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SUPPLY CHAIN INNOVATION AND PERFORMANCE OF MANUFACTURING COMPANIES IN NIGERIA

SINGHRY HASSAN BARAU

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SUPPLY CHAIN INNOVATION AND PERFORMANCE OF MANUFACTURING COMPANIES IN NIGERIA

By

SINGHRY HASSAN BARAU

Thesis Submitted to Graduate School of Management, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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DEDICATION

My Father, Abubakar Barau (Blessed Memory) and my Mother Adama Abubakar Harun

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ABSTRACT

SUPPLY CHAIN INNOVATION AND THE PERFORMANCE OF MANUFACTURING COMPANIES IN NIGERIA

By

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Abstract

Supply chain management (SCM) is an important strategy for firm competitiveness and performance. Yet issues emerging issues from disparity in technological capability, low level of trust-entwined collaboration, new supply chain capability, top management commitment, supply chain vision and planning, and poor visibility continue to challenge firms' abilities to deliver quality products at the right cost, place and time. However, literature on supply chain innovation is quite scarce and researchers have lamented that studies in supply chain management have either ignored innovation or innovation itself has overlooked supply chain. Therefore, the need to advance the literature of supply chain innovation through a post-positivism world-view is required more than ever. The general objective of the study was to investigate the relationship between supply chain innovation and supply chain performance from the intervening role of innovation capability and the interactive effect of top management support. Theorizing from the dynamic capabilities theory, social exchange theory, and upper echelon theory, the study postulated a mediated-moderated hypotheses based on the post-positivism worldview. The study was based on cross-sectional survey of 286 manufacturing companies in Nigeria. Cluster and stratified random sampling were employed and self-administered (face-to-face) questionnaires were distributed to the selected companies with help of research assistants. Data was analyze using structural equation modeling with Amos graphics. The findings suggest that supply chain innovation has significant relationship with supply chain performance. Analyses of the indicators of supply chain innovation show that both supply chain technology and supply chain collaboration have significant relationship with supply chain performance. It is also found that supply chain innovation capability is significantly related with supply chain performance. Further analyses of mediation indicates that supply chain innovation capability is a full mediator between on relationship between supply chain technology and supply chain performance as well as on relationship between supply chain collaboration and supply chain performance. The findings also provided evidence of partial moderating effect of top management support on the relationship between

supply chain technology and supply chain performance. However, top management support does not moderate the relationship between supply chain collaboration and supply chain performance. The study enhances literature of supply chain innovation by advancing theoretical knowledge and empirical evidence of how indicators of supply chain innovation through supply chain technology and supply chain collaboration could be integrated with managerial roles and innovation capability to improve supply chain performance. For practice, the study provides guidance to managers to design innovative supply chain. Limitations and recommendations for further studies are provided.

Keywords: Supply chain innovation, supply chain technology, supply chain collaboration, innovation capability, top management support, supply chain performance.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
Sebagai memenuhi keperluan untuk ijazah (Pengurusan)

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Bulan dan Tahun *Viva Voce* diadakan

Abstrak
Kepentingan strategi pengurusan rantaian bekalan adalah kritikal bagi kejayaan sesebuah organisasi. Walau bagaimanapun pelbagai isu sering membatasi kejayaan ini dari aspek kemampuan teknologi, kerjasama yang rendah, kemampuan pengurusan rantaian bekalan yang baru, komitmen pengurusan atasan, visi dan perancangan pengurusan rantaian bekalan, ketidak mampuan dalam menghadapi cabaran organisasi untuk menghasilkan produk yang berkualiti tinggi dengan kos yang efektif. Ketidakmampuan dalam menghadapi cabaran-cabaran ini telah mengakibatkan penutupan sebahagaian besar syarikat pembuatan di Nigeria. Masalah yang berlaku telah menimbulkan persoalan tentang keberkesanan model pengurusan rantaian bekalan ketika ini. Pada waktu yang sama, hasil kajian terdahulu dan penulisan berkaitan inovasi rantaian bekalan didapati agak terhad dan para penyelidik telah menyuarakan kebimbangan samada kajian terhadap pengurusan rantaian bekalan telah mengabaikan aspek inovasi. Oleh itu,perlunya satu kajian empirikal dilakukan dari sudut pandangan positif tentang kepentingan inovasi dalam model pengurusan rantaian bekalan yang sedia ada.

