iJETRM
International Journal of Engineering Technology Research & Management

THE ROLE OF FLEXIBILITY IN SUPPLY CHAIN MANAGEMENT – A REVIEW OF EMPIRICAL STUDIES

Ehsan Salavatihesari*(corresponding author)
Azman Hashim International Business School, Universiti Teknologi Malaysia
Johor Bahru, Malaysia
E-mail: sehsan3@gradute.utm.my Tel: +60167257395

Ai Chin Thoo
Department of Business Administration, Azman Hashim International Business School
Universiti Teknologi Malaysia,Johor Bahru, Malaysia

Mohd Noor Azli Bin Ali Khan
Department of Accounting and Finance, Azman Hashim International Business School
Universiti Teknologi Malaysia, Johor Bahru, Malaysia

Abstract
Firms are facing the competitive side effects and dynamic challenges of the domestic and global markets. In this scenario, flexibility of supply chain has become a key priority for organizations to respond effectively and efficiently to environmental uncertainty and increasingly customer expectations.This study systematically reviews the empirical studies on flexibility in context of supply chain to provide a broad map of the current state of research on different aspects of supply chain flexibility (SCF).To obtain a database, a term-specific literature review technique was used which led to identify 201 articles from various journals, and through a three-stage refinement process, 59 empirical articles were chosen for analysis.The results of content analysis are categorized and discussed based onmethods, applied theory, enablers of SCF, positive outcomes of SCF, and the role of flexibility in different performance measurement. Finally, the issues and potential gaps of current studies are highlighted which can provide valuable academic and managerial insights for researcher and practitioners in the field of supply chain.

Keywords:
Flexibility, Supply Chain, Review, Empirical

1Introduction

Firms are increasingly facing multiplicity of competing, bargaining power of customers and growing demand for customized products. However, SCM is considered as weapon for organizations to enhance their capabilities and competitiveness (Rezaei et al., 2018; Kumar and Singh, 2017; Kherbach and Mocan, 2016), but planning and managing supply chain effectively in a competitive and uncertain environment is challenging (Phate et al., 2021; Wang *et al.,* 2016). Supply chain is a complex system and influenced by inherent external and internal uncertainties that arise from Intra- and inter-organizational relationships such as operational decisions and conflicting objectives of partners in the supply chain network which places new challenges for the firms to manage and anticipate the behaviour of their partners (Jajja et al., 2018; Hou et al., 2018; Fayezi *et al.,* 2014). Besides, complexity of products derived from increasing need for customized products, changing demand, supplier lead-time, and information delay are other sources of uncertainty which may occur in a supply chain network (Seebacher and Winkler 2015). All these challenges increase the complexity of supply chain networks which negatively affect the responsiveness of supply chain (Chand et al., 2018; Blome et al., 2014),

iJETRM
International Journal of Engineering Technology Research & Management

and make the supply chain more unstable and more vulnerable to risks and disruptions (Rajagopal et al., 2017). In such an environment, various researchers have stressed that flexibility as a capability is critical for ensuring supply chain success (Delic and Eyers, 2020; Singh et al., 2017; Kumar et al., 2017; Fischer et al., 2016; Tiwari et al., 2015). Therefore, achieving SCF has been acknowledged as the most important factor to deal with the uncertain environment (Kong and Li, 2018), managing the risk of disruption (Parast and Shekarian, 2019; Dubey et al., 2018; Sreedevi andSaranga, 2017), and gaining competitive advantage by responding quickly and effectively to the constantly changes in marketplace (Abdelilah et al., 2018; Willis et al., 2016).

The concept of SCF expanded from manufacturing flexibility in operation management (Perez-Perez et al., 2018),and in essence comprises of both intra-firm and inter-firm flexibility (Tiwari *et al.*, 2015; Tipu and Fantazy, 2014). Owing to its complex and multi-dimensional concept (Abdelilah et al., 2018; Tiwari *et al.*, 2015), there is no commonly accepted definition of SCF in literature. In general, SCF can be defined as the focal firms and its supply chain partner's ability to respond to uncertainties (e.g., Blome et al., 2014; Moon and Ngai, 2012;Winkler and Seebacher, 2012) and customer expectations (e.g., Gupta et al., 2019; Nagarajan et al., 2013).

Given the critical role of flexibility in supply chain, this topic has gained considerable attention during the last two decades. However, majority of earlier studies focused on drivers, classification, constructs, and measurement models of SCF, but in recent years flexibility has become a substantial part of supply chain strategy, and many researchers empirically examined its different aspects. Accordingly, this study aims to systematically review and analyse the empirical studies to provide a comprehensive view of the role of flexibility in the context of supply chain. Specifically, the focus of this study is on the current progresses and issues regarding enabler and consequences of SCF.

