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Supply Risk Management and Firms' Competitive Advantage: moderating effect of Intellectual Capital and Risk Management Capability

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Abstract

In today's dynamic business environment, supply chain disruptions and uncertainties were inevitable, posing significant challenges to firms aiming to maintain a competitive edge. Firms faced increasing risks from global supply chain complexities, geopolitical tensions, and unexpected events such as natural disasters and pandemics. This study addressed a critical knowledge gap by exploring the nuanced interplay between supply risk management (SRM) practices, a firm's competitive advantage, and the moderating influences of intellectual capital (IC) and risk management capability (RMC). Our research investigated these relationships through a survey of 284 Ghanaian SMEs and a comprehensive analysis. The results revealed that effective SRM practices significantly enhanced a firm's competitive advantage by enabling better risk identification, assessment, and mitigation strategies. However, contrary to conventional wisdom, the study found that high levels of intellectual capital could negatively moderate this relationship. This unexpected finding suggested that over-reliance on IC might introduce cognitive biases or resource allocation challenges that undermine SRM effectiveness, potentially leading firms to underestimate risks or misallocate resources. Conversely, the findings confirmed that robust RMC positively moderated the relationship between SRM and competitive advantage. Firms with strong risk management capabilities were better equipped to align their risk management practices with broader organizational strategies, enhancing their ability to respond to and recover from disruptions. This alignment allowed firms to maintain operational continuity and achieve strategic objectives, thereby reinforcing their competitive position in the market. This study contributes to the literature by providing a nuanced understanding of how SRM, IC, and RMC interacted to influence competitive advantage. It offered both theoretical insights into the complex dynamics of supply chain risk management and practical implications for organizations striving to optimize their supply chain strategies amidst a volatile

business environment. By highlighting the critical roles of intellectual capital and risk management capability, the research underscored the need for a balanced approach that leverages both intellectual resources and robust risk management practices to sustain competitive advantage.

Keywords: *supply risk management, firms' competitive advantage, intellectual capital, risk management capability*

1. Introduction

In the contemporary business landscape, characterized by globalization, interconnected supply chains, and heightened uncertainties, organizations face an imperative to navigate and mitigate risks effectively. Central to this endeavor is the discipline of Supply Risk Management (SRM), which has garnered increasing attention due to its profound implications for a firm's competitiveness and sustainability (Tang, 2016; Chopra & Sodhi, 2019). The evolution of Supply Risk Management (SRM) is deeply entwined with the escalating complexity and interdependence of global supply chains. Organizations, facing a myriad of risks ranging from natural disasters to geopolitical disruptions, have recognized the need for a proactive approach to anticipate, assess, and mitigate these risks (Chopra & Sodhi, 2018). The traditional reactive stance has given way to strategic SRM, where organizations seek to integrate risk management practices seamlessly into their supply chain strategies (Wagner & Bode, 2018).

Competitive advantage stands as a paramount objective for organizations striving to outperform rivals and secure sustainable success (Porter, 1985). In the context of supply chains, competitive advantage extends beyond traditional cost considerations to encompass operational efficiency, innovation, and resilience (Christopher, 2016). Achieving and sustaining competitive advantage in the supply chain is contingent upon a multifaceted understanding of risk management and its integration into organizational strategies (Mentzer et al., 2021).

Intellectual Capital (IC), comprising human, structural, and relational dimensions, emerges as a critical factor in shaping the link between SRM and competitive advantage. The knowledge, skills, and relationships embedded in Intellectual Capital are posited to act as a dynamic force that influences how organizations respond to and leverage supply chain risks (Bontis, 1998; Subramaniam & Youndt, 2017). As organizations navigate uncertainties, the intellectual resources they possess become instrumental in not only mitigating risks but also in innovating and creating a distinctive competitive edge. Beyond SRM, the broader organizational capacity to manage risks, termed as Risk Management Capability (RMC), assumes significance. Risk Management Capability involves the integration of risk management practices across different levels of the organization, aligning them with strategic goals (Chapman & Ward, 2017). Risk Management Capability acts as a comprehensive framework that extends beyond supply chain-specific risks to encompass a broader spectrum of uncertainties, enabling organizations to respond to challenges with agility and resilience.

While the importance of Supply Risk Management and its relationship with competitive advantage has gained attention, there exists a notable research gap concerning the nuanced roles of Intellectual Capital and Risk Management Capability. The interplay between Intellectual Capital, Risk Management Capability, and their combined impact on how Supply Risk

Management translates into competitive advantage remains underexplored. Understanding this intersection is crucial for organizations seeking a holistic and effective approach to navigate uncertainties in the supply chain landscape. This research aims to fill the identified research gap by investigating the roles of Intellectual Capital and Risk Management Capability in moderating the relationship between Supply Risk Management and a firm's Competitive Advantage. The study seeks to contribute theoretical insights and practical implications for organizations striving to optimize their supply chain strategies in a dynamically changing environment.

1.1. Problem Statement

In today's dynamic business environment, supply chain disruptions and uncertainties have become inevitable, posing significant challenges to firms aiming to maintain a competitive edge. As organizations increasingly recognize the importance of supply risk management in navigating these uncertainties, a critical knowledge gap exists in understanding the nuanced interplay between supply risk management practices, a firm's competitive advantage, and the moderating influences of intellectual capital and risk management capability (Chopra & Sodhi, 2021; Wagner & Bode, 2018). Despite the growing recognition of the pivotal role of supply risk management in addressing disruptions, there is a noticeable gap in the understanding of its direct impact on a firm's competitive advantage (Chen, Paulraj, & Lado, 2021). Achieving and sustaining a competitive advantage in today's volatile environment necessitate a nuanced exploration of how supply risk management practices contribute to enhanced firm performance and market positioning (Soni, Kodukula, & Papudesu, 2020).

Moreover, the potential moderating effects of intellectual capital and risk management capability on the relationship between supply risk management and competitive advantage remain underexplored. Intellectual capital, encompassing human, structural, and relational capital, is increasingly recognized as a source of competitive advantage (Bontis, 1998; Subramaniam & Youndt, 2005). Additionally, the role of an organization's risk management capability in influencing the effectiveness of supply risk management strategies is an area that merits closer examination (Cagliano, Caniato, & Spina, 2006).

While studies acknowledge the pivotal role of Supply Risk Management in mitigating supply chain risks and maintaining competitiveness (Tang, 2006; Christopher, 2016), there is a paucity of research that comprehensively explores how Intellectual Capital and Risk Management Capability, as moderating factors, influence the relationship between SRM and Competitive Advantage. The limited research fails to provide a holistic understanding of how intellectual resources and broader organizational risk management strategies amplify or attenuate the impact of SRM on a firm's competitive position. Hence this study seeks to determine the combined effect of Intellectual Capital and Risk Management

Capability independently moderates the relationship between supply risk management and firm's competitive advantage.

Intellectual Capital, encompassing human, structural, and relational dimensions, introduces a layer of complexity to the relationship. The knowledge, skills, and relationships embedded in intellectual resources have been recognized as influential factors in organizational success (Bontis, 1998; Subramaniam & Youndt, 2019). However, the specific mechanisms through which Intellectual Capital interacts with SRM and shapes a firm's Competitive Advantage remain underexplored. Therefore, this study seeks to assess the moderating effect of Intellectual Capital on the relationship between supply risk management and firm's competitive advantage.

Similarly, the broader organizational Risk Management Capability, extending beyond supply chain-specific risks, adds another dimension to the complexity. Chapman and Ward (2020) argue for a comprehensive risk management approach that integrates various levels of the organization and aligns with strategic objectives. Yet, the literature lacks clarity on how this broader risk management capability interacts with Supply Risk Management and contributes to a firm's Competitive Advantage. This has then necessitated the need to examine the moderating effect of Risk Management Capability on the relationship between supply risk management and firm's competitive advantage.

The overarching problem addressed by this study is the need for a nuanced understanding of the interplay between Supply Risk Management, Intellectual Capital, Risk Management Capability, and a firm's Competitive Advantage. The existing gap hinders organizations from strategically aligning their intellectual resources and risk management practices with supply chain strategies, potentially limiting the realization of the full potential of SRM (Wagner & Bode, 2008; Subramaniam & Youndt, 2005).

This research aims to bridge this gap by investigating the moderating effects of Intellectual Capital and Risk Management Capability on the relationship between Supply Risk Management and a firm's Competitive Advantage. The study seeks to provide insights that not only contribute to theoretical advancements in the field but also offer practical implications for organizations striving to optimize their supply chain strategies amidst a dynamic and uncertain business environment.

Research Gaps

While existing literature recognizes the essential role of SRM in mitigating supply chain risks (Tang, 2006; Christopher, 2016), there is a conspicuous lack of comprehensive exploration into the specific mechanisms through which Intellectual Capital and broader Risk Management practices interact with and shape the relationship between Supply Risk Management and a firm's Competitive Advantage. The literature has yet to provide a holistic understanding of how intellectual resources and organizational risk management strategies contribute to or hinder the optimization of SRM for sustained competitive advantage.