Kajian ini dilakukan adalah bertujuan untuk mengkaji kesan inovasi terhadap prestasi pengurusan rantaian bekalan di dalam syarikat pembuatan. Berdasarkan teori-teori dynamic capabilities theory, social exchange theory dan upper echelon theory, kajian ini mengandaikan satu hipotesis pengantara-penyederhana iaitu keupayaan inovasi rantaian bekalan dan sokongan pengurusan atasan terhadap hubungan di antara inovasi dan prestasi pengurusan rantaian bekalan. Kajian ini berdasarkan satu kaji selidik secara keratan rentas terhadap 286 syarikat pengeluar di Nigeria. Bagi tujuan persampelan, kluster dan persampelan rawak berstrata telah digunakan dan borang soal selidik telah diedarkan secara terus oleh penyelidik kepada wakil-wakil syarikat yang terpilih. Data yang diperolehi daripada kaji selidik tersebut dianalisa denganmenggunakan Structural Equation Modeling (Amos) versi 22.

Keputusan kajian menunjukkan bahawa inovasi rantaian bekalan mempunyai hubungan yang signifikan dengan prestasi rantaian bekalan. Analisa terhadap penunjuk inovasi bekalan rantaian bekalan memperlihatkan kedua-dua teknologi bekalan rantaian dan kerjasama mempunyai hubungan yang signifikan dengan prestasi rantaian bekalan. Selain itu, keputusan juga mendapati bahawa keupayaan inovasi rantaian bekalan mempunyai hubungan signifikan denganprestasi rantaian bekalan. Analisa selanjutnya terhadap pengantara menunjukkan keupayaan inovasi rantaian bekalan menjadi pengantara penuh bagi hubungan di antara teknologi rangkaianbekalan dan prestasi rantaian bekalan serta hubungan di antara kerjasama rantaian bekalan dan prestasi rantaian bekalan. Hasil kajian juga membuktikan terdapat kesan penyerdahanaan separaoleh sokongan pengurusan atasan terhadap hubungan di antara teknologi rangkaian bekalan dan prestasi rantaian bekalan. Walau bagaimanapun, sokongan pengurusan atasan tidak menyederhanakan hubungan di antara kerjasama rantaian bekalan dan prestasi rantaian bekalan.

Kajian ini menyumbang kepada peningkatan hasil kajian dan penulisan akademik di dalam bidang inovasi rantaian bekalan dengan penambahbaikan pengetahuan secara teori dan bukti empirikal bagaimana inovasi rantaian bekalan melalui teknologi rantaian bekalan (teknologi pembbuatan termaju dan teknologi maklumat) dan kerjasama rantaian bekalan (kejuruteraan reka bentuk produk, perancangan usaha sama, dan kerjasama pemasran) boleh disepadukan dengan peranan pengurusan dan keupayaan inovasi untuk meningkatkan prestasi rantaian bekalan. Bagi tujuan praktis dan keperluan industri, kajian ini memberi panduan terhadap penghasilan rantaian bekalan yang berinovatif. Kekangan kajian dan cadangan untuk kajian lebih lanjut turut dinyatakan.

Kata Kunci: inovasi rantaian bekalan, teknologi rangkaian bekalan, teknologi pembuatan termaju, teknologi maklumat, kerjasama rantaian bekalan, kejuruteraan serentak, perancangan usaha sama, kerjasama pemasaran, sokongan pengurusan atasan dan prestasi bekalan

Approval sheets 1

I certify that a Thesis Examination Committee has met on 28th September, 2015 to conduct the final examination of Hassan Barau Singhry on his thesis entitled "Supply Chain Innovation and the Performance of Manufacturing Companies in Nigeria" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U. (A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy Degree in Management.

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Declaration form

Declaration by graduate student

I hereby confirm that:

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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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LIST OF ABBREVIATIONS

AMT – Advanced Manufacturing Technology
CEPD – Concurrent Engineering of Product Design
CFA – Confirmatory factor analysis
CM – Collaborative Marketing
CPFR – Collaborative Planning, Forecasting, & Replenishment
EFA – Exploratory factor analysis
GDP – Gross Domestic Product
FL – Factor loading
IT – Information Technology
MAN – Manufacturers' Association of Nigeria
QM – Quality management
SC- Supply chain
SCIC – Supply chain innovation capability
SCM – Supply chain management
SCP – Supply Chain Performance

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter covers the background of the study, focusing on the origin, essence, changes and challenges of supply chain innovation (SCI). The basic arguments of the research that leads to present study are highlighted. Next, the working definition and indicators of supply chain innovation are highlighted. Furthermore, the chapter provides some statistical indices that explained why investigation into the supply chain innovation of manufacturing companies in Nigerian is timely and relevant. Additionally, problem statements which comprised of issues arising from Nigerian manufacturing sector and gaps from previous studies on supply chain innovation were identified. Based on the problem statement, four (4) research questions and four specific objectives were formulated. The scope of the study and its limitations were also stated. The significance of the study on practice, theory, policy and society were highlighted. Lastly, the operational definitions of variables in the study are provided.