2Methodology

To achieve the desired result, a systematic literature review including three steps applied to search and select the articles. In the first step, the reputable peer reviewed online journals and databases such as Emerald, Springer, Science direct, Elsevier, Wiley online library, and Scopus were searchedby using a word sensitive filter including the keywords such as supply chain flexibility, flexibility in supply chain, flexibility and supply chain management. Since the advent of SCF back to1999, a time span filter from 1999 up to end of 2020 applied to shorten the list by avoiding the articles which may be related to manufacturing flexibility concept. The first phase of data collection led to downloading 203 articles which after coding and deletion of duplicated papers in the second step186 articles remained. In the thirdstep, the articles' abstracts were scrutinized based on two criteria in accordance with the purpose of study. First, the study must be empirical, and second, the flexibility should be related to the context of supply chain. Finally, 59 articles were chosen for the final full paper content analysis.

3Findings

This section provides the findings of content analysis of 59 empirical articles on flexibility in the context of supply chain.The selected articles investigated thoroughly, and various information extracted and categorized in different parts including the methodology, applied theory, antecedents and enablers, and performance outcomes of flexibility in supply chain.

Prior to discussion of findings, a timeline analysis is conducted to illustrate the distribution of empirical studies on SCF in different time periods. To gain a better understanding about the frequencies of empirical studies during the time, the articles are divided into four timespansbased on their publication year including 1999-2004, 2005-2009, 2010-2014, and 2015-2020. As it is reflected in Figure 1, the frequency of empirical studies is increasing sharply, especially more than half of the studies (56 %) are conducted in the period of 2015 to 2020. This implies that in current business environment SCF is becoming an effective strategy for organizations.

iJETRM
International Journal of Engineering Technology Research & Management

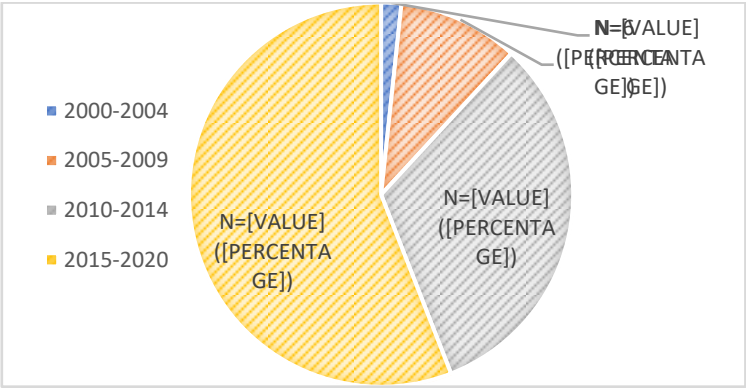

Figure 1. Distribution of empirical studies on supply chain flexibility

3.1Methods and Samples

The empirical studies under investigation were checked for the method of data collection and target samples as two major subsets of methodology. As shown in Table 1, most of the empirical studies (97%) have used survey questionnaire as the method of data collection, followed by semi-structured interviews (3%). Regarding the samples, most of the studies collected their datafrom manufacturing firms (59%) and other studies used a mixed samples including supplier, manufacturer, buyer, distributer, wholesaler, retailer, and logistic companies which counts for 41% of total studies. This highlights the critical role of SCF for manufacturing firms.

Table 1. Data collection method and target sample

Method	Frequency	Percentage
Survey – questionnaire	57	97%
Survey – semi-structured interviews	2	3%
Total	59	100%
Sample	Frequency	Percentage
Manufacturing industry	35	59%
Mixed sample (e.g., supplier, manufacturer, buyer, distributer, wholesaler, retailer, logistic company)	24	41%
Total	59	100%

3.2 Theory

While theories provide valuable insights and direction in knowledge creation(Collins and Stockton, 2018), the review of empirical studies on SCF revealed that only 30 studies out 59 were theory driven. Overall, as reflected in table 2, studies on SCF grounded their theoretical framework on 14 different theories which shows the flexibility in supply chain have been viewed from different perspectives. However, some studies are grounded on two theories, but dynamic capability perspective, contingency theory, resource-based view theory (RBV), extended resource-based view theory (ERBV), and organization information processing theory are among the most applied theory respectively.

