of the coronavirus crisis on business models. *Industrial Marketing Management*, 88, 214-224.
- Runyan, R. C. (2006). Small Business in the Face of Crisis: Identifying Barriers to Recovery from a Natural Disaster. *Journal of Contingencies and Crisis Management*, 14(1), 12-26.
- Sherehiy, B., Karwowski, W., & Layer, J. K. (2007). A review of enterprise agility: Concepts, frameworks, and attributes. *International Journal of Industrial Ergonomics*, 37(5), 445-460.
- Smarthub Achterhoek. (2017). *Innovatiehub Achterhoek Liemers*. Retrieved from Smarthub Achterhoek: <https://www.innovatiehub.com/innovatiehub-achterhoek-liemers/>
- Smeltink-Mensen, A., & Briesen, C. (2012). *Wonen, werken en winkelen in de Liemers*. Zevenaar: Rabobank De Liemers.
- Sood, A., & Tellis, G. J. (2011). Demystifying Disruption: A New Model for Understanding and Predicting Disruptive Technologies. *Marketing Science*, 30(2), 339-354.

- Sorescu, A., Frambach, R. T., Singh, J., Rangaswamy, A., & Bridges, C. (2011). Innovations in Retail Business Models. *Journal of Retailing*, 87(1), 3-16.
- Souto, J. E. (2015). Business model innovation and business concept innovation as the context of incremental innovation and radical innovation. *Tourism Management*, 51, 142-155.
- Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Long Range Planning*, 43(2-3), 172-194.
- Tseng, Y.-H., & Lin, C.-T. (2011). Enhancing enterprise agility by deploying agile drivers, capabilities and providers. *Information Sciences*, 181(17), 3693-3708.
- Tsourveloudis, N., Valavanis, K., Gracanin, D., & Matijasevic, M. (1999). On the Measurement of Agility in Manufacturing Systems, in *Proceedings of the 2nd European Symposium on Intelligent Techniques*, Chania, Greece, June.
- Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change. *California Management Review*, 38(4), 8-30.
- Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of Management Review*, 11(4), 801-814.
- Von Delft, S., Kortmann, S., Gelhard, C., & Pisani, N. (2019). Leveraging global sources of knowledge for business model innovation . *Long Range Planning*, 52(5).
- Walford, G. (2005). Research ethical guidelines and anonymity. *International Journal of Research & Method in Education*, 28(1), 83-93.
- Wirtz, B. W., & Daiser, P. (2017). Business Model Innovation: An Integrative Conceptual Framework. *Journal of Business Models*, 5(1), 14-34.
- Yang, C., & Liu, H.-M. (2012). Boosting firm performance via enterprise agility and network structure. *Management Decision*, 50(6), 1022-1044.
- Yip, C., Han, N.-L. R., & Sng, B. L. (2016). Legal and ethical issues in research. *Indian Journal of Anaesthesia*, 60(9), 684-688.
- Younes, G. A., Ayoubi, C., Ballester, O., Cristelli, G., de Rassenfosse, G., Foray, D., . . . Ling, Z. (2020). COVID-19: Insights from innovation economists. *Science and Public Policy*, 1-13.
- Yusuf, Y. Y., Sarhadi, M., & Gunasekaran, A. (1999). Agile manufacturing: The drivers, concepts and attributes. *International Journal of Production Economics*, 62(1-2), 33-43.
- Zhang, Z., & Sharifi, H. (2000). A methodology for achieving agility in manufacturing organisations. *International Journal of Operations & Production Management*, 20(4), 496-512.
- Zott, C., & Amit, R. (2008). The fit between product market strategy and business model: implications for firm performance. *Strategic Management Journal*, 29(1), 1-26.

Zott, C., Amit, R., & Massa, L. (2011). The Business Model: Recent Developments and Future Research. *Journal of Management*, 37(4), 1019-1042.