1.2 Background of the Study

The idea of supply chain management is attributed to (Forrester, 1958) who proposed that success of business is reliant on the "interactions between the flows of information, materials, money, manpower, and capital equipment" (Melnyk et al. 2009; Soni & Kodali, 2012). These five systems inter-connect to strengthen one another and form the basis for designing strategies that yield competitive advantage and performance. In the 1980s the concept is coined and popularized by Oliver & Webber (1982), and in 1990s academic interest and investigation started. The essence of supply management is the adoption of sardine strategy – 'move as one' (Bolstorff & Rosenbaum, 2012). Supply chain is critical to the success of manufacturing companies, and its strategy largely depends on sourcing, procurement, transformation, and delivery to meet the changing demand of customers (Hugos, 2011). Successful supply chain also involves the integration of employees, processes, technologies, networks, and functions to build collective capabilities and gain competitive advantages (Gianakis & Mccue, 2012).

To improve the supply chain performance, manufacturing firms repeatedly encourage their upstream and downstream supply chain partners to implement shared processes for innovation. The advantages of innovation include sustainable development, supply chain efficiency and effectiveness, and prompt response to changes in competition and customers' demands (Li & Lin, 2006).

Cheng, Chen & Huang (2014) show that supply chain innovation performance depends on collaborations and dynamic capabilities among partners. Literature have recognized that an efficient and effective supply chain delivers quality product on-time and at right quantity reduces order cycle-time, improves accurate demand forecast, responds to disasters and terrorism, reduces cost of managing the supply chain, inventory costs, and provides mutual benefits for partners (Chang, Tsai, & Hsu, 2013). However, challenges such as shortened lead times and late delivery (Fawcett, Jones, & Fawcett, 2012), bullwhip effect (Barros, Barbosa-Póvoa, & Blanco, 2013), rising manufacturing costs, customer responsiveness (Butner, 2010), high cost of inventory (Storer & Hyland, 2009), weak collaboration (Agus & Hassan, 2008; Hamid, Agus, & Hassan, 1991) continue to undermine the success of supply chain performance.

Supply chain performance has been extensively debated with significant impact on organizational performance (Qrunfleh & Tarafdar, 2014; Youn, Yang, Kim, & Hong, 2014). Antecedents such as supply chain capability (Liao & Kuo, 2014), organizational culture (Cadden, Marshall, & Cao, 2013), innovativeness (Seo, Dinwoodie, & Kwak, 2014), supply chain integration (Gimenez, van der Vaart, & Pieter, 2012), and integrated marketing (Green, Whitten, & Inman, 2012) influence supply chain performance. Although, supply chain innovation has relationship with supply chain performance (Prajogo, McDermott, & Goh, 2008; Ulusoy, 2003), what is lacking is its integration with innovation capability and top management support (TMS). Understanding innovation capability is topical if one considers the fact that today's business environment is fragile and uncertain. To compete in dynamic and uncertain business environment, organization requires improvement in innovation capability in order to build organizational competences, understands customers, reduces operational costs and enhances innovation performance. Top management support is needed to influence the processes and tools managers use to achieve organizational excellence (Zwikael, 2008) as well as encourage the supply chain activities.

Within the short periods of its conceptualization and empiricism, challenges from globalization and competition is changing supply chain thinking from operation-*decoupled* to strategic-coupled discipline (Melnyk et al., 2009), from functional silos to functional integration (Stank, Paul Dittmann, & Autry, 2011), from inventory management to information management (Franks, 2000). These changes have triggered academics and practitioners rethink and rebuild a responsive, efficient and visible supply chain. On top of these, the supply chain is the largest cost center in manufacturing firms and the second largest after personnel costs in the healthcare industry (Ivan Su, Gammelgaard, & Yang, 2011). It has been discovered that 80 per cent (Appelqvist, Lehtonen, & Kokkonen, 2004); 60-70 per cent (Stank et al., 2011) of the total operating costs, asset and working capital costs of a company are incurred by the supply chain. These costs continue to rise, lead-time increases, and delivery is delayed, thus making the supply chain more complex, dynamic, and risky (Butner, 2010; Jin,

Hewitt-Dundas & Thompson, 2004). As a result, the need to rethink and redesign an innovative supply chain is emphasized (Lavastre, Ageron, Chaze-Magnan, & Spalanzani, 2014).

1.2.1 Need for innovation in the supply chain

The changing nature of innovation means that what has work well in the past does not mean it will work now and in the future. What has work better in other industries and economies may not apply in others. Firms have to keep sensing and seizing opportunities in order to relinquish their old configuration to reconfigure their processes and capabilities (Storer & Hyland, 2009). Many factors are changing and reshaping the supply chain. Butner (2010) identifies risk management (80%), visibility (70%), increasing customer demand (56%), increasing cost (55%), and globalization (43%) as challenges that are changing the supply chain. Accordingly, the new supply chain is expected to be smarter by possessing three characteristics such as are digitalization (instrumented), interconnectedness, and intelligence. Hitachi Consulting Corporation (2009) and Rimiene & Bernatonyte (2013) identify globalization, upward integration, demand planning, competitive pressures, shortened product life cycles, and outsourcing as challenges that are changing the today's supply chain.

