Enhancing performance and managing disruptions in supply chains: The role of dynamic capabilities

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Abstract

Disruptions in supply chains affect the capacity of firms to continue operating normally, satisfying customer requirements, remaining responsive, and attracting revenue. Companies need to develop capabilities that allow them to adapt to changing circumstances and manage disruptions. Dynamic capabilities perspective is valuable for addressing evolving and uncertain environments. This study proposes a model based on findings from a study to empirically evaluate the effect of dynamic capabilities on financial performance and the impact caused by the COVID-19 pandemic using structural equation modelling. Findings suggest agility is a major enabler for increasing financial performance and reducing the negative impacts caused by disruptions.

Keywords: Dynamic capabilities, Agility, Supply chain disruption

Introduction

Businesses face different types of disruptions every day. There are risks that can disrupt normal activities (Kleindorfer & Saad, 2005). Disruptions in the supply chain affect the capacity of the company to operate normally, satisfy customer requirements, remain responsive, and attract revenue. Therefore, companies need to develop mechanisms to handle disruptions and mitigate their impacts (Kovacs & Tatham, 2009).

Dynamic capabilities are firm-specific capabilities that are used to produce a competitive advantage for companies (Teece et al., 1997) through sensing and seizing opportunities (Altay et al., 2018). These capabilities are critical to managing and thriving in evolving and uncertain environments. For instance, risk management, disruption absorption, adaptability, and agility facilitate adaptation to changing circumstances. Among these concepts, agility has gained a lot of attention as a key aspect for supply chains to thrive under changing environments. Nevertheless, there is a lack of empirical evidence oft its capacity to mitigate the damage caused by major disruptions to companies and their supply chains. This research examines the influence of dynamic capabilities in reducing and managing the impact of major disruptions in companies in the context of the COVID-19 pandemic. The study addresses the following research question: What is

the effect of supply chain agility in mitigating the impact of disruptions during the COVID-19 pandemic?

The model is developed using hypothesis from the literature and tested using information gathered from 101 managers in the UK. The data is analysed using structural equation modelling (SEM) to test the hypotheses and draw conclusions. The purpose is to provide empirical evidence to decision-makers about the role of agility to support businesses affected by disruptions.

Background

Dynamic capabilities

"Dynamic capabilities" is an extension of the resource-based view (Wamba et al., 2020) which refers to investigating the firm-specific capabilities and the combination of competences and internal and external resources that can generate competitive advantage for a company (Teece et al., 1997). The purpose of dynamic capabilities is to sense and seize opportunities to gain competitive advantage (Altay et al., 2018). These capabilities are the outcomes of the decisions made by the company and these are developed over time (Blome et al., 2013). The purpose is to allow companies to adapt to changing environments giving them the capacity to leverage the new conditions. Therefore, these capabilities are crucial for developing a set of temporary advantages that are useful to stay ahead of competitors (Teece et al., 1997).

Uncertainty is a common feature of various markets. This is the reason why there have been appeals for the development of dynamic capabilities to allow firms to react, adapt and reconfigure their supply chains (Blome et al., 2013). There is little evidence, however, about the value of these capabilities in addressing the impacts of major disruptions in the operations of a company. When companies are faced with disruptions in their supply chains, it is crucial to be responsive to remain competitive in the market. In fact, it is important that companies have the capacity to adjust to the new conditions in order to leverage them to create an advantage against competitors. Therefore, this research is using the theoretical lens of dynamic capabilities (Teece, 1997) to examine the impact of these capabilities on the mitigation of the impacts of disruptions in the company and on financial performance.

Agility

Agility involves the abilities to sense changes, and rapidly and flexibly react to them (Aslam et al., 2018; Wamba et al., 2020). Agility is focused on customer responsiveness and it can be seen as a valuable strategy for the survival and success of organisations (Bruce & Daly, 2011; Mafakheri et al., 2008; Potdar et al., 2017) as it allows companies to seize opportunities once these are identified (Aslam et al., 2018). That is the reason agility has been widely studied in manufacturing and supply chain management (Blome et al., 2013; Lee, 2002) as well as in humanitarian supply chains (Oloruntoba & Gray, 2006; L'Hermitte et al., 2016).

Agility has been identified as a key capability to improve performance in environments surrounded by uncertainty (Lee, 2002). It can be essential for the survival of companies because rather than adjusting to the status quo, it welcomes change in order to thrive and prosper (Loss & Crave, 2011; Maskell, 2001). That means that agility can be seen as a capability that can become a conduit to gaining competitive advantage.