9. Appendices

Appendix 1: Online survey questions

Innovation in times of a nation-wide crisis

Start of Block: Introduction

Q1 Beste participant,

Bedankt voor uw deelname aan deze enquête voor mijn master scriptie. Het onderwerp van mijn scriptie is innovatie in tijden van een wereldwijde crisis met de focus op de huidige COVID-19 crisis. Voor mijn onderzoek ben ik op zoek naar eigenaren van bedrijven of werknemers met een management functie.

Het invullen van deze enquête zal ongeveer 10 minuten duren. De enquête bestaat uit zes korte blokken. Het eerste blok bevat inleidende vragen en de andere vijf blokken bevatten meer inhoudelijke vragen. Elk blok begint met een korte inleidende tekst over het onderwerp.

Aangezien deze enquête anoniem is en uw antwoorden niet aan u gelinkt kunnen worden, is uw privacy gegarandeerd. Daarnaast kunt u op elk gewenst moment uw deelname aan deze enquête beëindigen. Voor vragen, antwoorden of opmerkingen betreffende deze enquête kunt u contact met mij opnemen via het volgende e-mailadres: d.wiggers@student.ru.nl.

Door op ja, ik geef toestemming te klikken, gaat u ermee akkoord de vragen in deze enquête te willen beantwoorden en geeft u toestemming om uw antwoorden te gebruiken voor onderzoeksdoeleinden. Uw antwoorden zullen enkel voor dit onderzoek gebruikt worden en niet online gepubliceerd worden.

- ☐ Ja, ik geef toestemming (1)
- ☐ Nee, ik geef geen toestemming (2)

Skip To: End of Survey If Beste participant, Bedankt voor uw deelname aan deze enquête voor mijn master scriptie. Het ond... = Nee, ik geef geen toestemming

End of Block: Introduction

Start of Block: Inleidende vragen

Q2 Binnen welke sector is uw bedrijf werkzaam?

- ☐ Landbouw, bosbouw en visserij sector (Agriculture, Forestry, Fishing) (1)
 - ☐ Bouwsector (Construction) (3)
 - ☐ Productie sector (Manufacturing) (4)
 - ☐ Transport & Logistiek sector (Transport & Logistics) (5)
 - ☐ Detailhandel sector (Retail Trade) (6)
 - ☐ Financiële, verzekering en vastgoed sector (Finance, Insurance, and Real Estate) (7)
 - ☐ Zorgsector (Caring) (8)
 - ☐ Dienstensector (Service) (9)
 - ☐ Publieke sector (Public) (11)
 - ☐ Anders, namelijk... (12) _____
-

Q3 Hoe lang bestaat het bedrijf al?

- ☐ 0-5 jaar (1)
 - ☐ 5-10 jaar (2)
 - ☐ 10-15 jaar (3)
 - ☐ 15-20 jaar (4)
 - ☐ Meer dan 20 jaar (5)
-

Q4 Wat is de omvang van het bedrijf (hoeveelheid medewerkers)?

- ☐ 1-10 (1)
 - ☐ 11-50 (2)
 - ☐ 51-250 (3)
 - ☐ 251-1000 (4)
 - ☐ 1001-50.000 (5)
 - ☐ Meer dan 50.000 (6)
-

Q5 Wat is uw huidige functie binnen het bedrijf?

- ☐ Algemeen directeur (CEO) (1)
 - ☐ Operationeel directeur (COO) (2)
 - ☐ Technisch directeur (CTO) (3)
 - ☐ President (4)
 - ☐ Hoofd van het bestuursorgaan (chairman) (5)
 - ☐ Directeur (director) (6)
 - ☐ Executive vice president (7)
 - ☐ Vice president (8)
 - ☐ Senior consultant (9)
 - ☐ President & algemeen directeur (CEO) (10)
 - ☐ Algemeen manager (general manager) (11)
 - ☐ Anders, namelijk... (12) _____
-

Q6 Hoe lang bent u al werkzaam voor het bedrijf?

