

LEVERAGING RISK-AFFECTING WAREHOUSING AND INVENTORY PRACTICE IN ASEAN REGION: CAMBODIAN SMEs PERSPECTIVE

Molika Mon*, Poti Chaopaisarnhaopaisarn

1 * Logistics Engineering and Supply Chain Management Program,
Department of Industrial Engineering

Faculty of Engineering Chiang Mai University, Chaing Mai, Thailand.

Tel: (+66) 62-2019139, Email: molika_mon@cmu.ac.th

2 Supply Chain Engineering Management Research Unit,

Faculty of Engineering, Chiang Mai University, Chiang Mai, Thailand.

Tel : (+66) 53-944125, E-mail : poti@eng.cmu.ac.th

ABSTRACT

Purpose: This study aims to investigate the impact of supply chain risk management (SCRM) on the inventory and warehousing practices of small and medium-sized enterprises (SMEs) in the retail sector prior and post pandemic in Cambodia.

Approach: The research employs a combination of quantitative and qualitative approaches to gain a comprehensive understanding of the dynamics within the Cambodian retail industry. The research methodology involves a questionnaire survey to collect data from SMEs in the Cambodian retail sector, followed by exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to uncover the underlying dimensions of supply chain risk and their relationships. Structural equation modeling (SEM) is then utilized to develop a comprehensive SCRM framework for Cambodian retail SMEs.

Finding: The findings of this research include addressing the logistics challenges and supply chain risk management issues in the warehousing and inventory practices of Cambodian SMEs, suggesting improvements to domestic inbound logistics in Cambodia, and understanding the causal relationships between factors related to SME retail business and supply chain risk management.

Practical implication: This study is expected to contribute to academic knowledge in the field of supply chain management and provide practical insights to help Cambodian retail SMEs enhance their supply chain risk management capabilities, optimize their inventory and material handling activities, and improve their overall competitiveness in the market.

Originality: The study specifically targets Cambodian SMEs in retail sector, on developing country context that may contribute to the understanding of supply chain risk management challenges faced by small enterprises. This can provide practical recommendation for improving logistics activities in Cambodia, aligned with current industry standards.

Keyword: Supply Chain Risk management, Small and Medium Enterprises, Retail sector, Inventory and material handling activities challenges prior and post-pandemic.

Introduction

In today's globalized market, characterized by intense competition, rapid changes, and various risks, businesses must swiftly adapt and effectively manage risks to remain competitive (Kubičková and Toulová, 2013). The issue of Risk Management (RM) has been a longstanding concern, with extensive research conducted over the years, particularly in supply chain management. Historical economic crises, such as those in 1998 and 2008, along with corporate scandals like Barings Bank (1995), Enron (2001), and WorldCom (2002), have brought significant attention to enterprise risk management (ERM) among scholars and industry professionals (Alawattegama, 2017). This focus has led to the development of supply chain risk management (SCRM), an innovative approach that integrates both financial and operational decision-making aspects.

While supply chain management has gained momentum, its adoption varies across regions, especially in developing countries. Many enterprises in these regions have yet to implement formal supply chain management practices. Despite the ongoing challenges, two primary sources of risk in supply chain

management—supply and demand—have been identified (Blos et al., 2009). Scholars agree that companies can only minimize, not entirely eliminate, supply chain risks, recognizing that losses may be unavoidable during unforeseen events. Nonetheless, adopting SCRM has proven effective in significantly reducing losses and damages (Blos et al., 2009).

Small and Medium-sized Enterprises (SMEs) are often managed by owners without formal management training (Millers and Gaile-Sarkane, 2021). In Cambodia, a developing country within ASEAN, approximately 40% of its 510,000 businesses are SMEs in the retail sector (Sambath, 2021). These enterprises have faced unexpected crises, particularly due to the global pandemic. To enhance the resilience of Cambodia's SMEs against potential disruptions, this study aims to improve their efficiency by addressing gaps in logistics activities, especially in warehouse and inventory management. Specifically, the focus will be on inbound logistics of SMEs to better understand potential risk factors.