Intellectual Capital, consisting of human, structural, and relational components, introduces an additional layer of complexity. The knowledge, skills, and relationships embedded within intellectual resources are recognized as critical drivers of organizational success (Bontis, 1998; Subramaniam & Youndt, 2019). However, the specific ways in which Intellectual Capital interfaces with SRM and influences a firm's Competitive Advantage remain inadequately explored.

In tandem, the broader organizational Risk Management practices extend beyond the realm of supply chain-specific risks. Chapman and Ward (2017) advocate for a comprehensive risk management approach that permeates different levels of the organization and aligns with strategic objectives. Yet, the literature lacks a clear understanding of how this holistic Risk Management framework interacts with SRM and contributes to the broader Competitive Advantage of the firm.

While the literature acknowledges the critical role of Intellectual Capital (IC) in organizational success (Bontis, 1998), there is a noticeable gap in understanding how IC specifically influences the relationship between Supply Risk Management (SRM) and a firm's Competitive Advantage. Existing studies often focus on the general importance of IC but fall short in providing a detailed examination of the mechanisms through which intellectual resources enhance or hinder the effectiveness of SRM strategies (Subramaniam & Youndt, 2015).

The broader organizational Risk Management Capability (RMC), extending beyond supply chain-specific risks, is an essential aspect that has not been thoroughly integrated into the literature on SRM and Competitive Advantage. While Chapman and Ward (2017) advocate for a comprehensive risk management approach aligned with strategic objectives, the literature lacks a cohesive understanding of how RMC interacts with and moderates the relationship between SRM and a firm's Competitive Advantage.

The current body of literature provides insights into the individual constructs of SRM, IC, and RMC, but there is a dearth of research that comprehensively explores their combined impact. There is limited understanding of how IC and RMC act as moderating factors in the relationship between SRM and a firm's Competitive Advantage. A nuanced examination of these moderating effects is crucial for a holistic understanding of the dynamics at play (Chopra & Sodhi, 2014; Wagner & Bode, 2018).

Contextual Gaps

Identifying contextual gaps involves highlighting areas within the existing literature where further research is needed. There are potential contextual gaps for the study on "Supply Risk Management and Firm's Competitive Advantage: Moderating Effect of Intellectual Capital and Risk Management Capability," Limited Exploration of Direct Impact on Competitive Advantage

While the importance of supply chain risk management is acknowledged (Wagner & Bode, 2018), there is a noticeable gap in understanding the direct impact of supply risk management practices on a firm's competitive advantage (Chen, Paulraj, & Lado, 2014). Existing studies often focus on risk mitigation without explicitly linking it to competitive advantage (Soni, Kodukula, & Papudesu, 2015).

Neglect of Intellectual Capital as a Moderator

Despite the growing recognition of intellectual capital as a driver of competitive advantage (Bontis, 2018; Subramaniam & Youndt, 2015), there is a paucity of research exploring its moderating role in the relationship between supply risk management and competitive advantage. Understanding how intellectual capital enhances or hinders the effectiveness of supply risk management practices is a critical gap in the literature.

Underexplored Role of Risk Management Capability

While risk management capability is acknowledged as essential in supply chain literature (Cagliano, Caniato, & Spina, 2016), its

specific role as a moderator in the relationship between supply risk management and competitive advantage remains underexplored. Existing studies often focus on risk management in general terms rather than examining how an organization's capability to manage risks influences the outcomes of supply risk management strategies.

Limited Integration of Moderating Factors

Current research tends to treat intellectual capital and risk management capability in isolation rather than exploring their combined moderating effects. There is a need for studies that integrate these two moderating factors to provide a more holistic understanding of how intellectual capital and risk management capability jointly influence the relationship between supply risk management and competitive advantage (Wagner & Bode, 2018). Many existing studies in the field tend to be theoretical or conceptual in nature, with a scarcity of empirical research that validates the proposed relationships. Empirical studies are essential to corroborate theoretical frameworks and provide practical insights into the effectiveness of SRM strategies, considering the moderating roles of IC and RMC (Tang, 2006; Christopher, 2016). The problem statement articulates the research gap, highlights the complexity introduced by Intellectual Capital and Risk Management Capability, and emphasizes the overarching challenge of understanding their moderating effects on the relationship between Supply Risk Management and Competitive Advantage.

2.1. Literature Review

2.2. Concept of Supply Risk Management

Supply chain risk management is the process of identifying, assessing, and controlling the various risks associated with the supply chain. Supply chain risk management is becoming increasingly important for businesses as supply chains have become more complex and global. It is essential to have an effective supply risk management strategy to mitigate the risks that can impact the supply chain. This paper will discuss the supply risk management concept in detail, including its definition, types of risks, risk assessment, and mitigation strategies Dullaert (2018). Supply risk management is the process of identifying, assessing, and controlling the various risks associated with the supply chain. It involves managing risks across the supply chain, including suppliers, manufacturers, distributors, and customers. The aim of supply risk management is to ensure that the supply chain is resilient to external and internal disruptions and continues to operate smoothly even in the face of disruptions (Ibid). There are various types of risks associated with the supply chain. These risks can be broadly classified into four categories: Operational risks: These risks are associated with the day-to-day operations of the supply chain, such as equipment breakdowns, power outages, and transportation disruptions. Financial risks: These risks are associated with the financial aspects of the supply chain, such as exchange rate fluctuations, credit risk, and supplier bankruptcy. Reputational risks: These risks are associated with the reputation of the supply chain, such as negative publicity due to environmental or social issues (Tang, 2016). Strategic risks: These risks are associated with the strategic decisions made by the supply chain, such as mergers and acquisitions, entering new markets, and changing suppliers.

Currently, supply chain risks are gaining prominence in both academic research and the business realm, and various categorizations of these risks exist in the literature. Managing supply chain risks is a crucial factor in identifying potential threats

in international markets, especially in times of intense competition (Wieland & Marcus Wallenburg, 2012). This management approach significantly contributes to reducing operational losses, enhancing supply chain performance, ensuring timely order deliveries, and increasing responsiveness (Munir et al., 2020). Operational supply chain risks, as defined by Lin and Zhou (2011) and Olson and Wu (2010), encompass internal risks (demand risks) and external risks (such as natural disasters, wars, terrorism, and political instability). Ravindran et al. (2010) identified risks related to late delivery and missing quality requirements, while Samvedi et al. (2013) classified risks into categories such as supply, demand, process, and environmental risks. Blackhurst et al. (2008) described supply chain risks, including supplier dependency, quality problems, security risks, disruptions in logistics processes, information systems problems, capacity shortages, and natural disasters. Analyzing 39 empirical studies, Wuni et al. (2019) identified 30 critical risk factors. Ho et al. (2015) evaluated supply chain risk types and reduction strategies based on academic studies in the field between 2003 and 2013.

Contrarily, Pham et al. (2022) pointed out that while academic studies primarily focus on identifying risks, there is a scarcity of research on risk reduction. Waqas et al. (2022) investigated the moderator effect of knowledge management on the relationship between food supply chain risks and supply chain performance in Malaysia. Shenoj et al. (2016) concluded that supply chain risk management plays a mediating role and has a positive effect on the relationship between supply chain risks and performance. Giannakis and Louis (2011) developed a multi-agent-based decision support system to detect interruptions and disruptions in supply chain processes, leading to quicker and more reliable information sharing throughout the supply chain. Risk, when dealing with the supply chain, is considered an unpredictable failure or undesirable outcome, encompassing any risks occurring during information flows, raw material, and production from initial suppliers to end-users in the entire supply chain (Jüttner et al., 2003). Previous studies suggest that supply chain risk refers to the negative deviation from expected performance measures, resulting in negative consequences for the focal firm (Wagner & Bode, 2008) and the potential variation of outcomes influencing the decrease of value-added at any activity cell in a chain (Bogataj & Bogataj, 2007). In the context of supply chain risk management, it can be defined as the recognition and control of supply chain risks to decrease susceptibility through a collaborative approach between supply chain actors (Jüttner, 2005; Jüttner et al., 2003). Supply chain risk management involves the administration of risks through allocation and collaboration among participants to ensure effectiveness and efficiency for the supply chain (Tang, 2006). Strong collaborations among stakeholders are crucial to identify and manage risks for reducing supply chain susceptibility within the supply network (Goh et al., 2007).

2.3. Intellectual capital

Intellectual capital (IC) is a concept that has gained significant attention in the management literature over the past few decades. It refers to the intangible assets of an organization that contributes to its competitiveness and long-term success. These intangible assets include knowledge, expertise, skills, relationships, and other non-physical resources that cannot be easily measured by traditional accounting methods. The purpose of this paper is to provide an overview of the concept of intellectual capital, its different components, and its significance in contemporary business environments. The concept of intellectual capital was first

introduced by Stewart (1991) who defined it as "the sum of everything everybody in a company knows that gives it a competitive edge". Since then, various scholars have proposed different frameworks to conceptualize and measure IC. One widely accepted framework is the one proposed by Bontis (1998), which categorizes IC into three components: human capital, structural capital, and relational capital.

