Alignment of Logistics Flexibility and Logistics Innovation with New Product Development: An Innovation Model

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A thesis submitted to NUST Business School for the degree of Master of Science in Logistics and Supply Chain Management

2021

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Submitted to: Dr. Muhammad Imran

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THESIS ACCEPTANCE CERTIFICATE

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Declaration

I hereby certify that this research work titled ***"Alignment of logistics flexibility and logistics innovation with new product development: An innovation model"*** is purely my own work. Hence, I declare that this work has not been submitted for any other purposes or for any other degree to any other university. Moreover, sources assisted in this research study are separately mentioned and referred.

Student Name: Fatima Rahman

Signature:

Acknowledgements

Firstly, I would like to express my sincere and humble gratitude to Almighty Allah whose blessings and guidance has been a real source of all the achievements in my life.

Secondly, I truly appreciate my parents, my siblings, and my husband for their continuous support and encouragement. I cannot express my words to explain the efforts, dedication, and support of my father Syed Muhammad Rashid Jamil (Late) behind this success.

Thirdly, I would like to thank my MS supervisor Dr. Muhammad Imran for his precious time, relentless efforts and continuous support. I am also thankful to my GEC members Dr. Adeel Tariq and Mr. Kamran Khalid whose valuable suggestions assisted me in improving my work. I would not be able to complete this journey successfully without their constant support and guidance.

Fourthly, I am grateful to all of my class fellows and friends who have been along with me through this journey. I am thankful to Ms. Momina Asad and Mr. Abdullah Matloob who kept me motivated to pursue my goals.

Lastly, I am also thankful to the faculty members and administrative staff at NUST Business School.

Abstract

The research aims to investigate the association between logistics flexibility, logistics innovation and new product development while identifying the role of manufacturing capabilities as a mediator and environmentally sustainable innovation as moderator in assuring the improvement and enhancement in development of new products. A survey method has been used through the questionnaire in order to check the relationship between defined variables.

Verily, it has been found that very few studies have linked logistics with new product development while the role of manufacturing capabilities has also not been explored yet. But this particular research study is connecting logistics in terms of flexibility and innovation. This research also probes the role of environmentally sustainable innovation in strengthening the association between manufacturing capabilities and new product development. Resource-based view and diffusion of innovation theory has been adopted in order to examine how logistics flexibility, and logistics innovation influences new product development while identifying the strengthening role of environmentally sustainable innovation.

This research collected data from manufacturing organizations registered with the Securities and Exchange Commission of Pakistan. Moreover, it employs structural equation modeling to inspect the proposed hypotheses between constructs. Hypothesized relationships between constructs found to be significant and provide strength to the arguments. Logistics flexibility and logistics innovation positively influence new product development. Meanwhile manufacturing capabilities found to be mediating the relationship between logistics flexibility and new product development. Besides, this research testifies that environmentally sustainable innovation strengthens the relationship between manufacturing capabilities and new product development.

This study theoretically contributes in the literature as a tested framework and connecting constructs i.e. logistics flexibility, logistics innovation, and new product development while opening up new avenues of research in this context. Moreover, it makes contribution by elucidating role of manufacturing capabilities and environmentally sustainable innovation which makes it easy for managers to make better and informed decisions regarding adoption of enhanced manufacturing equipment and allowing for necessary innovations to improve new product development. When considering the broader aspect of this research study, new products will contribute in gaining competitive advantage for organizations and in growth of economy as well because failure rate will be comparatively low which will aid in profitability of the organizations.

Keywords: Logistics flexibility, logistics innovation, manufacturing capabilities, environmentally sustainable innovation, new product development.

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Chapter No. 1

1. Introduction

1.1 Background

According to Marchesini and Alcântara (2016), logistics as a function is known for contributing a remarkable role in ensuring the benefit of organization since years. While on the other hand its horizon is expanding towards entailing business activities and processes. It is due to the reason that logistics affect the efficiency and effectiveness of business processes directly. It is argued by Schilling (2013) that key factor responsible for an organization's success is its capacity to manufacture improved products efficiently and effectively. As logistics serve a necessary role in other business processes such as quality assurance, delivery of product and service, development of employees; new product development also require connection with logistics function. Every year organizations spend a huge amount of budget to finance the development of new products, but usually new products fail in the market and a possible reason is new product features should get matched with the logistics features which are neglected and not considered by organizations.

Logistics and product development are two ends of a business which is why direct link of logistics and new product development may not be possible. It is one of the reasons, this particular study is incorporating other variables i.e., manufacturing capabilities and environmentally sustainable innovation to understand the relationship between logistics flexibility, innovation in logistics and new product development. Association among logistics and new product development is seen as neglected in the literature while the impact of logistics upon new product development has its implications and needs to be researched.

The products which are new usually measured with regard to perceived quality, high reliability, delivery, and right positioning in the market. But one factor that should be included i.e., whether the organization need a separate channel to move new product towards point of consumption or move those new products through the same channel. The new product characteristics such as aesthetics related to logistics which includes product design, packaging, weight should also have an alignment. These aspects also contribute towards improvement in new product development.

Instead of merely including customer needs for a new product, organizations must include its logistical aspects. For instance, a responsive channel, flexibility in schedules and storing, introducing innovative delivery modes, higher capabilities to manufacture will bring newness in business processes thus improving new product development. For this purpose, firms should make a transition towards logistics-oriented from customer-oriented approach.

New products in the market usually fail because managers do not consider the factors which are responsible in accomplishment of new product development such as innovation in delivery schedule, packaging, warehousing, transportation and other related activities. These factors may influence the enhancement of new product development. According to Yuan and Zelong (2009), approximately 50% of new products which are presented in marketplace failed while 70% are unable to reach the specified sales goals and one of the underlying reasons is lack of flexibility in new product development.

One aspect towards the production process of new products is it could hamper the surrounding environment. While creating new products organizations did not play their role to adopt sustainable practices in last decades which later on impact the environment Kneipp et al. (2019). With passage of time organizations realized the significance of sustainable innovation which could reduce the negative impact on environment. According to Szekely and Strebel, (2013), sustainable innovation is building of anything new which assists in refining fulfilment in aspects of social, environmental and economic development meanwhile these enhancements are not limited to replacements in technology, instead it may connect to replacements related to businesses related procedures and operations.

Environmentally sustainable innovations are crucial to adopt in organizations due to certain barriers. Zhang et al. (2011) argue that economic incentive for environmentally sustainable innovations is high while its adoption is quite slow and undetermined. However, Naor et al. (2015) determined the overcoming barriers in order to adopt environmentally sustainable innovations which further explains the underlying causes of those barriers. Moreover, there is a challenge to market environmentally sustainable innovative products in capitalist economies. De Medeiros and Riberio (2017) identified the buying process of consumers for environmentally sustainable products while investigating the attributes for automobile and furniture products. Moreover

organization of product life cycle is significant to attain new product development sustainably. Gmelin and Seuring (2014) conducted a study to connect sustainable new product development and product life cycle.

1.2 Problem Statement

Being responsive to changes catering customer needs and demands may assist in new product development which is why it is significant to connect logistics flexibility and logistics innovation with new product development. The role of logistics has not been considered in perspective of new product development till now. In order to explain the relationship between these variables, manufacturing capabilities will assist while environmentally sustainable innovation will strengthen the relationship between these variables.

1.3 Research Questions

The research questions which lay foundations of this research study are as following.

RQ1: What is the contribution of logistics flexibility to improve the new product development?

RQ2: Do logistics innovation takes part in improving new product development?

RQ3: Do manufacturing capabilities mediates the relationship between logistics flexibility and new product development?

RQ4: Do manufacturing capabilities mediates the relationship between logistics innovation and new product development?

RQ5: Do environmentally sustainable innovation moderates the relationship between manufacturing capabilities and new product development?

1.4 Research Objectives

The research objectives which will be achieved in this research study are as under.

RO1: To identify the contribution of logistics flexibility for enhancement of new product development.

RO2: To know if logistics innovation takes part in improving new product development.

RO3: To learn whether manufacturing capabilities may assist in describing relationship between logistics flexibility and new product development.

RO4: To identify if manufacturing capabilities may assist in explaining the association between logistics innovation and new product development?

RO5: To understand the impact of environmentally sustainable innovation in strengthening the association between manufacturing capabilities and new product development.

1.5 Research Significance

This research study is going to be conducted with an aim to bring positivity, innovation, and improve the processes in manufacturing organizations that are important for new product development. The contributions of this research study are two-fold i.e., for academicians and organizations. This also entails introducing a new model which will innovate the way new products have been developed. It adds value to the literature by connecting the variables which do exist but not connected previously i.e., logistics flexibility, logistics innovation and new product development. Meanwhile this research study also incorporates manufacturing capabilities and environmentally sustainable innovation in order to understand this relationship. The improvements will ensure the success of new products in the market and enlarges the profitability of organization in return. On the flip side, consumers will also gain benefit for enjoying diversified, new, and improved products as per their needs and demands.

Furthermore, present research adds value to the literature by drawing on the resource-based view and diffusion of innovation theory as the theoretical underpinnings in order to research the impact of logistics flexibility and logistics innovation on new product development. Moreover, this research has investigated how manufacturing capabilities mediate the relationship of logistics flexibility and logistics innovation on new product development. This research also contributed in the literature by considering the role of environmentally sustainable innovation as a moderator.

Moreover, this research has also contributed in the academic literature by identifying the drivers and consequences of logistics flexibility and logistics innovation to develop a conceptual framework. Furthermore, it explains type of methodologies and analysis techniques, main drivers,

consequences, mediating and moderating variables and theoretical underpinnings used in previous researches.

1.6 Thesis Structure

The rest of research is organized as follows:

Chapter No. 2 which constitutes of systematics literature review. This section emphasizes upon the research method which was used to select the keywords and peer-reviewed journals shortlisted to perform systematic literature review. Upon the basis of systematic literature review, this research segment will further illuminate the gaps identified in relevant literature.

Chapter No. 3 presents the conceptual framework which is founded on theoretical underpinnings for this research study. Hypotheses are developed to investigate the influence of logistics flexibility, logistics innovation and new product development. Manufacturing capabilities is considered as mediating variable in order to examine the influence of logistics flexibility, logistics innovation, and new product development. Besides, this chapter also provides hypothesis to understand the relationship between manufacturing capabilities and new product development. Environmentally sustainable innovation is considered as moderating variable to predict the relationship between manufacturing capabilities and new product development.

Chapter No. 4, elaborates the methodology for this research study which includes study settings, procedure for data collection, and measurement of constructs to test the proposed hypotheses.

Chapter No. 5, explains the analytical process employed in this research. This chapter elaborates the statistical procedures conducted to analyze the collected data which includes reliability analysis in order to examine the internal cohesion among construct items. Furthermore, it describes structural equation modeling which includes exploratory factor analysis, confirmatory factor analysis, and measurement model analysis.

Chapter No. 6, presents the findings and conclusions for this research study.

1.7 Conclusion

The first chapter describes the background for this research study, problem statement, research questions, research objectives, significance of the research, and structure of the thesis in

great detail. This chapter elaborates on the growing interest of researchers in the field of logistics due to its practical and theoretical implications. Moreover, it intricate the purpose of this research followed by the questions which is the foundation of this research study. Furthermore, it describes the research objectives which has been achieved in order to complete this research study. Lastly, it elaborates on the importance of this research and the structure which has been followed for the research study.

Chapter No. 2

2. Literature Review

2.1 Overview

This chapter elucidates upon previous literature by conducting a systematic literature review to present a complete and absolute view on logistics flexibility, logistics innovation, and new product development. Based on the systematic literature review, this chapter brings conceptual clarity by developing a conceptual framework though identifying drivers, consequences, mediators, and moderators. Furthermore, this chapter addresses the gaps in literature by evaluating critically.

Today the business environment is not certain yet quite dynamic as it depends upon several factors such as sudden changes in product design or shipment, increase in demand of products due to some disaster which requires logistics to incorporate rapid changes while at the same time maintaining the quality and keeping the cost within budget. This is why logistics should be flexible enough to absorb rapid changes and respond quickly in an effective manner. This includes being flexible in storing, packaging, transportation and other support activities. Irrespective of industry, firms engage in moving products which requires flexibility in processes in purpose to meet the changing needs and demands of customers. This construct may also be linked with logistics innovation as flexibility in logistics operations will pave the way for creating newness in operations and processes.