- ☐ Minder dan 1 jaar (1)
- ☐ 1-2 jaar (2)
- ☐ 2-3 jaar (3)
- ☐ 3-4 jaar (4)
- ☐ 4-5 jaar (5)
- ☐ Meer dan 5 jaar (6)

End of Block: Inleidende vragen

Start of Block: Innovation ambidexterity

Q7

Het onderwerp van het volgende blok is combinatie strategie (innovation ambidexterity). In de bedrijfskunde wereld kan er onderscheid gemaakt worden tussen drie innovatie strategieën: een explorerende, exploiterende en een ambidextrous innovatie strategie. Een explorerende innovatie strategie focust op de ontwikkeling van nieuwe kennis door nieuwe en meer radicale innovaties te introduceren. Een exploiterende innovatie strategie focust op het uitputten van de huidige middelen en het verbreden van de huidige kennis. Een ambidextrous innovatie strategie is een combinatie van beide strategieën.

Beoordeel de oriëntatie van uw bedrijf over de laatste 1.5 jaar met behulp van onderstaande stellingen.

In hoeverre zijn onderstaande stellingen van toepassing op uw bedrijf?

Mijn bedrijf/het bedrijf waar ik werkzaam ben...

Q8	Sterk mee oneens (1)	Oneens (2)	Enigszins mee oneens (3)	Niet mee oneens en niet mee eens (neutraal) (4)	Enigszins mee eens (5)	Eens (6)	Sterk mee eens (7)
Is op zoek naar nieuwe technologische ideeën door buiten de kaders te denken (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Baseert zijn succes op zijn vermogen om nieuwe technologieën toe te passen (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Creëert innovatieve producten/services (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is op zoek naar creatieve manieren om aan de behoeften van klanten te voldoen (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gaat doelgericht op zoek naar nieuwe segmenten binnen de markt (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Richt zich actief op nieuwe klantgroepen (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Richt zich actief op het verbeteren van kwaliteit en het verlagen van kosten (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verbetert continu de betrouwbaarheid van zijn producten/services (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Richt zich actief op het automatiseren van zijn processen (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Onderzoekt continu de tevredenheid van bestaande klanten (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Probeert bestaande
klanten tevreden te
houden door
bestaande
producten/services
te verbeteren (11)

☐☐☐☐☐☐☐

Focust zich
voornamelijk op
zijn bestaande
klantgroepen (12)

☐☐☐☐☐☐☐

End of Block: Innovation ambidexterity

Start of Block: Enterprise agility

Q9 Het onderwerp van het volgende blok is enterprise agility. Dit refereert naar de wendbaarheid van het bedrijf en dus het vermogen om te anticiperen op veranderingen in het bedrijfsmilieu en snel en op de juiste manier reageren op deze veranderingen.

Q10 Deze vraag kijkt naar hoe uw bedrijf presteert de afgelopen 1.5 jaar in vergelijking tot de concurrentie. Geef alstublieft aan in hoeverre u het eens bent met onderstaande stellingen.

	Sterk mee oneens (1)	Oneens (2)	Enigszins mee oneens (3)	Niet mee oneens en niet mee eens (neutraal) (4)	Enigszins mee eens (5)	Eens (6)	Sterk mee eens (7)
We kunnen snel reageren op speciale klant verzoeken wanneer deze zich voordoen; onze klanten hebben vertrouwen in ons vermogen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We kunnen onze productie/service levels snel opschalen of afbouwen om te anticiperen op schommelingen in vraag vanuit de markt (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wanneer er sprake is van een verstoring van aanbod van onze leveranciers/aanbieders kunnen we hier snel op anticiperen door middel van alternatieve regelingen en interne aanpassingen (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We kunnen snel goede beslissingen maken en implementeren met betrekking tot veranderingen in de markt/klant (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We kijken continu naar manieren om ons bedrijf te reorganiseren om onze markt beter te kunnen dienen (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We gebruiken veranderingen in de markt en ogenschijnlijke chaos als mogelijkheden om van te profiteren (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Enterprise agility

Start of Block: BMI

Q11 Het onderwerp van onderstaand blok is Business Model Innovation (BMI). BMI faciliteert de creatie van nieuwe markten en is een mogelijkheid om de competitieve voordelen (competitive advantages) van de competitie te verstoren. BMI focust op het creëren van waarde voor zowel bestaande als nieuwe klantsegmenten.