Small, and Medium Enterprises (SMEs) are vital to global economies, especially in developing nations (Rahadi, 2016). They make up the majority of businesses worldwide, contributing significantly to job creation and economic development. SMEs account for about 90% of businesses and provide over 50% of global employment (Bank, 2019). However, the prolonged effects of the COVID-19 pandemic have led to closures and survival struggles for many enterprises, even within the same industry (Gupta et al., 2024). These risks, including natural disasters and man-made disruptions, hinder their adaptability due to limited resources and operational experience (Skouloudis et al., 2023). This vulnerability has been exacerbated by crises like COVID-19. The purpose of this study is to examine SMEs risk factors and challenges affecting warehousing and inventory practices prior and post-pandemic in Cambodia. The study answers the following research question:

1. What are the risk factors and challenges impacting warehousing and inventory practices, and how do these factors influence each other?
2. How did the risks faced by SMEs change before and after the COVID-19 pandemic?
3. What is the degree of risks affecting SMEs in the retail sector in Cambodia, and how can data analysis reveal these impacts?

To answer above question, questionnaire survey will be utilized to collect responses from the SME retail sector in Cambodia, specifically targeting participants found in Facebook groups. Additionally, factor analysis will be employed to assess the impact of risks on warehousing and inventory practices.

Literature Review

Small, and Medium Enterprises (SMEs) are vital to Cambodia's economic landscape, contributing significantly to employment and GDP. Approximately 40% of the 510,000 registered businesses operate within the retail sector, underscoring the importance of these enterprises in driving economic growth. However, despite their critical role, SMEs face numerous risks that threaten their sustainability and operational efficiency. The challenges face by SMEs in Cambodia are diverse and complex. Key issues include supplier disruptions, natural disasters, geopolitical tensions, demand fluctuations, and cybersecurity threats (Tukamuhabwa et al., 2017). The COVID-19 pandemic intensified these challenges, leading to operational disruptions, increased costs, and business closures. Many SMEs lacked the resilience to adapt to the rapidly changing environment, resulting in significant economic setbacks (Gupta et al., 2024).

In Cambodia, the classification of SMEs is based on factors such as employee count, turnover, and capital investment, which vary significantly across sectors (D.K.Nema, 2021). For instance, while some SMEs operate in agriculture, others are involved in industry and services. This diversity means that risk exposure can differ widely, with the retail sector particularly vulnerable due to its reliance on consumer demand and supply chain stability (Kosalsereyvuth and Julien, 2021). Cambodia's supply chain framework faces systemic challenges, including inadequate infrastructure, regulatory complexities, and logistical constraints (Hang, 2013). These challenges compel SMEs to adapt their supply chain strategies to navigate obstacles effectively. For example, many SMEs struggle with inventory management, often leading to stockouts or overstocking, which can tie up capital and reduce profitability (Hamza Kasim, 2015). The lack of expertise in supply chain management further intensifies these issues, making it difficult for small businesses to implement effective inventory control measures (Rubel, 2021).

Moreover, the COVID-19 pandemic highlighted the vulnerabilities in supply chains, as lockdowns and restrictions disrupted the flow of goods and services. Many local businesses faced delays in raw material deliveries, production bottlenecks, and distribution challenges, severely impacting their operational performance (Sambath, 2021). This situation necessitated a reevaluation of risk management practices among SMEs in Cambodia. To counter these challenges, it is essential for SMEs to adopt comprehensive risk management strategies. Enhancing supply chain resilience is crucial, particularly through improved inventory management practices. Effective inventory management helps prevent stockouts and minimizes excess inventory costs, ensuring that products are available to meet customer demand (Lenny Koh et al., 2007). Furthermore, implementing better forecasting techniques can aid SMEs in anticipating demand fluctuations and adjusting their inventory levels accordingly.

Investing in technology is another critical strategy for improving supply chain operations. Digital tools can streamline logistics, enhance communication with suppliers, and provide real-time data on inventory levels (Dallasega et al., 2022). By leveraging technology, SMEs can gain better visibility into their supply chains and respond more effectively to disruptions. Collaboration among stakeholders is also vital in mitigating risks associated with supply chain disruptions. Establishing partnerships with local suppliers, logistics providers, and even other SMEs can create a more resilient network capable of weathering challenges (Salleh Hudin et al., 2017). This collaborative approach allows for shared resources and knowledge, enabling SMEs to navigate complexities more effectively.