2.2 Systematic literature review

Numerous studies have explained the significance of logistics flexibility on firm and supply chain performance Fantazy et al. (2012), how it encourages customer satisfaction Shah and Sharma (2014), and its role in enhancing logistics service quality Yu et al. (2017). In order to determine key drivers behind efficient and effective logistics management Hartmann and Grahl (2011) has found flexibility, uncertainty in volume demanded and delivery of goods Tachizawa and Thomsen (2007) and value-added distribution Aghazadeh (2004) while strong market communication and a growing large market Barclay and Benson (1990) are key forces behind new product development. This emphasizes the significance of flexibility in effective and efficient logistics management. Furthermore, literature has identified lack of coordination, delivery constraints Sanchez-Rodrigues

(2010) inefficient logistics systems, transportation bottlenecks Goh and Pinaikul (1998) as barriers in logistics flexibility. These obstacles could create problems for firms in carrying out flexible logistics operations. Moreover, trade between countries has increased in recent past which urges firms to move products to distant parts of the world. This includes determining the best and fast trade routes, real time information about product demand and prediction about uncertain demand of products so as to reduce any delays in delivery, efficient handling procedures of goods in warehouse, and innovative packaging solutions that ensures safe and secure delivery of products. Bringing flexibility and innovation in logistics activities and replacing previous time taking and inefficient activities with new and improved processes can also be linked to development of new products.

The extensive systematic literature review on previous studies revealed eminent contributions in the field of logistics, logistics flexibility and innovation, and new product development. However, literature did not provide a coherent picture of logistic flexibility and innovation, its drivers, barriers, and consequences. This is done by consolidating literature on drivers, consequences, barriers, mediators, and moderators of logistics flexibility which exists in literature, but an organized and coherent view seems to be missing.

This study exhibits a comprehensive view of relevant literature identifying noteworthy contributions on logistics flexibility and innovation, and new product development while identifying gap in previous studies which has not been filled in top management, economics and business journals. Moreover, the study identifies drivers, consequences, mediators, and moderators used by relevant literature. It also provides an outline of research methodologies, analyses techniques, and type of research conducted whether quantitative, qualitative or mixed method in previous studies. In view of significance of theoretical foundations for the purpose of testing relationship between constructs, this study presents theories found in literature such as resource-based view, resource dependence theory, competence and capability theory, information processing theory, transaction cost theory, and institutional theory.

2.2.1 Research method for systematic literature review

This study conducts a systematic literature review that is recognized for a broader view and incorporates in identifying trends in a more accurate way which is usually overlooked in

conducting individual studies Haase (2011), helps in identifying discrepancies across various studies Mulrow (1994) while paving way for future research Knipschild (1994).

The motive for conducting a systematic literature review is twofold. In order to find relevant literature upon antecedents and consequences for logistics flexibility, keywords were used to identify search terms in this research study. Following literature Jafari (2015) in order to get more appropriate and precise literature flexibility in logistics operations, logistics management, logistics innovation, agility, sustainable logistics, and logistics performance were searched as related terms and synonyms. Moreover, following Tariq et al. (2017) these terms were refined over repeated iterations.

In order to extract more relevant papers, the study identified most appropriate journals from web of science master journal list and Scopus while Google Scholar database was also explored to trace relevant articles (Table 2.1). To get an exact view books, chapters of books, reports, and non-peer reviewed journals were excluded and merely peer reviewed journals were included with high impact factor. To begin with, articles were searched in selected journals of Management, Economics and Business derived from Web of science master journal list and Scopus. In this regard, to find relevant literature, all issues of each journal were explored. Logistics flexibility and logistics innovation articles appeared in five journals while articles on new product development were found in nine journals. Furthermore, other relevant articles were found using logistics management as search term. As a result, four articles were found in top journals. The remaining relevant articles were found by employing advanced search option in Google Scholar database.

This study used keywords, phrases, and keywords with different combinations while negating certain words in order to get most relevant and refined articles. In this process, 3165 articles were extracted which had one or more keywords either in abstract, title, or in full text. Moreover, based on relevancy and quality, articles were shortlisted out of the total articles. For this purpose, articles and abstracts were assessed in-depth to get the final list of 52 articles published between 1990 and 2019.

2.2.2 Literature based conceptual framework

A systematic review of literature reveals that logistics flexibility notion has gathered researcher's attention in last two decades due to its broader execution and implementation in business organizations. Previous researches conducted in this domain have also incorporated agility, flexibility Fantazy (2009), flexibility in logistics management Stefansson (2006), innovation in logistics Björklund and Forslund (2018), supply chain agility Jermsittiparsert and Srisawat (2019), agility for effective logistics network Schönsleben (2000), achieving agility through continuous implementation Holmqvist and Pessi (2006) for flexible logistics operations in businesses and supply chains. From figure 2.1 an increasing trend can be seen for the articles published on logistics flexibility between the years 1990 and 2005. Afterwards a fluctuation has been observed for the studies conducted in the domain of logistics flexibility which created room for more research studies in this domain. Another insight from the literature review is more quantitative studies have been conducted in previous studies (Figure 2.2). Further extraction of information from literature reveals that structural equation modeling, multiple regression, and correlation analysis are mostly used as analytical techniques followed by t-test, K means cluster analysis, and Smart PLS in quantitative studies (Figure 2.3 and 2.4).

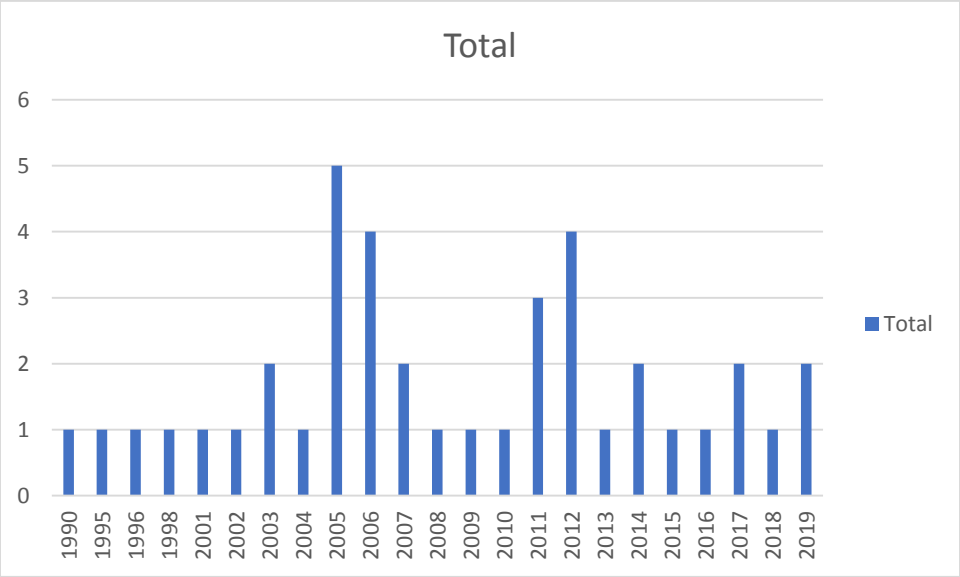


Figure 2.1. Number of Articles Published in Years

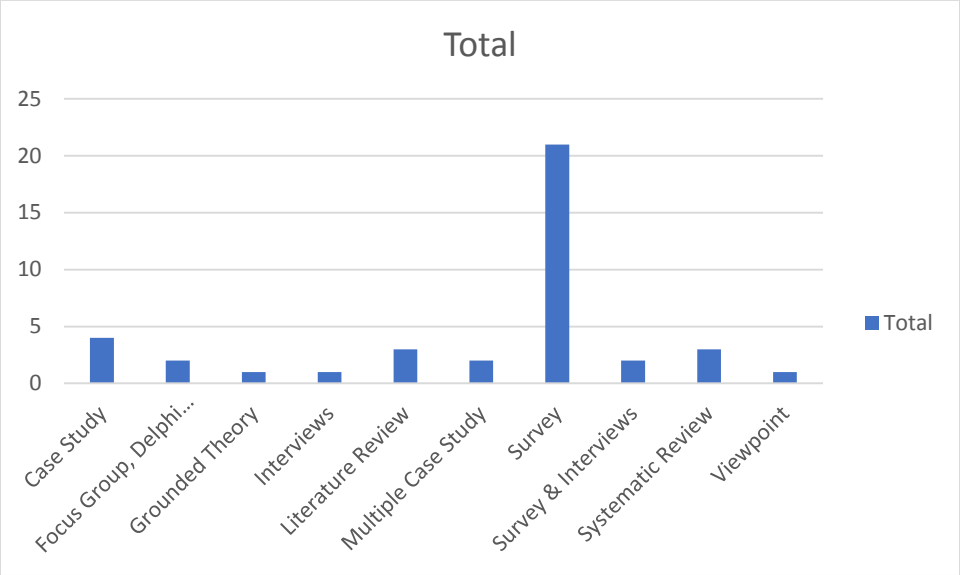


Figure 2.2. Type of Study

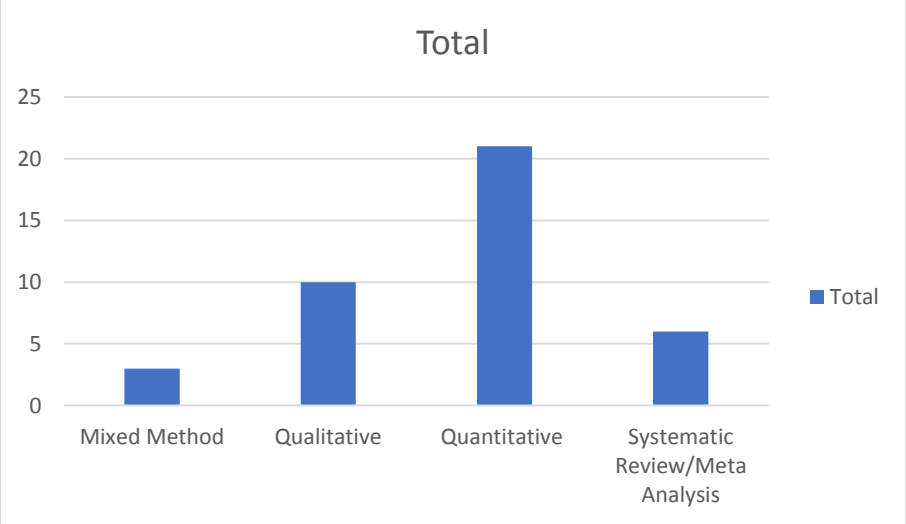


Figure 2.3. Type of Methodology Conducted in Previous Studies

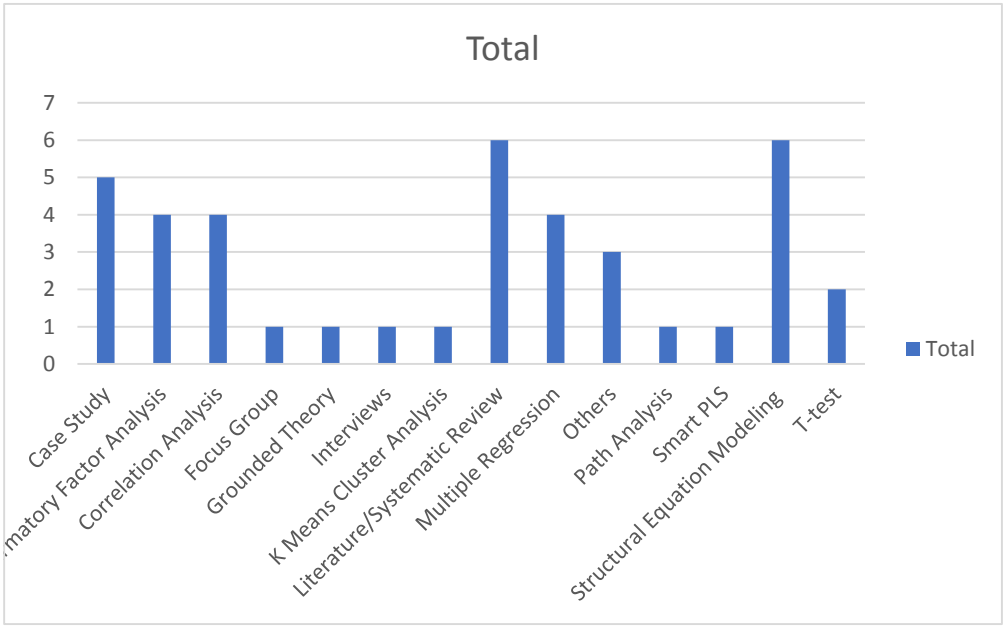


Figure 2.4. Analysis Technique Conducted in Previous Studies

The articles shortlisted for this research were further categorized upon the basis of drivers, barriers, antecedents, consequences, mediators, moderators, and attributes in relation to logistics flexibility. Based on the information available in literature about antecedents, drivers, consequences, attributes, mediators, and moderators a conceptual framework is developed in this research study as contribution (Figure 2.5).