Q12 Geef alstublieft aan in hoeverre u het eens bent met onderstaande stellingen. Mijn bedrijf heeft de afgelopen 1.5 jaar significante veranderingen gemaakt in...

	Sterk mee oneens (1)	Oneens (2)	Enigszins mee oneens (3)	Niet mee oneens en niet mee eens (neutraal) (4)	Enigszins mee eens (5)	Eens (6)	Sterk mee eens (7)
... de focus op bepaalde klanten en/of klantgroepen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de manier van het voldoen aan belangrijke klantbehoeften (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... het product/service aanbod (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... het ontwerp van het product/service aanbod (op welke manier worden deze aangeboden) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de prijs van het product/service aanbod (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de prijs en verkoopstrategie (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de commercialisatie strategie (bijvoorbeeld inschrijfkosten, leasen, licenties) (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de kostenstructuur van het product/service aanbod (vaste kosten, variabele kosten) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... het incalculeren van strategisch belangrijke kosten (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de productie/operatie strategie (bijvoorbeeld automatisering/arbeidsintensief of zelf doen/uitbesteden) (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de kostenstructuur van de operationele processen (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de belangrijkste prestatie indicatoren (bijvoorbeeld return on investment, return on assets, lead times) (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de benodigdheden voor het creëren en leveren van het product/service aanbod (veranderingen in assets/middelen) (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

... de belangrijkste hulpmiddelen die het bereiken van de gewenste markt faciliteren (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de technologieën, componenten en onderdelen van het product/service aanbod (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... het merk (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... het netwerk van leveranciers en partners (17)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de distributie en verkoop processen (18)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de processen gerelateerd aan het ontwerpen, maken en leveren van het aanbod (19)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de processen van product/service ontwikkeling (20)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de manier van communiceren en contact hebben met de klanten (21)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... financiële statistieken (bijvoorbeeld tijd tot break-even of brutowinstmarge) (22)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... operationele statistieken (bijvoorbeeld kwaliteit van het eindproduct, de wacht/leverings/doorlooptijd) (23)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... andere statistieken (bijvoorbeeld prestatie eisen, de levenscyclus van product ontwikkelingen) (24)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: BMI

Start of Block: Firm performance

Q13 Het volgende blok gaat over firm performance (bedrijfsprestatie). Bedrijfsprestatie bevat zowel operationele als financiële resultaten. Het hangt niet alleen af van de effectiviteit en efficiëntie van het bedrijf zelf, maar ook van de markt waarin het bedrijf opereert.

Q14 Geef aan in hoeverre de volgende stellingen gelden voor uw bedrijf terugkijkend op de laatste 1.5 jaar. Dit is op basis van inschatting, niet op basis van harde cijfers.

	Sterk mee oneens (1)	Oneens (2)	Enigszins mee oneens (3)	Niet mee oneens en niet mee eens (neutraal) (4)	Enigszins mee eens (5)	Eens (6)	Sterk mee eens (7)
Onze financiële prestatie was veel beter dan die van de competitie (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het marktaandeel van ons bedrijf was veel beter dan die van de competitie (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De verkoopgroei van ons bedrijf was veel beter dan die van de competitie (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De product ontwikkeling van ons bedrijf was veel beter dan die van de competitie (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De algemene ontwikkeling van ons bedrijf was veel beter dan die van de competitie (bijvoorbeeld strategie, structuur, personeel) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Firm performance

Start of Block: The COVID-19 crisis

Q15 Het laatste blok van deze enquête gaat over de gevolgen van de COVID-19 crisis voor uw bedrijf.

Q16 Geef aan in hoeverre de huidige COVID-19 crisis heeft geleid tot grote veranderingen met betrekking tot...