Human capital refers to the knowledge, skills, and abilities of the employees of an organization. It includes their education, training, experience, and expertise. Human capital is critical for firms because it enables them to innovate, create new products, and adapt to changing business environments. Organizations that invest in their employees' development and well-being can enhance their human capital, which in turn contributes to their competitiveness and long-term success (Bontis et al., 2002). Structural capital refers to the organizational infrastructure that supports knowledge creation, transfer, and utilization. It includes the organization's systems, processes, databases, and intellectual property. Structural capital is critical for firms because it enables them to leverage their human capital and create value from it. Organizations that invest in their structural capital can enhance their ability to innovate, improve efficiency, and respond to market changes (Bontis et al., 2002).

Relational capital refers to the relationships that an organization has with its external stakeholders, such as customers, suppliers, partners, and communities. It includes the organization's reputation, brand image, and social capital. Relational capital is critical for firms because it enables them to build trust, loyalty, and commitment with their stakeholders. Organizations that invest in their relational capital can enhance their reputation, attract new customers, and create long-term partnerships that contribute to their competitiveness and long-term success (Bontis et al., 2002).

The significance of intellectual capital in contemporary business environments cannot be overstated. In today's knowledge-based economy, organizations that effectively manage their intellectual capital can gain a competitive advantage over their rivals. They can innovate, create new products, and respond to market changes more effectively than their competitors. Additionally, they can attract and retain talented employees, create strong relationships with their stakeholders, and enhance their reputation and brand image (Bontis et al., 2002). Intellectual capital is a critical concept in contemporary business environments. It refers to the intangible assets of an organization that contribute to its competitiveness and long-term success. These intangible assets include human capital, structural capital, and relational capital. Organizations that invest in their intellectual capital can gain a competitive advantage over their rivals by leveraging their knowledge, skills, and relationships to create value and respond to market changes. Therefore, the effective management of intellectual capital is a key driver of organizational success.

2.4. Risk Management Capability

Risk management capability is essential for firms operating in today's complex and unpredictable business environment. It refers to the ability of a firm to identify, assess, and respond to risks in a proactive and effective manner. In this paper, we will explore the concept of risk management capability, including its definition, components, and how firms can develop and improve it (Hillson, 2022). Risk management capability refers to a firm's ability to anticipate and manage risks across its operations and value chain, including strategic, operational, financial, and reputational risks

(Hillson, 2002). It involves a range of activities, such as risk identification, risk assessment, risk mitigation, risk transfer, and risk monitoring and reporting. Risk management capability can be broken down into several key components, including organizational culture, risk assessment processes, risk management tools and techniques, and risk governance structures (Schoemaker et al., 2018). Organizational culture refers to the shared values, beliefs, and norms that shape how a firm approaches risk management. Risk assessment processes involve identifying and evaluating risks, including their likelihood and potential impact. Risk management tools and techniques include risk mitigation strategies, such as insurance, hedging, and diversification. Risk governance structures refer to the formal policies, procedures, and governance mechanisms that guide risk management activities and decision-making. Firms can develop and improve their risk management capability through various strategies, such as investing in risk management education and training, fostering a risk-aware culture, and implementing robust risk management processes and tools (Schoemaker et al., 2018). Additionally, firms can leverage emerging technologies, such as artificial intelligence and machine learning, to improve their risk management capabilities. Risk management capability is critical for firms operating in today's dynamic and uncertain business environment. By developing and improving their risk management capabilities, firms can enhance their resilience, reduce their exposure to risks, and achieve sustainable growth and competitive advantage. As such, risk management capability should be a top priority for firms of all sizes and industries.

2.5. Firms' Competitive Advantage

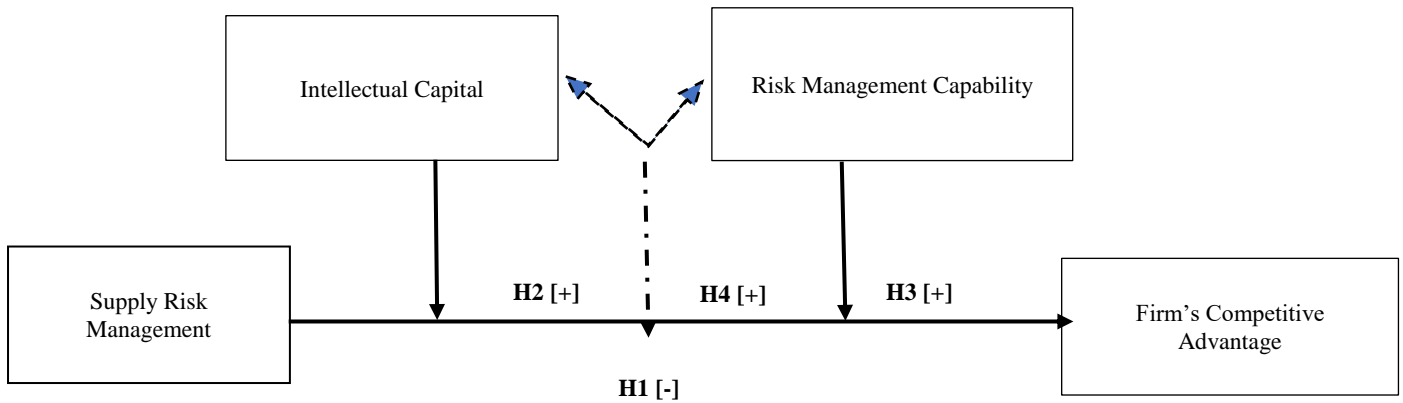
Competitive advantage is the ability of a firm to outperform its competitors in terms of profitability, market share, customer loyalty, and other key performance indicators. It is a critical concept in the field of strategic management, as firms strive to gain and sustain competitive advantage in order to achieve long-term success. One of the most influential frameworks for understanding competitive advantage is the resource-based theory, which suggests that a firm's resources and capabilities are the primary drivers of its competitive advantage. According to this theory, firms can achieve a sustained competitive advantage by developing and leveraging resources and capabilities that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). One key resource that can contribute to a firm's competitive advantage is its human capital. Human capital refers to the knowledge, skills, and experience of a firm's employees, which can enable the firm to innovate, improve efficiency, and provide superior customer service. Research has shown that firms with high levels of human capital tend to perform better than those with lower levels (Hitt et al., 2001).

Another important resource for competitive advantage is technology. Firms that are able to develop or acquire cutting-edge technology can gain a significant edge over their competitors, as they can use this technology to improve their products, processes, and services. For example, Apple's development of the iPhone and iPad helped it to gain a significant advantage over its competitors in the mobile device market. In addition to resources, firms can also develop capabilities that contribute to their competitive advantage. One important capability is innovation, which refers to a firm's ability to develop new products, processes, and business models. Firms that are able to consistently innovate can gain a significant advantage over their competitors, as they can introduce new products and services that meet evolving customer needs. Another important capability is operational efficiency, which refers

to a firm's ability to produce goods and services at a lower cost than its competitors. This can be achieved through various means, such as optimizing supply chain management, reducing waste, and improving production processes. Firms that are able to achieve high levels of operational efficiency can offer lower prices to customers, which can help them to gain market share. Competitive advantage is a critical concept in the field of strategic management, as it can enable firms to achieve long-term success. By developing

and leveraging valuable resources and capabilities, firms can outperform their competitors in terms of profitability, market share, and other key performance indicators. The resource-based theory provides a useful framework for understanding how firms can achieve sustained competitive advantage, by identifying resources and capabilities that are valuable, rare, inimitable, and non-substitutable.

2.6. Hypothetical model for the Study



2.6.1. Supply Risk Management and Firms' Competitive Advantage

Supply risk management has become a critical area of focus for firms across industries due to the growing recognition of its impact on a firm's competitive advantage. Managing supply risks effectively cannot only reduce the negative impact of disruptions but also create a competitive edge for firms. This paper proposes the hypothesis that effective supply risk management positively impacts a firm's competitive advantage. Firstly, supply chain disruptions have a significant impact on firm performance. According to Kerkhof et al. (2018), supply chain disruptions have resulted in decreased sales, increased costs, and lost market share for many firms. The ability to mitigate these risks through effective supply risk management can prevent such negative impacts on firm performance, leading to competitive advantages in the long term. Secondly, effective supply risk management can create opportunities for firms to innovate and differentiate themselves from their competitors. For example, firms that develop more resilient supply chains can deliver higher product quality and consistency levels, leading to increased customer satisfaction and loyalty (Kerkhof et al., 2018). Additionally, firms that successfully manage supply risks can develop new product offerings, expand into new markets, and create stronger supplier relationships, all of which can contribute to competitive advantage. Finally, supply risk management can lead to improved operational efficiency and cost savings, which can also contribute to a firm's competitive advantage. By proactively managing risks, firms can reduce costs associated with supply chain disruptions, such as rush orders, inventory costs, and production delays (Handfield et al., 2011). In conclusion, the effective management of supply chain risks can provide firms with a competitive advantage through improved performance, innovation, and cost savings. However, ineffective supply risk management will not have a negative influence on firms' competitive advantage. This study, therefore, hypothesizes that:

H1: Supply risk management has a positive relationship with firms' competitive advantage.