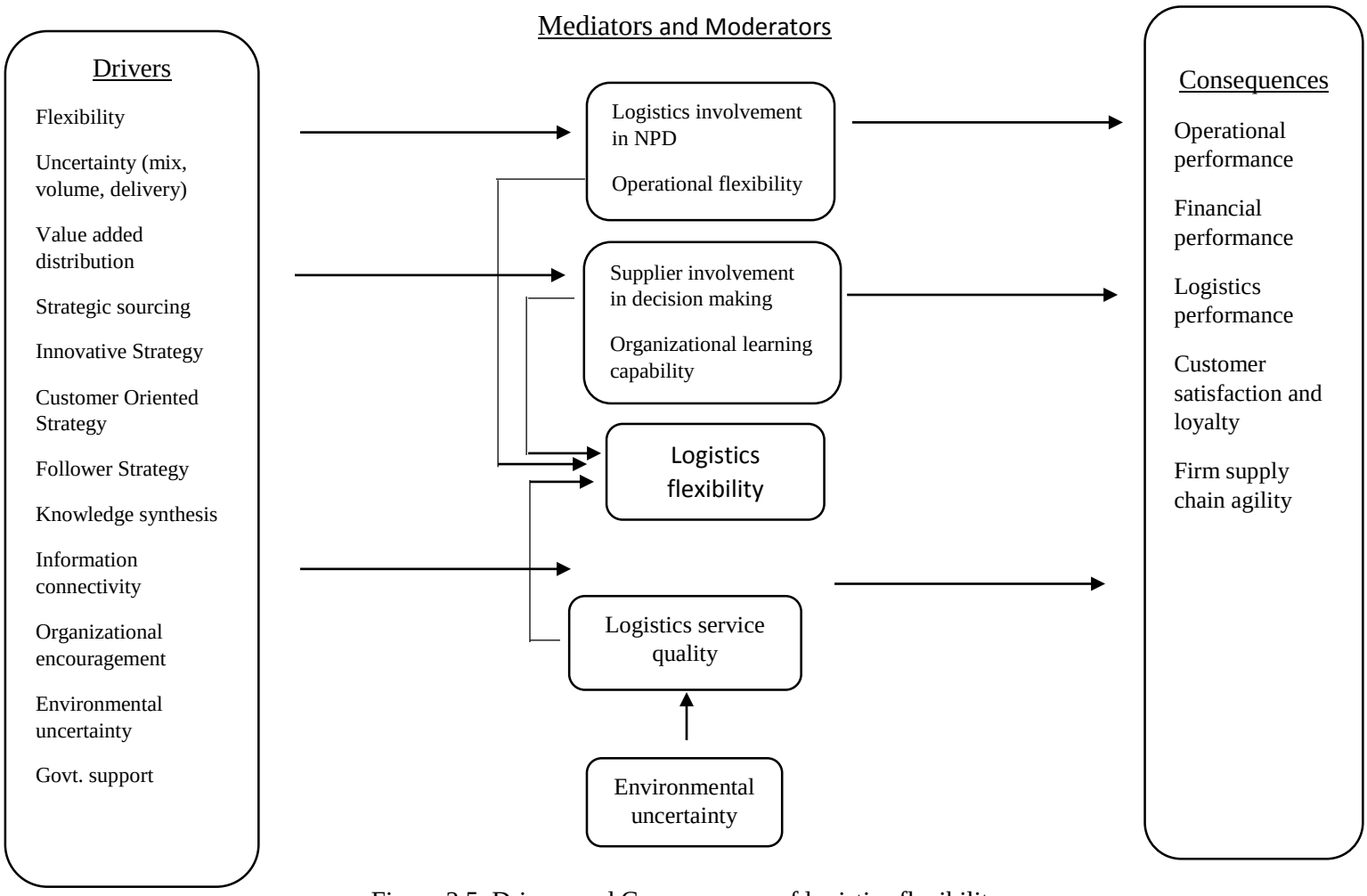


Figure 2.5. Drivers and Consequences of logistics flexibility

2.2.3 Drivers of logistics flexibility

The literature provided a distinct view of previous studies conducted on logistics flexibility. In the recent past several studies have identified key drivers of logistics flexibility. This study has identified eight drivers of logistics flexibility as shown in figure 2.5.

Flexibility

The literature addressed the significance of flexibility in logistics. As identified by Tachizawa and Thomsen (2007) flexibility is seen as an emerging driver in the field of logistics. With the perspective of addressing growing needs in logistics and supply chains, flexibility is the factor behind effective logistics management which in turn impacts customer loyalty in a positive

manner. Moreover, it is in best interest of logistics service providers to incorporate flexibility in daily operations.

Uncertainty (volume, mix, and delivery)

Literature reveals uncertainty as a potential driver to logistics flexibility. In a study conducted by Aghazadeh (2004), exhibits flexibility is usually repercussions of uncertainty which is further categorized into volume, mix and delivery. As reported in the literature uncertainty in volume of goods demanded versus the real amount of goods produced creates problems in supply chains and drives a firm to become flexible. While on the other hand, production schedules need to combat with periodic changes occur due to mix/specification and delivery of components.

Value added distribution

Value added services are always regarded as core competencies which urges a firm to incorporate value added distribution as well Barclay and Benson (1990). A firm with value added distribution enhances agility, less time to market while decreasing the complications in logistics management Burton (1997).

Strategic sourcing

The systematic literature review has investigated strategic sourcing crucial for making strategic decisions with agility in purchasing, inter-functional coordination, association with providers, and expansion of suppliers Kocabasoglu and Suresh (2006). Strategic sourcing in a firm drive flexibility in supply, design of product, and processes Fantazy et al. (2012).

Innovative, customer oriented, and follower strategy

In a study conducted by Shah and Sharma (2014), addressed the significance of innovative, customer oriented and follower strategy in impacting logistics flexibility in manufacturing companies. With innovative strategy a firm becomes flexible in paying costs related to innovation, while with a customer-oriented strategy firm gains customer satisfaction and follower strategy assists in controlling production costs flexibly. Hence combination of these strategies helps a firm in gaining logistics flexibility.

Knowledge synthesis

Literature has reported a positive role of knowledge synthesis in formation of innovative logistics processes. It has been argued that the diffusion of knowledge across a firm paves the way for innovation in processes and operations of logistics Grawe et al. (2011).

Information connectivity

Logistics flexibility has also been characterized as flexible logistics programs in literature whereas role of information connectivity has seen as quite critical in determining the success of flexible logistics programs Closs et al. (2005). Information sharing among key stakeholders facilitates flexibility in logistics.

Organizational encouragement, environmental uncertainty, and government support

Being innovative in logistics processes paves way for flexibility and agility in procedures and operations of logistics. It has been argued that if a firm has characteristics of human capital, responsive towards unpredictability in surroundings, and with the assistance of government assists a firm in logistics innovation Lin (2007).

2.2.4 Mediators and moderators of logistics flexibility

This research study has identified several mediators and moderators contributed in literature of logistics flexibility. Earlier studies have shown direct relationship with logistics flexibility is not providing meaningful insights. Hence, there comes a need of mediators and moderators to intervene.

Logistics service quality

Logistics service quality is seen as mediating the relationship between logistics flexibility and satisfaction. The capacity to store, material handling, scheduling, selecting mode of transport, and inventory management in relation to customer demand needs logistics flexibility to enhance relationship satisfaction Hartmann and Grahl (2011).

Logistics involvement in NPD

Logistics involvement in NPD is seen as a mediator between logistics salience and NPD project performance Zacharia and John (2007). This study proposes that logistics salience i.e. significance of logistics respective to other functions encourages logistics involvement in new product development which in turn increases project performance of NPD.

Operational flexibility

In a study conducted by Burton (1997), operational flexibility mediates the relationship between knowledge synthesis and logistics performance. According to this study, it is operational flexibility which bridges the gap between knowledge synthesis and logistics performance of a firm.

Supplier involvement in decision making

The role of supplier involvement is seen as vital in literature review whether it is through a formal point of entrance or by a casual channel. Supplier involvement mediates the relationship between customer knowledge of supplier and project outcomes Petersen et al. (2003).

Organizational learning capability

Organizational learning capability is seen as mediating the relationship between intellectual capital and new product development performance in literature. In a particular study Hsu and Fang (2009) argues that the capability of an organization to absorb the knowledge strengthens the relationship between intellectual capital and new product development performance.

Environmental uncertainty

Environmental uncertainty is used to explain the relationship between logistics flexibility and relationship satisfaction in literature Barclay and Benson (1990). Upon investigation the study has found that in an uncertain environmental condition, logistics flexibility fosters by firm's capabilities in order to increase logistics service quality.

2.2.5 Consequences of logistics flexibility

The literature has examined the consequences of logistics flexibility in detail. In this respect certain consequences have been found in the literature.

Operational performance and financial performance

Previous studies conducted in the domain of logistics flexibility contributed in the literature by connecting logistics flexibility with performance i.e., operational and financial Shah and Sharma (2014). Several measures have been employed in order to gauge performance in literature. Literature has implied that with the assistance of logistics flexibility a firm can achieve financial and operational performance in perspective of net profit, sales growth and customer satisfaction respectively.

Logistics performance

It has been addressed in the literature that operational flexibility in relation to adaptability towards logistics enhances logistics performance Burton (1997). When a firm becomes capable in carrying out flexible operations it leads towards achieving logistics performance.

Customer Satisfaction and loyalty

Literature has shown that few studies have tried to find direct link of logistics flexibility with customer satisfaction Yu et al. (2017). A firm with responsiveness towards changes in supply chains are able to create certain solutions to enhance customer satisfaction.

Firm supply chain agility

The literature implies that firm's strategic sourcing in terms of purchasing, coordination, and supplier development paves way for supply chain agility Fantazy et al. (2012). Firm's supply chain agility is an organization wide phenomenon along with upstream and downstream linkages which makes its scope broader.

2.2.6 Theoretical underpinnings

Previous studies on logistics flexibility and logistics innovation are supported by strong theoretical foundations. Resource-based view (RBV) and resource dependence theory (RDT) are

seen as prominent theories in literature. One of the most dominant theories is resource-based view as theoretical base in research studies conducted upon logistics flexibility and new product development. Besides resource-based view, resource dependence theory is another notable theoretical underpinning which has become a strong basis to support theoretical frameworks in literature. It grasps that an organization is considered as federation of resources which helps it survive, while management has control over and power to authorize the use of resources Pfeffer and Salancik (1978). Kocabasoglu, and Suresh (2006) enlightens the significance of logistics as a function and responsible for controlling resources for other functions in organizations. A detailed study was conducted upon several sectors i.e., truck and rail transportation, consumer goods, chemical industries, automotive, telecommunications in order to know the contribution of logistics in new product development. This study further identified the critical role of logistics in selecting efficient mode of transport, availability of product, effect of packaging, and product delivering in safe condition. Olsen et al. (1997) developed a contingency model constructed upon resource dependence theory which recommended that a combination of innovativeness of product and participativeness of coordination mechanism improves the outcome for product development. Previous studies have incorporated resource dependence theory in understanding how logistics as a function is able to manage resources for other silos in organization, involvement of customers and significance of product innovativeness is crucial in providing input for product development.