	Sterk mee oneens (1)	Oneens (2)	Enigszins mee oneens (3)	Niet mee oneens en niet mee eens (neutraal) (4)	Enigszins mee eens (5)	Eens (6)	Sterk mee eens (7)
... de acties van concurrentie in onze voornaamste markten (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de technologische veranderingen in onze industrie (bijvoorbeeld creaties of verbeteringen van producten/processen) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... de product/service voorkeuren van klanten (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... ons eigen bedrijf (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: The COVID-19 crisis

Start of Block: The End

Q17 Hartelijk dank voor uw deelname aan deze enquête en de rest van mijn onderzoek. Mocht u geïnteresseerd zijn in het ontvangen van de resultaten van mijn onderzoek dan kunt u contact met mij opnemen via het volgende emailadres: d.wiggers@student.ru.nl.

End of Block: The End

Appendix 2: Descriptive statistics

Appendix 2.1 Respondent descriptive statistics

Table 15: Descriptive statistics job title (Von Delft et al., 2019)

Job title	Frequency	Percentage
CEO	59	52.68%
COO	3	2.68%
CTO	1	.89%
President	1	.89%
Chairman	1	.89%
Director	18	16.07%
Executive vice president	0	n.a.
Vice president	0	n.a.
Senior consultant	1	.89%
President & CEO	1	.89%
General manager	6	5.36%
Other	21	18.75%

Table 16: Descriptive statistics job experience

Job experience	Frequency	Percentage
< 1 year	0	n.a.
1-2 year	2	1.79%
2-3 year	2	1.79%
3-4 year	9	8.04%
4-5 year	5	4.46%
> 5 year	94	83.93%

Appendix 2.2 Firm descriptive statistics

Table 17: Descriptive statistics firm sector (Von Delft et al., 2019)

Firm sector	Frequency	Percentage
Agriculture, Forestry, Fishing	2	1.79%
Construction	9	8.04%
Manufacturing	11	9.82%
Transport & Logistics	2	1.79%
Retail Trade	9	8.04%
Finance, Insurance and Real Estate	10	8.93%
Caring	1	.89%
Services	32	28.57%
Public	7	6.25%
Other	29	25.89%

Table 18: Descriptive statistics firm age

Firm age	Frequency	Percentage
0-5 years	10	8.93%
5-10 years	14	12.50%
10-15 years	10	8.93%
15-20 years	18	16.07%
> 20 years	60	53.57%

Table 19: Descriptive statistics firm size (Von Delft et al., 2019)

Firm size	Frequency	Percentage
1-10	63	56.25%
11-50	21	18.75%
51-250	17	15.18%
251-1000	8	7.14%
1001-50,000	3	2.68%
> 50,000	0	n.a.

Appendix 3: Item loadings

Table 20: Item loadings

Items	Explorative (IA1-6)	Exploitative (IA7-11)	OA (EA1-3)	MA (EA5-6)	CVP	PF	KR	KP	FP	C-19
IA1	.46									
IA2	.57									
IA3	.51									
IA4	.57									
IA5	.76									
IA6	.55									
IA7		.42								
IA8		.65								
IA9		.56								
IA10		.36								
IA11		.56								
EA1			.54							
EA2			.63							
EA3			.77							
EA5				.64						
EA6				.75						
CVP1					.88					
CVP2					.61					
CVP3					.73					
CVP4					.76					
CVP5					.57					
PF1						.56				
PF2						.74				
PF3						.77				
PF4						.71				
PF5						.63				
PF6						.81				
PF7						.71				
KR1							.72			
KR2							.72			
KR3							.71			
KR4							.59			
KR5							.65			
KP1								.54		
KP2								.80		
KP3								.73		
KP4								.74		
KP5								.36		
KP6								.70		
KP7								.73		
FP1									.61	
FP2									.89	
FP3									.63	
FP4									.96	
C-19_1										.32
C-19_2										.75
C-19_3										.64
C-19_4										.97

Appendix 4: Cross-loadings (item-to-construct correlations)

Table 21: Cross-loadings (item-to-construct correlations)

