A Thesis Submitted for the Degree of Doctor of Philosophy

Supply Chain Visibility Tools Usage and Their Impact on On-Time Delivery:

A Case Study of a Fast Moving Consumer Goods Small, Medium Enterprise in London

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Abstract

The strategic importance of FMCG SME's supply chains makes it paramount that their performances are measured. Performance measurement in the context of on-time delivery is of high importance to SME's. SME's compete with large companies within the FMCG sector, as such gaining a competitive advantage is an extremely difficult task for these small and medium companies.There is an ever-increasing interest toward the field of supply chain management and much attention has been deemed towards the importance of information sharing in gaining competitive advantage for SMEs. The integration of the chain both internally and externally through information sharing (visibility) can lead to increase supply chain performance such as on-time delivery, therefore increasing competitive advantage for the SME's.

The study aim to develop a conceptual framework and a model to evaluate the impact of visibility tools usage in FMCG SME's. This research highlights some visibility tools such as ERP systems, Sage software that influences the level of information shared among the parties within the SME supply chain.This research examined the potential of information technology based tools and visibility factors and aims to provide factors that may influence the sharing of information between suppliers and customers along the supply chain, thus meeting on time delivery schedules.

This research employed both quantitative and qualitative approaches, with regression and correlation tests also conducted. Two questionnaires were administered, one at the case study company, the other at 100 SME's across London, 63 valid questionnaires were received and analyzed using SPSS software (manufactured by IBM, version 20). The findings of this research revealed that having shared values among SME's influenced the level of information that is shared and thus the level of visibility achieved within the supply chain. Further, it was revealed that large companies are able to utilize more in depth IT based systems, while small and medium sized companies had a tendency to utilize informal means for their visibility tools. In addition, the analysis of the research model indicated that supplier lead time and supplier chain reliability greatly influenced the ICT infrastructure of a FMCG SME. The model analysis also indicated that the delivery lead time influenced on-time delivery. In addition supply chain responsiveness was found to explain 30.9% of the variances found in supply chain visibility.

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Dedication

I dedicate this work to my late grandmother (may her soul rest in peace), who despite not having a formal education, and was illiterate believed in my dream and did everything possible to support it. She wanted me to achieve the highest possible education, and become an aeronautical engineer, despite not becoming an aeronautical engineer I pursued mechanical engineering which made her happy. I am happy that her dream of me achieving the highest possible education has come true and despite my sadness that she is not here to actually see my achievements, I am sure she is very pleased as well as proud of me and is watching over me from Heaven. This PhD is dedicated to the memory of Miss Monica Allen.

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List of Abbreviations

ANOVA	Analysis of Variance
AHP	Analytical Hierarchy Process
APS	Advanced Planning and Scheduling
ß	Beta Coefficient
BPO	Business Processes Outsourcing
CAPE	Computer-Aided Production Engineering
CIM	Computer Integrated Manufacturing
CRM	Customer Relationship Management
EDI	Electronic Data Interchange
ENAPS	European Network Advanced Performance Studies
ERP	Enterprise Resource Planning
FMCG	Fast Moving Consumer Goods
FMS	Flexible Manufacturing System
GT	Game Theory
GT	Group Technology
GSCF	Global Supply Chain Forum
ICT	Information and Communications Technology
IPT	Information Processing Theory
SCM	Supply Chain Management
IS	Information Systems
IT	Information Technology
JIT	Just In Time
KPI	Key Performance Indicator
m	Mean
MRP	Materials Requirement Planning
NPT	Network Perspective theory
NT	Network Theory
PAT	Principal Agent Theory
RTA	Returnable Transport Asset
RBV	Resource Based View
ROI	Return on Investment
RFID	Radio Frequency Identification
SOA	Service Oriented Architecture
SME	Small, Medium Enterprise
SCOR	Supply Chain Operation Reference Model
SD	Standard Deviation

SPSS	Statistical Package for the Social Science
ST	Systems Theory
SCC	Supply Chain Council
SCR	Supply Chain Relationships
SCV	Supply Chain Visibility
TQM	Total Quality Management
TCE	Transaction Cost Economics
UK	United Kingdom
VA	Value Assessment
VAN	Value Added Network

Declaration

I, Yolanda Silvera, declare that the presented work is my own unless otherwise stated and duly acknowledged.

Yolanda Silvera

13/03/2017

1. Introduction

1.1. Research Background

The term supply chain management (SCM) as a defined function and term first appeared in academia literature in 2002 (Cooper, Douglas and Pagh, 1997). It is at times used in reference to logistics but has also been defined in terms of the movement and flow of materials and information (Cooper, Douglas, and Pagh, 1997) across the entire supply chain; this movement begins from the point of raw material conversion to the point of delivery to customers. With the evolution of supply chains, as well as changes in the global business structure and economy, the need for improved performance within supply chain also increased. An important performance measurement to every successful supply chain is that of on time delivery to customers. As the need for efficiency within supply chains, and as customers have become more demanding of quality and meeting their needs, they have placed these high demands on their suppliers as such on- time delivery has become a critical measure of customer satisfaction and has become a critical performance metric (Vachon & Klassen, 2002).

The idea of the use of technology to achieve complete visibility throughout the supply chain is not a new concept; the use of technology to monitor most if not all aspects of the supply chain was started in 2000. The evolution of the use of technology came about at a point in time when everyone was seeking a new supply chain technology as a solution to world hunger and the provision of world peace (McCrea, 2011). Visibility is a very important concept for supply chains and logistics operations; it provides to information to supply chain managers that allow them to be knowledgeable in all aspects of the business. It allows the manufacturers, shippers, suppliers, retailers and even customers to have an idea of exactly where along the supply chain their products are located. At any point along the supply chain, information from the point of the raw material supplier to the point of customer contact (final destination) can be accessed. Supply chain visibility is made easier for all stakeholders within the chain, through the use of technology, but it is only effective if the data provided for use is of the highest quality.

On-time delivery, simply put, is the delivery of an order to supplier or customers on or before the required date, taking into consideration whether or not the customer facilitates early delivery. On-time delivery is often used as a performance measurement indicator within supply chains, it is one of those factors that can make or break a business. The failure to meet delivery times to customers can cause a company millions of dollars not just in lost revenue, but in customer loyalty, damage to the company's image or reputation and can force a product or company into early withdrawal from the business.