Previous studies have also incorporated competency and capability view with the perspective to be competitive in relation to cost and differentiation while enhancing customer satisfaction. Moreover, it has been suggested that managers may embrace vertical integration in firms to bring competency and capability in logistics which in turn enhances customer satisfaction Daugherty et al. (2011). Competence in logistics flexibility authorizes a firm to be responsive towards customers' needs and more competitive in cost structures which will assist a firm to increase customer satisfaction Zhang et al. (2005). The use of competence and capability theory is finite in logistics flexibility literature and can be expanded to examine competence and capabilities in flexible logistics operations and processes.

Some of the studies in literature were conducted to explain logistics flexibility with the assistance of information processing theory Yu et al. (2017), transaction cost economics, organizational design, relational theory, and network theory Grawe et al. (2011), theory of logistics

innovation Flint et al. (2005), cooperative game theory Vanovermeire et al. (2014), and social exchange theory Gligor and Holcomb (2012).

2.3 Conclusions from systematic literature review

Mentzer and Kahn (1995) argue that the context of logistics is now emerged out of merely management of placing goods physically in an efficient and effective manner. According to Zhang et al. (2002), when an organization reacts rapidly for the provision of efficient delivery, assistance, and care to its customers. Tummala et al. (2006) argues that for the successful implementation of activities in relation to supply chain management flexibility is contemplated as a basic factor. While according to Yu et al. (2012), "concerning the unpredictability and unreliability in business arena flexibility became subject of debate in operations research to think about bringing flexibility in supply chains rather than having a flexible factory."

2.3.1 Resource-based view

As reported by Kraaijenbrink (2009) till now in management literature resource based view is considered as most dominant and recognized theory. It elucidates the contribution of the assets possessed by an organization to gain edge on its rivals in markets. Penrose (1959) is recognized as first scholar in the literature. Later on, with the passage of time several eminent scholars presented their arguments regarding this view. However, Wernerfelt (1984) presented the resource-based view in a more organized and formal view. Grant (1991) presented a practical framework in which resource-based approach has been used for the strategy analysis. According to Barney (1991) gaining competitive advantage is possible when an organization has resources which are profitable, few, non-interchangeable and static proficiencies. Porter (1991) argues that the perception about resources is wrong about their value as they assist in building edges because of certain processes. This argument is extended in this research to study how an organization's resources allows themselves to enhance logistics flexibility, logistics innovation, and manufacturing capabilities paves the way for an organization to enhance new product development which makes it helpful to gain competitive advantage.

Literature has reported that several studies have considered organizational resources i.e. the formation of company Daugherty et al. (2011) and capabilities which includes buyer's and

supplier's ability to achieve performance indicators Salema (2019) crucial for sustaining competitive advantage which further leads towards achieving organizational performance. It has been noted that researchers have applied resource-based view to gain and sustain competitive advantage with the help of valuable, rare, and inimitable resources. However, those valuable and inimitable resources in firms could be utilized to innovate processes or initiating flexibility in logistics operations in previous studies.

Yu et al. (2017) addressed logistics flexibility and relationship flexibility will improve the logistics service quality in terms of timeliness, condition, and availability. It also considered unpredictability from environment and logistics service quality will in turn strengthen the relationship between buyer and supplier. This study suggested that for the purpose of adjustments in schedules and storage, mode of delivery, and other outbound processes being responsive to customer demands firm should contemplate logistics flexibility implicating information flux. In this study researchers only considered Chinese manufacturers to monitor the effects of environmental uncertainty and neglected other manufacturers who could provide significant data aiding research study. Secondly, researchers have not tried to create a link between logistics flexibility and logistics innovation which could be a significant prospect in this research study.

Ko et al. (2018) contributed in the literature by examining how external supply chain flexibility which is further divided into inbound supplier flexibility and outbound logistics flexibility will impact production innovation performance. For new products the firm will not have adequate information for forecasting demand and as a result firm should have flexible logistics to cater the needs of market which is why outbound logistics flexibility is seen as important variable for product innovation performance. Authors merely considered small and medium sized enterprises. Besides this, due to the fact researchers have collected cross-sectional data which is why in this study researchers were not able to see long-term effects.

The disturbances in supply chain are unavoidable for which it is difficult to know when it will happen and to which extent it will affect the supply chains, Skipper and Hanna (2009). This is the reason for acknowledging the role of flexibility in logistics and supply chains. Uncertainty in demand affects members of supply chain which requires logistically flexible operations to cater demand changes, Jafari (2016). As a common practice retailer delay customer demands and

changes which further causes problems for retailers in losing customer base. According to Flint et al. (2005), any new activity, process or procedure which assists in logistics and aiding in customer service is termed as logistics innovation. Most of the organizations outsource logistics activities to logistics service providers which due to some unforeseen circumstances are unable to provide services. In order to resolve this issue Wallenburg (2009) offered a framework which classified the innovations in detail for logistics service providers to enhance the competitiveness. In addition to other industries shipping industry has realized the significance of innovation in logistics operations by decreasing costs associated with doing business and lead times Lee and Song (2010) while increasing agility, dependability, and flexibility which would in return enhance logistics value Lee and Song (2015).

Increased pace for globalization in recent years has increased trade between countries which led towards increase in demand of products. For this reason, firms move products to distant parts of world for which they need to determine the best and fast trade routes, real time information about product demand and prediction about uncertain demand of products so as to reduce any delays in delivery, efficient handling procedures of goods in warehouse, and innovative packaging solutions that ensures safe and secure delivery of products. Bringing innovation in logistics activities and replacing previous time taking and inefficient activities with new and improved processes can also be linked to development of new products. This is due to the reason generation of new ideas, concepts, processes, and activities will assist in development of new products.

Ardito et al. (2018) proposed a framework to measure ambidexterity performance employing logistics innovation, technology innovation, and production innovation. Ambidexterity refers to the situation where organization has the capability for being explorative and exploitative at the same time i.e., explore new possibilities and exploit previous certainties. This study explored the role of improvements in logistics processes in achieving a balance between exploration and exploitation. It did not consider a significant factor i.e., environment which may have its impact upon the processes of logistics. For this purpose, it could consider natural environment which may have direct impact and business environment which may have indirect impact. Secondly, environment is also responsible for contributing its resources in learning explorative and exploitative processes. Another aspect of this study is it was conducted in Italy and results could be generalized when conducted in other countries as well.

Feibert and Jacobsen (2018) contributed in literature by exploring the innovation factors which can improve logistics processes in healthcare. Healthcare logistics processes should get improve with the adoption of technology in order to better serve patients. This study merely included small sized public hospitals serving up to 700 beds only. Another important aspect in the study was missing i.e., human capital which could be included as well. This is due to the reason along with technological role of human capital is also significant in healthcare.

Firms are continuously increasing in number with the span of time which is one of the reasons for increased competition in marketplaces. In order to be in the competition and gain competitive advantage over a firm's rivals, firms are always in the process of developing something new and unique in terms of products. This view has also been reported in literature as reduction in product life cycle span of products and ever-increasing demand of customers is changing the dynamics of competitive edge for companies which was previously based on two dimensions i.e., quality and cost (Sorescu & Spanjol, 2008, as cited in Yu, et al., 2019). Now firms must engage themselves in launching new products. Firms spend a major timespan and assets to bring an idea from conception to reality. Most of the times new products fail to offer expected value in the market due to the lack of collaboration and connection with the right source i.e., logistics.

The unfolding of an authorized and accredited up to date product development function is assigned to necessities of organizations in industrialist economies for the maintenance of edges in marketplace which is preconditioned for organization's development White (1976).

The procedure of introducing a new product into market is termed as new product development (NPD) which can be something your organization or any other organization has not made and any new innovative product introduced in marketplace.

Input from logistics could be helpful in improving new product development in terms of better and valuable products which would meet the needs and demands of customers. This will also have a positive impact upon the economy. A study conducted by Cooper and Kleinschmidt (2000) accentuate the significance of new product development for a company's success. The study considered some factors to be responsible for new product performance development such as process of new product development, organization of new product development program, strategy of firm towards new product development, organization's culture of innovation and commitment

of senior management. This study neglected the logistics aspect of organization and its role while enhancing new product performance development.

While Jespersen (2012) challenged the traditional approach towards new product development and stressed upon the fact that organizations should extend boundaries of supply chains in order to accelerate learning and new product development. Information dependency may prospectively confine managers rather than creating constructive learning. For new product development identified stages are idea generation and accepting, conception, designing of prototype, testing of prototype, and final launch of product. These stages should be synchronized in terms of information sharing. According to Saxena and Wadhwa (2009) in order to cope up with competition and uncertainty supply chains should consider flexibility in business processes. Fantazy et al., (2009) see a potential in flexibility if incorporated in new product development in order to enhance competence and performance of company. A study conducted by Fantazy and Salem (2016) investigated the association between implementation of new product development and aligned strategy, and substantiating the effect of this association on supply chain performance."

Samra et al. (2018) pointed out how organizations cope with calamities which arises in development of new products. Informal collaboration plays a significant role in solving crises for new product development. This study merely included technological industries where each industry may have different crises and characteristics which may impact new product development differently. Cooper (2018) focused on the drivers which contribute in the accomplishment of new product development. Meanwhile researcher has also shed light upon the factors which result in hindrance of new product development. Researchers identified generic drivers for favorable outcome of new product development and ignored challenges and problems which firms face in development of new products from logistics aspect.

Mikkelsen and Johnsen (2018) explored how early supplier involvement considering unpredictability in technology employed in new product development will affect the sourcing strategy which company is exercising. Researchers considered how unpredictability in technology employed for new product development projects will worsen the situation for company but neglected the aspect of how logistics innovation will assist. A comparative study for both studies

is needed to know both aspects where dynamics of logistics innovation in context of new product development can be seen.

2.3.2 Diffusion of innovation theory

This research builds on diffusion of innovation theory in order to further investigate the moderating role of environmentally sustainable innovation. E.M. Rogers in 1962 developed this theory which proposes that how an idea or a product spreads in a social system through the process of diffusion. As a result, that idea or product is adopted by the people. While the process of adoption may happen differently to different audience based on their perception and acceptance Robertson, Thomas S. (1967). In this regard, few of them are categorized as innovators, early adopters, and early majority who adopt the idea or product very quickly. While rest are categorized as late majority and laggards as they adopt it so lately. Libertore and Bream (1997) conducted a study upon banks and insurance companies to determine the diffusion of technology and found out that an organization large in size adopts technology earlier than a small organization. The behavior of diffusion was also studied in context of software and hardware. In a study conducted by Rogers (1995), found out that software diffuses faster than hardware. Ziemnowicz (2013) argues that bridging the gap between an idea and implementation will be helpful in "incremental improvements to existing processes or products." While incubation time is considered as a significant element in innovation diffusion Kohli, Lehman and Pae (1999). It is the time between the product completion and the inception of product sales. Moreover, regional effects were also studied to explore the rate of diffusion Baptista (2000). This research study has incorporated manufacturing sector mainly in order to determine the diffusion of environmentally sustainable innovations.

With the growing awareness concerning environmental sustainability organizations are stressing upon alternatives and substitutes that may help in mitigating environmental degradation. Environmentally sustainable innovation refers to development of products which follow the practices and processes while procuring, production, and disposal that may not harm the environment at any stage. Rennings (2000) argues that building up to schemes, conduct, goods and activities that come up solutions which decreases implications on surroundings. In a study conducted by Huesemann (2003) identified that radical innovation is significant along with incremental innovation as it assists in attaining the targets in relation to emission for sustainable

development. This is why organizations cannot achieve it by simply improving technologies moderately. Hellstom (2007) addressed that the formation of ideas related to environmental innovation in perspective of innovative dimensions, i.e., if it is progressive or absolute. Previous studies have also incorporated competency and capability view with the perspective to be competitive in relation to cost and differentiation while enhancing customer satisfaction. Moreover, it has been suggested that managers may embrace vertical integration in firms to bring competency and capability in logistics which in turn enhances customer satisfaction Daugherty et al. (2011). Competence in logistics flexibility authorizes a firm to be responsive towards customers' needs and more competitive in cost structures which will assist a firm to increase customer satisfaction Zhang et al. (2005). The use of competence and capability theory is finite in logistics flexibility literature and can be expanded to examine competence and capabilities in flexible logistics operations and processes.