2.6.2. Moderating effect of intellectual capital on the relationship between supply risk management and firms' competitive advantage

The concept of supply chain risk management has become increasingly important in the contemporary business landscape. Supply chain disruptions can have severe impacts on firms' operations, revenue, and reputation. As such, firms have recognized the need to implement effective supply chain risk management strategies to mitigate the potential risks. However, the effectiveness of these strategies in enhancing firms' competitive advantage is contingent on the moderating effect of intellectual capital. Intellectual capital refers to the intangible assets that contribute to a firm's competitive advantage, such as knowledge, skills, and expertise. The literature has highlighted the crucial role that intellectual capital plays in enhancing firms' competitiveness by enabling them to adapt to changes in the business environment and innovate in response to emerging challenges (Bontis, 2001; Subramaniam & Youndt, 2005). Therefore, the hypothesis that intellectual capital positively moderates the relationship between supply risk management and firms' competitive advantage is both plausible and worthy of investigation. Previous research has established a positive relationship between supply chain risk management and firms' performance (e.g., Wang & Cousins, 2015; Tang, 2016). However, the effectiveness of these strategies is contingent on the level of intellectual capital within the firm. Firms with high levels of intellectual capital are better equipped to identify and respond to supply chain risks, enabling them to reduce the negative impact of disruptions on their operations and maintain their competitive advantage (Srivastava et al., 2008). Conversely, firms with low levels of intellectual capital are more vulnerable to supply chain disruptions, which can undermine their competitiveness and reputation (Tsai et al., 2017). In conclusion, the study hypothesis that:

H2: intellectual capital positively moderates the relationship between supply risk management and firms' competitive advantage is worthy of investigation

2.6.3. The moderating effect of Risk Management Capability on the relationship between Supply Risk management and firms' competitive advantage

Effective supply chain risk management (SCRM) is crucial for the long-term success and competitiveness of firms. Supply chain risks can have a significant impact on the firm's profitability, reputation, and customer satisfaction. Many studies have explored the relationship between SCRM and firm performance, but the moderating role of risk management capability (RMC) has not been extensively studied. In this argument, we propose that RMC positively moderates the relationship between supply risk management (SRM) and firms' competitive advantage. We will provide a brief overview of the literature on SCRM, RMC, and competitive advantage, followed by our argument and evidence supporting the proposed hypothesis. Supply chain risks can originate from various sources, including natural disasters, geopolitical instability, supplier bankruptcy, and technological disruption. Effective SCRM involves identifying, assessing, and managing these risks to minimize their impact on the firm's operations and performance. Many studies have shown a positive relationship between SCRM and firm performance (e.g., Wu et al., 2017; Cao and Qin, 2018; Yu et al., 2020). However, these studies have not considered the moderating role of RMC.

RMC refers to the firm's ability to effectively manage risks by developing risk management processes, structures, and culture (Kazancoglu and Tanyas, 2018). RMC can enhance the firm's resilience to supply chain risks and improve its overall performance. Several studies have highlighted the importance of RMC in SCRM (e.g., Yoon and Hong, 2017; Kazancoglu and Tanyas, 2018; Singhal et al., 2020). Competitive advantage refers to the firm's ability to outperform its competitors by providing superior value to customers or reducing costs (Porter, 1985). Many studies have shown that effective SCRM can enhance firms' competitive advantage (e.g., Wu et al., 2017; Cao and Qin, 2018; Yu et al., 2020). However, the moderating role of RMC in this relationship has not been explored. Based on the arguments raised, this study proposes that

H3: Risk Management Capability positively moderates the relationship between Supply Risk Management and firms' competitive advantage.

2.6.4. Moderating effects of Intellectual capital and risk management capability

Intellectual capital and risk management capability play crucial roles in moderating the relationship between supply risk management and firms' competitive advantage. The following paragraphs explore the relationship in more detail with supporting citations.

Intellectual capital refers to the knowledge, skills, and expertise that enable a firm to innovate and adapt to changes in the business environment. Research has shown that intellectual capital positively moderates the relationship between supply chain risk management and firms' competitive advantage. For example, Tsai et al. (2017) found that intellectual capital plays a critical role in mitigating the negative impact of supply chain risk on firms' performance. Firms with high levels of intellectual capital are better able to identify and respond to supply chain risks, enabling them to maintain their competitive advantage. Similarly, risk management capability is also an essential moderating factor in the relationship between supply risk management and firms'

competitive advantage. Firms with high levels of risk management capability are better equipped to identify and manage supply chain risks, enabling them to maintain their competitive advantage. For example, Wang and Cousins (2015) found that firms with strong risk management capabilities were better able to mitigate the negative impact of supply chain disruptions on their operational performance.

Furthermore, the combination of intellectual capital and risk management capability can significantly enhance firms' ability to manage supply chain risks effectively and maintain their competitive advantage. Srivastava et al. (2008) found that a knowledge-based risk management framework can help firms to manage supply chain risks more effectively, thereby enhancing their competitive advantage. Such frameworks leverage the firm's intellectual capital to identify and respond to supply chain risks, while also enhancing the firm's risk management capability. In conclusion, intellectual capital and risk management capability play essential roles in moderating the relationship between supply risk management and firms' competitive advantage. Firms with high levels of intellectual capital and risk management capability are better able to manage supply chain risks effectively, enabling them to maintain their competitive advantage. As such, firms should invest in developing their intellectual capital and risk management capabilities to enhance their ability to manage supply chain risks effectively and maintain their competitive advantage. Based on the arguments raised, this study proposes that:

H4: Intellectual capital and risk management capability positively moderate the relationship between supply risk management and firms' competitive advantage.

2.7. Resource-Based View Theory

Resource-based theory (RBT) is a widely used theoretical framework that explains how firms can achieve a sustained competitive advantage through their resources and capabilities (Barney, 1991; Wernerfelt, 1984). In the context of supply chain management, resource-based theory suggests that firms can use their unique resources and capabilities to manage supply chain risks and gain a competitive advantage. This paper explores how resource-based theory underpins supply risk management and firms' competitive advantage. Resource-based theory suggests that a firm's resources and capabilities are the key drivers of its competitive advantage (Barney, 1991). Resources refer to the assets, knowledge, and capabilities of the firm, while capabilities refer to the firm's ability to use its resources effectively to achieve its goals. In the context of supply chain management, a firm's resources and capabilities are critical in managing supply chain risks.

According to resource-based theory, firms that have unique resources and capabilities are better equipped to manage supply chain risks than their competitors. For example, a firm with a highly skilled and experienced supply chain team may be better equipped to identify and mitigate supply chain risks than a firm with a less skilled team (Gibson et al., 2005). Similarly, a firm with strong relationships with its suppliers may be better able to manage supply chain risks than a firm with weaker relationships (Cousins et al., 2008).

Moreover, resource-based theory suggests that firms can create value for their customers and stakeholders by using their unique resources and capabilities (Barney, 1991). In the context of supply chain management, firms that are better able to manage supply

chain risks can provide more reliable and consistent delivery of products to their customers. This can lead to increased customer loyalty and improved reputation, which can in turn lead to a sustained competitive advantage (Mentzer et al., 2001). The resource-based theory also suggests that the sustained competitive advantage of a firm is difficult to imitate or replicate by its competitors (Barney, 1991). In the context of supply chain management, firms that have unique resources and capabilities for managing supply chain risks are better able to differentiate themselves from their competitors (Gibson et al., 2005). For example, a firm with a strong supply chain risk management strategy may be able to provide its customers with a level of assurance that its competitors cannot match.

The resource-based theory provides a theoretical foundation for understanding how firms can achieve a sustained competitive advantage in supply chain management by using their unique resources and capabilities. Through their resources and capabilities, firms can manage supply chain risks more effectively, create value for their customers and stakeholders, and differentiate themselves from their competitors. Firms that use resource-based theory to underpin their supply chain risk management strategies are better positioned to achieve a sustained competitive advantage. Resource-based theory underpins supply risk management and firms' competitive advantage by suggesting that a firm's resources and capabilities can lead to a sustained competitive advantage. Resources refer to the assets, knowledge, and capabilities of the firm, while capabilities refer to the firm's ability to use its resources effectively to achieve its goals.