Table 2. Theory in supply chain flexibility

No.	Theory	Author	Frequency
1	Resurce-based View (RBV)	Niranjan et al. (2018); Hatani (2017). Brusset and Teller(2017); Mandal et al. (2016); Mandal, (2015); Hartmann and De Grahl (2011).	6
2	Extended Resource-based	Yu et al. (2018); Niranjan et al. (2018); Ko et al.	4

iJETRM
International Journal of Engineering Technology Research & Management

	View	(2018) Nagarajan et al. (2013).	
3	Dynamic Capability Perspective	Irfan et al. (2019); Jajja et al. (2018); Brussetand Teller, (2017);Mandal et al. (2016); Mandal (2015); Jin et al. (2014); Youn et al. (2014); Chiang et al. (2012).	8
4	Relational View	Jin et al. (2014).	1
5	Knowledge-based View	Willis et al. (2016); Blome et al. (2014).	2
6	Agency Theory	Chaudhuri et al. (2018).	1
7	Organization Information Processing Theory	Gupta et al. (2019); Shou et al. (2018); Williams et al. (2013).	3
8	Contingency Theory	Irfan et al. (2019); Ko et al. (2018);Sáenz et al. (2018); Blome et al. (2014); Wong et al. (2017); Qrunfleh et al. (2012); Skipper and Hanna (2009). Wong et al. (2011)	8
9	Program Theory	Arawati (2011).	1
10	Resource Orchestration Theory	Burin et al. (2020).	1
11	Relational Contracting Theory	Han et al. (2014).	1
12	Trust theory	He et al. (2014).	1
13	Coordination Theory	Gosain et al. (2004).	1
14	Theory of Complementarity	Malhotra and Mackelprang, (2012).	1

3.3 Enablers of SCF

From a system perspective SCF is the combination of external flexibility of supply chain and internal manufacturing flexibility (Malhotra and Mackelprang (2012). Given that SCF is a broad concept, researchers have identified a wide range of factors that contribute to improveflexibility of supply chain. To summarize and report the antecedents and enablers of SCF, this study categorized them intothree groups based on theircommon characteristics including SCM related factors, strategy related factor, and technology.

SCM related factors represent a set of activities executed by the firm to ensure the effective management of value chain (Sharma and Modgil, 2019). Table 3 represent enablers of SCF which are related to different aspect of SCM such as supply-side practices, demand-side practices, supply chain capabilities, internal practices, information and knowledge sharing, managerial role, and relationship quality.The factors inside each set are based on similar concepts and mostly inter-related, or in some cases their underlying items are overlapping. The diversity of SCM practices not only highlights the prominent role of SCM in achieving SCF, but also denotes that to enhance the flexibility of the whole supply chain in order to respond to different uncertainties, firms have to focus on a combination of both internal and external practices and activities across the supply chain network.

Table 3.Supply chain management related factor

Supply side practices	Author
• Supplier partnership / integration / collaboration / alliance • Supply management • Strategic sourcing / purchasing (Supplier development, Supplier involvement, Supplier training, long-term relationships with suppliers, Forecast sharing with suppliers, Joint product development, Agile Supplier Practices)	Chaudhuri et al. (2018); Um, (2017); Arawati (2011); Liao et al. (2010); Acur et al. (2009); Shou et al. (2018); Jajja et al. (2018); Muntanka et al. (2017); Wong et al. (2017); Chiadamrong and Sophonsaritsook (2015); He et al. (2014); Wong et al. (2011); Sáenz et al. (2018); Chiang et al. (2012); Qrunfleh et al. (2012); Fayezi and Zomorrodi (2015);Goyal et al. (2018); Barber et al. (2017). Gawankar et al. (2017).
Demand side practices	Author
• Customer relationships / integration /	Chaudhuri et al. (2018); Um (2017); Shou et al. (2018);

iJETRM
International Journal of Engineering Technology Research & Management

collaboration	Jajja et al. (2018); Muntanka et al. (2017); Wong et al. (2017); Wong et al. (2011); Sáenz et al. (2018); Fayezi & Zomorrodi (2015); Barber et al. (2017); Gawankar et al. (2017).
Supply chain capabilities	Author
• Process integration • Supply chain collaboration / integration • Supply and Demand competence • Collaborative logistics • Supply Chain Ambidexterity • Supply chain risk management	Irfan et al. (2019); Kumar et al. (2017); Mandal et al. (2016); Hartmann and De Grahl (2011); Skipper and Hanna (2009); Willis et al. (2016)Mandal(2015) Hatani (2017). Nagarajan et al. (2013). Burin et al. (2020); Rojo et al. (2016). Chaudhuri et al. (2018).
Internal practices	Author
• Internal integration • Cross functional integration • Lean Manufacturing practices • Modular product design • Postponement	Chaudhuri et al. (2018); Wong et al. (2017); Williams et al. (2013); Chiang et al. (2012); Wong et al. (2011); Muntanka et al. (2017); Hatani (2017). Zu'bi, M. F. (2015); Arawati (2011); Hallgren and Olhager (2009); Gosain et al. (2004); Delic and Eyers (2020);Barber et al. (2017); Gawankar et al. (2017).
Information &knowledge sharing	Author
• Information exchange / Information Sharing / Information dissemination / Information integration • Information quality • Internal and External knowledge transfer	Niranjan et al. (2018); Fayezi and Zomorrodi (2015); Chiang et al. (2012); Acur et al. (2009); Yu et al. (2018); Hartmann and De Grahl (2011); Youn et al. (2014); Nagarajan et al. (2013); Barber et al. (2017); Gawankar et al. (2017); Gosain et al. (2004). Blome et al. (2014).
Managerial role	Author
• top management support / commitment	Skipper & Hanna (2009); Goyal et al. (2018).
Relationship quality	Author
• Trust / Commitment	Han et al. (2014).