The integration of supply chain visibility technology as a means of improving on time delivery provides a tool that could provide significant improvements to customer satisfaction. In a recent study supply chain best practices survey, it was found that in order to achieve 100% on time delivery satisfaction companies had to have high inventory on hand for days (Best Practices, LLC, 2002). This, of course, affected their holding costs and overall operational costs. With these issues in mind, the analysis as to whether or not supply chain visibility offers a means of improvement for on time delivery becomes very critical to the supply chain industry. In addition, the focus of most research in the past has not been on small medium enterprises and the impact of supply chain visibility tools on their delivery time.

The importance of on-time delivery within supply chains cannot be denied. This performance indicator has a tremendous impact on a company's strategic objectives. Customer satisfaction is imperative to the strategic viability of any organization, and meeting the expectations of customers can provide a lasting business relationship for a company. Part of meeting a customer's expectation involves aligning the suppliers' output performance with the strategic goals of the customer, this means if a customer values consistent delivery rather than fast delivery, then it is necessary as a supplier to have delivery done on time rather than focusing on short lead times (Beamon, 1999).

Small Medium Enterprises (SME) have incorporated supply chain management techniques within their businesses over the years, but what has been lacking is specific research indicating the exact benefits of SCM to this category of business (Arend & Wisner, 2005). It is said that on one hand SCM can bring improvement to factors such as cost, quality and customer service for SME's. But on the other hand, it can affect how well SME's are able to manage and control hazards relating to the business, and SCM also affects the advantage SME's usually have of being able to use the private differentiation focus in their marketing strategy (Beamon, 1999). SME's in the UK are classified according to the number of employees within the organization, as such a small company employs between 10-49 employees, a medium sized company employs between 50-249 employees and a large company employs over 250 employees (Rhodes, 2016).

This research focuses on a specific type of SME's, those distributing fast moving consumer goods. According to the University of Sussex's research site fast moving consumer goods covers all products ranging from food and drinks to household goods. These products tend to be sold in high volumes and are low cost items, food & drink represents the largest manufacturing sector in the UK (14%) (University of Sussex, 2017). The FMCG sector is a very important sector globally as well in the UK, in the UK the UK the sector contributes over 8% of the UK's Gross Domestic Product (GDP) (Aljunaidi & Ankrah, 2014). The FMCG sector is also the largest sector in New Zealand and the fourth largest in India (Economy Watch, 2010).

1.2. Research Aims,Objectives & Questions

1.2.1. Research Aim

To examine the impact of visibility tools usage in SME's within the FMCG sector in the UK and the factors and practices which influences these organizations on-time delivery practices.

1.2.2. Research Objectives

The main focus of this study is on small, medium enterprises (SME), whose supply chain business is in the fast moving consumer goods sector (FMCG),. Most existing research in the area of visibility, supply chain management and on- time delivery has focused on large manufacturing companies and their suppliers. There is a lack of focus on the impact of visibility tools and on-time delivery as it relates to small businesses such as restaurants, small manufacturing/distribution companies and other small family owned businesses within the FMCG sector. Supply chain management and on-time delivery is becoming of growing importance in small business as well as their large counterparts. The focus of the research is confined to the United Kingdom, more specifically the geographic area of London.

In the study the following research objectives were achieved:

- To determine the factors that companies within the Fast Moving Consumer Goods (FMCG) supply chain consider a priority to meeting On Time Delivery of their goods and services.
- To determine the extent to which the companies are satisfied with the delivery performance of their suppliers within the supply chain.
- To ascertain what percentage of companies use information technology as a visibility tool to transact supply, purchasing and delivery business within the supply chain.
- To estimate what the lead time is for companies who conduct business using information technology (visibility) tools.
- To determine how visibility is defined within the industry.
- To determine how visibility is achieved within the industry (the performance indicators).

1.2.3. Research Questions

Key questions that would allow for thorough examination of the phenomenon of on time delivery and supply chain visibility were developed. Factors and practices within small, and medium supply chains were assessed, factors that were considered relevant to achieving on-time delivery, questions were developed that would allow the research to identify and assess these important factors. After identifying these factors, analysis was done to study how visibility tools impact on time delivery.

Therefore the following research questions were developed:

1. What factors do companies within the Fast Moving Consumer Goods (FMCG) supply chain consider a priority to meeting On Time Delivery of their goods and services?
2. To what extent are companies satisfied with the delivery performance of their suppliers within the supply chain?
3. What percentage of companies uses information technology as a visibility tool to transact supply, purchasing and delivery business within the supply chain?
4. What is the lead time for companies who conduct business using information technology (visibility) tools?

The research main hypothesis is:

- H_1: On time delivery in a case study FMCG SME is positively impacted by the use of visibility tools.
- H_o: On time delivery in FMCG SME's is not positively impacted by the use of visibility tools

1.3. Research Theoretical Context

This research has its theoretical foundations rooted in four main supply chain perspectives: Supply chain relationships, supply chain management, supply chain network responsiveness and supply chain performance measurement. The supply chain relationship theory has been studied extensively by researchers and is based on a combination of theories steeped in marketing and relationship management within supply chains. The relationship theory according to D. Flint, 2004 is relevant to supply chain research as "strong supply chain relationships enable firms to react to changes in the market: changes in what customers value and how competitors move". Bantham, Celuch, and Kasouf, (2003); Dubois, Hulthen, and Pedersen (2004) as well as Pohja (2004) have all indicated that "supply chains are interdependent firms and as such collaboration and relationship development is necessary"(p.4).

The development of supply chain management as a theoretical perspective has been widely attributed to researchers Lambert, and Cooper, 2000 as well as

Bowersox, Closs and Stank (1999), who all helped to develop the term supply chain management and its grounding perspectives. Bowersox et al. (1999) provided the link in their research between supply chain management and logistics. The supplier network responsiveness model or theory, has been researched as far back as 1991, as written by Williamson, P. J. who indicated that " in order for a firm to gain competitive advantage their responsiveness to their customers must be better than that of their competitors" (p.75-90). Other researchers such as Christopher (1992); Li, Rao, Ragu-Nathan, T. and Ragu-Nathan,B. (2005); Vastag, Kasarda, and Boone (1994); Christopher and Peck (2004); Academic Alliance Forum (1999); Pelton, Strutton and Lumpkin (1997); Lummus and Vokurka (1999 as cited in Sukati, Hamid, Baharun, Alifiah, and Anuar, 2012, p. 2) have all contributed various perspective regarding theories for supply chain research.