Research indicates that a structured approach to risk assessment can significantly enhance the performance of SMEs in Cambodia (Chen et al., 2013). Utilizing methods such as exploratory factor analysis (EFA) enables businesses to identify and prioritize risk factors, allowing them to focus on critical areas that require immediate attention (Piyanush Toptompong and Piromsopa, 2018). This method provides a clearer understanding of the relationships between various risk dimensions, facilitating the development of targeted risk management strategies.

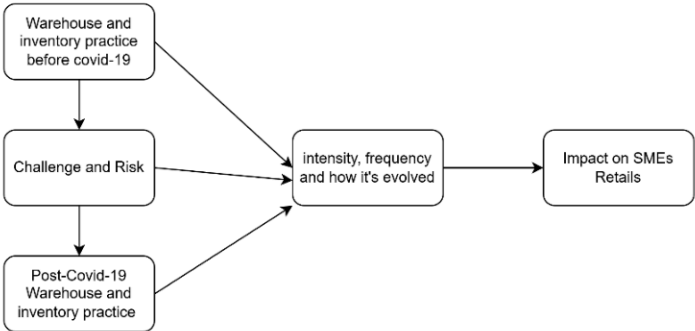


Figure 3. How warehouse and inventory practice impact on SMEs

The diagram above outlines the relationship and impact between warehouse and inventory practices before and after COVID-19. It highlights the challenges and risks faced by warehouses, such as supply chain disruptions and inefficiencies. Post-pandemic practices have adapted to address these issues, leading to changes in operational intensity and frequency. The implications of these shifts are particularly significant for Small and Medium Enterprises (SMEs) in the retail sector, affecting their operations and overall challenges. Additionally, training and capacity-building initiatives are essential for equipping SMEs owners and employees with the necessary skills to manage risks effectively. By fostering a culture of continuous learning, SMEs can enhance their operational resilience and adaptability in the face of emerging challenges. While SMEs in Cambodia face significant risks that threaten their sustainability and growth, strategic interventions can strengthen their resilience. By adopting improved inventory management practices, investing in technology, fostering collaboration, and implementing structured risk assessment processes, SMEs can better navigate the complexities of the Cambodian market. These measures not only enhance operational efficiency but also contribute to the overall economic stability of the country, ensuring that SMEs continue to play a vital role in Cambodia's economic development.

Methodology

The methodology of this study focuses on analyzing the challenges and risks in warehousing and inventory practices within SMEs in Cambodia's retail sector. The research uses a mixed-method approach combining both quantitative and qualitative techniques to ensure comprehensive data collection and analysis. For the quantitative part, data was gathered primarily through structured questionnaires and surveys, targeting SMEs in Cambodia. The surveys assess constructs such as post-pandemic challenges, cyber risks, and interconnection and material flow transparency, using a five-point Likert scale (Hair J.F, 1998) . To achieve this, the research employs Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). EFA is utilized to identify and explore the underlying relationships between observed variables, such as risks associated with supply chains, which are not initially known. Once these relationships are uncovered, CFA is then applied to validate and confirm the hypothesized structure of these connections, ensuring the reliability of the findings (Byrne, 2010). A pilot test was conducted to refine the questions and ensure clarity before distributing the survey to the broader target group. The goal is to achieve a sample size of at least 200 respondents, all of whom meet the criteria for being SMEs in retail. For the qualitative part, in-depth interviews with SME owners and key stakeholders were conducted to gather insights on their experiences and the challenges they face. This allowed for a deeper understanding of the operational dynamics within the sector.

Table 7 Construct items factor in dimensions before and post-pandemic.

Items	References
Prior Pandemic	
PPF1: Natural Disaster	(Rahadi, 2016)
PPF2: Geopolitical risk	
PPF3: Warehouse and inventory storage	(Thun et al., 2011)
PPF4: there overcapacity in transportation	
PPF5: Supplier with high quality product	
Post-Pandemic Challenges	
PECF1: Decreasing in Customer Purchasing Power	(Anatan, 2021) (Chen et al., 2013)
PECF2: Financial and Funding Management	
PECF3: Delivery speed	
PECF4: Customer satisfaction	
Interconnection and Material Flow Transparency	
IMFTR1: Product tracking	
IMFTR2: Customer supplier connection	(Dallasega et al., 2022) (Oyegoke et al., 2023)
IMFTR3: Inventory transparency	
IMFTR4: Material cost increase	
IMFTR5: Communication issues	