As stated by Kumar et al. (2006), strategy is an important determinant of SCF and competitiveness of a firm. Accordingly, few studies have found direct relationship between firm strategy and orientation on SCF. Another stream of researcher emphasises on the role of technology in achieving SCF. Adoption of technology is regarded asan essential factor to improve efficiency, speedup the processes, and cost and waste reduction and consequently for achieving competitiveness of organizations (Kumar et al. (2017).Specially, information technology has become an imperative part of supply chain networks which play a critical role in system integration and flexibility (Burin et al., 2020). The studies relating to role of strategy and technology on SCF are shown in Table 4.

Table 4. Strategy and technology related factors

Strategy	Author
• Innovative strategy, Customer-oriented strategy, Follower strategy • Variety management strategy • Market orientation	Fantazy and Salem, (2016); Khademolomoom and Emeagwali, (2015); Tipu and Fantazy, (2014); Fantazy et al. (2009). Um (2017). Braunscheidel and Suresh (2009).
Technology	Author
• Information and communication	Kumar et al. (2017); Jin et al. (2014); Skipper and Hanna

iJETRM
International Journal of Engineering Technology Research & Management

technology, IT capability, structured data connectivity, Information System • advanced manufacturing technology • Additive Manufacturing adoption	(2009); Gupta et al. (2019); Gosain et al. (2004). Hallgren and Olhager, (2009). Delic and Eyers (2020).

3.4 Performance outcome of SCF

To provide a clear understanding of the role of flexibility in supply chain,this study distinguished between two different streams of research in SCM literature. The first stream has considered flexibility as the capability of the firm and its supply chain partners to respond effectively and efficiently to uncertainty and changes in environment. Following thisperspective, previous empirical studies have found various positive outcomes of SCF which are listed in Table 5 as SCF outcome. On the other side, in the second stream of research, flexibility has regarded as a dimension of performance measurement, whether it is related to the firm performance (operational performance and competitive advantage) or related to supply chain (supply chain performance, agility, and responsiveness). In this way, Table 6 presents the studies in which flexibility act as a dimension of performance measurement.

Table 5. Positive outcome of flexibility

Supply chain flexibility outcome	Author
• Partner satisfaction • Customer satisfaction • Customer loyalty • Relationship satisfaction	Putra et al. (2020); Niranjan et al. (2018); Sáenz et al. (2018). Al-Hawary et al. (2017). Hartmann and De Grahl,(2011). Han et al. (2014).
• Supply chain performance	Delic and Eyers, (2020); Mhelembe and Mafini, (2019); Kumar et al. (2017); Chiang et al. (2012); Liu (2011); Liao et al. (2010); Acur et al. (2009).
• Supply chain agility	Irfan et al. (2019); Chan et al. (2017); Ngai et al. (2011).
• Product innovation	Ko et al. (2018).
• Operational performance	Yu et al. (2018); Mandal (2015); Fantazy and Salem,(2016).
• Firm / Business performance (Financial and non-financial)	Niranjan et al. (2018); Muntanka et al. (2017); Chan et al. (2017); Chiadamrong and Sophonsaritsook(2015); Khademolomoom and Emeagwali(2015);Hatani et al. (2013); Merschmann and Thonemann,(2011). Arawati(2011). Liu (2011); Sánchez and Pérez (2005); Tipu and. Fantazy (2014).Fantazy et al. (2009); Fantazy and Salem(2016).
• Supply chain resilience	Brusset and Teller (2017).
• Competitive advantage	Hatani(2017); Jin et al. (2014), Liu(2011); Hatani et al. (2013).
• Delivery performance	Malhotra and Mackelprang(2012).
• Risk mitigation	Sreedevi and Saranga (2017).

Table 6. Role of flexibility in performance measurement

Flexibility as a dimension of performance	Author
Operational performance Supply chain agility Supply chain responsiveness Supply chain performance Competitive advantage	Shou et al. (2018). Wong et al. (2017) Jajja et al. (2018). Williams et al. (2013). Barber et al. (2017). Gawankar et al. (2017). Chiadamrong and Sophonsaritsook (2015).