Supply chain innovation is defined as a "change (incremental or radical) within the SC network, SC technology, or SC processes (or combinations of these) that can take place in a company function, within a company, in an industry or in a SC in order to enhance new value creation for the stakeholder" (Arlbjørn, de Haas, & Munksgaard, 2011). In this study, supply chain innovation is conceptualized as technology and collaboration. These constructs influence innovation capability, and are affected by the top management support. Although, past studies linked supply chain innovation with supply chain performance (Panayides & Lun, 2009; Tan et al., 2015), the empirical integration and investigation of technology, collaborative processes, innovation capability, and top management support in a research framework remain unknown in the literature.

Supply chain technology is defined as the "technologies that can be applied in isolation or in combination with other technologies or the supply chain business processes and supply chain network structure to create supply chain innovation" (Arlbjørn, et al., 2011). In this study, supply chain technology consists of advanced manufacturing technology (AMT) and information technology (IT). AMT is defined as "a group of computer-based technologies, which includes computer-aided design, computer-aided manufacturing, manufacturing resources planning, robotics, group technology, flexible manufacturing systems, automated materials handling systems, computer numerically controlled (CNC) machine tools, and bar-coding or other automated

identification techniques and any technology, which is new or advanced to a company when compared to its previous or current manufacturing technology" (Abd Rahman & Bennett, 2009).

Advanced manufacturing technology is essential in supply chain management because it improves the process of transforming raw materials into finished goods; fosters close collaboration between the upstream and downstream supply chain (Meybodi 2013); helps the supply chain to increase production capacity, reduce production costs, lead time, wastages and rework and thus improves product availability and quality (Das & Nair 2010). On the other hand, information technology is defined as "computer and communication technology which facilitates the creation, storage, transformation, and transmission of information between two or more companies" (Youn et al. 2014). Information technology helps the supply chain achieve agility, adaptability, and alignment (Rajaguru & Matanda, 2013). It facilitates communication and real-time information, reduces inventory and transaction costs (Prajogo & Olhager, 2012).

Supply chain collaboration is defined as a "partnership process where two or more autonomous firms work closely to plan and execute supply chain operations toward common goals and mutual benefits" (Cao & Zhang, 2011). Collaboration allow partners to share new knowledge and capabilities, which eventually influences organizational innovation capability and performance (Zheng et al. 2011). In this study, supply chain collaboration consists of processes as concurrent engineering of product design (CEPD), collaborative planning, forecasting, & replenishment (CPFR), and collaborative marketing (CM). Concurrent engineering is a manufacturing philosophy where designers, manufacturers, suppliers, marketers, and customers work simultaneously right from the design of a product to its market success (Liang 2009; Nategh 2009).

Concurrent engineering enables partners to jointly share product design information which subsequently reduce manufacturing costs, improves product quality, increase time-to-market, and reduce costs of scrap and rework (Kowang & Rasli 2011). Collaborative planning, forecasting, & replenishment is "a business practice that combines the intelligence of multiple SC partners and synchronize them into joint forecasting, and planning with the aim of improving demand visibility and supply chain efficiency (Danese 2007; Danese & Kalchschmidt, 2011). Collaborative planning, forecasting, & replenishment helps the supply chain to develop a mutual plan, forecast and replenishment and therefore improves SC efficiency and boost supply chain performance (Småros 2007).

Collaborative marketing is defines as the ability of seller and buyer to aligned their pricing, promotion and distribution activities, in order to achieve supply chain performance and organizational performance (Le Meunier-FitzHugh & Lane 2009). Collaborative marketing (CM) helps to redesign the level of major

customer involvement with marketing strategy and thus influences supply chain performance (Green, et al., 2012). Innovation is an action-based variable that only improves internal operations (Rhee, Park, & Lee 2010). Innovation capability is a 'learning-to-learn type' (Collis 1994), the "cultural readiness and appreciation of innovation' (Hult, Hurley, & Knight 2004), and the engine forces that boost performance (Amabile 1998). Innovation capability is the mechanism through which partners formulate strategies to achieve business performance (Hult, Hurley, & Knight 2004). Innovation capability is useful for developing unique knowledge, new product, innovation performance, (Schweitzer, 2014), and firm growth (Yang, 2013).