<p>Cyber Risk</p> <p>CRF1: operating system of the computer</p> <p>CRF2: Website server compromise</p> <p>CRF3: Portable devices in the company (i.e. laptop, mobile phone or tablet)</p> <p>CRF4: knowledge awareness regarding IT security threats</p> <p>CRF5: Lack of Contingency</p>	<p>(Amrin, 2014)</p>
--	-----------------------------

In terms of data analysis, the study employs statistical tools such as SPSS and Structural Equation Modelling (SEM) using AMOS to examine the relationships between variables, supported by factor analysis to explore latent structures. Additionally, Microsoft Excel was used for initial data organization and exploratory analysis, including visualization techniques like pivot tables and charts. This comprehensive approach ensures that the findings are reliable and valid, providing valuable insights into the risks that SMEs in Cambodia face, especially concerning warehousing and inventory practices.

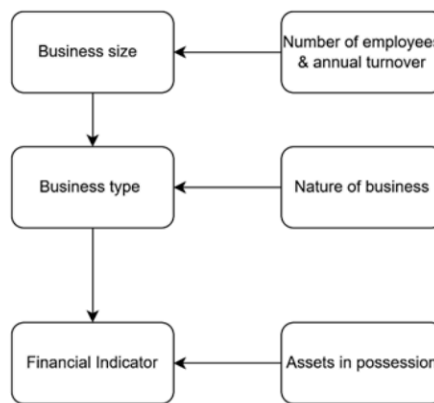


Figure 4 Designed Filter in Questionnaires

The study draws on an extensive literature review to identify key factors and constructs relevant to supply chain risk and uncertainty. This includes risks such as natural disasters, geopolitical challenges, and technological disruptions, all of which have been identified as critical to the operational efficiency of SMEs in Cambodia (Chen et al., 2013). The statistical models developed from this data are grounded in both empirical research and theoretical frameworks (Dallasega et al., 2022). This ensures that the models are robust and capable of providing meaningful insights into supply chain dynamics. An essential part of the methodology is the categorization of risks into manageable types, such as natural disasters, geopolitical risks, and technology-related uncertainties. These categories are crucial for understanding the vulnerabilities faced by SMEs (Salleh Hudin et al., 2017). By categorizing and analyzing these risks, the study provides a comprehensive view of the challenges that impact inventory management, logistics, and overall supply chain resilience.

Result: Leveraging Risk-Affecting Warehousing and Inventory Practice

The research focused on analyzing the challenges and risks associated with warehousing and inventory management practices among SMEs in Cambodia's retail sector. The findings revealed significant trends in how SMEs manage their supply chains, particularly in response to challenges that have intensified during and after the COVID-19 pandemic. The quantitative analysis, using data from questionnaires and surveys, highlighted several critical factors that influence SMEs' ability to manage risks effectively. Among these, post-pandemic challenges stood out, with many businesses reporting difficulties in transitioning from traditional sales methods to digital platforms. This transition brought

about a need for better interconnection and material flow transparency, as online sales require more sophisticated tracking and inventory management systems (Varma and Dutta, 2022). Additionally, cyber risks emerged as a significant concern, as the shift to digital platforms made businesses more vulnerable to cyberattacks and data breaches, further complicating supply chain operations (Chen et al., 2013). The data indicated that SMEs are particularly vulnerable to supply chain risks due to their limited resources and lack of advanced management systems. For instance, over 65% of respondents cited issues with inventory management and stockouts, which disrupted their ability to meet customer demand. In addition, 43% of businesses reported an increase in operational costs due to inefficient warehousing practices, such as overstocking or disorganization, which further exacerbated their financial vulnerabilities.

The qualitative interviews conducted with key stakeholders and business owners provided deeper insights into these quantitative findings. Many participants emphasized the challenge of maintaining sufficient inventory levels during the pandemic due to disruptions in both local and international supply chains. They also noted that geopolitical factors, such as regional trade restrictions, made it difficult to source materials reliably. Several business owners expressed concerns about the high cost of implementing new digital tools and systems necessary for efficient inventory tracking and warehousing operations. The Structural Equation Modelling (SEM) analysis confirmed the strong relationship between inadequate warehousing practices and increased supply chain risks. The results showed that businesses with poor inventory management systems were more likely to experience delays, stockouts, and higher operational costs. Furthermore, businesses that adopted digital tools for supply chain transparency reported improved performance, with more than 70% of these businesses noting better inventory control and fewer disruptions.