Considering its value to support organisations facing uncertain circumstances, agility is becoming an increasingly relevant concept for crisis management (Rodríguez-

Espíndola et al., 2021). Different authors have highlighted the value of this capability to operate within the context and constraints found on crisis and major disruptions. Particularly, agility can be a corner stone of the development of resilient companies (Altay et al., 2018; Lotfi & Saghiri, 2017). Despite these advantages, and the plentiful literature available in the commercial sector, there is an absence of empirical evidence confirming the influence of agility on mitigating the impact of supply chain disruptions. It is important to examine the potential of the concept of agility to support companies affected by disruptions in order to provide insights for research and practice. Therefore, this research investigates empirical evidence of the impact of agility for crisis management using the context of the COVID-19 pandemic.

Hypothesis development

Within supply chain management, risk management plays a major role in successfully managing business processes in a proactive manner (Lavastre et al., 2012). Supply chain risk has multiple sources including process, control, demand, supply and environment. Supply chain management, faced with these risks, requires specific and adequate responses such as techniques, attitude and strategies for management of risk.

Furthermore, risk management has been traditionally known as a key aspect for the successful operation of businesses (Lavastre et al 2012). There are a variety of contributions considering risk management as the corner stone of support for different dynamic capabilities (Abeysekara et al., 2019; Um & Han, 2021; Wieland & Marcus Wallenburg, 2012). Risk management allows companies to be aware of their vulnerabilities, analyse them and define potential initiatives to manage the situation. It is a valuable capability to mitigate the impact of disruptions in companies. That is the reason it has been considered the antecedent in the literature on capabilities such as agility, robustness, collaboration, resilience, and reengineering (Abeysekara et al., 2019; Um & Han, 2021; Wieland & Marcus Wallenburg, 2012). Given the connections between risk management and other dynamic capabilities, this paper examines the potential of these relationships using the following hypotheses:

- H1: The implementation of risk management strategies has a positive influence on the level of adaptability of the company.
- H2: The implementation of risk management has a positive influence on the agility of the company.
- H3: The implementation of risk management has a positive influence on the capacity of the company to absorb the impact from disruptions to keep operating.

Supply chain adaptability allows companies to sense fundamental changes in the market and the supply chain through the emphasis on innovativeness (Eckstein et al., 2015). This capability can help organisations to continue operating even in shifting markets because of the high level of structural flexibility. It also creates the conditions and expertise required for increased agility (Wamba et al., 2020). Therefore, the following hypotheses are tested by the model in the study:

- H4: Supply chain adaptability has a positive effect on the agility of the company.
- H5: Supply chain adaptability has a positive influence on the ability of the company to absorb the impact from disruptions to keep operating.

Agility has been identified as an essential capability for organisations because its positive effect on performance (Loss & Crave, 2011). It includes the ability to change and react promptly to a variety of circumstances, which allow companies to become more

responsive and gain competitive advantage, thereby increasing financial performance (Eckstein et al., 2015; Wamba et al., 2020). Considering the need for more empirical evidence connecting agility and performance (Blome et al., 2013; Lotfi & Saghiri, 2017), this research is testing the following hypothesis:

- H6: The capacity of the company to quickly change and react to unexpected conditions has a positive influence on its financial performance.

Agility has also been recognized as a valuable capability to ensure the delivery of relief in chaotic conditions in humanitarian supply chains (Oloruntoba & Gray, 2006). It is the ability of organisations to change and adapt their processes under chaotic circumstances, which has shown the potential to improve their activities in these environments (Rodríguez-Espíndola et al., 2021). Despite the evidence in the literature about the value of agility to handle risks and uncertainties (L'Hermitte et al., 2016) and its positive effect on pre-disaster performance (Altay et al., 2018), there is a need for empirical evidence to define the role of agility to improve management in cases of crisis. Therefore, the following hypothesis is tested:

- H7: The capacity of the company to quickly change and react to unexpected conditions has a positive influence on the reduction of the negative impact caused by the COVID-19 pandemic.

Companies prepared to continue operating despite challenging and unexpected conditions can thrive under difficult circumstances. Having better information and the ability to absorb the impact of the disruption can facilitate decision-making to allow companies to leverage the new situation and the effect on the market. Therefore, the following hypotheses are tested:

- H8: The capability of the company to keep operating under disruptions has a positive effect on its financial performance.
- H9: The capability of the company to keep operating under disruptions has a positive effect on the reduction of the negative impact caused by the COVID-19 pandemic.