In the context of supply risk management, the theory suggests that firms that have unique resources and capabilities are better able to manage supply chain risks than their competitors. For example, a firm with a highly skilled and experienced supply chain team may be better equipped to identify and mitigate supply chain risks than a firm with a less skilled team. In this way, the firm's resources and capabilities can lead to a competitive advantage in supply chain risk management. Furthermore, resource-based theory suggests that firms that have unique resources and capabilities can use them to create value for their customers and stakeholders. This can lead to a sustained competitive advantage because it is difficult for competitors to imitate or replicate these unique resources and capabilities. According to the RBV theory, an organization is a collection of resources that may be leveraged to gain a competitive advantage and deliver strong organizational performance in the short or long term (Barney, 1991; Penrose, 1959). The RBV framework is frequently utilized to describe variations in business marketing tactics and level of competitiveness (Kozlenkova et al., 2014; Morgan, 2012). The company's RBV offers a theoretical framework for evaluating internal organizations' capacity to create competitive advantage (Barney, 1991; Grant, 1991). It was also conveyed by Penrose (1959) in his research which stated that the RBV considers that a company is a collection of resources. The core tenet of RBV is that a company's ability to access, control, and manage corporate resources determines how competitive it is.

2.8. Dynamic Capability Theory

The dynamic capabilities framework is an approach to strategic management that seeks to explain how firms acquire and maintain competitive advantages under conditions of change and uncertainty in their competitive environments. It is particularly focused on accounting for why some firms rather than others are able to adapt or reconfigure resources and operational capabilities to respond to

(and even spark) disruptive, innovative change. Hence, Teece (2014) defines dynamic capabilities as “higher-level activities that can enable an enterprise to direct its ordinary activities towards high-demand uses and to manage, or ‘orchestrate,’ the firm’s resources to address and shape rapidly changing business environments.” The problem of conceptualizing and explaining change over time is implicit in several aspects of the dynamic capabilities framework, from (1) why competitive environments change in ways that are characterized by rapid innovation and uncertainty to (2) why some firms develop the ability over time to more effectively reconfigure resources and capabilities to address such change to (3) the problem of identifying the “micro-foundations” by which managers and organizations “sense” the opportunities inherent in change and “seize” and “transform” resources to intentionally capitalize on it (Teece 2007). In fact, the intellectual origins of the contemporary dynamic capabilities framework can be traced to the efforts of strategy researchers to grapple with the fact that existing theories of competitive advantage, including conventional resource-based theory (Barney 1991) in addition to those based on industrial organization (Porter 1980) and game theory (Brandenberger and Nalebuff 1995), could not account for the survival and competitiveness of some firms over others during periods of rapid and disruptive change.

While the resource-based view (RBV) accounted for the sustainable competitive advantage of particular firms in relatively stable markets, it faced the problem that rapid changes in technologies, markets, and business models could undermine the value of a firm’s existing capabilities and require the creation of new ones. Teece, Pisano, and Shuen (1997) thus explain that “[t]he development of this framework flows from a recognition by the authors that strategic theory is replete with analyses of firm-level strategies for sustaining and safeguarding extant competitive advantage, but has performed less well with respect to assisting in the understanding of how and why certain firms build competitive advantage in regimes of rapid change.” Eisenhardt and Martin (2000) echoed that the dynamic capabilities framework is designed to explain “why certain firms have competitive advantage in situations of rapid and unpredictable change.” In particular, dynamic capabilities focuses on the challenge managers face in leading organizations through periods of deep, fundamental change characterized by Knightian uncertainty (Teece, Peteraf et al. 2016).

3.1. Methodology

3.2. Research Design

Research design refers to the systematic structure and plan that a researcher employs to conduct a study and address specific research questions. It encompasses the overall strategy outlining how the study will be executed, including the methods used, the process of data compilation, the pathway to reaching logical conclusions, and an acknowledgment of any inherent limitations in the research. In essence, it serves as a blueprint for the entire research process. Wills (2021) emphasizes that a research design is a carefully organized framework that guides the researcher in conducting the study. It outlines the steps involved, the methods of data collection, the analytical procedures, and considerations for mitigating potential biases or limitations. The goal is to ensure that the study is conducted in a systematic and rigorous manner, leading to credible and valid results. In this study, the research design is explanatory, employing a single cross-sectional survey. A survey is a methodical approach for collecting information from a sample to construct quantitative descriptors of the attributes of the

larger population to which the sample belongs (Avedian, 2014). The single cross-sectional design involves collecting information at a single point in time (Churchill and Iacobucci, 2015), offering a snapshot of the group's status at that specific moment. Typically, cross-sectional designs are either explanatory or descriptive, aiming to describe behavior or attitudes (Mathers et al., 2017).

A single cross-sectional survey involves collecting data at one point in time from a sample representing a larger population, aligning with the methodology of this study. The ultimate goal of research is to gather and analyze data for desired outcomes, and the choice of technique should align with the research problem and purpose (Nyberg, 2011). Creswell (2014) emphasizes the importance of researchers questioning their knowledge claims, theoretical perspectives, and methodological strategies to ensure awareness of potential biases and their impact on the chosen approach and data collection tools (Vogt et al., 2012). Research approaches can broadly be categorized as quantitative, qualitative, or mixed methods. This study adopts a quantitative method approach, as the researcher tests hypotheses using inferential statistics. Quantitative research is deductive, where the researcher proposes a theory exemplified in a specific hypothesis, subjected to testing, and conclusions are drawn based on observations and data analysis (Rovai et al., 2014). This approach involves mathematically based methods focusing on surveys to gather numerical data and generalize findings across different groups of people. A quantitative approach is well-suited for examining relationships between variables with a high degree of precision and generalizability (Rovai et al., 2014). In the context of this study, quantitative method will allow for statistical analysis, enabling the examination of the magnitude and significance of the relationships between supply risk management, intellectual capital, risk management capability, and competitive advantage across a larger sample. Quantitative research facilitates the use of objective measures and standardized instruments to assess constructs such as supply risk management, intellectual capital, and competitive advantage (Creswell, 2014). This enhances the reliability and validity of the study, ensuring consistent and comparable data across participants (Rovai et al., 2014).

The study aims to investigate the moderating effects of intellectual capital and risk management capability. Quantitative methods, particularly regression analysis and moderation analysis, provide a robust framework for statistically modeling and analyzing these complex relationships (Hayes, 2018). This approach allows for a nuanced understanding of how these moderating variables influence the relationships between supply risk management and competitive advantage. Quantitative research is efficient for large-scale data collection (Creswell, 2014). Given the multidimensional nature of the study's variables and the desire to capture a diverse range of perspectives, a quantitative approach allows for the collection of data from a sizable sample of firms, contributing to the generalizability of the findings. The study focuses on business-related outcomes such as competitive advantage. Quantitative methods are well-suited for analyzing quantifiable business metrics and outcomes, providing a clear and measurable understanding of the impact of supply risk management and its interaction with intellectual capital and risk management capability on firm performance (Rovai et al., 2014). The adoption of a quantitative research approach aligns with the objectives of precision, generalizability, and statistical modeling required to explore the relationships and moderating effects in the study. This approach

allows for a rigorous examination of the research questions and contributes to the advancement of knowledge in the field.

4.1. Results and Discussions

4.2. Exploratory factor analysis (EFA)

To establish the uni-dimensionality of the measurement items, exploratory factor analysis was conducted in SPSS. Beyond helping to establish unidimensionality, EFA is also a good forerunner to the conduct of the more rigorous confirmatory factor analysis (CFA). The principal components extraction method was chosen, and the rotation method was varimax rotation. According to Kline, (2011), the principal component analysis seeks to examine the total variance and estimate factors as simple linear combinations of the measured indicators. This technique is generally considered less complex and it's also psychometrically sound. The varimax rotation was selected because the aim was to assess the unidimensionality of the measurement items, and so an orthogonal rotation method was preferred to an oblique method.

In providing a distinction between the two methods, Field, (2018) noted that whiles the orthogonal methods (e.g. Varimax, quatermax, equamax) rotate factors while keeping the independent, Oblique rotation methods (Direct oblimin and Promax) allow factors to correlate. The varimax rotation tries to load a smaller number of variables highly onto each factor, resulting in more interpretable clusters of factors (Field, 2018). The combination of principal component extraction and Varimax rotation has been used in several studies (see e.g. Harris and Ogbonna, 2001; Kuvaas and Dysvik, 2010; Michaelis et al., 2015; Rahimnia and Sharifirad, 2015). The EFA results shows that all the sub dimensions of the multi-dimensional constructs loaded together. Hence, supply risk management (risk identification, risk assessment and risk mitigation), risk management capability (robustness and resilience capability), intellectual capital (human capital, structural capital and relational capital) and firm competitive advantage were put together showing four. Overall, items from 9 different constructs were added to the model, made up of 4 general constructs. The initial results showed that the sub dimensions of supply risk management, risk management capability and intellectual capital were loading together, whilst that of firm competitive advantage also loaded as a separate construct. Due to these initial results, and because prior knowledge of the items forming each construct was known beforehand and theoretically validated in other studies, SPSS was instructed to extract 4 components from the data. The extraction method was principal component analysis using the varimax rotation. The results are presented in Table 5.13 below. The Kaiser-Meyer-Olin (KMO) measure of sampling adequacy statistic was 0.964. which is above the minimum threshold of 0.6 (Tabachnik & Fidell, 2013).