1.2.2 Nigerian manufacturing companies

Nigeria is Africa's largest economy. In order to maintain this position and diversify the economy, manufacturing companies needs more encouragement to compete in changing technological and global markets. With advantages of resources, human capital, and the market, the manufacturing sector looks better positioned for success. Nigeria is diversifying her economy from oil to non-oil sector (MAN, 2013). The Nigerian manufacturing industry comprises of sectors such as Food, beverages and tobacco, chemicals and pharmaceuticals, textiles, cement, electrical & electronics, footwear, automobiles, metal, iron & steel, non-metallic products, paper, printing & publishing. Investment in the sector is increasing and with positive effect on capacity utilization and output. Innovations, inventory management, improved packaging have positively driven increased level of sales and profitability (MAN, 2013). The industry accounts for 12% of the labour in the formal sector of the economy (National Bureau of Statistic, 2014).

Despite the fact that Nigerian manufacturers are confident and hopeful about the sector, studies have observed low levels of technical efficiency in many manufacturing sectors of developing countries (Sleuwaegen & Goedhuys, 2003). In Africa, poor transportation and distribution networks, outdated production technologies, underdeveloped information systems, and low manufacturing skill levels are obstacles to manufacturing performance (Bigsten & Söderbom, 2006). Some of the problems facing Nigerian manufacturing sector include high cost of manufacturing; weak technological support, poor linkages, harsh business environment, lack of patronage, low level of manufacturing competences and skills (Onuoha, 2012).

1.3 Problem Statement

Supply chain management (SCM) is an important strategy for firm competitiveness and performance. Yet issues emerging from disparity in technological capability, trust-entwined collaboration, new supply chain capability, top management commitment, supply chain vision and planning, and poor visibility continue to challenge firms' abilities to deliver quality products at the right cost, place and time (Ramesh, Banwet, & Shankar, 2010). These problems severely test and question the application of traditional supply chain management models. Thus, the need to constantly apply innovative approaches to improve the supply chain (Ageron, Lavastre, & Spalanzani, 2013). Although, supply chain performance has been extensively investigated (Ryoo & Kim, 2015), empirical literature on how supply chain innovation influence supply chain performance is under-research. Therefore, the need to advance the literature of supply chain innovation through a post-positivism world-view is more than ever.

Second, although the performances of Nigerian manufacturing companies has improved from 6.13 per cent to 7.71 per cent (Alao & Amoo, 2014; Schwab, 2013). Yet the industry is being confronted by several supply chain issues. Specific difficulties include inadequate supply chain infrastructure, less advanced production and information technologies, dearth of qualified middle managers, high operating costs, and late delivery (Aniki, Mbohwa, & Akinlabi, 2014). Other challenges are poor customer responsiveness and patronage, poor product quality (Onuoha, 2012), high inventories, lack of patronage and absent of collaboration (Onuoha, 2013). These difficulties are partly responsible for the closed down of some of the Nigerian manufacturing companies. These challenges if not resolve will continue to make the manufacturing sector uncompetitive both locally and globally (Ebhota & Ugwu, 2014). In this regard, the need to investigate how innovation could improve these challenges and metrics have been emphasized (Chete, et al., 2014; Gado & Nmadu, 2012). It was argued that innovation will positioned the sector to be more competitive, cost efficient, and effective regarding quality of goods (Onuoha, 2012). This study argues that supply chain innovation could help the manufacturing industry overcome these challenges.

Third, although previous studies found significant relationship between supply chain innovation and supply chain performance (Lee, Donhee, & Schniederjans, 2011; Oke, Prajogo, & Jayaram, 2013), Rhee et al. (2010) argue that innovation is action-based which cannot be measured directly on performance. Despite the importance of innovation in supply chain, studies that investigate the intervening role of innovation capability and the interactive role of top management support in the context of supply chain innovation (supply chain technology and supply chain collaborative processes) remain unknown. Innovation can only occur if the capability to innovate exist (Saunila & Ukko,

2012). However, Nigerian manufacturing companies encounter impediment such as less advanced manufacturing and information technologies, less skilled personnel, less information availability, and less collaboration culture (Onuoha, 2013). These obstacles are challenges to innovation capability

Fourth, the few empirical studies conducted on supply chain innovation have not integrate the holistic domain of technological capabilities and collaborative processes into a single framework. (Bello, Lohtia, & Sangtani, 2004; Tan et al., 2015). Although, isolated studies have set the interest in supply chain innovation study, there is need for empirical studies to harmonize and integrate the fragmented studies. Dong-Young, Kumar, & Kumar (2012) and Marsillac & Roh (2014) argue that integrating constructs and concepts is good for performance of a system. This study cover this gap through the holistic integration of supply chain technology, supply chain collaboration, innovation capability, and top management support to enable companies improve the supply chain. This type of integration remains unknown in the literature.