4 Conclusion and recommendation

iJETRM
International Journal of Engineering Technology Research & Management

The trends of studies on SCF shows the fast transition of business environment to an extremely dynamic, vulnerable, and complex environment.In this situation, as revealed by the findings of this review paper, SCF is an undeniable prerequisite for gaining various positive outcomes which are vital for firms' competitiveness. Moreover, this review study identified three different types of enablers which can be considered by firms to enhance their SCF. However, firms' strategy and technology are of important in achieving SCF but investing and enhancing different SCM practices is critical as the implementation of strategy and exploit the benefit of different technologies are highly dependent on successful execution of SCM practices. In addition, as the findings revealed, it is necessary to focus on a combination of internal and external practices across the supply chain network to improve SCF.

Despite the significant advances on the role of flexibility in supply chain context but review the current empirical studies on this topic identified some issues and shortcomings which can be explored by future studies. First, majority of empirical studies on SCF have confined the concept of SCF to internal flexibility or a particular part or dimension of the supply chain, and future studies need to consider a multi-dimensional view of SCF which cover the entire supply chain.The second issue is related to some inconsistent findings on enabler of SCFwhich may be related to contingent factors, and future studies can examine the moderation role of different contingent variables on the relationship between SCM practices andSCF. finally, most of the empirical studies are conducted on medium to large firms, and there is a need for future studies to focus more on SMEs.

References

Abdelilah, B., El Korchi, A., & Balambo, M. A. (2018). Flexibility and agility: evolution and relationship. *Journal of Manufacturing Technology Management*.

Acur, N., Voss, C., Stevenson, M., & Spring, M. (2009). Supply chain flexibility: an inter-firm empirical study. *International Journal of Operations & Production Management*.

Al-Hawary, S. I. S., Mohammad, A. S., Mohammad, A. A. S., & Alsarahni, A. H. H. (2017). Supply chain flexibility aspects and their impact on customers satisfaction of pharmaceutical industry in Jordan. *International Journal of Business Performance and Supply Chain Modelling*, *9*(4), 326-343.

Arawati, A. G. U. S. (2011). Supply chain management, supply chain flexibility and business performance. *Journal of Global Strategic Management*, *9*(1), 134-145.

Barber, K. D., Garza-Reyes, J. A., Kumar, V., & Abdi, M. R. (2017). The effect of supply chain management practices on supply chain and manufacturing firms' performance. *Journal of Manufacturing Technology Management*.

Burin, A. R. G., Perez-Arostegui, M. N., & Llorens-Montes, J. (2020). Ambidexterity and IT competence can improve supply chain flexibility? A resource orchestration approach. *Journal of Purchasing and Supply Management*, 100610.

Blome, C., Schoenherr, T., & Eckstein, D. (2014). The impact of knowledge transfer and complexity on supply chain flexibility: A knowledge-based view. *International Journal of Production Economics*, *147*, 307-316.

Braunscheidel, M. J., & Suresh, N. C. (2009). The organizational antecedents of a firm's supply chain agility for risk mitigation and response. *Journal of operations Management*, *27*(2), 119-140.

Brusset, X., & Teller, C. (2017). Supply chain capabilities, risks, and resilience. *International Journal of Production Economics*, *184*, 59-68.

Chan, A. T., Ngai, E. W., & Moon, K. K. (2017). The effects of strategic and manufacturing flexibilities and supply chain agility on firm performance in the fashion industry. *European Journal of Operational Research*, *259*(2), 486-499.

Chand, P., Thakkar, J. J., & Ghosh, K. K. (2018). Analysis of supply chain complexity drivers for Indian mining equipment manufacturing companies combining SAP-LAP and AHP. *Resources Policy*, *59*, 389-410.

Chaudhuri, A., Boer, H., & Taran, Y. (2018). Supply chain integration, risk management and manufacturing flexibility. *International Journal of Operations & Production Management*.

iJETRM
International Journal of Engineering Technology Research & Management

Chiadamrong, N., & Sophonsaritsook, P. (2015). Relationships between supply chain capabilities, competitive advantage and business performance: an exploratory study of the food industry in Thailand. *International Journal of Logistics Systems and Management 8*, *20*(4), 447-479.

Chiang, C. Y., Kocabasoglu-Hillmer, C., & Suresh, N. (2012). An empirical investigation of the impact of strategic sourcing and flexibility on firm's supply chain agility. *International Journal of Operations & Production Management*, *32*(1), 49-78.

Collins, C. S., & Stockton, C. M. (2018). The central role of theory in qualitative research. *International Journal of Qualitative Methods*, *17*(1), 1609406918797475.

Delic, M., & Eyers, D. R. (2020). The effect of additive manufacturing adoption on supply chain flexibility and performance: An empirical analysis from the automotive industry. *International Journal of Production Economics*, *228*, 107689.