The perspective of supply chain performance measurement as developed by the Supply Chain Council uses the Supply Chain Operations Reference Model (SCOR) as a tool for managing supply chains. The model provides information and metrics to guide practitioners and researchers of supply chain management in the management and assessment of metrics relating to all aspects of supply chain. It also shows the relationship between delivery and other aspects of the supply chain and provides useful metrics that may be used for the assessment of delivery performance. This theoretical perspective provides the platform upon which this research seeks to identify the impact visibility tools (information exchange/relationship management) has on performance improvement (namely on-time delivery) within the supply chain. The model provides a framework for supply chain planning and features supply chain management practices integrated with business process engineering techniques. From amongst these theories research has shown that the theory of most significance is that of supply chain management as this perspective encompasses all other theory and/or perspective, and can be linked to social theories such as networking theories in supply chain, as well economical theories such as transaction theories in supply chain. These and other theories will be discussed in depth in Chapter 3 of this document.

1.4. Research Methodology

A case study design, as well as a multiple methods approach of qualitative and quantitative analysis, was used to investigate a supply chain in the UK. with stochastic demand and fixed delivery times. The research was conducted in two phases. The first phase consisted of the development of a framework for on-time delivery performance based on the extensive review of existing literature on this area. The second phase of the research involved the development of a mathematical model based on the analysis of data collected through surveys using SPSS as well as the Analytical Hierarchy Process (AHP). AHP was developed by Thomas Saaty, as a decision making tool for researchers. It has been found to be an effective tool as it allows for both "subjective and objective evaluation measures, providing a useful mechanism for checking their consistency relative to considered alternatives, thus reducing bias in decision making" (Fad, 2005, p. 501-514).

The decision model was developed with the aid of the commercial software called ProModel as well as through the use of other software packages. ProModel is an Optimization Suite Software package that can be used for the modeling of all types of manufacturing systems, from small jobs to large jobs including supply chains. A multi –product supply chain is assessed, the products are delivered to three distinct markets in the supply chain, specific products are distributed to restaurants and pubs, major brands retailers and corner shops. When conducting research involving the analysis of performance, the use of qualitative techniques, which provides feed-back such as "good" or "poor" in relation to performance, have been found to be in-sufficient in providing quality data, hence the decision to use both qualitative and quantitative techniques within the case study design and analysis.

The research conducted connects the qualitative and quantitative theories to the methodology. The qualitative methodology is thought to be an appropriate method to be used when one is building or starting a research study (Martinez & Poole, 2004). This approach is thought to be best for the starting of a research as it allows researchers to conduct the research in the natural research environment. It also allow persons conducting research to visit the site or location to conduct the research. The mixed methods or multiple methods approach is one that is "relatively new in the social and human science as a distinct research approach" (Creswell, 2009 p. 204). But despite being a fairly new approach, it is one that is gaining interest in the field of research due to its adaptability to various research areas and topics. This method allows for the "mixing" or fusing of qualitative, quantitative and other research methods such as case study research. Creswell in his analysis of the method has pointed out that it is a relevant approach to research methodology as it allows for multiple approaches to data collection and analysis. Researchers are able to incorporate interviews of their subject matter along with data collected by survey, or conduct a case study analysis along with interviews and data collection.

1.5. Contribution to Knowledge

In the wider area of supply chain management and the impact of delivery time on cost and other performance factors, a significant number of researches have been done. However there have been very few papers focusing on small and medium enterprises within the fast moving consumer goods sector. Most of the existing studies have focused on delivery time or other performance criteria within the supply chain using large companies as their case studies. Also, the focus in regards to the application of visibility tools for the improvement of the delivery performance factor has always been researched within the context of large supply chains. The backbone of most research papers have been the integration of Enterprise Resource

Planning systems with agility, flexibility and other supply chain performance factors. The importance and integration systems within supply chains and their impact on performance has been extensively researched and brought out in papers written by Pant, Sethi and Bhandari (2003), Bendoly and Kaefer (2004), Gunasekaran, Patel and McGaughey (2004), Gunasekaran and Ngai (2004), Gunasekaran, Williams and McGaughey (2005), as cited in Kelle and Akbulut (2005), Akyuz and Rehan (2009).

Supply chains have evolved over the years, one of the main focus of research in regard to visibility tools and improving supply chain performance, has been in the area of the use of Radio Frequency Identification (RFID) technology. Extensive research has also been done showing the implications of RFID on delivery performance; Alexander et al. (2002) analyzed the contributions of Auto-ID technologies on the retail supply chain and the difficulties of the adoption in these companies. There have also been papers by Kambil and Brooks (2002), Chappell et al. (2003), Tellkamp (2006), focusing on the impact of RFID on supply chains. There are also several academic papers concerning potential benefits of RFID technologies in supply chains as it relates to inventory inaccuracies and delivery time errors. Inventory inaccuracy, replenishment policies, bullwhip effect, are some of the main problems of supply chains which could be tackled using RFID technologies. Inventory inaccuracy is the discrepancy that occurs in the supply chain when errors occur in delivery when there is theft, misplacements or shipment errors. Kang and Gershwin (2004), Atali, Lee and Ozer (2005) and Fleisch and Tellkamp (2005) are some of the authors who focused on the impact of RFID on the inventory inaccuracy which affects delivery time. In these articles the authors focus on technology application within large companies, thus the need for this study which focuses on small organizations.

The knowledge gained from this study can be used to reduce penalty charges for small, medium enterprises especially those that have a supplier-buyer relationship with major chain supermarkets within the U.K. We investigate the impact of supply chain visibility on delivery time in different types of fast moving consumer goods businesses. The researcher looked at restaurants, pubs, corner stores and major chain supermarkets and their use of visibility tools and its impact on their delivery time. The researcher also looked at the use of visibility tools by a major supplier to these entities the penalties they are charged relating to late deliveries, hence the need for improvement. This research will serve as a framework tool that can be used to improve delivery performance within this sector. This dissertation expands on existing models, frameworks and research assumptions as outlined in the literature. No previous research examines the specific Fast Moving Consumer Goods (FMCG) sector (which is small, medium sized company that consists of three branches operating independently and interdependently) under research in this dissertation and the problems faced by this sector as it relates to delivery performance and supply chain visibility, which is motivated through the consideration given to costs (shipping, penalties, delivery, technology), the size of the businesses (SME's) and the limited resources available to these businesses. These are issues faced by other supply chain environments and as such the dissertation can also be used as a correlation between small, medium enterprises and large multinationals and major brand retailers.