Sampling adequacy is the ratio of the sum of correlations to the sum of squared correlations plus the sum of squared partial correlations. The result around 0.964 indicates that the data is factorable and good for factor analysis. Bartlett's test of sphericity is significant (Approx. Chi-square = 7435.689, df = 666) at 1%. Bartlett's test of sphericity tests the null hypothesis that correlations among the items are zero. The significant test indicates that this null hypothesis is rejected and that there exist correlations among the items. Items that did not meet a threshold of 0.4 were taken out and those that loaded on more than one factor were also taken out. After this, as depicted in Table 5.13, the results of the EFA indicate that all items loaded sufficiently on their respective scales and the loading were all above 0.7.

Table 4.1: Results of exploratory factor analysis

Rotated Component Matrix				
	FCA	IC	RMC	SRM
FCA1	0.817435			
FCA2	0.853112			
FCA3	0.8475			
FCA4	0.850116			
FCA5	0.722057			
HC1		0.705503		
HC3		0.753447		
HC4		0.829567		
HC5		0.797611		
RC1		0.816982		
RC2		0.818221		
RC3		0.753953		
RC6		0.767238		
SC1		0.80495		
SC2		0.735136		
SC3		0.733435		
SC4		0.762409		
SC5		0.772528		
REC1			0.85628	
REC2			0.848563	
REC3			0.838558	
ROC1			0.760545	
ROC2			0.821988	
ROC3			0.836292	
ROC4			0.797077	
RA2				0.715217
RA3				0.739802
RI3				0.771986
RI5				0.746998
RI6				0.73024
RI7				0.771592
RM1				0.768166
RM2				0.762274
RM3				0.805467
RM4				0.784336

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .964, Bartlett's test of sphericity (Approx. Chi-Square = 7435.689, df = 666, sig = .000)

4.3. Confirmatory factor analysis (CFA)

Confirmatory factor analysis was used to validate the measurement scales used in the study. The CFA was applied on items that have been retained from the exploratory factor analysis. Amos 23 was employed to conduct the CFA. Following the EFA, 4 constructs were tested, namely supply risk management, risk management capability, intellectual capability and firm competitive advantage. Some items (which had low loading) were removed from their respective scales during the CFA to ensure model fit. Before removing the items, the scales were checked to ensure that the domain of the construct was still captured by the remaining items. Following the removed items, the CFA model showed good fit Chi-square (χ^2) = 1151.839, degrees of freedom (df) = 550, χ^2/df = 2.09, RMSEA = 0.062, IFI = 0.917, CFI = 0.916, SRMR = 0.0431. Items in the model have high (greater than .70) positive loading on the theoretical construct.

The loadings are all statistically significant at 1%. The average variance extracted (AVE) for each construct are higher than the recommended 0.5 threshold (Hair et al, 2014), and this indicates that the unique variance of each scale is more than 50%. The AVE values above 0.5 also indicate that the scales have sufficient convergent validity. Composite reliability (CR) scores and Cronbach's alpha (CA) values for the scales are above 0.7, indicating strong internal consistency among the items in the various scales.

To establish discriminant validity, Hetero Trait Mono Trait (HTMT) was assessed. The results indicate that the HTMT values are below 0.9 indicating sufficient discriminant validity.

Table 4.2: Results of confirmatory factor analysis

	Construct/Measures (Composite reliability; Average variance extracted; Cronbach alpha)	Loadings	T-value
	Firm competitive advantage (CA = 0.877, AVE = 0.672, CR = 0.911)		
FCA1		0.817	Fixed
FCA2		0.853	14.306
FCA3		0.848	14.165
FCA4		0.850	14.353
FCA5		0.722	10.95
	Supply Risk Management (CA = 0.919, AVE = 0.578, CR = 0.932)		
RI3		0.772	Fixed
RA2		0.715	12.182
RA3		0.740	11.795
RI5		0.747	12.658

RI6		0.730	11.152
RI7		0.772	11.75
RM1		0.768	12.482
RM2		0.762	12.614
RM3		0.805	13.495
RM4		0.784	13.037
	Risk Management Capability (CA = 0.921 , AVE = 0.678 , CR = 0.936)		
ROC1		0.761	Fixed
ROC2		0.822	12.713
ROC3		0.836	12.65
ROC4		0.797	12.239
REC1		0.856	13.118
REC2		0.849	13.091
REC3		0.839	12.893
	Intellectual Capital (CA = 0.944 , AVE = 0.599 , CR = 0.951)		
HC1		0.706	Fixed
HC3		0.753	11.737
HC4		0.830	13.016
HC5		0.798	12.452
SC1		0.805	12.271
SC2		0.735	11.206
SC3		0.733	11.102
SC4		0.762	11.586
SC5		0.773	11.966
RC1		0.817	12.58
RC2		0.818	12.551
RC3		0.754	11.494
RC6		0.767	11.696
	Model fit Indices		
Chi-square = 1151.839, degrees of freedom (df) = 550, Chi-square/df = 2.09, RMSEA = 0.062, IFI = 0.917, CFI = 0.916, SRMR = 0.0431			
Notes: CA = Cronbach's alpha, CR = Composite reliability, AVE = Average Variance Extracted.			

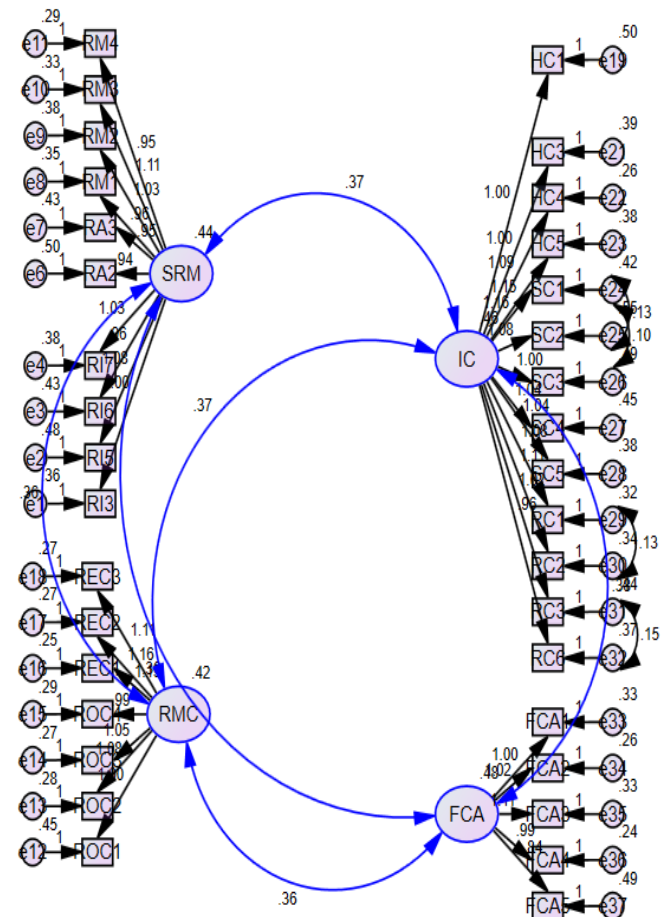


Figure 4.1: CFA results

5.0. Examination of construct validity

Validating the measurement constructs is an important and necessary part of the research process (Schwab, 1980). According to Hair et al, (2014) construct validity refers to the extent to which the indicators are a reflection of the theoretical latent constructs they are expected to measure. Thus, construct validity is concerned with the extent to which the construct's measures (indicators) are sufficient measures of the intended concept. That is the extent to which the measured constructs are free from measurement errors (O'Leary-kelly & Vokurka, 1998). Four aspects of construct validity – content, convergent, discriminant, and nomological are assessed in this study, and the CFA process together with other techniques have been used to demonstrate these forms of validity.

5.1.1. Content Validity

Generally, content validity is concerned with the extent to which the measurement indicators in an instrument reflect the content universe for which the instrument is generated (Mackenzie et al., 2011). It is considered by many as the most important test of validity because its not possible to specify measurement theory if one does not understand the content of the items (Hair et al., 2014). Most often, content validity is established using the opinion of experts, and not statistical analysis (Kline, 2011). In this study, I established content validity in three ways. First, the measurement items were largely adapted from the literature following a critical review (Sousa & Bradley, 2006). Second, a team of peer researchers was invited to scrutinize and provide their views of the suitability of the items to the study's context. Following the guidelines of (Mackenzie et al., 2011) the peer researchers were tasked to undertake two specific analyses – (1) to assess if an individual item is representative of an aspect of the construct's

domain and (2) if the items altogether capture the entire domain of the construct. Third, a pilot study was also conducted and the feedback was used to improve the suitability of the items to the study context. Using these procedures, the researcher concluded that the items have content validity.