2.4 Conclusion

This chapter has provided eight drivers of logistics flexibility and innovation i.e., flexibility, uncertainty (volume, mix, and delivery), value added distribution, strategic sourcing, innovative, customer oriented, and follower strategy, knowledge synthesis, information connectivity, and organizational encouragement, environmental uncertainty, and government support. Meanwhile, this chapter presented five consequences i.e., Operational performance and financial performance, logistics performance, customer satisfaction and loyalty, and firm supply chain agility. Later on, this chapter addressed the gaps in literature. Moreover, this chapter reported that this research mainly relies on resource-based view and diffusion of innovation theory in order to examine the proposed hypotheses.

Chapter 3

3. Research Hypotheses and Conceptual Framework

3.1 Overview

Researcher develops the hypotheses for this research study. The conceptual framework and hypotheses are developed by reviewing the literature in detail as described in chapter 2. Logistics flexibility, logistics innovation, and manufacturing capabilities are included as influential drivers in this research. Meanwhile, environmentally sustainable innovation is considered as moderating variable in order to examine its influence on manufacturing capabilities and new product development.

3.2 Logistics flexibility, logistics innovation and new product development

This research places confidence in resource-based view for understanding of do logistics flexibility and logistics innovation influences new product development and how manufacturing capabilities mediates the relationship between logistics flexibility and new product development. According to resource-based view when an organization wants to achieve competitive advantage, it should be able to obtain and control resources which are non-imitable, rare, and valuable Barney (1994, 2002).

One of the most dominant theories is resource-based view as theoretical base in research studies conducted upon logistics flexibility and new product development. In a study conducted by Björklund and Forslund (2018) incorporated two essential resources i.e., knowledge and logistics processes to enhance logistics performance. He argues a combination of knowledge resource and innovation in logistics processes could be helpful in improving logistics performance considering these resources as rare and valuable. In an effort to do so a framework was developed with the application of resource-based view.

Abrahamsson et al. (2003) introduced a logistics platform which was flexible for dynamic business environment and helped in maintaining a competitive position in the market as well. It is therefore necessary for the firms to consider logistics as an integrated part of firm's business model.

Whilst literature has shown positive influence of logistics involvement and logistics strategy on new product launch Calantone and Di Benedetto (2007). Furthermore, in a study conducted by Calantone et al. (2017) found the relationship between logistics involvement and new product development through moderated mediated analysis. While logistics innovation has not been studied in context of new product development.

Hypothesis 1b: Logistics innovation has a positive influence on new product development.

Hypothesis 1a: Logistics flexibility has a positive influence on new product development.

3.3 Mediating role of manufacturing capabilities

Literature has shown various frameworks proposed by researchers regarding manufacturing capabilities. This varies from general and static models to specific and dynamic ones. Swink and Harvey Hegarty (1998) contributed in the literature by providing a dynamic framework in which manufacturing infrastructure positively influences growth capabilities and steady state capabilities which in turn further influences better manufacturing outcomes. Moreover, better manufacturing outcomes helps in increasing product differentiation. This view can be elaborated by incorporating flexible logistics operations along with high manufacturing capabilities in order to get better new products in the market.

Conventionally manufacturing capabilities are classified as better perceived quality, responsiveness in terms of delivery, efficiency in terms of cost, and agility are necessary for an organization to gain competitive advantage in market Kristianto et al. (2011). Chavez et al. (2017) conducted a study to examine the role of manufacturing capabilities upon firm's performance with a role of organizational behaviors which are entrepreneurial. This study connects manufacturing capabilities to the market demand. The study was conducted upon manufacturing sector where responses were taken from automobile, chemicals, food and beverages, textiles, and rubber industry. Moreover, it considered innovativeness while in the context of entrepreneurial orientation, autonomy and competitiveness could also be studied. It merely considered the perspective of how capabilities in manufacturing could enhance organizational performance and neglected other capabilities of firms.

For an organization it is quite beneficial to be flexible in daily operations while bringing new ideas and innovation could also be helpful when it has high manufacturing capabilities. Brown and Bessant (2003) have shown that better capabilities development helps in enhancing the competencies for current and existing technologies in the organizations. Hence, it can be proposed that logistics innovation could also positively influence manufacturing capabilities.

Hypothesis 2a: Manufacturing capabilities mediates the relationship between logistics flexibility and new product development.

Hypothesis 2b: Manufacturing capabilities mediates the relationship between logistics innovation and new product development.

3.4 Manufacturing capabilities and new product development

Each organization performs in the market upon the basis of some capabilities which assist the firm in achieving its goals and aims. Those capabilities are inimitable for their rivals mostly which is why those organizations have competitive edge over their competitors. Some organizations have manufacturing capabilities which help them produce high volume demand in shorter lead times with available resources being cost efficient. If in an organization, manufacturing capabilities are high it may lead towards higher flexibility in logistics and improved new product development as well.

Bag et al. (2018) explored the role of remanufacturing capabilities in impacting resilience for supply chains in a circular economy. This study explains how resources from within and outside the organization combine to develop capabilities for remanufacturing which help the companies in sustaining in the business arena. For this particular study researchers transitioned from linear models towards circular economy business models because it aims at shifting towards long-term resilience. This study was conducted in South Africa and at the time of research economy was volatile. It is one of the reasons this study could have impacts of macroeconomic factors indirectly.

Previous studies from literature have also applied resource-based view, the firm's abilities in combining and developing resources and capabilities help it achieves superior organizational performance Bharadwaj (2000), while resources necessary to gain competitive advantage are

assets, knowledge, information, and processes which authorize a firm to develop strategies to become efficient and effective Barney (1991).

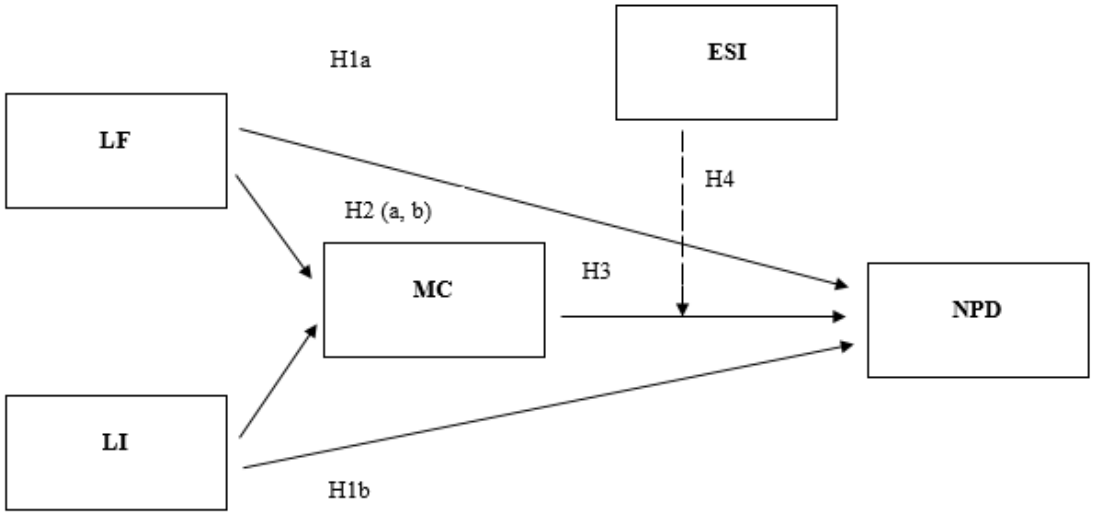
Hypothesis 3: Manufacturing capabilities has a positive influence on new product development.

3.5 Moderating role of environmentally sustainable innovation

In preceding years there is an increasing stress on multinational companies to minimize waste, carbon emissions which are harmful for the environment. This puts pressure upon companies to innovate their processes and procedures by enhancing knowledge and information Galdamez et al. (2009). Prahalad and Ramaswamy (2003) reported that for the purpose of creating profitability the stress is increasing persistently. While in the procedure of innovation the characteristics related to environment are dominant traits Saraceni and Andrade Junior (2012). This research study was conducted on industrial clusters and has shown that bringing innovation while developing ends up in better outcomes.

Hypothesis 4: Environmentally sustainable innovation strengthens the relationship between manufacturing capabilities and new product development.

3.6 Conceptual framework



Note: LF = Logistics flexibility, LI = Logistics innovation, MC = Manufacturing capabilities, ESI = Environmentally sustainable innovation, NPD = New product development.

Whereas,

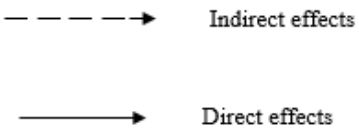


Figure 3.1. Conceptual Framework

3.7 Conclusion

This chapter explains the proposed hypotheses for this research study. This chapter sheds light upon the proposed relationship between the constructs with the help of theoretical underpinnings in this research study. Furthermore, this chapter develops the conceptual framework which is tested through statistical procedures in this research study.

Chapter 4

4. Research Methodology

4.1 Overview

Researcher explains the methodology for this research study which includes settings 9f study, procedure of data collection, measurement of constructs, and strategy to analyze in order to test the proposed hypotheses. The aim of this research is to understand the role of logistics flexibility and logistics innovation in enhancing new product development. In order to understand the relationship between logistics flexibility, logistics innovation, and new product development, manufacturing capabilities mediates while environmentally sustainable innovation moderates the relationship. For the purpose of better understanding the relationship between these variables the manufacturing sector of Pakistan was selected to collect primary data through questionnaire survey. Furthermore, the data was collected from the manufacturing companies listed on Stock Exchange of Pakistan, and Securities and Exchange Commission of Pakistan. Logistics flexibility, logistics innovation, manufacturing capabilities, new product development, and environmentally sustainable innovation data were collected using questionnaire survey. All of the survey questions used a five-point Likert scale.

4.2 Quantitative methodology

In order to test the proposed hypotheses and confirm the persisting theories about logistics flexibility and logistics innovation, this research study aims to rely on quantitative methodology. Furthermore, quantitative methodology is also appropriate for examining the relationship between several constructs. For instance, in this research study, what is the role of logistics flexibility and logistics innovation in improving new product development? Do manufacturing capabilities mediates the relationship between logistics flexibility, logistics innovation and new product development? Does environmentally sustainable innovation moderate the relationship between logistics flexibility, logistics innovation and new product development?

4.3 Study settings

For the purpose of testing proposed hypotheses, this research study collected data from registered manufacturing firms in Pakistan. The manufacturing sector of Pakistan plays quite

significant role in the economic growth of country while sharing a major contribution in the GDP (gross domestic product). Manufacturing sector has shared around 18.34% in GDP of Pakistan in the year 2019 (Statista, 2020). Therefore, the economy of Pakistan relies on manufacturing sector which is why it continues to make progress in terms of production. But new products sometimes fail to offer expected value in return. Meanwhile literature has revealed that new product development is not connected with its right source i.e. logistics. This is why it is significant to study this sector and address the problems with better solutions.

4.4 Data collection

This research study opted for survey-based approach and collected data from registered manufacturing firms in Pakistan. The next step was to find the relevant firms for data collection. In this process, the researcher requested SECP (Securities and Exchange Commission of Pakistan) registrar formally to provide relevant data about the firms which are registered with SECP. Moreover, several manufacturing sectors were also shortlisted and shared with SECP registrar. This procedure took almost 15 days and the list of registered firms was provided through an email.

Afterwards, the researcher started to request manufacturing firms to fill out the questionnaire through emails formally. In this lieu questionnaire along with a recommendation letter duly signed and stamped by advisor was sent to around 400 firms. The response rate through emails was quite low which is why data was collected through personal visits to firms. In this process, prior to visit, appointments were taken from the firms as per their availability. Few of the firms shared the data without hesitation while some were reluctant to share company data. To overcome this issue researcher assured the company representatives about confidentiality of data and will only be viewed by the researcher while results will be shared with the firms also. Moreover, a recommendation letter from advisor was also shared with firm's management to ensure data confidentiality. This increased their interest in the research and agreed to share results. This procedure took almost two months to complete the data collection for 96 manufacturing firms. This research study followed Roscoe (1975) guidelines which suggests a considerable size of sample which should lie between 30 and 500 firms. Moreover, sample to variable ratio Hair et al., (2018) is also followed which suggests a minimum of 5:1 and 15:1 as preferred ratio. This research study has incorporated five variables i.e. 15:5 = 75 responses. While this research used 96 responses greater than 75. The data was collected through self-administered questionnaire from

the most relevant personnel in the company who had the relevant experience i.e., supply chain manager, logistics manager, and new product development manager. One questionnaire from one firm was filled out considering unit of analysis for this study is a manufacturing firm. Hence, the respondents for this research study had the relevant experience in the firm.