1.6. Thesis Outline

Below is a short summary of the rest of the chapters

Chapter Two

Background: Reviews the body of research literature circumscribing the field of interest for this thesis which include supply chain visibility, supply chain visibility tools, SCOR Model and supply chain performance metrics.Gaps in the current literature, which provide direction for the study, are identified in this chapter.

Chapter Three

Presents the conceptual frame work of the study and hypotheses development. Different types of supply chain partnerships and relationship types are assessed and discussed. A discussion of current literature on the topic as well as a review of theories and the gaps identified, is carried out. This is done with the aim of providing a theoretical base for the partnership model developed in this research as well as providing an overall theoretical foundation for the study.

Chapter Four

Research Approach: Describes the research paradigm that has been followed in this study and research instruments used which include repertory grid and questionnaires.

Chapter Five

This chapter provides a presentation of the common literature opinion about the context of supply chain visibility as well as supply chain performance measures and the impact of relationship types within supply chains. In this chapter the performance metrics that are considered important to achieving efficient delivery performance is discussed. The chapter also provides information on a journal paper published by the researcher, this study focused on the impact of visibility tools on the case study company. This chapter also provides information on the proposed partnership model presented and published in a peer reviewed journal.

Chapter Six

This chapter is concerned with the analysis of the results of this research (with special focus on ANOVA tests and t-tests) and compare them with the common literature opinion discussed in chapter five. The findings regarding information sharing within the different types of FMCG businesses is presented and discussed. The chapter concludes with a cross analysis of the different companies; differences and similarities between them are also discussed.

Chapter Seven

Research model testing: Discusses the main statistical methods used for model testing. Subsequently, the hypotheses test results are reported. The validation interviews are also presented

Chapter Eight

Discussion: Reports the research empirical findings in the context of the extant literature

Chapter Nine

Conclusion: Provides a summary for this research by describing the limitation, implications and finally talks about future work which might support this study and make it more comprehensive.

2. Literature Review

2.1. Introduction

In this chapter, various performance assessments that are currently used in supply chains are reviewed. Various papers by leading researchers in the area of supply chain visibility, supply chain visibility tools and on-time delivery are reviewed by assessing their contribution or gaps to the body of knowledge regarding supply chain performance assessments, supply chain performance metrics and their impact on the business. The papers were also assessed regarding their pros and cons as it relates to supply chains, specifically SME's and FMCG Small- Medium businesses. The research also analyze the Balance Score Card Model as proposed by Kaplan & Norton, The SCOR (Supply Chain Operational Reference Model), The Relationship/Partnership Model and TQM (Total Quality Management) Model as a means of arriving at pertinent metrics and factors for this research.

2.1.1. Supply Chain Relationships

Supply chain relationships play a significant role in supply chain management and a number of theories have been used to explain its relation and impact on supply chains. When the relationships between supplier, buyer and customers are weak, they impede the emergence of a high performance supply chain within the FMCG market. Supply chain relationships have been reviewed in the past, from the perspectives of relationship marketing theory, network theory and transaction cost theory. The conceptual framework which forms the foundation of this paper, is built by offering a central proposition that specific dimensions of relationships, networks and transactions are the key antecedents of information sharing, which in turn influences supply chain delivery performance, hence the review of existing literatures to provide grounded theory for this framework.

Supply chain partnership is defined as a strategic coalition of two or more firms in a supply chain to facilitate joint effort and collaboration in one or more core value creating activities such as research, product development, manufacturing, marketing, sales, and distribution (Jraisat, 2011). Existing research have provided concepts and theories on which supply chain relationships are built, theories such as the resource based view theory and the social theory, have elicited the concepts of political-economy relationships as a contributor to supply chain relationships, other factors such as the social orientation of the supply chain relationships, asset availability, uncertainty and organizational processes have all been identified as having an impact on the nature supply chain relationships, delivery and visibility performance (Fynes & Burca, 2008). The objective of supply chain partnership and other supply chain relationship types is to increase benefits to all partners within the chain by reducing total cost of acquisition, possession, and disposal of goods and services (Maheshwari, Kumar, V & Kumar, U., 2006; Li, Ragu-Nathan, T.S. & Rao, B, 2006). Hence it can be deduced that, visibility and on-time delivery are influenced by the type of supply chain relationship that exists amongst all partners within the supply chain and are also influenced by the social and political environment within which businesses operates.

Supply chain partnership is designed to influence the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits (Stuart, 1997). Relationship marketing theory offers researchers a useful perspective as it explains and provides explanations of several processes or dimensions (e.g. commitment and cooperation) that are significant in studying the interrelationships between certain phenomena of the buyer-seller relationship (Wilson, 1995), the theory also provides constructs that shows the interconnections between information sharing in supply chain management and relationship types (Toften & Olsen, 2003). This theory on analysis it was deduced that it may also be used to explain relationship types within the FMCG sector, as the buyer-supplier relationships are atypical to other types of supply chains. It offers the explanation of FMCG buyer-seller relationship and indicates that there is a need for information sharing, the theory also offers explanations for the several types of supply chain relationships that exits (from which previous researchers as well as this research identified factors for the relationship/partnership models for supply chains), the dimensions in relationships, such as the rationale for, process of and structure of relationships that can be applied within the supply chain.

According to Wilson (1995) as well as Dash, Bruning and Guin (2007), the key theoretical dimensions that are often focused upon as it relates to relationships and supply chain management includes trust, communication, cooperation, collaboration, and information sharing. Tomkins (2001) explained that trust leads to increased information between firms in business, pointing to the fact that there is a link between supply chain relationships and information sharing (visibility). Trust and information sharing is said to have a functional association and this allows for positive relationships over the lifecycle of the supply chain's existence (Tomkins, 2001). Commitment and trust are important to the success of the relationship and are developed and fostered at different times within the lifecycle of the supply chain. Commitment is seen as the desire to continue and foster the relationship and is usually developed within the mature stage of the lifecycle while trust is developed in the early stages of the relationship (Wilson, 1995).