Despite the importance of supply chain technologies toward reduction of cost, lead-times, inventories, and improvement of quality; factors such as high cost of technology, weak top management support for technology implementation, wrong corporate culture for technology, lack of technical expertise, underutilization, and system incompatibility continue to affect the implementation of supply chain technology in Nigeria (Adegbie & Adeniji, 2013). Additionally, despite the benefits of supply chain collaboration on firm competiveness and performance, collaboration has proven more challenging and it remains delicate to implement (Nagashima, Wehrle, Kerbache, & Lassagne, 2015). Difficulties such as lack of trust, different goals and priorities, and lack of compatible communication structure affect the development of collaborative culture. On top of these problems, there are mixed findings on the indicators of supply chain innovation. Previous studies suggest significant relationship between supply chain technology and supply chain performance (Davis-Sramek, Germain, & Iyer, 2010; Richey, Adams, & Dalela, 2012). However, Omar, et al. (2006) concluded that supply chain technology is not significantly related to manufacturing performance.

Furthermore, a significant relationship was found between concurrent engineering of new product development and innovation performance (Meybodi, 2013); collaborative planning, forecasting & replenishment (CPFR) and performance (Nakano, 2009); collaborative marketing and SCP (Green et al., 2012). However, Valle & Vázquez-Bustelo (2009) suggested that in a period of uncertainties and for companies pursuing radical innovation, concurrent engineering does not influence product development time and quality. Likewise, previous studies on supply chain collaboration examined its antecedents as well as isolated processes; studies did not integrate CEPD, CPRF, and CM with trust. In this study, it is argued that trust as an important

component of collaboration is embedded into the collaborative processes. Therefore, the inconsistent findings and problems associated with indicators of supply chain innovation (technology and collaboration) justify the need for further research by taking into account innovation capability to mediate the influence of supply chain technology, collaboration on supply chain performance.

Fifth, although, the dynamic capabilities theory (DCT) and the social exchange theory (SET) have been used to explain supply chain innovation and supply chain performance, previous studies did not use the upper echelon theory to explain the relationship (Brun, et al., 2013). In order to spin the theoretical boundary of supply chain innovation, this study argues for a tripartite blend of the DCT, SET, and UET. Okhuysen & Bonardi (2011) argue that combining multiple theoretical-lens bridge silos of knowledge within and across disciplines. Although the effect of top management support in supply chain is unclear in the Nigerian context, chief executives are becoming more aware that successful integration of technologies and inter-network processes cannot be left to chance (Lambert, Cooper, & Pagh 1998). Therefore, this study argued that the interactive role of top management support would help explain how supply chain innovation could enhance supply chain performance than when there is no executive support. Manufacturing companies face a number of short-coming which include technological backwardness, weak collaboration, and managerial poverty because due to top managers' lack of commitment (Mwinyimbegu, 1993). Therefore, the integration of the upper echelon theory might help to explain the wrong perception of top management toward supply chain innovation.

Lastly, previous studies on supply chain innovation were dominant in North America, with about 5 per cent in Asia and South America (Soni & Kodali, 2012). Africa in general and Nigeria in particular is virtually missing in the research agenda. Thus, the need for country-specific and firm specific studies of supply chain innovation to help Nigerian manufacturing companies compete in a globalized economy is needed greater than ever. Problems from the industry, gaps in the literature, spinning the boundary of theoretical lenses, inconsistent and inconclusive findings, problems with methodology and methods were gaps identified and thus provide the motivation to conduct the study.

1.4 Research question

In line with the issues raise above, the study was guided by the following questions:

a) To what extent does supply chain innovation influences supply chain performance?
b) To what extent does supply chain technology and supply chain collaboration affect supply chain performance?
c) Why does innovation capability intervene in the relationship between the indicators of supply chain innovation (supply chain technology and supply chain collaboration) to enhance the supply chain performance?
d) How does the effect of top management support interact with the indicators of supply chain innovation (supply chain technology and supply chain collaboration) to improve supply chain performance?

1.5 Objectives of the study

The general objective of the study is to investigate the relationship between supply chain innovation and supply chain performance from the role of innovation capability and interactive effect of top management support. This general objective was achieved through the following specific objectives:

a) To investigate the integrated effect of supply chain technology (advanced manufacturing technology and information technology) on supply chain performance.
b) To investigate the integrated impact of supply chain collaboration (concurrent engineering of product design, collaborative planning, forecasting, and replenishment, and collaborative marketing) on supply chain performance.
c) To analyze the intervening effect of innovation capability on its role with supply chain technology and supply chain collaboration and supply chain performance.
d) To ascertain whether the direct effect of supply chain technology and supply chain collaboration on supply chain performance is moderated by top management support, and whether the effects are stronger for those companies whose top management support is effective.