Moreover, sample categorization was done upon the basis of relevant manufacturing sectors. The categorized sectors were pharmaceutical, consumer goods, marble and granite, textile, paints, cement, steel and aluminum, and industrial equipment and energy deliverable firms. The major contribution in the data was of consumer goods i.e., 39 firms followed by steel and aluminum i.e., 16 firms, marble and granite i.e., 11 firms, pharmaceutical i.e., 7 firms, paints i.e. 6 firms, textile and industrial equipment i.e., 6 firms, cement i.e., 4 firms, and energy deliverables i.e., 2 firms.

Table 4.1

Measurement of constructs

Constructs	Source
New product development	Sari & Asad (2019)
Logistics innovativeness	Peter, M. Ralston, Scott J. Grawe and Patricia J. Daughtery (2013) (adapted from Anderson and West, 1998)
Manufacturing capabilities	Ray and Ramakrishan (2006), Day (1994), Grant (1991) and Narasimhan et al. (2001)
Environmentally sustainable innovation	Jordana et al. (2018)
Logistics flexibility	Jafari, H. (2015)

4.5 Measures

In this research study, a questionnaire was used to measure the hypothesized constructs. The scales of measurement in this research study were adapted from the literature. Moreover, this research also conducted a pilot test in order to authenticate the reliability and relevancy of scales used in the research. In order to serve this purpose 20 managers from manufacturing industry with the relevant background and experience were asked to provide their feedback. After getting satisfactory results from pilot testing actual data collection was started. For this purpose, this research study has five constructs which have been measured by using questionnaire instrument i.e., logistics flexibility, logistics innovation, manufacturing capabilities, environmentally

sustainable innovation, and new product development. These constructs have been validated and used in previous studies (Table 4.1).

The wording of items was modified to enhance clarity for the readers. Moreover, a pilot test was also conducted in order to authenticate the reliability and relevancy of scales used in the research. The adapted questionnaire was pilot-tested on 20 supply chain and logistics managers from relevant industries. After the satisfactory results data collection was started.

4.5.1 Logistics flexibility

This research study has used logistics flexibility as an independent variable. Literature has used logistics flexibility in different contexts i.e., as an antecedent and as well as a consequence to various constructs. This research followed Jafari, H. (2015) scale to measure logistics flexibility.

4.5.2 Logistics innovation

Logistics innovation has also been widely used in previous research studies. This research used logistics innovation as an independent variable and followed Peter, M. Ralston, Scott J. Grawe and Patricia J. Daughtery (2013) (adapted from Anderson and West, 1998) scale to measure logistics innovation.

4.5.3 Manufacturing capabilities

In previous research studies, manufacturing capabilities has been used in different contexts. In this research study manufacturing capabilities is used as mediator. This research followed Ray and Ramakrishan (2006), Day (1994), Grant (1991) and Narasimhan et al. (2001) scale to measure manufacturing capabilities.

4.5.4 Environmentally sustainable innovation

Environmentally sustainable innovation is also measured through questionnaire surveys. In this research study, environmentally sustainable innovation has been used as moderator. This research followed Jordana Marques Kneipp, Clandia Maffini Gomes, Roberto Schoproni Bichueti,

Kamila Frizzo and Ana Paula Perlin (2018) scale to measure environmentally sustainable innovation.

4.5.5 New product development

New product development is used as a dependent variable in this research study. In order to measure new product development, this research study has followed Sari & Asad (2019) scale.

4.6 Conclusion

This chapter, in detail elaborates how the data was collected for this research, the study settings, and the measures, analyzed to obtain results. The data was collected from registered manufacturing organizations operating in Pakistan. Moreover, it employs quantitative methodology and presents the measures used in this research to obtain data in detail. This chapter also explains which statistical tools have been used to analyze the data collected from registered manufacturing organizations.

Chapter 5

5 Analysis and Results

5.1 Overview

This chapter explains the process employed to conduct the analysis for this research study in order to test the proposed hypotheses. This research study has conducted certain statistical analysis which includes reliability analysis and structural equation modeling which further includes exploratory factor analysis, confirmatory factor analysis, and measurement model analysis. Firstly, descriptive statistics were measured followed by correlation among variables. Secondly, common method bias was conducted to check the variance. Thirdly, validity and reliability of questionnaire items was checked using Kaiser-Meyer-Olkin measure. Fourthly, in order to test the reliability coefficient of constructs, Cronbach alpha was conducted. Fifthly, average variance extracted was conducted to test the convergent and discriminant validity. Lastly, hypotheses were tested using structural equation modeling.

5.2 Descriptive Statistics and Correlation

Following are the descriptive statistics of 96 responses collected from manufacturing sector of Pakistan. It shows the mean, standard deviation, and number of responses.

Figure 5.1

Variables	Mean	S.D	N
Age	30.9219	22.35731	96
Experience_Company	8.1198	7.17222	96
Experience_Position	7.9427	6.89656	96
Size	908.3854	2767.10268	96
LF	4.0521	1.01691	96

			9
LI	4.0729	0.8175	6
			9
MC	4.3542	0.81909	6
			9
NPD	4.2917	1.02769	6
			9
ESI	4.1536	0.74195	6

Note: LF = logistics flexibility, LI = logistics innovation, MC = manufacturing capabilities, NPD = new product development, ESI = environmentally sustainable innovation.

Figure 5.1 Descriptive statistics

It shows that on average there are 908 employees, the age of an organization is 31 years, the experience of employees in organization is 8 years, and experience on that particular position is around 7 years.

The following figure shows the correlation among constructs. It shows significant correlation among constructs after which further analysis was conducted.

Correlations

Correlations

		LF	LI	MC	ESI	NPD
LF	Pearson Correlation	1	.225*	.355**	.135	.446**
	Sig. (2-tailed)		.027	.000	.190	.000
	N	96	96	96	96	96
LI	Pearson Correlation	.225*	1	.211*	.252*	.331**
	Sig. (2-tailed)	.027		.039	.013	.001
	N	96	96	96	96	96
MC	Pearson Correlation	.355**	.211*	1	.225*	.402**
	Sig. (2-tailed)	.000	.039		.028	.000
	N	96	96	96	96	96
ESI	Pearson Correlation	.135	.252*	.225*	1	.031
	Sig. (2-tailed)	.190	.013	.028		.762
	N	96	96	96	96	96
NPD	Pearson Correlation	.446**	.331**	.402**	.031	1
	Sig. (2-tailed)	.000	.001	.000	.762	
	N	96	96	96	96	96

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 5.2 Correlation

5.3 Common method bias

In this study common method variance was checked using Hermann's single factor test. It was conducted by using principal component analysis in SPSS while loading items of all constructs on one factor. The factor analysis extracts no more than 27.715% variance which is less than 50%. Hence, this is not a major problem in the data set.

5.4 Reliability and validity

For the purpose of improving validity and reliability of questionnaire items, a principal component factor analysis with promax rotation was conducted first with the assistance of SPSS. Moreover, the validity of constructs was tested using Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of Sphericity. According to the results of KMO and Bartlett's test of sphericity suggests that both are significant to perform factor analysis (Table 5.1). The value of KMO i.e., 0.818 shows that the sample is adequate. Meanwhile, Bartlett's test of sphericity

indicates sufficient correlation between the variables as it shows 514.696 and significant (p>0.000).

In order to test the reliability coefficient of constructs, Cronbach alpha was employed to measure the reliability. The scales of reliability vary from 0.712 to 0.807 (Table 5.2) which indicates the reliability of factors, according to the results of Cronbach alpha. In this process several items were removed in order to enhance the reliability.

Furthermore, convergent and discriminant validities were also measured by using average variance extracted. The average variance extracted scores range from 0.441 to 0.772. While the scores of composite reliability ranges from 0.731 to 0.864. Following Hair et al. (2010) the scores of CR should be equal or greater than 0.7 respectively. Following Fornell and Larcker (1981), Average Variance Extracted (AVE) should be higher than 0.5 but we can accept 0.4 as it has been argued that if AVE is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct is still adequate. In this case composite reliability is greater than 0.7 so further analysis has been conducted.

5.5 Hypothesis testing

In order to examine the relationship between constructs structural equation modeling SEM model was employed. In an effort to do so AMOS 23 version was used to perform the analysis. The results after the analysis support the Goodness of fit indices. The statistical results show that Chi-square/df = 1.427, CFI (comparative fit index) = 0.950, IFI (incremental fit index) = 0.952, RMSEA (root mean square error) = 0.067, and GFI (goodness of fit index) = 0.901. (Table 5.3).

Furthermore, the hypothesized relationships were tested using the structural model as depicted in the figure 5.1. The results indicate that all paths are significant except H1b (LI NPD). The SEM model reveals that logistics flexibility positively effects the manufacturing capabilities, environmentally sustainable innovation, and new product development. The entire paths were significant except H1b. Logistics flexibility directly effects the new product development in the manufacturing sector. After conducting SEM, it is revealed that logistics flexibility has positive impact upon new product development. Therefore, the hypothesis H1a accepted at $p < 0.05$. Furthermore, we did not get sufficient evidence for H1b i.e. logistics innovation does not directly impact positively new product development. Hence, the hypothesis H1b not accepted at $p < 0.05$.

However, the findings show that logistics flexibility has positive impact upon manufacturing capabilities. Hence, this hypothesis H2a is accepted at $p < 0.05$. Meanwhile, the results showed that the relationship between logistics innovation and manufacturing capabilities is statistically significant as well. This is the reason H2b is accepted at $p < 0.01$. Besides, the results showed that logistics flexibility which supported for the manufacturing capabilities eventually triggers direct impact to the new product development. The results of this model confirmed that relationship between manufacturing capabilities and new product development is significant. Hence, H3 is accepted at $p < 0.1$. Moreover, the study presents that the results for the model suggest that environmentally sustainable innovation has positive impact upon new product development. Therefore, H4 is accepted at $p < 0.05$ (Table 5.4).

Table 5.1

KMO Bartlett's test.

Kaiser–Mayer–Olkin measures of sampling adequacy	0.818
Bartlett's Test of Sphericity	
	514.69
Approx. chi-square	6
Df	78
Sig	0.000

Table 5.1. KMO Bartlett's test

Table 5.2					
Factor loading and reliability analysis					
Latent Variable	**Items**	**Factor loading**	**Cronbach's α**	**Average Variance Extracted (AVE)**	**Composite Reliability (CR)**

Table 5.2. Factor Loading and Reliability Analysis

Logistics Flexibility (LF)	My company is flexible in making changes in space of warehouse, capacity for loading and unloading, and distribution.	0.880	0.712	0.580	0.731
	My company is capable of adding and removing carriers such as trucks with respect to increase or decrease in demand.	1.000			
Manufacturing Capabilities (MC)	My company is using advanced and latest machinery and equipment for production.	1.000	0.759	0.520	0.763
	Machinery is able to produce large number of products to meet uncertain demand.	1.150			
	My company has some backup plan in case of any fault (minor or major) in machinery.	0.84			
Logistics Innovation (LI)	My company provides support for the implementation of new ideas in logistics.	1.000	0.770	0.637	0.778
	My company has improved processes with the adoption of new technology.	0.990			
New Product Development (NPD)	Before the actual development of products my company makes a detailed plan.	1.000	0.807	0.772	0.864
	My company selects the design of product considering logistical aspects of products.	0.550			
Environmentally Sustainable	My company introduces sustainable solutions by interacting with stakeholders to	1.000	0.757	0.441	0.758

Innovation (ESI)	generate social and environmental benefits.				
	My company manufactures products which use less resources and generate less waste, emissions and pollution	0.740			
	My company introduces and follows practices which improves efficiency.	0.690			
	My company improves the quality of new products that meet the requirement of industry and environment.	0.690			

Table 5.3

Model Fit

Goodness of Fit Indices	Results
χ^2/degree of freedom	1.427
CFI (comparative fit index)	0.950
IFI (incremental fit index)	0.952
RMSEA (root mean square error)	0.067
GFI (goodness fit index)	0.901

Table 5.3. Model Fit

Table 5.4

Standard Estimation of Main Model

Hypotheses	**Path**	**Estimate**	**SE**	**CR**	**p-value**
H1a	LF→NPD	.455	.177	2.569	.010
H1b	LI→NPD	.114	.194	.589	.556

H2a	LF→MC	0.266	0.131	2.031	0.042
H2b	LI→MC	0.448	0.145	3.085	0.002
H3	MC→NPD	.353	0.213	1.656	.098
H4	ESI→NPD	.285	0.130	2.195	.028

Table 5.4. Standard Estimation of Main Model

The following figure shows the factor loadings for each item and co-variation among constructs conducted through AMOS 23.