Cooperation is another key element in achieving or forming successful supply chain relationships/partnerships in order to ensure that both parties can gain benefits (Wilson, 1995). Shaw and Gibbs (1995) pointed out in their research the importance of cooperative relationships in the food supply chain especially the supply of supply fruit and vegetables (an example of an FMCG sector) in the required quantities and of the required quality to the target markets. Collaboration offers the FMCG businesses a competitive advantage as they work together to achieve success, collaboration also helps to define the type of relationship (arms length, partnership) each business will agree to be a part of for their individual business (Simatupang & Sridharan, 2002).

Communication is also a necessary dimension to the success of supply chain relationships, as good communication practices enhances knowledge sharing and provides for “rich” knowledge creation (de Lurdes, Veludo & Macbeth, 2004). The sharing information not only enhances communication, it also helps to improve commitment and cooperation among all parties within the supply chain, and helps the buyer and seller through the adaptation of new processes (Kalafatis, 2000; Andersen, 2006). Sharing the right information between the members of the supply chain group provides them with the opportunity to review the credibility of the other party, which assists in making decisions regarding whether or not to form binding relationships for business (Dash et al., 2007). Strategic partnership with suppliers enables organizations to work more effectively with a few important suppliers who are willing to share responsibility for the success of the products (Anderson & Katz, 1998; Li et al., 2006).

It has been shown that the growth of many giant FMCG retail companies all over the world, can be and is mainly attributed to the type of supply chain relationship/partnership such organizations are engaged in and how they manage their clients and partners. According to Pule and Kalinzi (2014), when Procter and Gamble forged a strategic alliance with Wal-Mart to ensure that its products are brought closer to consumers markets; the result was that the two companies grew from $375million when their relationship began in 1988 to over $4 billion today. Similarly, Pule and Kalinzi pointed out in their research that companies like Tesco, Costco, and Cardinal Health have also grown, and this is largely because they accord significant amount of attention to downstream relationship building and collaborating with their suppliers and customers. These companies have maintained their success and growth through the forming of collaborations and other forms of strategic alliances; this has also led to improved supply chain processes, which is seen in their success in terms of business growth and expansion. When companies do not give attention to their relationship strategies, this is usually depicted in the form of low levels of technology integration (Pule & Kalinzi, 2014). Sweeney (2006) stated that technological integration plays a pivotal role in promoting relationship and integration within the supply chain network. Its absence therefore affects the management of relationships within the supply chain process. This points to the fact that information sharing (visibility) and the type of relationship that exists within a supply chain goes “hand –in hand”.

Supply chain partnerships provide both large and small firms with numerous opportunities to improve their conduct of business. Li et al.(2006) emphasized the importance of all departments within partnering companies working together in evaluating inventories, systems, processes, training, work methodologies, equipment utilization, and a host of other opportunities to reduce the cost of operations and explore other beneficial opportunities for the partnerships. Kotabe, Martin and Domoto (2003) pointed out that involving suppliers extensively in SCM, organizations could gain more production flexibility, faster product development cycles, faster product delivery, lower input costs and higher end-product quality in order to gain greater market share and premium prices.

From the theories and literatures the relationship concepts underpinning this research were identified as; relationship type (such as leverage, arms length, partnership), trust, delivery time, accuracy of delivery, communication channel both internal and external to the business, customer value, Cost, quality product range. These factors were identified as key contributing concepts to the building of successful relationships and visibility within SME businesses.

2.2. Review of Existing Literatures

Past research studies in the area of supply chain visibility, and its impact on performance in supply chains focused primarily on information sharing and its use for performance improvement. There have been a number of research papers written using simulations and modeling to indicate how information improves supply chain performance (Barratt & Oke, 2007). The problem with this research focus is the fact that information sharing does not necessarily mean that a company has achieved visibility within its supply chain, most of the existing research contains a missing link between information sharing and visibility as well as the link between visibility and on time delivery. It has been suggested that the concept of information sharing is not directly linked to improvement in delivery performance, instead it is the use of the information to improve visibility that leads to improvement in performance (Barratt & Oke, 2007).

Most authors have researched supply chain visibility and on time delivery as stand-alone topics, they have assessed the impact of each on profitability or the use of each as a performance measure. There has not been a lot of research done on the impact one factor has on the other, in this case the impact of visibility on delivery time. A more detailed assessment of this impact can provide pertinent information for the improvement of delivery time in supply chain and by extension an improvement in customer satisfaction ratings, efficiencies and profitability. Supply chain visibility does not mean that an organization shares all information with its partners, however the information shared across the network must be meaningful information and relevant to the particular supply chain (Kaipia & Hartiala, 2006). Having visibility throughout the entire chain or having end- to end visibility can be described as the sharing of all relevant information across all spheres of the chain, between all relevant parties within the chain. The focus of this research paper is on the delivery aspect of the supply chain, as the case study company is the distributor within the supply chain.

The topic of supply chain visibility, has been researched and reviewed extensively, many researchers have proven that increase visibility improves the performance of the supply chain. There have been improvements in inventory management, sales and a better understanding of demand (Kulp, 2002; Gavirneni, Kapuscinski & Tayur ,1999; Lee , So & Tang, 2000; Lee & Whang, 2000; Yu, Yan & Cheng, 2001; Li, Shaw, Sikora, Tan & Yang, 2001; as cited in Kaipia & Hartiala, 2006.). What has been missing from these existing research papers is the impact of supply chain visibility and visibility tools usage on the delivery time to customers, this is the focus of this paper. In addition, most of these studies have been theoretical in nature and does not focus on the practical application of supply chain visibility and its impact. The uniqueness of this research is the fact that we are focusing on the impact of supply chain visibility usage within a case study company, as such our research is both theoretical and practical in nature.