5.1.2. Convergent Validity

Convergent validity examines the degree of correlation between measures of the same construct (Hair et al., 2014). Researchers demonstrate convergent validity when the indicators of a construct have a high proportion of shared variance. In the literature, convergent validity has been demonstrated often using positive and significant factor loadings (Morgan et al., 2004) Average variance extracted (AVE) values above 0.5 (O’Leary-kelly & Vokurka, 1998; Son et al., 2016), and Composite reliability (Hong et al., 2020). In this study, all the retained items loaded positively and significantly at 1% on their respective constructs, and factor loadings were above 0.7. Again, all AVE values were above the threshold of 0.5. Further, the composite reliability scores were all above 0.7. Based on these results, there is sufficient demonstration of convergent validity among the study’s constructs.

5.1.3. Discriminant Validity

Discriminant validity is the degree to which two conceptually similar concepts are distinct (Hair et al., 2014). Thus, it is a measure of the extent to which the underlying factor of one construct differs from the others. In this study, I demonstrate discriminant validity in two ways. First, evidence from the exploratory factor analysis indicates that all items loaded respectively on their constructs, and cross-loadings were minimal (SPSS was set to ignore all loadings below 0.4). Second, the Hetero Trait Mono Trait (HTMT) ratio (Henseler et al., 2015) was used. HTMT is a criterion to verify that a construct exhibits stronger relationships with its own indicators than with other constructs. It uses the heterotrait-monotrait ratio of correlations (HTMT) to calculate the discriminant validity index. An HTMT value of less than 0.9 establishes discriminant validity. As depicted in table 5.15, the highest value is 0.836, meaning discriminant validity is established.

Table 4.3: Hetero Trait Mono Trait (HTMT) – Matrix

	FCA	IC	RMC	SRM
FCA				
IC	0.806			
RMC	0.799	0.837		
SRM	0.794	0.824	0.836	

5.1.4. Nomological Validity

When a construct demonstrates acceptable convergent and discriminant validities, the test of the structural model then constitutes a confirmatory assessment of nomological validity (Anderson & Gerbing, 1988). Nomological validity in this study is indicated by the good fit of the OLS (process) regression models (Aker et al., 2016; Kitsis & Chen, 2019). According to (Hair et al., 2014), examining the correlations among constructs in the measurement theory can be used to assess nomological validity. This study uses both approaches in establishing nomological validity for the study. First, Table 5.20 above shows the inter-construct correlation between the study’s main variables is

statistically significant. Second, the model fit results for all the estimated models are satisfactory.

5.1.5. Common method bias (CMB)

Common method bias has been acknowledged as a potential problem in all behavioral studies (Podsakoff et al., 2003). CMB is a major source of measurement error (Podsakoff et al., 2012) and studies that use self-reported measures are prone to common method bias (Craighead et al., 2011). Because this study used self-reported measures and cross-sectional data, several steps were taken to deal with common method bias. Following recommendations in (Podsakoff et al., 2012), procedural and statistical remedies were taken to deal with the potential of CMB. It is worth noting that one of the key procedural remedies for dealing with CMB is using different respondents/sources for the criterion and predictor variables. This method has been used in some studies (see e.g. Carmeli et al., 2011; Wang et al., 2015).

However, that cannot be applied to this study, as it is conducted to capture the beliefs and judgment of individuals (Podsakoff et al., 2012). In this study, the procedural steps taken to deal with CMB are explained as follows. First, all questionnaire items were thoroughly reviewed to deal with ambiguous statements or questions, that can cause respondents to be uncertain about how to respond to the content, and may lead to idiosyncratic interpretations. Second, different scale formats (anchor labels) were used in the questionnaire item to eliminate common scale properties that may cause “probability that cognitions generated in answering one question will be retrieved to answer subsequent questions.” (Podsakoff et al., 2012). Third, respondents were assured of the confidentiality of their responses the promised anonymity helped to attenuate the possibility of evaluation apprehension which could cause respondents to give responses that they consider as socially desirable.

Several statistical remedies for dealing with CMB have been reported in the wellbeing literature. These include the use of one factor CFA measurement model (Ogbonnaya & Messersmith, 2018) and Harman’s one-factor test (Kuvaas & Dysvik, 2010; Zhang et al., 2013). In this study, I used both Harman’s one-factor test and the latent factor CFA model (Cooke et al., 2016; Jyoti & Rani, 2019) to statistically test for common method bias.

Harman’s one-factor test was conducted using exploratory factor analysis. All the measurement items for the various constructs were entered in an EFA model. The principal component extraction method was selected and the solution was unrotated. The results indicate that the first factor accounted for only 23.65% of the variance, which is below the maximum threshold of 50%. Also, the solution delivered 4 factors, which indicates that multiple factors exist in the data and common method variance is not present in the data.

The latent factor model was executed following the CFA approach developed by Cote & Buckley, (1987). Harman’s one-factor technique has been labelled “insensitive” (Podsakoff et al., 2003) and the latent factor approach is more robust. In this approach, I tested three competing models. In model 1, I estimated a trait-only model where all the indicators (of the various constructs) were loaded on a single latent factor. In model 2, a method only model where the items were loaded on their respective latent constructs. In the third model, a combination of the method and trait models is implemented. The results are presented in Table 5.17.

Table 4 .4: Results of common method variance test

Measurement model	χ^2	DF	χ^2/DF	RMSEA	SRMR	IFI	CFI
Measurement set 1 (method-only CMB)	1754.54	356	4.928	0.187	0.156	0.634	0.633
Measurement set 2 (trait-only CMB)	1151.84	550	2.09	0.062	0.043	0.917	0.916
Measurement set 3 (method and trait CMB)	1084.13	549	1.975	0.059	0.0766	0.926	0.926

From the results, the trait-only model (where the items are loaded onto their respective constructs) provides better fit results in comparison with the method-only model and the combined method and trait model. Again, the method-only model provides a very poor fit of the data, which indicates that the items do not represent a single factor. These results suggest that common method bias is not an issue in this study.

Table 4.5: Summary of results.

Hypothesis	Path	<i>B</i>	t-value	Remarks
H1	SRM → FCA	.232	3.369	Supported
H2	SRM x IC → FCA	-.081	-2.515	Not supported
H3	SRM x RMC → FCA	.215	2.641	Supported
H4	SRM x (IC x RMC) → FCA	.038	1.303	Not supported

SRM = Supply Risk Management, FCA = Firm Competitive Advantage, IC = Intellectual Capital, RMC = Risk Management Capability.

From the hypothesis tests, the relationship between t supply risk management and firm competitive advantage was statistically significant leading to the acceptance of hypothesis one. The tests have also revealed that intellectual capital moderates the relationship between supply risk management and firm competitive advantage negatively whiles risk management culture moderates the relationship between supply risk management and firm competitive advantage positively. These provided support for hypotheses three and a rejection of hypothesis two.

The findings also reveal that intellectual capital and risk management capability together does not moderate the relationship between supply risk management and firm competitive advantage, hence hypothesis four is rejected.

6.0. DISCUSSION OF RESULTS AND CONCLUSION

6.1. Discussion of the Results

The study sought to achieve three objectives. First, the study sought to examine the relationship between supply risk management and firm competitive advantage. Secondly, the study sought to examine the moderating role of intellectual capital in the relationship between supply risk management and firm competitive advantage. Lastly, the study sought to examine the moderating role of risk management capability in the relationship between supply risk management and firm competitive advantage. In achieving these objectives, the study made four hypothesis, first supply risk management has a positive influence on firm competitive advantage, secondly, intellectual capital positively moderates the relationship between supply risk management and firm competitive advantage, third, risk management capability positively moderates the relationship between supply risk management and firm competitive advantage and lastly, both intellectual capital and risk management culture jointly positively moderates the relationship between supply risk management and firm competitive advantage. The findings of the study are discussed below.

The Relationship Between Supply Risk Management and Firm Competitive Advantage

In the pursuit of the primary objective of this study, which was to delve into the intricate relationship between supply risk management (SRM) and firm competitive advantage, a hypothesis was formulated, suggesting that SRM positively influences firm competitive advantage. Through meticulous study design and thorough data analysis, the results unequivocally validated this hypothesis, providing compelling evidence that effective supply risk management indeed contributes to the enhancement of firm competitive advantage.

These findings shed light on the critical role of supply risk management in bolstering competitive positioning. Specifically, the results demonstrate that as firms adeptly manage supply risk, they are better equipped to leverage opportunities and navigate challenges in the competitive landscape (Nguyen et al., 2024). The ability to identify, assess, and mitigate supply risk emerges as a pivotal factor in gaining and sustaining a competitive edge in the marketplace. This underscores the strategic significance of integrating robust supply risk management practices into organizational frameworks.