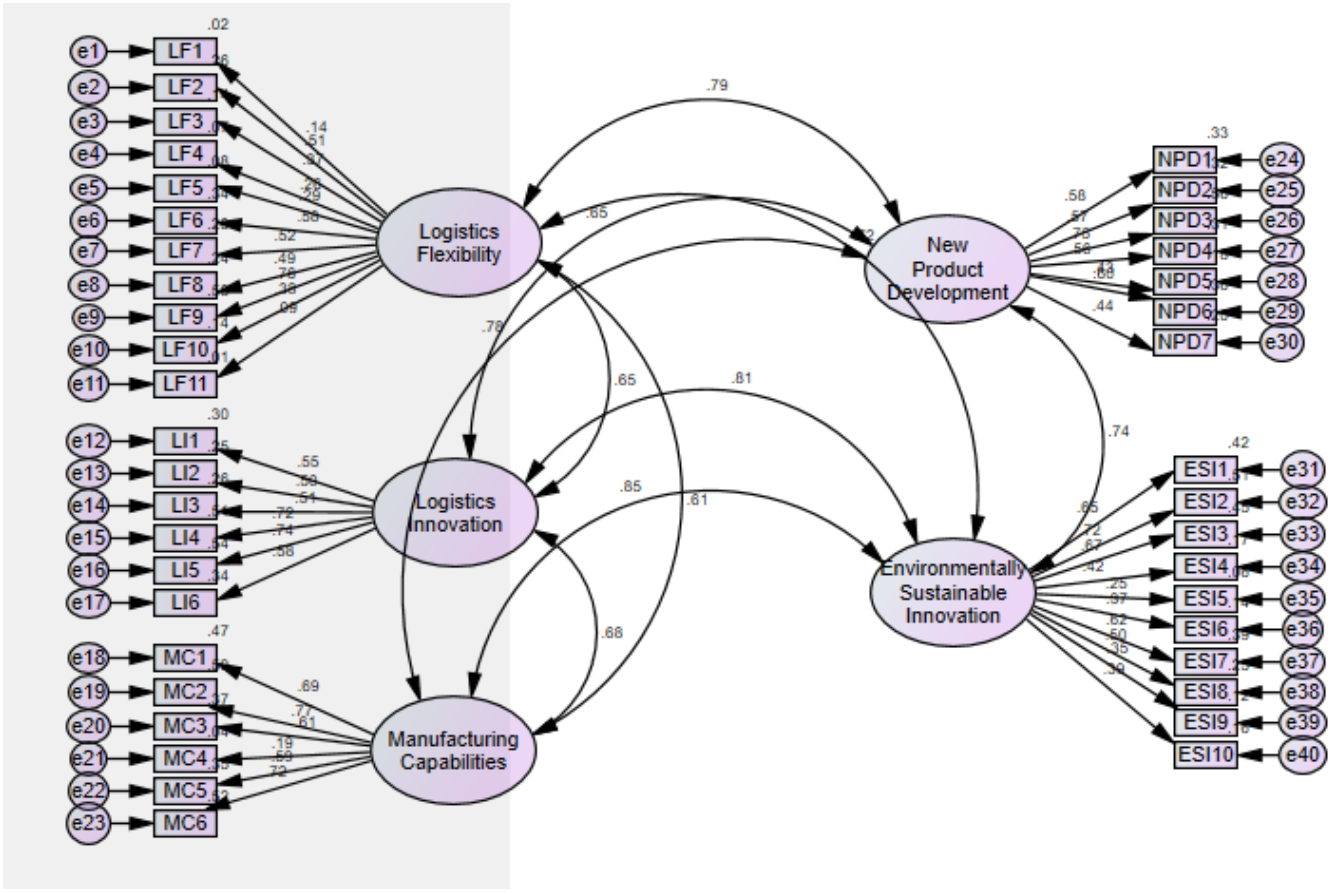


Figure 5.3 Confirmatory Factor Analysis Model

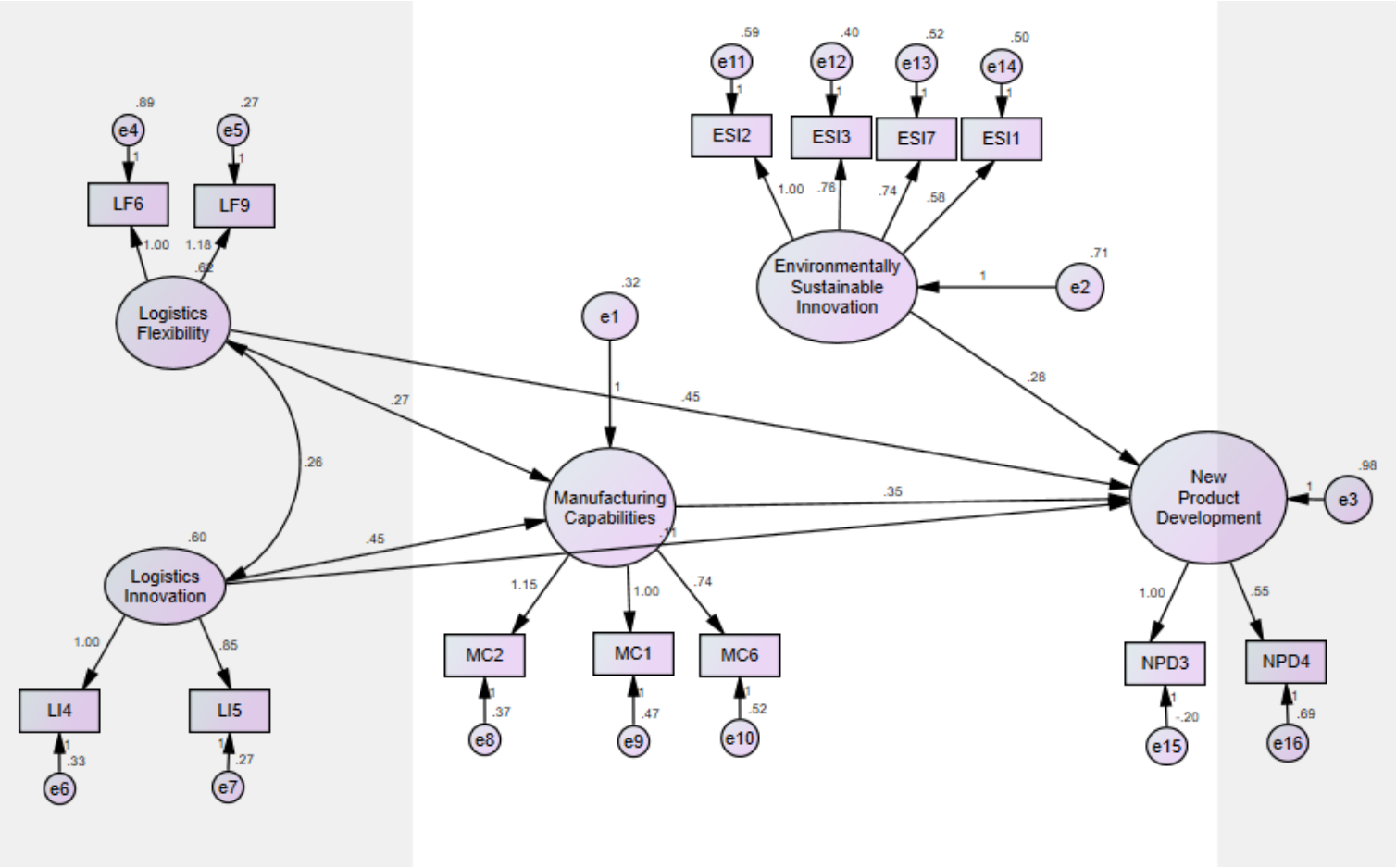


Figure 5.4. Structural Equation Model (Path Analysis)

5.6 Conclusion

This chapter concludes the results gathered after performing the necessary analysis through various statistical procedures. Firstly, common method variance was analyzed in order to know if there is any major problem in the data set. Secondly, reliability and validity were checked by performing Kaiser-Meyer-Olkin measure and Bartlett's test of sphericity. Moreover, Cronbach alpha values were also measured to check the reliability. Thirdly, convergent and discriminant validity were also measured with the help of average variance extracted. Lastly, hypotheses were tested using the structural equation modeling. Summing up, the data analysis required a series of tests and measures which led towards the end results which helped in knowing the accepted and

rejected proposed hypotheses. After performing the complete data analysis, it appeared that all hypotheses have been accepted except H1b.

Chapter 6

6 Discussions and Conclusion

6.1 Overview

This chapter demonstrates the discussions and conclusions for this research study. Furthermore, it explains how this research was conducted and describes how conceptual framework and hypotheses were proposed based on theoretical underpinnings. Moreover, it elaborates theoretical and managerial implications for this research. Lastly, this chapter also explains the limitations and future research directions.

6.2 Discussions

First of all, this research examines the influence of logistics flexibility and logistics innovation on new product development. Furthermore, it explores the mediating role of manufacturing capabilities on this relationship. In addition, this research investigates the influence of logistics innovation on new product development. Based on the data collected from 96 registered manufacturing organizations in Pakistan, this research finds out that logistics flexibility and logistics innovation positively influence new product development. It suggests that organizations with higher logistics flexibility and higher logistics innovation assists in better new product development. This could be fairly justified as the organizations which align logistics with development of products are closely connected and get real time information which helps them to make changes accordingly. This in turn leads towards creating better and improved new products which are made considering the logistical aspects of a product as well. Organizations which are flexible in their logistical activities, operations and processes will make new products in an improved manner. Besides this, organizations with higher logistics innovation i.e., bringing new and innovative ways to perform logistical related activities will improve new product development as well. Moreover, this research also finds that manufacturing capabilities mediates the relationship between logistics flexibility, logistics innovation and new product development. The possible explanation for this is organizations which are more flexible and innovative in

incorporating rapid changes in logistical activities are also capable to manufacture with higher abilities which in turn enhances new product development as well. Altogether this implies that organizations with higher logistics flexibility and increased manufacturing capabilities of a firm in turn enhances the new product development.

Furthermore, this research argues that organizations need to bring variation the way products are made and transit towards a sustainable practice while creating products through sustainably innovative processes and procedures. This would in turn put less strain on environment as less waste and carbon emissions will generate. It explores the contribution of environmentally sustainable innovation as a moderator between manufacturing capabilities and new product development. Findings of this research suggests that environmentally sustainable innovation strengthen the relationship between manufacturing capabilities and new product development. It means higher the environmentally sustainable innovation in an organization would leads towards higher manufacturing capabilities and better new product development.

Lastly, this research findings do not support the hypothesis which determines the relationship between logistics innovation and new product development. The findings suggest that logistics innovation does not positively influence new product development in an organization. The results indicate that we did not get sufficient evidence to support this hypothesis. It has been revealed that direct relationship between these variables is insignificant, however if in a firm which has high manufacturing capabilities may positively influences new product development. Secondly as logistics innovation means bringing new and innovative ways to perform logistical related activities. This has been seen as limited and on small scale in organizations operating in Pakistan. If we have conducted this research in different context i.e., in any other developed country results definitely would be different.