Thomas F. Siems (2005) in his article, article implied that there is a direct correlation between visibility within a supply chain and efficiency as well as a reduction in overall operational costs. This correlation provided a guideline for this research, as this provided direction in developing ideas for the exploratory study in this research. Supply chain visibility as it relates to the sharing of critical information across all areas of the supply chain has been highlighted as one of the major challenges being faced by modern supply chains (Mahadevan, 2010). Some of these challenges arise out of the lack of the right technology by some organizations especially small business, lack of trust amongst companies within the supply chain (this leads to the withholding of critical information within the chain) and at times companies have the required visibility tools, and not the personnel required to use these tools correctly (Tumaini, 2011). As such it was important to use this research paper to only explore the use of technology, looking also at what types of technology would be most suited for FMCG SME's. Xiao-Feng & Yu (2009) in their paper states that "Many researchers who have approached the issue have proved that increased visibility will improve the performance of the supply chain"(p.2) as cited in (Adielsson & Gustavsson, 2011, p.2). Visibility is therefore seen by many researchers as well as supply chain practitioners, as an important parameter in achieving high quality supply chain performance. Missing form these research papers is a narrowing of the area or term visibility and visibility tools and a direct research focus on small and medium businesses.

Supply chain performance can be ranked using key performance indicators or performance metrics. In researching the existing literature on supply chain performance metrics/indicators, a number of metrics are constantly repeated throughout these existing research papers. The literature divide performance metrics into the categories of tactical, operational and strategic functions, these are felt to be the pillars upon which company policies can be built, and suitable control measures implemented and exerted (Ballou, 1992). Strategic performance indicators are used to assess top level management decisions, tactical measures focus on resource allocations and the measurement of performance against targets, while operational measures assesses the impact of decisions made by lower level managers (Gunasekaran, Patel & McGaughey, 2004). Whenever we decide to use metrics for performance measurement within a supply chain these metrics should truly capture or nobody the vision of the supply chain organization, they should also be “understood by all members of the supply chain and do not give rise to manipulation (Gunasekaran, et al. 2004). Most companies whether they are large or small have realized the importance of performance metrics, most times the emphasis has been on measuring financial performance metrics. Some companies have emphasized financial metrics while others have focused on operational metrics, but what has been lacking is a balanced focus on both. This is also true for supply chain companies, delivery time performance indicators are either assess for their financial impact or operational impact rather assessed with a view to understand the impact delivery time has both on finical metrics as well operational metrics.

Market segmentation has been recognized as an important factor when one refers to the importance of delivery time in the Fast Moving Consumer Goods Sector (FMCG). This is due to the fact that each segment may have different criteria regarding delivery performance, it has been stated that there is no one definition of perfect order, as each customer has his/her requirement regarding what is needed and the time and place it is needed (Christopher, 2011,). Martin (2011), went further and pointed out that customers can be characterized and grouped into segments which is then used to determine their service needs . This is just one of the existing views regarding the identification of the necessary parameters to be used to measure delivery performance within FMCG sector and supply chains overall. In conducting this research, segments of supermarkets, restaurants, pubs and small stores were analyzed. This was done so as to analyze whether or not each segment had different requirements in regards to visibility tools and delivery time.

Devlin Browne (1998) and his co-authors developed the European Network Advanced Performance Studies (ENAPS) approach of performance measurement. This approach focused on a generic set of performance measures and indicators and uses a process-oriented top down approach. The process uses financial, non-financial and quantitative measures however it is limited in its focus and scope as it focuses only on the processes within an organization. It contains a large number of performance measures or factors. In a 2003 research Rouse and Putterill argued that a “performance measurement framework assists in the process of performance measurement system building, by clarifying performance measurement boundaries, and specifying performance measurement dimensions or views”(p.791- 805). Folan and Browne (2005) took a different approach when presenting performance measurement frameworks, they looked at performance measurement systems of extended enterprises, by assessing two performance measurement frameworks: the enterprise balanced scorecard and the framework needed to allow for the selection and implementation of the required measures.

In the last decade, the impact of globalization has led most managers of companies to become more focused on satisfying their customers. The supply chain and fast moving consumer goods (FMCG) industries are highly competitive and as such, performance becomes critical to the success of the business. Therefore, the issue of on-time delivery of goods or services becomes very important to the business, as this leads to higher customer satisfaction and as such better supplier-customer relationships that can develop into loyalty type relationships. In defining the problem, the given operational conditions (the focal company responsible for manufacturing as well as sourcing finished goods to be distributed to customers) were assessed to arrive at a conclusion regarding supply chain process factors. The problem addressed in this study was from the perspective of the distributor within a supply chain. The problem is to identify whether or not the decision to improve visibility with various tools as well as policy development leads to improvement of delivery times to customers. There is little empirical evidence on this topic, that is the impact of supply chain visibility on delivery time in relation to non-traditional Small, Medium Enterprises. The question, therefore, is: How does Supply Chain Visibility impact on time delivery within a Small, Medium Enterprise which focuses on the delivery of Fast Moving Consumer Goods?

2.3. Research Articles on Supply Chain Visibility

In order to grasp the concept of supply chain visibility a careful review of the research articles concerning the topic was done (these are presented in the tables below). From the review of existing literatures it was found that most research articles concerning supply chain visibility can be divided into three general areas; technology for sharing information, information criteria and the benefits of sharing information. Technology for information sharing or enablers of information sharing articles focused on enablers of information sharing ranging from information technology solutions to relational matters which allows information sharing across different supply chain inter-organizational linkages. The articles focusing on information criteria provided information that shifted technology from normal operational technology to those providing information geared towards visibility. Articles in this area is focused on how information sharing in elevated to visibility e.g., by only sharing relevant information. Articles focusing on the benefits of sharing information provided information on visibility and performance within the supply chain. Articles in this area focused on how information sharing (extended to visibility) affect performance at different levels of the chain (Johansson & Melin, 2008).

Tables 2.1 and 2.2 provide a listing of existing research articles focusing on supply chain visibility and its impact on supply chains. These tables highlight the fact that visibility is a topic of great interest to supply chains especially as it relates to improving supply chains. Of importance is the fact that these existing research papers does not specifically focus on small businesses within the FMCG sector or the specific performance factor of on-time delivery. The existing literatures (as shown in Tables 2.1 and 2.2) focused on shared information and the properties of shared information a sit related to supply chain visibility. These existing papers, therefore, allowed for the identification of gaps in existing research regarding visibility and supply chain performance. See Appendix C for tables relating to literature sources on supply chain visibility.

Table 2.1.: Articles focusing on Enablers of Information Sharing.