1.6 Significance of the Study

It is not enough to point out the problem of a study. Researchers have to provide reasons why the issue is important. Creswell (2008) indicates that justifying a research problem means presenting reasons that explain the significance of investigating the issue. In general, the study has both managerial and theoretical implications to executives, managers, society, government, literature, and theory

of supply chain innovation. Findings from this study guide executives, managers, and practitioners in manufacturing companies to acquire insights about how supply chain partners could reduce costs, be customer responsive and improve the market performance through integrative effects of technological capabilities, collaborative processes, managerial roles and innovation capability. In this regard, chief executives could understand the importance of supply chain innovation especially in today's globalized and competitive business environment. Supply chain partners could also benefit by improving the extent at which they collaborate to achieve collective gain.

Findings from the study could benefit the society at large through improved quality, on time delivery and reduction of costs of goods. The Nigerian government can benefit from the outcome of this research because improvement in supply chain innovation might lead to organizational success, which will increase the contribution of the sector to gross domestic products (GDP). Government can use the outcome of this study to develop policies aim at providing suitable institutional and infrastructural frameworks that stimulate supply chain innovation.

Findings from this study could advance the body of literature and knowledge on supply chain innovation. By including TMSs in supply chain management study, the research responds to calls for further study by Chen & Paulraj (2004), and Mangan & Christopher (2005). Furthermore, van Hoek et al. (2013) emphasize the difficulty inherent in maintaining senior managers' motivation to supply chain management, and thus call for studies to develop strategies of attracting their interests. Previous research has revealed that a lack of TMS leads to resources being allocated to other projects that are important for top management (Swink, 2006).

The study also improved supply chain innovation model proposed Ageron et al. (2013a) and Arlbjørn et al. (2011)by introducing innovation capability and top management support. Despite the increasing studies on supply chain capability, the role of innovation capability on supply chain technology and collaboration remain unclear. Specifically, the researcher argues that managing and integrating improved technology and collaborative process may require corresponding improvement in innovation capability. Sedera & Dey (2013) argued that technology and processes cannot be adopted without complement. Huber & Sweeney (2007) point that implementation of supply chain solutions demands the integration of resources and knowledge. Fawcett et al. (2012) argue that implementation of new systems, technologies, and processes requires improvement in skills and competences. Hilvo & Scott-Kennel (2011) argue that collaboration increases knowledge and competence.

The study contributed to supply chain innovation literature by integrating technology, collaborative processes, and people processes in one framework.

Since isolated studies of supply chain management have produced conflicting findings, a need for integrated studies cannot be overemphasized. Kim, Kumar, & Kumar (2012) suggest that managers should avoid putting too much emphasis on a single quality improvement practices; and further stressed that firms that disregard holistic perspective and synergies may not benefit from innovative performances. Lastly, the study adds value to theory building in supply chain innovation by testing the applicability of DCT, SET and UET in explaining the impacts of supply chain innovation on supply chain performance. Previous studies tested DCT(Brun et al., 2013; Storer & Hyland, 2009), resource dependency theory (Oke et al., 2013), and Relational contracting theory (Bello et al., 2004) to explain the relationship between supply chain innovation and supply chain performance. Thus, the inclusion of UET and SET in this study is a major contribution.

1.7 Scope of the Study

To examine this novel research, study focused on manufacturing companies in Nigeria. The target responded were the companies on the database of the Nigerian Manufacturers' Association (MAN). These companies were expected to be proactive at adopting innovative supply chain strategies. Even though, there are many other factors that influence supply chain innovation in manufacturing companies, this study examined the relationship and integration of supply chain technology which comprises AMT and information technology; supply chain collaboration which consist of CEPD, CPFR, and CM, which are all intertwine with collaborative trust. Other factors include TMS; innovation capability; and SCP.

The manufacturers Association of Nigeria comprises of 15 branches such as (1) Cross River/Akwa Ibom (2) Bauchi/Benue/Plateau/ Gombe/ Nasarawa (3) Anambra/Enugu (4) Abuja (5) Ikeja (6) Edo/Delta (7) Apapa (8) Rivers/Bayelsa (9) Oyo/Osun/Ekiti/ Ondo (10) Ogun (11) Kano sharada Challawa (12) Kano Bompai (13) Kaduna South-east (14) Kaduna North-west (15) Imo/Abia. 10 out of the 15 branches were clustered and administered the questionnaire. The branches not included in the survey are Cross River/Akwa Ibom; Anambra/Enugu; Edo/Delta; Rivers/Bayelsa; and Imo/Abia. The numver of companies on the database of MAN is about 2000.