Dubey, R., Altay, N., Gunasekaran, A., Blome, C., Papadopoulos, T., & Childe, S. J. (2018). Supply chain agility, adaptability and alignment: empirical evidence from the Indian auto components industry. *International Journal of Operations & Production Management*.

Fantazy, K. A., Kumar, V., & Kumar, U. (2009). An empirical study of the relationships among strategy, flexibility, and performance in the supply chain context. *Supply Chain Management: An International Journal*.

Fantazy, K. A., & Salem, M. (2016). The value of strategy and flexibility in new product development. *Journal of Enterprise Information Management*.

Fayezi, S., Zutshi, A., & O'Loughlin, A. (2014). Developing an analytical framework to assess the uncertainty and flexibility mismatches across the supply chain. *Business process management journal*.

Fayezi, S., & Zomorrodi, M. (2015). The role of relationship integration in supply chain agility and flexibility development: an Australian perspective. *Journal of Manufacturing Technology Management*, *26*(8), 1126-1157.

Fischer, J. H., Thomé, A. M. T., Scavarda, L. F., Hellingrath, B., & Martins, R. (2016). Development and application of a maturity measurement framework for supply chain flexibility. *Procedia CIRP*, *41*, 514-519.

Gawankar, S. A., Kamble, S., & Raut, R. (2017). An investigation of the relationship between supply chain management practices (SCMP) on supply chain performance measurement (SCPM) of Indian retail chain using SEM. *Benchmarking: An International Journal*, *24*(1), 257-295.

Gosain, S., Malhotra, A., & El Sawy, O. A. (2004). Coordinating for flexibility in e-business supply chains. *Journal of management information systems*, *21*(3), 7-45.

Goyal, G., Samalia, H. V., & Verma, P. (2018). Mediating role of process simplification in process integration and upstream supply chain flexibility. *International Journal of Productivity and Performance Management*.

Gupta, S., Drave, V. A., Bag, S., & Luo, Z. (2019).Leveraging smart supply chain and information system agility for supply chain flexibility. *Information Systems Frontiers*, *21*(3), 547-564.

Han, S. L., Sung, H. S., & Shim, H. S. (2014). Antecedents and performance outcomes of flexibility in industrial customer–supplier relationships. *Journal of Business Research*, *67*(10), 2115-2122.

Hallgren, M., & Olhager, J. (2009). Flexibility configurations: Empirical analysis of volume and product mix flexibility. *Omega*, *37*(4), 746-756.

Hartmann, E. V. I., & De Grahl, A. (2011). The flexibility of logistics service providers and its impact on customer loyalty–an empirical study. In *Success Factors in Logistics Outsourcing* (pp. 7-51). Gabler Verlag.

Hatani, L. (2017). Supply Chain Integration and Flexibility as a Competitive Advantage in the Southeast Sulawesi Fishery Sector. *International Business Management 11 (12): 2063-2077*.

Hatani, L., Zain, D., & Wirjodirjo, B. (2013). The role of competitiveness as mediator for the relation between supply chain flexibility and firm performance. *Journal of Management Research*, *5*(1), 269.

iJETRM
International Journal of Engineering Technology Research & Management

He, Y., Lai, K. K., Sun, H., & Chen, Y. (2014). The impact of supplier integration on customer integration and new product performance: the mediating role of manufacturing flexibility under trust theory.

Hou, Y., Wang, X., Wu, Y. J., & He, P. (2018). How does the trust affect the topology of supply chain network and its resilience? An agent-based approach. *Transportation Research Part E: Logistics and Transportation Review*, *116*, 229-241.

Irfan, M., Wang, M., & Akhtar, N. (2019). Enabling supply chain agility through process integration and supply flexibility. *Asia Pacific Journal of Marketing and Logistics*.

Jajja, M. S. S., Chatha, K. A., & Farooq, S. (2018). Impact of supply chain risk on agility performance: Mediating role of supply chain integration. *International Journal of Production Economics*, *205*, 118-138.

Jin, Y., Vonderembse, M., Ragu-Nathan, T. S., & Smith, J. T. (2014). Exploring relationships among IT-enabled sharing capability, supply chain flexibility, and competitive performance. *International Journal of Production Economics*, *153*, 24-34.

Khademolomoom, A. H., & Emeagwali, O. L. Relationship among Strategy, Flexibility, & Performance in the Supply Chain of the Iranian Automotive Industry.

Kherbach, O., & Mocan, M. L. (2016). The importance of logistics and supply chain management in the enhancement of Romanian SMEs. *Procedia-Social and Behavioral Sciences*, *221*, 405-413.

Ko, W. W. J., Liu, G., Ngugi, I. K., & Chapleo, C. (2018). External supply chain flexibility and product innovation performance: A study of small-and medium-sized UK-based manufacturers. *European Journal of Marketing*, *52*(9/10), 1981-2004.