Enablers of Information Sharing				
Author	**Year**	**Focus**	**Research**	**Conclusion**
Bailey and Pearson 1983	1983	How to establish satisfaction and information transparency in the era of computers	Interdisciplinary approach in order to develop a measurement tool	A definition of computer user satisfaction and a valid approach for measuring satisfaction.
C. Garita, Hamideh Afsarmanech and L.O Hertzberger	2000	The need for different levels of visibility in information systems (IT). Different nodes (actors) need different information. The focus are, how great the need of different visibility levels are, and how this can be achieved.	Case study based research. Studying the development of an information system	The key conclusion is regarding the data visibility, which means that the level of visibility (information access) must be determined on a node level with respect for the information needed in other nodes. The whole article mainly regards how to share data within the system rather than to tackle the question of which data.
Alexis Barlow, Feng Li	2004	How internet related technology can be a tool to share information in inter-organizational linkages.	Case study based research on four different actors, how they use technology and what information they share.	The researchers identify the importance of handling different relationships in different ways and that strategic relationships should be paid more attention when designing IRT. Visibility is identified as information that has been streamlined by members of the network and technology to fit each linkage perfectly (right information in the right way).
Elini Mangina, Ilias P. Vlachos	2004	This article analyze how agent technology can provide improvement (structure, flexibility, transaction harmonization and simplicity) in the supply chain and the information flow in the supply chain.	A review of existing literature and a model to support the hypothesis	Agent technology can be used to create effective supply chains. Visibility is understood as the right information at the right place at the right time. As a consequence, the success of any technology improvements depends on its ability to deliver visibility into the system.
Scott J Mason et al.	2003	To examine the cost benefits of a fully integrated system for warehousing and transportation	The empirical material is gathered from a discrete event simulation tool (data simulation of reality).	Real time information does not provide visibility. Visibility is provided by the right information at the right time. An integrated system can provide global inventory visibility. The benefits are, less excess inventory, shorter lead times and increased accuracy.

Source: Johansson & Melin(2008, p. 23-32)

Table 2.2.: Overview of Literature Regarding the Measure of Visibility in Supply Chains.

Paper	Focus of visibility measure: Shared information	Focus of visibility measure: Properties of shared information	Research methodology: Survey	Research methodology: Case-study	Scope of the work
Gustin *et al.* (1995)		X	X		Individual firms
Mohr and Sohi (1995)		X	X		Linear supply chains (*N* tiers)
Simatupang and Sridharan (2005)	X		X		Two-tier supply chain (1 supplier, 1 retailer)
Kaipia and Hartiala (2006)		X		X	Two-tier supply chain (*N* suppliers, 1 manufacturer/retailer)
Barratt and Oke (2007)		X		X	Two-tier supply chain (*N* suppliers, 1 manufacturer/retailer)
Zhou and Benton (2007)		X	X		Two-tier supply chain (*N* suppliers, 1 manufacturer/retailer)

Source: Caridi et al.,(2010, p. 598)

2.4. Research Framework Parameters and Theories

In the supply chain context and as it relates to on time delivery and visibility a company needs to have performance measurements to be able to evaluate the efficiency of the Supply chain. According to Sink and Tuttle (1989), you can't manage if you can't measure as such we need metrics in order to measure the performance of the supply chain. Christopher (2011) claimed that companies have to achieve both cost leadership and service leadership to have an efficient Supply chain. If a company only measure internal performance measurements as for example order handling time and yield in production the measurements cannot be used for evaluating the efficiency in a company as we also need to measure external performance such as delivery time, customer satisfaction and delivery accuracy, just to name a few. Lambert and Pohlen (2001) also claimed that most of the supply related performance measurements have an internal focus and do not measure how the company drives profitability. In developing this study and formalizing the context of the research, theories and literature relating to both internal performance as well as external performance measures that can be measured and used to improve delivery time through the use of visibility tools were reviewed and analyzed.

The theories within the SCM area are connected to many different areas. There is a need to move from studying supply chain as individual "elements" and as such applying atomistic theories, towards looking at the supply chain in its entirety that is a having a more holistic view of the supply chain and as such applying cross disciplinary theory that goes beyond the traditional boundaries of SCM (Svensson, 2003). SCM should be considered to come from economics, engineering, operation management, production management and logistics. This requires a holistic theory generation writes Svensson (2003). With this in mind supply chain is deemed to span all levels in a company such as:

- The strategic level deals with decisions that have long–lasting effect on the firm. This includes decisions regarding the number, location and capacity of warehouses and manufacturing plants and flow of material through the logistics network.
- The tactical level includes decisions that are typically updated anywhere between once every quarter and once every year. These include purchasing and production decisions, inventory policies and transportation strategies including the frequency with which customers are visited.
- The operational level refers to day-to-day decisions such as scheduling, lead-time quotations, routing and truck loading.

In this research, a combination of metrics taken from various levels of SCM and the combination of fundamental theories for the development of the research questions and assessment of the findings were applied. These were also used in the earlier stages of the research to develop and propose a relationship model (as discussed in chapter six)for supply chains and incorporate them with some other factors from the literature, such as order fulfillment, delivery lead time, technology application, and supply chain visibility. These factors are reviewed in the preceding sections, the theories from which these factors were developed are first reviewed. These are found in sections from 2.3.1.1 to 2.3.1.6

2.4.1. Supply Chain Management Theories and Corresponding Constructs

SCM is a management concept that has constructs which are borrowed from fields such as accounting, management, economics, sociology and engineering. Though the aim of any research is to constantly test and develop new theories which are applicable to the present supply chain environment, it has been found that majority of the theories that are employed as foundational theories in SCM research have existed for a long time and may be older than the SCM concept itself (Mollel, 2015). Some of the common and most researched supply chain theories are; the Transaction Cost Economics Theory, Network Perspective, Social Network Theory, Resource Based View, Principle-Agent Theory, Game Theory, Systems Theory and Strategic Choice Theory. The main ones that forms the theoretical premise of this research are described below.

2.4.1.1. Transaction Cost Economics Theory

The main question that Transaction Cost Economics theory (TCE) tries to answer is why do SC firms exist? In essence what is the main reason for the establishment of the supply chain organization? In the context of SCM one would apply TCE concepts with the aim of reducing the costs associated with carrying out a transaction when deciding whether or not to make or buy the items needed for the supply chain distribution. There are three attributes which can influence a firm's decision to make or buy: frequency of transaction, asset specificity and degree of uncertainty associated with a transaction. In general the theorists of TCE theory argues that different control and governance mechanisms should be employed to mitigate the risk of opportunistic behavior of supply chain firms when outsourcing (Mollel, 2015).