Moreover, the resonance of these findings within the framework of the Dynamic Capabilities Theory adds further depth to their significance (Teece, 2007). According to this theoretical perspective, organizations must cultivate dynamic capabilities — encompassing adaptability, innovation, and effective responsiveness to evolving environments — to thrive amidst market turbulence. Within the realm of SRM, these dynamic capabilities manifest in the organization's proactive approach to identifying, evaluating, and mitigating supply chain risks. By fostering resilience and strategic agility, organizations can effectively navigate uncertainties and capitalize on emerging opportunities, thus fortifying their competitive standing in dynamic market conditions.

Overall, these results underscore the strategic imperative for organizations to prioritize supply risk management as a means to

bolster competitive advantage. They highlight the need for continuous adaptation and innovation in response to evolving market dynamics, emphasizing the role of dynamic capabilities in driving sustained success in today's volatile business landscape (Shou et al., 2018). By embracing effective SRM practices and cultivating dynamic capabilities, organizations can position themselves for long-term competitiveness and resilience in the face of uncertainty.

The Moderating Role of Intellectual Capital

The second hypothesis posited a positive moderating role of intellectual capital in the relationship between supply risk management and firm competitive advantage. The results however showed a negative moderating role of intellectual capital in the relationship between supply risk management and firm competitive advantage. The negative moderation of the relationship between supply risk management (SRM) and firm competitive advantage by intellectual capital suggests that the presence of high levels of intellectual capital within an organization diminishes the positive impact of SRM practices on competitive advantage. This result is counter intuitive, as it contradicts a number of studies. For instance, Khan and Ali (2017) found intellectual capital to positively moderate the relationship between enterprise risk management and firm performance. Even though the finding is counter intuitive, it may be drawing our attention to some empirical nuances. These results could mean that despite possessing significant intellectual capital, organizations may still harbor cognitive biases and blind spots that limit their ability to effectively manage supply chain risks (Luthra and Muhr, 2023). Intellectual capital may create a false sense of security, leading organizations to underestimate the severity of potential risks or overlook emerging threats, ultimately undermining their competitive advantage. Again, organizations with high levels of intellectual capital may face challenges in effectively allocating resources to support SRM initiatives (Borner et al., 2023). While intellectual capital is valuable, it may compete with other organizational priorities for resources such as financial investments, technology upgrades, or talent development, limiting the organization's ability to fully leverage SRM practices to enhance competitive advantage.

The Moderating Role of Risk Management Capability

The third hypothesis of the study posited a positive moderating role of risk management capability on the relationship between supply risk management and firm competitive advantage. The findings show that risk management capability positively moderates the relationship between supply risk management and firm competitive advantage. This means that as the risk management capability is higher, supply risk management better influences firm competitive advantages. This result is significant when viewed through the lens of contingency theory, which emphasizes the importance of aligning organizational practices with contextual factors to achieve optimal outcomes. In this context, risk management capability serves as a contingent factor that enhances the effectiveness of SRM practices. These findings align with that of Singh (2020).

The Joint Moderating Role of Intellectual Capital and Risk Management Capability

The last hypothesis posited a positive moderating joint role of intellectual capital and risk management capability on the relationship between supply risk management and firm competitive management. The results shows that the joint moderating role of intellectual capital and risk management capability on the

relationship between supply risk management and firm competitive advantage. The insignificant moderating role of joint intellectual capital and risk management capability could mean that the inefficient management of intellectual capital offsets the positive influence of risk management capability.

6.2. Theoretical Implications

The study sought to achieve three objectives. First, the study sought to examine the relationship between supply risk management and firm competitive advantage. Secondly, the study sought to examine the moderating role of intellectual capital in the relationship between supply risk management and firm competitive advantage. Lastly, the study sought to examine the moderating role of risk management capability in the relationship between supply risk management and firm competitive advantage. The findings of the study has a number contributions to literature.

The study makes a distinctive contribution to existing literature by shifting the focus from general risk management to a more specialized examination of supply risk management. While many studies address risk management broadly, this research delves into the unique challenges and opportunities presented by supply chain risks. By honing in on supply risk management, the study provides a nuanced and detailed understanding of how risks within the supply chain landscape impact competitive advantage. This specificity allows for a deeper exploration of the intricacies involved in managing risks within the supply chain, including supplier disruptions, inventory shortages, and logistics bottlenecks, among others. By elucidating the mechanisms through which supply risk influences competitive advantage, the study offers valuable insights that can inform strategic decision-making and operational practices in organizations across various industries.

Additionally, the study unveils a counterintuitive finding: the negative moderation effect of intellectual capital on the relationship between supply risk management and firm competitive advantage. This unexpected outcome challenges conventional wisdom and underscores the complex interplay between intellectual capital, risk management, and competitive advantage. By shedding light on this nuanced relationship, the study advances the discourse within the risk management literature, offering valuable insights into the role of intellectual capital in shaping organizational outcomes. The discovery of this negative moderation effect prompts a re-evaluation of traditional perspectives on the management of intellectual capital within the context of supply chain risk. Rather than viewing intellectual capital solely as a facilitator of competitive advantage, the study suggests that its impact may be contingent upon various factors, including its interaction with supply risk management practices. This nuanced understanding highlights the need for organizations to carefully consider how they leverage intellectual capital to enhance their resilience and competitiveness in the face of supply chain disruptions.

6.3. Practical Implications

The findings of this study carry significant managerial implications. First, organizations should carefully consider how they allocate and leverage their intellectual capital resources. While intellectual capital is valuable for driving innovation and competitiveness, its indiscriminate application may inadvertently hinder the effectiveness of supply risk management practices. Therefore, organizations should adopt a strategic approach to the allocation of intellectual capital, ensuring that it is directed towards

areas where it can enhance, rather than detract from, the effectiveness of risk management efforts.

Also, organizations need to strike a balance between leveraging intellectual capital to drive innovation and managing supply chain risks effectively. Rather than viewing intellectual capital and risk management as separate domains, organizations should integrate these functions into a cohesive strategy that maximizes the benefits of intellectual capital while mitigating the potential downsides in terms of risk exposure. This requires a holistic approach to risk management that considers the broader organizational context and aligns intellectual capital investments with risk management objectives.

Furthermore, organizations should prioritize investments in robust SRM practices to proactively identify, assess, and mitigate supply chain risks. This includes implementing risk assessment methodologies, establishing contingency plans, and fostering collaboration with suppliers to enhance supply chain visibility and responsiveness. By investing in SRM practices, organizations can safeguard their operations against disruptions and strengthen their competitive position in the marketplace.

Again, organizations should strategically evaluate their sourcing decisions to minimize supply chain risks and maximize competitive advantage. This may involve diversifying supplier portfolios, sourcing from multiple geographic regions, and adopting dual-sourcing strategies to mitigate the impact of potential disruptions. By strategically sourcing materials and components, organizations can enhance supply chain resilience and maintain a competitive edge in the face of uncertainty.

6.4. Limitations and recommendations for Future Research

While the findings of this study offer valuable insights into the relationship between supply risk management (SRM) and competitive advantage, it is essential to acknowledge that, like any research endeavor, this study has its limitations. Identifying and acknowledging these limitations is crucial as it not only enhances the transparency and credibility of the research but also provides a roadmap for future investigations to further refine our understanding of this critical issue.

One limitation of this study is its focus on a specific set of contingency variables, namely intellectual capital and risk management capability, in conditioning the relationship between SRM and competitive advantage. While these variables were deemed relevant based on existing literature and theoretical frameworks, it is important to recognize that there may be additional variables that could also influence this relationship. For instance, organizational culture, supply chain structure, technological infrastructure, and market dynamics are potential variables that warrant consideration in future studies

Once more, the findings of this study reveal a counterintuitive result: the negative moderation effect of intellectual capital on the relationship between supply risk management (SRM) and firm competitive advantage. This unexpected outcome challenges conventional assumptions and underscores the complexity of the relationship between intellectual capital, risk management, and organizational performance. As such, future studies are encouraged to delve deeper into the nuances of intellectual capital within the context of risk management to better understand the underlying mechanisms at play. Given the unexpected nature of this result, it is imperative for future research to explore various dimensions of

intellectual capital that may influence its interaction with SRM and firm competitive advantage. For example, studies may examine the specific components of intellectual capital, such as human capital, structural capital, and relational capital, and their respective impacts on risk management practices and organizational outcomes. Understanding how different facets of intellectual capital contribute to or inhibit effective risk management can provide valuable insights for organizations seeking to optimize their strategies.

Moreover, it's important to note that data for this study was collected through a cross-sectional survey. While this methodology allows for the examination of relationships at a single point in time, it inherently limits the ability to infer causality. Therefore, future studies may benefit from undertaking a longitudinal study to confirm the causal relationships among the variables under investigation. By employing a longitudinal approach, researchers can track changes in intellectual capital, supply risk management practices, and firm competitive advantage over time. This enables a more comprehensive analysis of how variations in these factors influence one another and how they ultimately impact organizational performance.

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