The research also highlighted the significant impact of external risks, such as natural disasters and geopolitical issues, on SMEs' supply chain performance. Businesses that were better equipped with resilient supply chain strategies, such as diversified sourcing and flexible warehousing, fared better in mitigating the effects of these risks. However, the majority of respondents expressed a need for more government support and financial assistance to adopt these strategies. The results of this study demonstrate that while SMEs in Cambodia's retail sector face substantial supply chain risks, particularly in warehousing and inventory management, there are clear opportunities for improvement through the adoption of digital tools and more robust risk management strategies. These findings offer practical insights that can guide SMEs in enhancing their resilience to supply chain disruptions in an evolving business landscape.

Discussion and Conclusion

The findings of this study provide a comprehensive analysis of supply chain risks faced by Cambodian SMEs in the retail sector, especially regarding warehousing and inventory management. The study demonstrates that Cambodian SMEs are particularly vulnerable to risks such as natural disasters, geopolitical tensions particularly post-pandemic challenges, cyber risks, and interconnection and material flow transparency. These risks have been exacerbated by the COVID-19 pandemic, which forced many SMEs to shift from traditional physical sales to online platforms. This transition, while necessary for survival, introduced new challenges such as cyber risks and the need for greater material flow transparency (Varma and Dutta, 2022).

The combination of quantitative and qualitative data collection methods proved effective in gathering a holistic understanding of these challenges. Surveys provided insight into the frequency and intensity of risks both before and after the pandemic, while interviews offered deeper context regarding the practical implications of these risks. The application of tools like SPSS and Structural Equation Modelling (SEM) allowed for a nuanced analysis of the relationships between different risk factors, uncovering how they influence each other and the overall resilience of SMEs (Hair J.F, 1998).

This study highlights the importance of effective supply chain risk management for Cambodian SMEs, especially as they navigate the post-pandemic business landscape. The findings emphasize the need for SMEs to adopt more robust inventory and warehousing practices, alongside enhanced digital resilience, to mitigate risks in an increasingly interconnected and volatile environment. The integration of quantitative and qualitative research methods, combined with advanced statistical analysis, has yielded valuable insights that can inform both academic research and practical strategies for SMEs in Cambodia.