Kong, F., & Li, J. (2018). The promotion strategy of supply chain flexibility based on deep belief network. *Applied Intelligence*, *48*(5), 1394-1405.

Kumar, V., Fantazy, K. A., Kumar, U., & Boyle, T. A. (2006). Implementation and management framework for supply chain flexibility. *Journal of Enterprise Information Management*.

Kumar, R., & Singh, R. K. (2017). Coordination and responsiveness issues in SME supply chains: a review. *Benchmarking: An International Journal*.

Kumar, V., Verma, P., Sharma, R. R. K., & Khan, A. F. (2017). Conquering in emerging markets: critical success factors to enhance supply chain performance. *Benchmarking: An International Journal*, *24*(3), 570-593.

Liao, Y., Hong, P., & Rao, S. S. (2010). Supply management, supply flexibility and performance outcomes: an empirical investigation of manufacturing firms. *Journal of Supply Chain Management*, *46*(3), 6-22.

Liu, L. (2011, April). The Effects of Manufacturing Firm's Supply Chain Performance on Competitive Advantage. In *2011 Fourth International Joint Conference on Computational Sciences and Optimization* (pp. 1259-1262).

Malhotra, M. K., & Mackelprang, A. W. (2012). Are internal manufacturing and external supply chain flexibilities complementary capabilities?. *Journal of Operations Management*, *30*(3), 180-200.

Mandal, S. (2015). Supply and demand effects on supply chain flexibility: An empirical exploration. *Knowledge and Process Management*, *22*(3), 206-219.

Mandal, S., Sarathy, R., Korasiga, V. R., Bhattacharya, S., & Dastidar, S. G. (2016). Achieving supply chain resilience: The contribution of logistics and supply chain capabilities. *International Journal of Disaster Resilience in the Built Environment*, *7*(5), 544-562.

Merschmann, U., & Thonemann, U. W. (2011). Supply chain flexibility, uncertainty and firm performance: An empirical analysis of German manufacturing firms. *International Journal of Production Economics*, *130*(1), 43-53.

Mhelembe, K., & Mafini, C. (2019). Modelling the link between supply chain risk, flexibility and performance in the public sector. *South African Journal of Economic and Management Sciences*, *22*(1), 1-12.

iJETRM
International Journal of Engineering Technology Research & Management

Mishra, R., & Mishra, O. N. (2019). Prioritising dimensions of entrepreneurial orientation for supply chain flexibility development in an uncertain environment. *Journal of Manufacturing Technology Management*, *30*(2), 483-505.

Moon, K. K. L., Yi, C. Y., & Ngai, E. W. T. (2012). An instrument for measuring supply chain flexibility for the textile and clothing companies. *European Journal of Operational Research*, *222*(2), 191-203.

Muntanka, A. S., Haruna, A., & Mensah, H. K. (2017). Supply Chain Integration and Flexibility and Its Impact on Business Performance. *International Journal of Business and Management*, *12*(4), 130-143.

Ngai, E. W., Chau, D. C., & Chan, T. L. A. (2011). Information technology, operational, and management competencies for supply chain agility: Findings from case studies. *The Journal of Strategic Information Systems*, *20*(3), 232-249.

Nagarajan, V., Savitskie, K., Ranganathan, S., Sen, S., & Alexandrov, A. (2013). The effect of environmental uncertainty, information quality, and collaborative logistics on supply chain flexibility of small manufacturing firms in India. *Asia Pacific Journal of Marketing and Logistics*, *25*(5), 784-802.

Niranjan, S., Spulick, S. R., & Savitskie, K. (2018). Mediating and moderating influencers of firm performance: Supply chain managers perspective. *Journal of Enterprise Information Management*, *31*(1), 38-63.

Parast, M. M., & Shekarian, M. (2019). The impact of supply chain disruptions on organizational performance: A literature review. *Revisiting supply chain risk*, 367-389.

Perez-Perez, M., Bedia, A. M. S., Lopez-Fernandez, M. C., & Garcia-Piqueres, G. (2018). Research opportunities on manufacturing flexibility domain: A review and theory-based research agenda. *Journal of Manufacturing Systems*, *48*, 9-20.

Phate, M., Toney, S., & Phate, V. (2021). Optimistic Implementation of Supply Chain Management in Small & Medium Enterprise: Approach using Grey Relational Analysis (GRA). *International Journal of Industrial Engineering & Production Research*, *32*(1), 65-77.

Putra, A., Tarigan, Z. J. H., & Siagian, H. (2020). Influence of Information Quality on Retailer Satisfaction through Supply Chain Flexibility and Supplier Relationship Management in the Retail Industry. *Jurnal Teknik Industri*, *22*(2), 93-102.