The Nigerian manufacturing industry is classified into 10 sectors such as (1) Food, beverages & tobacco sectoral group (2) Chemicals and pharmaceuticals sectoral group (3) Domestic and industrial plastic, rubber and foam sectoral group (4) Basic metal, iron and steel and fabricated metal products sectoral group (5) pulp, paper & paper products, printing & publishing sectoral group (6) Electrical & electronics sectoral group (7) Textile, wearing apparel, carpet, leather/leather footwear sectoral group (8) Wood and wood products including

furniture sectoral group (9) Non-metallic mineral products sectoral group, and (10) Motor vehicle & miscellaneous assembly sectoral group. The study covered all sector based on probability sampling techniques of cluster and systematic sampling. One of the limitation of this study is that the analyses did not control for sectoral classification of the manufacturing industry. Secondly, indicators of supply chain innovation could extend beyond technologies and collaboration. Therefore, future studies should examine the effects of quality management, organizational culture, collaboration with non-supply chain partners, and risk management. Investigations of these variables as either exogenous, moderating, or mediating constructs could shed more light on supply chain innovation.

1.8 Operational Definition of this Study

Supply chain: "A network of facilities that performs the functions of procurement of material, transformation of material to intermediate and finished products, and distribution of finished products to customers" (Lee & Billington, 1995).

Supply chain innovation: The system by which companies reconfigure and integrate their technological capabilities and collaborative processes with the aim of sensing and seizing new opportunities that facilitate information management, sourcing, production, and delivery of products in a responsive, cost efficient and timely manner to the end-consumer (Author, 2015).

Supply chain technology: "Technologies that can be applied in isolation or in combination with other technologies or the supply chain business processes and supply chain network structure to create supply chain innovation" (Arlbjørn et al., 2011).

Advanced manufacturing technology: "A group of computer-based technologies, which includes computer-aided design, computer-aided manufacturing, manufacturing resources planning, robotics, group technology, flexible manufacturing systems, automated materials handling systems, computer numerically controlled (CNC) machine tools, and bar-coding or other automated identification techniques and any technology, which is new or advanced to a company when compared to its previous or current manufacturing technology" (Abd Rahman & Bennett, 2009).

Information technology: "Computer and communication technology which facilitates the creation, storage, transformation, and transmission of information between two or more companies" (Youn et al. 2014).

Supply chain collaboration: SC collaboration is defined as a trust-based relationship where two or more interdependent but independent firms integrate

their product design process, planning and forecasting processes, and marketing processes with the aim of sharing real-time information and facilitating a responsive and efficient supply chain (Author, 2015).

Concurrent engineering: An integrated trust-related teamwork and simultaneous approach process of generating new ideas to develop a new product or improve an existing product or both through involvement of SC partners which yield costs reduction, quick production, quality improvement, prototyping, and customer satisfaction (Author, 2015).

Collaborative, planning, forecasting, & replenishment is "a business practice that combines the intelligence of multiple SC partners and synchronize them into joint forecasting, and planning with the aim of improving demand visibility and supply chain efficiency (Danese 2007; Danese 2011).

Collaborative marketing: A trust-based synergetic process of aligning a firm's marketing strategies with those of its customers to accomplish more than can be achieved alone (Author, 2015).

Collaborative trust: A knit-relationship where parties on a supply chain share all sensitive and non-sensitive information willingly, and view the success and well-being of each other as an extension of their business (Author, 2015).

Innovation capability: Ability of firm to improve its knowledge, skills and competence bases as a result of integrating their technological capabilities and collaborative processes with supply chain partners (Author, 2015).

Top management support: The degree to which chief executive officer (CEO) and directors understands the impact of supply chain management on firm performance and are willing to provide financial and moral encouragement for carrying out successful supply chain activities (Author, 2015).

1.9 Summary of the Chapter

This chapter provided the roadmap for the thesis. First, the background of the study provided key arguments and assumptions of the study and their justification from practice and literature. The chapter explains the performance of Nigerian manufacturing companies and why an empirical study is necessary. Furthermore, research problem is stated, four research questions and subsequently four objectives were formulated for the study. The significance of the study were highlighted. The scope and limitations of the study were discussed. Lastly the operational definitions of constructs are provided. The rest of the thesis is organized into 5 chapters. Chapter 2 presents the literature review of the study which comprises of both the endogenous and exogenous constructs as highlighted in the objectives and operational definition. It also explains the theoretical lenses of the study and the research gaps identified. Chapter 3 is the theoretical framework and hypotheses development of this study. The theoretical lenses include the DCT, SET, and UET. Chapter 4 describes the research methodology employed based on the post-positivism worldview. Chapter 5 discusses the data analysis and research findings. The data analysis technique is the structural equation modeling through AMOS graphics. Finally, Chapter 6 presents the discussion of findings and conclusion.

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