Reference

- ALAWATTEGAMA, K. K. 2017. The Impact of Enterprise Risk Management on Firm Performance: Evidence from Sri Lankan Banking and Finance Industry. *International Journal of Business and Management*, 13.
- AMRIN, N. 2014. *The Impact of Cyber Security on SMEs*. Master university of Twente
- ANATAN, L. 2021. A Review on MSMEs Resilience: Strategies and Policies Post Covid-19 Pandemic.
- BANK, T. W. 2019. *Small and Medium Enterprises (SMEs) Finance* [Online]. Available: <https://www.worldbank.org/en/topic/sme/finance> [Accessed].
- BLOS, M. F., QUADDUS, M., WEE, H. M. & WATANABE, K. 2009. Supply chain risk management (SCRM): a case study on the automotive and electronic industries in Brazil. *Supply Chain Management: An International Journal*, 14, 247-252.
- BYRNE, B. M. 2010. *Structural Equation Modeling With AMOS: basic concepts, applications, and programming* Taylor and Francis Group, LLC.
- CHEN, J., SOHAL, A. S. & PRAJOGO, D. I. 2013. Supply chain operational risk mitigation: a collaborative approach. *International Journal of Production Research*, 51, 2186-2199.
- D.K.NEMA, P. S. A. T. L. V. 2021. A STUDY ON EVER-CHANGING DEFINITION OF MICRO, SMALL AND MEDIUM ENTERPRISES (MSMEs). *International Journal of Recent Scientific Research*.
- DALLASEGA, P., WOSCHANK, M., SARKIS, J. & TIPPAYAWONG, K. Y. 2022. Logistics 4.0 measurement model: empirical validation based on an international survey. *Industrial Management & Data Systems*, 122, 1384-1409.
- GUPTA, N., SARDANA, D. & LEE, R. 2024. Dynamic capabilities that matter for business failure versus survival. *Industrial Marketing Management*, 116, 40-50.
- HAIR J.F, W. C. B., BARRY J BABIN, ROLPH E ANDERSON, RONALD L TATHAM 1998. *Multivariate data analysis*.
- HAMZA KASIM, M. Z., STEPHEN KWADWO ANTWI 2015. <An_assessment_of_the_Inventory_Managemen.pdf>. 7.
- HANG, S. C. 2013. Binding Constraints on Economic Growth in Cambodia: A Growth Diagnostic Approach.
- KOSALSEREYVUTH, C. & JULIEN, L. 2021. Roles of Small and Medium-Sized Enterprises (SMEs) in Cambodian Economic Development and Challenges during Covid-19.
- KUBÍČKOVÁ, L. & TOULOVÁ, M. 2013. Risk factors in the internationalization process of SMEs. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 61, 2385-2392.
- LENNY KOH, S. C., DEMIRBAG, M., BAYRAKTAR, E., TATOGLU, E. & ZAIM, S. 2007. The impact of supply chain management practices on performance of SMEs. *Industrial Management & Data Systems*, 107, 103-124.
- MILLERS, M. & GAILE-SARKANE, E. 2021. Management Practice in Small and Medium-Sized Enterprises: Problems and Solutions from the Perspective of Open Innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 7.
- OYEGOKE, A. S., FISHER, B. W., AJAYI, S., OMOTAYO, T. S. & EWUGA, D. 2023. The disruptive factors and longevity effects of Covid-19 and Brexit on the SMEs construction supply chain in the UK. *Journal of Financial Management of Property and Construction*, 29, 115-134.
- PIYANUSH TOOPTOMPONG & PIROMSOPA, K. 2018. Using Factor Analysis Techniques to Identify SME Information Systems' Functionality Requirements. *The International Journal of Interdisciplinary Organizational Studies*.
- RAHADI, R. A. 2016. OPPORTUNITIES AND CHALLENGES FOR MICRO-SMALL AND MEDIUM BUSINESS IN INDONESIA FACING ASEAN ECONOMIC COMMUNITY
- RUBEL, B. K. 2021. Increasing the Efficiency and Effectiveness of Inventory Management by Optimizing Supply Chain through Enterprise Resource Planning Technology.
- SALLEH HUDIN, N., ABDUL HAMID, A. B., CHIN, T. A. & HABIDIN, N. F. 2017. Exploring Supply Chain Risks among Malaysian Automotive Smes. *IJASOS- International E-journal of Advances in Social Sciences*, 666-674.
- SAMBATH, T. 2021. Roles of SMEs in Cambodian Economic Development and Their Challenges. *8th Annual NBC Macroeconomic Conference*.
- SKOULODIS, A., LEAL FILHO, W., DELIGIANNAKIS, G., VOUIROS, P., NIKOLAOU, I. & EVANGELINOS, K. 2023. Coping with floods: impacts, preparedness and resilience capacity

of Greek micro-, small- and medium-sized enterprises in flood-affected areas. *International Journal of Climate Change Strategies and Management*, 15, 81-103.

- SORN, M. K. & , G. F. 2023. A STUDY ON THE STATUS, PROBLEMS AND COUNTERMEASURES OF SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs) IN CAMBODIA. *International Journal of Recent Research in Commerce Economics and Management (IJRRCEM)*, Vol. 10, pp: (114-127).
- THUN, J.-H., DRÜKE, M. & HOENIG, D. 2011. Managing uncertainty – an empirical analysis of supply chain risk management in small and medium-sized enterprises. *International Journal of Production Research*, 49, 5511-5525.
- TUKAMUHABWA, B., STEVENSON, M. & BUSBY, J. 2017. Supply chain resilience in a developing country context: a case study on the interconnectedness of threats, strategies and outcomes. *Supply Chain Management: An International Journal*, 22, 486-505.
- VARMA, D. & DUTTA, P. 2022. Restarting MSMEs and start-ups post COVID-19: a grounded theory approach to identify success factors to tackle changed business landscape. *Benchmarking: An International Journal*, 30, 1912-1941.