Items	Explorative (IA1-6)	Exploitative (IA7-11)	OA (EA1-3)	MA (EA5-6)	CVP	PF	KR	KP	FP	C-19
IA1	.46	.15	.17	.47	.24	.11	.32	.11	.19	.22
IA2	.57	.17	.09	.53	.29	.24	.37	.20	.28	.22
IA3	.51	.21	.19	.54	.28	.19	.33	.08	.16	.10
IA4	.57	.40	.44	.50	.35	.17	.32	.07	.23	.26
IA5	.76	.46	.31	.41	.48	.45	.45	.41	.32	.25
IA6	.55	.42	.12	.29	.38	.38	.33	.25	.24	.28
IA7	.23	.42	.02	.18	.17	.24	.14	.14	.11	.14
IA8	.39	.65	.17	.39	.14	.18	.21	.28	.17	.26
IA9	.26	.56	.10	.14	.01	.34	.12	.27	.34	.17
IA10	.24	.36	.23	.23	.13	.06	.09	.09	.07	.11
IA11	.27	.56	.33	.49	.21	.10	.12	.02	.07	.15
EA1	.16	.26	.54	.46	.21	.01	.20	.03	.03	.18
EA2	.28	.25	.63	.57	.19	.11	.22	.06	.15	.16
EA3	.31	.16	.77	.27	.23	.26	.30	.16	.18	.23
EA5	.62	.35	.29	.64	.25	.22	.30	.15	.07	.23
EA6	.47	.44	.57	.75	.49	.30	.37	.18	.14	.24
CVP1	.52	.27	.34	.53	.88	.63	.67	.56	.41	.28
CVP2	.37	.13	.18	.32	.61	.47	.58	.53	.25	.36
CVP3	.43	.11	.25	.43	.73	.53	.71	.54	.30	.30
CVP4	.49	.23	.21	.35	.76	.44	.67	.53	.27	.53
CVP5	.32	.11	.15	.29	.57	.66	.68	.52	.21	.36
PF1	.26	.04	.04	.11	.63	.56	.61	.58	.23	.35
PF2	.39	.17	.23	.24	.60	.74	.63	.49	.27	.29
PF3	.33	.29	.18	.33	.60	.77	.67	.65	.29	.29
PF4	.36	.26	.21	.35	.63	.71	.63	.54	.28	.37
PF5	.32	.36	.07	.20	.39	.63	.52	.63	.23	.22
PF6	.36	.35	.24	.29	.49	.81	.57	.61	.36	.23
PF7	.30	.27	.03	.32	.43	.71	.61	.67	.19	.28
KR1	.42	.38	.18	.43	.67	.57	.72	.61	.23	.29
KR2	.43	.26	.30	.30	.72	.70	.72	.71	.34	.35
KR3	.44	.08	.17	.41	.55	.53	.71	.39	.21	.30
KR4	.39	.01	.25	.19	.55	.53	.59	.56	.33	.27
KR5	.38	.15	.37	.29	.60	.54	.65	.51	.14	.36
KP1	.30	.09	.09	.01	.55	.52	.63	.54	.19	.28
KP2	.35	.27	.12	.27	.64	.57	.63	.80	.24	.37
KP3	.24	.24	.14	.18	.65	.57	.66	.73	.31	.37
KP4	.22	.29	.30	.34	.29	.32	.30	.74	.24	.35
KP5	.06	.02	.06	.12	.43	.66	.47	.36	.14	.23
KP6	.21	.22	-.02	.06	.50	.74	.62	.70	.38	.18
KP7	.22	.27	-.04	.08	.47	.69	.60	.73	.32	.28
FP1	.28	.21	.10	.01	.27	.24	.26	.22	.61	.04
FP2	.36	.23	.28	.13	.35	.36	.35	.32	.89	.15
FP3	.26	.24	.11	.06	.28	.25	.20	.22	.63	.07
FP4	.40	.29	.10	.23	.39	.32	.33	.44	.96	.16
C-19_1	.18	.16	.10	.13	.11	.14	.17	.19	-.08	.32
C-19_2	.38	.36	.18	.25	.42	.26	.36	.30	.18	.75
C-19_3	.20	.19	.23	.21	.33	.23	.24	.31	.16	.64
C-19_4	.32	.23	.29	.32	.45	.44	.47	.41	.07	.97

Notes: IA = innovation ambidexterity; EA = enterprise agility; FP = firm performance; C-19 = The COVID-19 crisis