Qrunfleh, S., Tarafdar, M., & Ragu-Nathan, T. S. (2012). Examining alignment between supplier management practices and information systems strategy. *Benchmarking: An International Journal*, *19*(4/5), 604-617.

Rajagopal, V., Venkatesan, S. P., & Goh, M. (2017). Decision-making models for supply chain risk mitigation: A review. *Computers & Industrial Engineering*, *113*, 646-682.

Rezaei, J., Ortt, R., & Trott, P. (2018). Supply chain drivers, partnerships and performance of high-tech SMEs: An empirical study using SEM. *International Journal of Productivity and Performance Management*, *67*(4), 629-653.

Rojo, A., Llorens-Montes, J., & Perez-Arostegui, M. N. (2016). The impact of ambidexterity on supply chain flexibility fit. *Supply Chain Management: An International Journal*, *21*(4), 433-452.

Sáenz, M. J., Knoppen, D., & Tachizawa, E. M. (2018). Building manufacturing flexibility with strategic suppliers and contingent effect of product dynamism on customer satisfaction. *Journal of purchasing and supply management*, *24*(3), 238-246.

Sánchez, A. M., & Pérez, M. P. (2005). Supply chain flexibility and firm performance: a conceptual model and empirical study in the automotive industry. *International Journal of Operations & Production Management*.

Sharma, S., & Modgil, S. (2019). TQM, SCM and operational performance: an empirical study of Indian pharmaceutical industry. *Business Process Management Journal*.

Seebacher, G., & Winkler, H. (2015). A capability approach to evaluate supply chain flexibility. *International Journal of Production Economics*, *167*, 177-186.

iJETRM
International Journal of Engineering Technology Research & Management

Shou, Y., Li, Y., Park, Y., & Kang, M. (2018). Supply chain integration and operational performance: the contingency effects of production systems. *Journal of Purchasing and Supply Management*, *24*(4), 352-360.

Singh, R. K., Koul, S., & Kumar, P. (2017). Analyzing the interaction of factors for flexibility in supply chains. *Journal of Modelling in Management*, *12*(4), 671-689.

Skipper, J. B., & Hanna, J. B. (2009). Minimizing supply chain disruption risk through enhanced flexibility. *International Journal of Physical Distribution & Logistics Management*.

Sreedevi, R., & Saranga, H. (2017). Uncertainty and supply chain risk: The moderating role of supply chain flexibility in risk mitigation. *International Journal of Production Economics*, *193*, 332-342.

Tipu, S. A. A., & Fantazy, K. A. (2014). Supply chain strategy, flexibility, and performance: a comparative study of SMEs in Pakistan and Canada. *The International Journal of Logistics Management*.

Tiwari, A. K., Tiwari, A., & Samuel, C. (2015). Supply chain flexibility: a comprehensive review. *Management Research Review*, *38*(7), 767-792.

Um, J. (2017).Improving supply chain flexibility and agility through variety management. *The international journal of logistics management*, *28*(2), 464-487.

Wang, H., Mastragostino, R., & Swartz, C. L. (2016). Flexibility analysis of process supply chain networks. *Computers & Chemical Engineering*, *84*, 409-421.

Williams, B. D., Roh, J., Tokar, T., & Swink, M. (2013). Leveraging supply chain visibility for responsiveness: The moderating role of internal integration. *Journal of Operations Management*, *31*(7-8), 543-554.

Willis, G., Genchev, S. E., & Chen, H. (2016). Supply chain learning, integration, and flexibility performance: an empirical study in India. *The International Journal of Logistics Management*, *27*(3), 755-769.

Winkler, H., & Seebacher, G. (2012). Considerations on a contemporary flexibility approach. *Research in Logistics & Production*, *2*, 147-161.

Wong, C. Y., Boon-Itt, S., & Wong, C. W. (2011). The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance. *Journal of Operations management*, *29*(6), 604-615.

Wong, C. W., Sancha, C., & Thomsen, C. G. (2017). A national culture perspective in the efficacy of supply chain integration practices. *International Journal of Production Economics*, *193*, 554-565.

Youn, S. H., Yang, M. G. M., Kim, J. H., & Hong, P. (2014). Supply chain information capabilities and performance outcomes: An empirical study of Korean steel suppliers. *International Journal of Information Management*, *34*(3), 369-380.

Yu, K., Luo, B. N., Feng, X., & Liu, J. (2018).Supply chain information integration, flexibility, and operational performance: An archival search and content analysis. *The International Journal of Logistics Management*, *29*(1), 340-364.

Zu'bi, M. F. (2015). Examining the impact of lean practices on flexibility performance: The moderating effect of environmental dynamism. *Engineering Management Research*, *4*(2), 54.