The purpose of the study is to understand the way dynamic capabilities can promote financial benefits and mitigate the negative impact of disruptions in organisations using the case of the COVID-19 pandemic.

Methodology

Survey development
Using the findings from a literature review, this study evaluates various hypotheses developed to identify the value of agility to achieve higher financial performance and reduce the impact from disruptions such as the COVID-19 pandemic. Various scales used in previous studies were introduced in a survey instrument using a five-point Likert scale (1 = completely disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = completely agree).

The questionnaire comprised two sections. The first section asked questions about the dynamic capabilities of companies including risk management, adaptability, flexibility, disruption absorption and agility. The second section of the questionnaire posed questions about performance measures such as financial performance and the impact of

the COVID-19 pandemic on the company. After the questionnaire was designed, it was pre-tested amongst a sample of managers in the UK to improve the precision of the questions,reduce ambiguity, increase validity and enhance readability.

Sampling

Purposive sampling was used in the analysis because of the need to gather insights from managers aware of internal processes and disruption management. The survey was set-up digitally by the authors and delivered by Qualtrics (https://tinyurl.com/2p8tnuhp). Bollen and Noble (2011) suggest a minimum of 100 responses, which is consistent with the findings from recent studies based on Monte Carlo simulation analysis (Sideridis et al., 2014; Wolf et al., 2013) and suggestion from Boomsma (1985). The study collected data from 101 managers to test the hypothesis. Only complete responses were used for the study. The responses used came from managers involved in operations management in companies operating in the UK. The data was collected in April 2021, in the midst of the pandemic and after stage 2 of the roadmap to decrease lockdown restrictions in the UK had been implemented (https://tinyurl.com/2t2867sx). Table 1 shows the demographics of the sample. The answers are spread among sectors and different company sizes, with most of the participants having between 1 and 10 years of experience

Table 1. Demographics of the sample

Title	Number
Number of employees	
Less than 10	16
11-50	14
51-100	21
101-250	50
More than 250	16
Years of experience at the company	
Less than 1	16
1-5	38
5-10	23
10-25	17
25+	7

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used to check the suitability of the sample size. The sample size was considered very good to conduct SEM analysis (0.859) (Hutcheson & Sofroniou, 1999). On the other hand, Bartlett's test confirms that the constructs are suitable for SEM analysis. The sample collected was considered adequate based on the findings from Muthén and Muthén (2002). The analysis of missing values and non-engaged responses did not show any concerns for analysis.

Data analysis

The hypotheses are evaluated using Structural Equation Modelling (SEM). SEM is very useful to analyse the relationships between constructs using quantitative information in social sciences (Dadeliene et al., 2020). It is an appropriate method to derive causal relationships among the constructs in an objective way. The results from the survey have been processed using SEM to test the links between dynamic capabilities and sustainable performance to identify significant relationships and discuss the findings. Maximum

likelihood has been used as estimation method for SEM using AMOS software (Arbuckle, 2006).

Analysis of data

Construct Validity
Construct validity in the study was tested following the recommendations from Dubey et al. (2019). The process included an exploratory factor analysis (EFA) using principal component analysis with Varimax rotation. The EFA was undertaken using SPSS and allowing the extraction of factors with eigenvalues over one. The results provided the same 6 constructs obtained from the literature review analysis, namely adaptability, financial performance, risk management, agility, disruption absorption, and disruption impact.
   Confirmatory factor analysis (CFA) was used to examine construct validity and unidimensionality. Convergent validity was ratified by having values of AVE over 0.5 in all cases, with Cronbach's alpha over 0.8 and composite reliability values over 0.8. These values ensure adequate reliability and consistency of the constructs (Albayati et al., 2020; Fornell & Larcker, 1981; Hair et al., 2013).

Common method bias
As the survey was applied to a single respondent per company, there is a possibility of having common method bias (Cao et al., 2010). To check for that possibility, Harman's single-factor test was performed by running an exploratory factor analysis (EFA) and looking at the unrotated solution to determine the number of factors to account for variance (Podsakoff et al., 2003). The variance explained by one factor was below the threshold of 50%, meaning that there is no common variance.