6.3 Implications

6.3.1 Theoretical implications

Firstly, this research consolidates the literature upon logistics flexibility, logistics innovation, and new product development. This research illustrates a clear understanding of previous studies conducted in the domain of logistics flexibility by employing systematic literature

review. This study adds value to existing literature by developing a conceptual framework considering drivers, consequences, mediators, and moderators of logistics flexibility.

Secondly, this research study contributes in the literature by proposing a conceptual framework that draws on resource-based view. This research reveals significant contributions in the literature by examining the influence of logistics flexibility, logistics innovation, and new product development. This accompanies the existing literature while suggesting logistics flexibility and logistics innovation plays a significant role in enhancing new product development. Agility, flexibility, and innovation in logistical activities paves way for new and improved products. In this manner, this research accounts to be the first to link constructs which do exists in literature but not connected in previous researches. Hence, this research enriches the literature by connecting the constructs which seems to be neglected in the literature.

Thirdly, this research elucidates the role of manufacturing capabilities that is seen as beneficial for explaining the relationship between logistics flexibility and new product development. This research study empirically supports the mediating role of manufacturing capabilities and till now this research is the first to empirically test the manufacturing capabilities as the mediator between logistics flexibility and new product development. Therefore, this research aims to provide a new perspective on the role of logistics flexibility and new product development considering manufacturing capabilities as a mediator.

Fourthly, this research recognizes the significance of environmentally sustainable innovation in determining the strength between the manufacturing capabilities and new product development relationship. By considering role of environmentally sustainable innovation to the best of author's knowledge, this research is the first to consider environmentally sustainable innovation to determine the strength on this relationship between constructs.

Lastly, this research is relying on resource-based theory and diffusion of innovation theory which suggests that if an organization is resourceful in adopting flexible and innovative processes in logistics, it would gain competitive advantage. In addition, this research also incorporates diffusion of innovation theory in order to explore the moderating role of environmentally sustainable innovation. This research incorporates flexibility and innovation in logistics processes, and manufacturing capabilities as necessary resources to enhance new product development which

will in turn assists in gaining competitive advantage. The resources needed to adopt flexibility, innovation, and high manufacturing capabilities are considered as rare, valuable, and inimitable. According to Wernerfelt (1984) the resources which an organization has are the assets attached to organization i.e. wisdom regarding technology, equipment, procedures, and finance.

6.3.2 Managerial implications

The research findings are insightful for managers working in organizations who are accountable for making decisions regarding logistics, supply chain, and product development. As a general observation at the time of data collection in organizations researcher noticed lack of recognition to logistics department in few organizations. Through this research it is evident that logistics department should be considered significant in organizations. Meanwhile, it is suggested to incorporate logistical insights with product development considering the associated benefits.

Moreover, the research findings imply that higher manufacturing capabilities tend to explain the relationship between logistic flexibility and new product development in a better way. This is one of the reasons managers should utilize new and advanced manufacturing equipment in organizations so as to reap benefits in terms of enhanced new product development. Moreover, this research study has several managerial implications for considering sustainable practices in organizations. This includes creating environmentally sustainably innovative products, adopting sustainable processes and procedures, disposing off waste materials properly which will result in less waste accumulation and landfills. Research findings indicate that environmentally sustainable innovation strengthens the relationship between manufacturing capabilities and new product development.

6.4 Conclusions

This research study addresses the research questions regarding logistics flexibility, logistics innovation, manufacturing capabilities, environmentally sustainable innovation, and new product development. This research study has used the data collected from 96 registered manufacturing organizations in Pakistan to investigate the influence of logistics flexibility, logistics innovation, and new product development. This research study acknowledges manufacturing capabilities as mediating variable important to consider while making organization wide decisions. Furthermore, this research study examines the influence of environmentally sustainable innovation as a

moderator on manufacturing capabilities and new product development. Hence, it can be suggested for managers to adopt sustainable practices and processes in manufacturing organizations. In addition, this research adopts resource-based theory and diffusion of innovation theory in order to explore how logistics flexibility and logistics innovation, manufacturing capabilities influence new product development while considering the role of environmentally sustainable innovation as a moderator.

Altogether, there are mainly five conclusions for this research study. Firstly, this research found out that there is significant relationship between logistics flexibility and new product development. If in an organization there is higher logistics flexibility, it will enhance new product development as well. Secondly, the research findings indicate that logistics innovation significantly increases new product development. An organization inclined towards innovative logistical activities will improve new product development. Thirdly, the findings conclude that manufacturing capabilities strongly mediates the relationship between logistics flexibility and new product development while on the other hand manufacturing capabilities does not mediates the relationship between logistics innovation and new product development. Hereby, only direct relationship between logistics innovation and new product development exists. Fourthly, this research findings presents that environmentally sustainable innovation strongly moderates the relationship between manufacturing capabilities and new product development. Lastly, this research relies on resource-based theory and diffusion of innovation theory to explore the relationship between constructs.

Conclusively, this research is the first to connect constructs that exists in literature but relationship between those constructs was not examined previously. Relationship between logistics flexibility, logistics innovation, and new product development has not been investigated in the literature. By doing so, this research provides several notable contributions to management literature.

6.5 Limitations and Future research

Although this research study has certain theoretical and managerial implications yet subject to few limitations which are opportunities for future researches. Firstly, this research was conducted upon manufacturing sector of Pakistan where data was collected from different sub-sectors such

as textile, consumer goods, pharmaceutical, automobiles, steel and aluminum, cement, marble and granite, and paints industry. Different industries have distinct characteristics from each other. These industries were selected considering logistical and product development aspects. Furthermore, comparison between these industries could also be examined. Meanwhile future researches could also be conducted on specific industry.

Secondly, this research accounts for manufacturing sector only. However, this research does not include service sector of Pakistan considering the contribution in economy and gross domestic product. Future researches could be conducted upon service sector as well.

Thirdly, for this research study cross-sectional data was taken due to time constraint. Meanwhile future researches could also be conducted using longitudinal data which would help in determining impact of time. In this manner researchers would be able to figure out if there is any change in organizations practices and procedures or not within that specific time.

Fourthly, this research only includes manufacturing capabilities as a mediator between logistics flexibility, logistics innovation, and new product development. Future researches could include several mediators as well to know other factors responsible for explaining the relationship between these constructs.

Fifthly, this research is conducted quantitatively merely. However, conducting it qualitatively may reveal different insights in detail. Hence, future researches could be conducted qualitatively or through mixed method approach.

Lastly, this research only accounts for registered manufacturing organizations of Pakistan. However, this study could be replicated in other countries as well in order to increase rigor and generalizability of this research.

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Appendix

ALIGNMENT OF LOGISTICS FLEXIBILITY AND LOGISTICS INNOVATION WITH NEW PRODUCT DEVELOPMENT: AN INNOVATION MODEL

This questionnaire is designed to evaluate the impact of logistics flexibility on new product development. There are six parts in this questionnaire which would take you approximately 15-20 minutes to answer.

Responses are confidential and will only be viewed by the researchers. Please answer every question to the best of your ability. If you are unsure of an answer and cannot confirm with someone in your company, please provide your best estimate.

Part 1: Company and Personal Information

A: Company information

1. Company Name: _____
2. Number of years since its establishment: _____
3. Number of employees: _____
4. Your organization operates in, name of industry _____

B: Personal information

1. Education level: _____
2. Position: × Logistics Manager × Supply Chain Manager ✈ Product Line Manager ✈ NPD Project Manager ✈ Business Unit Manager × Others _____
3. How long you have been serving in this company? _____
4. Your years of experience in this position: _____

- Would you like a summary report of the findings of this project? ✈ Yes ✈ No

Part 2: Logistics Flexibility

Please Circle (O) your desired response, expressing your opinion about the statements below:						
(1 = strongly disagree; 3 = neutral; 5 = strongly agree)						
1	My company chooses the suppliers who can work with uncertain demand patterns.	5	4	3	2	1
2	My company is able to deliver products on time irrespective of changes required in design and packaging of products.	5	4	3	2	1
3	Whenever demand for products increases my company is capable of obtaining raw materials effectively to meet uncertain demand.	5	4	3	2	1
4	My company can add and remove suppliers according to the situation.	5	4	3	2	1
5	My company is able to adjust location of facilities for customer's convenience.	5	4	3	2	1
6	My company is flexible in making changes in space of warehouse, capacity for loading and unloading, and distribution.	5	4	3	2	1
7	My company can successfully manage the assembling and completion of products and placing quickly in warehouse.	5	4	3	2	1
8	My company can quickly switch from one mode of transportation to another in supply chain network if needed.	5	4	3	2	1
9	My company is capable of adding and removing carriers such as trucks with respect to increase or decrease in demand.	5	4	3	2	1
10	My company is able to reduce the time between order receipt and customer delivery (lead time).	5	4	3	2	1
11	My company is able to provide different packaging considering the aesthetics of product and placement in warehouse.	5	4	3	2	1

Part 3: Logistics Innovation
Please Circle (O) your desired response, expressing your opinion about the statements below:

(1 = strongly disagree; 3 = neutral; 5 = strongly agree)						
1	My company is open and responsive to changes in logistics which could be beneficial for company.	5	4	3	2	1
2	My company works upon improving logistics and developing new ideas.	5	4	3	2	1
3	My company provides support for the implementation of new ideas in logistics.	5	4	3	2	1
4	My company has improved processes with the adoption of new technology.	5	4	3	2	1
5	Development of ideas for new products helps in improvement of processes.	5	4	3	2	1
6	My company has process innovations that lead towards improvements in new product development.	5	4	3	2	1

Part 5: New Product Development						
Please Circle (O) your desired response, expressing your opinion about the statements below:						
(1 = strongly disagree; 3 = neutral; 5 = strongly agree)						
1	My company has a group of related products in product lines under the brand name.	5	4	3	2	1
2	The products launched by the company helps in higher sales and profit.	5	4	3	2	1
3	Before the actual development of products my company makes a detailed plan.	5	4	3	2	1
4	My company selects the design of product considering logistical aspects of products.	5	4	3	2	1
5	Before the final launch of product, a prototype is made and tested.	5	4	3	2	1

Part 4: Environmental Sustainable Innovation						
Please Circle (O) your desired response, expressing your opinion about the statements below:						
(1 = strongly disagree; 3 = neutral; 5 = strongly agree)						
1	My company introduces sustainable solutions by interacting with stakeholders to generate social and environmental benefits.	5	4	3	2	1
2	My company manufactures products which use less resources and generate less waste, emissions and pollution.	5	4	3	2	1
3	My company introduces and follows practices which improves efficiency.	5	4	3	2	1
4	My company uses waste materials as raw materials for the production of new products.	5	4	3	2	1
5	Economic and environmental costs are reduced by reusing waste materials.	5	4	3	2	1
6	My company brings innovation in products and manufacturing processes, by using renewable resources and energy, and developing new sustainable solutions which is beneficial for stakeholders.	5	4	3	2	1
7	My company improves the quality of new products that meet the requirement of industry and environment.	5	4	3	2	1
8	Number of innovations under intellectual property protection increases in my company each year.	5	4	3	2	1
9	My company has production flexibility in terms of volume which means it can produce in bulk if demand increases.	5	4	3	2	1
10	My company has low cost of production per unit.	5	4	3	2	1
6	Input from logistics is helpful in developing new products.	5	4	3	2	1
7	Incorporating information from logistics assists new products to give expected value.	5	4	3	2	1

Part 6: Manufacturing Capabilities						
Please Circle (O) your desired response, expressing your opinion about the statements below:						
(1 = strongly disagree; 3 = neutral; 5 = strongly agree)						
1	My company is using advanced and latest machinery and equipment for production.	5	4	3	2	1
2	Machinery is able to produce large number of products to meet uncertain demand.	5	4	3	2	1
4	My company always makes efforts to enhance flexibility in manufacturing.	5	4	3	2	1
5	My company has not failed to meet desired demand of products due to incompetence in manufacturing.	5	4	3	2	1
6	My company has some backup plan in case of any fault (minor or major) in machinery.	5	4	3	2	1
7	My company has efficient and effective production system.	5	4	3	2	1