Goodness-of-fit.
The fit of the model examined was tested using traditional thresholds for Goodness-of-fit such as the comparative fit index (CFI), the Tucker-Lewis Index (TLI), the goodness-of-fit index coefficient (GFI), the root Mean Square Error of Approximation (RMSEA), and the $\chi 2$ /df ratio. CFI (0.949) and TLI (0.941) were above the 0.9 threshold, whereas GFI (0.819) was over the threshold of 0.8. In the other hand, the RMSEA (0.056) was below the acceptable value of 0.08. Overall, the values of goodness-of-fit of the model are deemed acceptable to test the hypotheses presented.

Hypothesis testing
The results of the analysis using AMOS with maximum likelihood as extraction method can be used to examine H1-H9 to provide insights for research and practice.
H1, H2, and H3 have been fully verified since the analysis showed that the risk management factor has a significant and positive effect on the latent factors of agility (beta = 0.450, p-value<0.001), adaptability (beta = 0.611, p-value<0.001), and disruption absorption (beta = 0.584, p-value<0.001), respectively. This result ratifies the importance of risk management as antecedent of other dynamic capabilities. The effect of adaptability on agility was confirmed (beta = 0.414, p-value<0.001) and there was is evidence of a weak effect of adaptability on disruption absorption (beta = 0.242, p-value<0.05), which leads to accept H4 and H5.

Agility has been found to have a significant positive impact on both financial performance (beta = 0.453, p-value<0.001) and on mitigating the impact from the COVID-19 pandemic (beta = 0.611, p-value<0.01), thereby confirming H6 and H7. However, hypothesis H8 and H9 are not accepted because there was no significant effect found between disruption absorption and financial performance nor mitigating COVID-19 impact.

Results and discussion
This paper examines the influence of dynamic capabilities in the financial performance of organisations as well as on the capacity to minimise the impact caused by disruptions such as the COVID-19 pandemic. This section presents the discussion of the main findings from the analysis.

Agility has gained increasing attention in the crisis management field (Rodríguez-Espíndola et al., 2021). The results from the analysis show a strong correlation between agility and the financial performance of the company, in line with findings from Eckstein et al. (2015). The potential of agility to support activities under uncertainty and time pressures can help companies to react and adapt more quickly to evolving circumstances, which in turn is reflected in their financial performance. The most interesting association found by the analysis, however, is the relationship between the level of supply chain agility of a firm and the mitigation of the impact from the COVID-19 pandemic. The findings from this study confirm that one of the benefits of agile supply chains for organisations is the capacity to quickly react and adapt to disruptions as well. On the other hand, despite the potential value of disruption absorption, the results suggest that it does not have a direct effect on financial performance nor the mitigation of COVID-19 impact.

The results of the study suggest supply chain adaptability is important to facilitate the short-term reaction required for supply chain agility.

Risk management has been identified as a corner stone for the development of dynamic capabilities supporting financial performance and managing disruptions, which is consistent with previous studies (Abeysekara et al., 2019; Parker & Ameen, 2018; Um & Han, 2021; Wieland & Marcus Wallenburg, 2012). The study confirmed that risk management can influence the adaptability of organisations (Slijper et al., 2020), their agility and their ability to continue operating when facing difficult conditions. This is an expected result because it stands to reason to believe that the ability to recognise and analyse vulnerabilities and risks can be the antecedent to develop risk responses enabling companies to change their supply network and resource base, and to foresee potential problems to be prepared and continue operating in the face of disruptions.

Conclusions
Following the calls for empirical studies analysing the role of agility for disruption management, this study has introduced empirical evidence about the impact of dynamic capabilities on financial performance and the ability of companies to mitigate the effect of major disruptions such as the COVID-19 pandemic. Using the theoretical lens of dynamic capabilities and following the findings from the literature review, this paper has identified main constructs affecting performance and disruption management in companies to introduce and empirically examine a model using SEM.

The study found that agility can become a major enabler to improve financial performance and reduce the negative impact caused by major disruptions. The positive relationship between agility and the mitigation of the damage caused by the COVID-19

pandemic provides evidence that the benefits for companies go beyond financial aspects only. It highlights the value of developing capabilities that allow organisations to react and adapt quickly to different circumstances. The findings of the model suggest that adaptability and disruption absorption can support an agile response, and these are underpinned by risk management capabilities.

The findings of this study open different venues for further research. The evidence of the impact of agility in the reduction of negative consequences from disruptions could be the basis to analyse the value of agility to promote resilience in other organisations, including NGOs and civil organisations. Additionally, a case-based methodology looking into that relationship in private companies could be used to develop a framework to implement agility to mitigate disruptions. Finally, the link between agility, resilience and sustainability could be further discussed using the lens of dynamic capabilities to advance the discussion about sustainable business models.

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