Researchers have argued that as it relates to TCE and SCM, visibility and delivery this theory is important as it allows for businesses to identify, develop and manage areas such as the flow of information within the supply chain. With the reduction of transaction costs, uncertainty and the ability to source the required assets for production, organizations are now experiencing a reduction in information flow along the supply chain, improved production efficiencies and improved deliveries (Iyengar, 2005). The theory of TCE is wildly researched and applied in the area of outsourcing but is also relevant to other aspects of SCM. According to Schwabe (2013,p.3), the theory of transaction cost economics (TCE) assesses the relationship between business partners within the supply chain; it looks at "how business partners collaborate with each other and shield each other from harmful relationships". It can therefore be deduced that TCE links information flow within the supply chain and allows for better business relationships. The two primary drivers of Transaction Cost Economics are uncertainty caused by the external environment and costs, which consist of coordination costs and transaction costs (Fink et al. 2006, p.504). Uncertainty as well as transaction cost is said to be influenced by the human agents within the supply chain (Williamson, 1981, p. 553), this includes the way they think and at times their opportunistic tendencies. People are subject of limited objectivity and may act in favor of themselves rather than the company (Williamson, 1981), either natural or mechanical doubt might be an adverse factor for buyer-supplier relationships. From this analysis constructs based on TCE were deduced to be used as guides for the development of the conceptual framework for the research. Table 2.3 highlights the main constructs identified from this theory and lists the literature sources from which these constructs were adapted.

2.4.1.2. Network Perspective Theory

In the Network Perspective Theory (NPT) firms rely not only on their relationship with direct partners, they also relied on the extended network of relationships with supply chain firms. This theory focuses on supply chain relationships and

Table 2.3.: TCE main constructs for on-time delivery and visibility and the sources from which these constructs were adapted

Theory -TCE	Construct	Source Adapted
TCE	Lead Time	Schwabe,2013
TCE	Uncertainty	Schwabe,2013; Arshinder et al.,2011
TCE	Asset Specificity	Schwabe,2013; Revilla et al,2011
TCE	Supply Chain Relationships	Schwabe,2013; Liu,2012; Revilla et al.,2011; Hoyt & Huq,2000
TCE	Information Visibility	Wang& Wei,2007

argues that competitive advantage within the chain can only be achieved through efficiently and effectively orchestrated supply chains. Thus it can be said that the focus of the NT is to develop long-term, trust based relationship between supply chain firms. The network perspective theory looks at an organizational usage of its resources, it assess whether or not resources are being used efficiently and whether or not the organization has the right resources for its supply chain (Halldorsson, Kotzab, Mikkola & Skjoett-Larsen, 2007). According to Jraisat (2011), network theory provides a useful framework for the analysis of a business situation example a supply chain. Network theory also provides a new level of insight into the relationship types and perspectives of supply chains and supply chain buyer-supplier relationships (Jarillo, 1988; Möller & Halinen, 1999; Croom, Romano & Giannakis, 2000). The network relationship creates information sharing opportunities hat enables buyers and sellers to have access to resources and knowledge beyond their abilities, leading to long-term relationships (Mikkola, 2008). This long term relationship based on information sharing allows for visibility within the chain which also strengthens the relationships among the players within the chain. This approach is a structure formed by the main dimensions (e.g. activities, resources and players or actors within the supply chain) that connect a set of relationships. Therefore, network theory allows for the analysis of information sharing technologies and techniques as this enables the analysis of the supply chain relationships, in the case of this research the relationships among SME's within the FMCG sector.

A business network is a set of relationships that are connected, showing a firms' identity, process and functions that contribute to explaining a dyadic relationship (Anderson et al., 1994; Ritter, 2004 as cited in Jraisat, 2011). The "actors" or "player provides an essential function within the supply chain relationship cycle as they determine the effectiveness and the level of meaning that builds the network structure. As such the network must have activities and the resources required to carry out those activities (McLoughlin & Horan, 2002; Jraisat, 2011). The performance of a firm depends not only on how efficiently it cooperates with its direct partners, these partners also have good cooperation with their own business partners. NT can be used to provide a basis for the conceptual analysis of reciprocity (Oliver, 1990; Halldorsson et al., 2007) in cooperative supply chain relationships. Here, the firm's continuous interaction with other players becomes an important factor in the development of new resources (Hakansson & Ford, 2002). The creation of a partnership or other types of relationships allows for the resources of the chain organizations to be combined to achieve more advantages than through individual efforts. Such a combination can be viewed as a quasi-organization (Hakansson & Snehota, 1995; Hakansson, 1987; Halldorsson et al., 2007). Thus, the resource structure determines the structure of the supply chain and becomes its motivating force. The network theory (NT) contributes profoundly to an understanding of the dynamics of inter-organizational relations, as it emphasizes the importance of factors such as "personal chemistry" between the supply chain organizations, the build-up of trust through positive long-term cooperative relations and the mutual adaptation of routines and systems through exchange processes such as information sharing (Halldorsson et al., 2007). Communication is very important to the operation and building out of the NT as it is through direct communication, the relationships forged is able to convey the uniqueness of each chain. This ultimately results in supply chain customization to meet individual customer requirements. See Table 2.4 for the constructs deduced from this theory and some researchers who have focused on the theory.

Table 2.4.: NPT main constructs as it relates to supply chain delivery and visibility

Theory –NT	Construct	Source Adapted
NT	Supply Chain Relationships	Halldorsson et al., (2007); Jsairat (2011)
NT	Information Visibility	Jsairat (2011)
NT	Resources	Jsairat (2011)
NT	Material Flow	Hearnshaw & Wilson (2013)

2.4.1.3. Resource Based Theory

Resource Based View believes that a firm's resources and capabilities are its most important assets, so the primary concern of RBV is about obtaining access to another firm's core competencies to gain competitive advantage. Researchers such as Barney (1991), Penrose (1959), Wernerfelt (1984) and according to the doctoral thesis by Bohnenkamp (2013) have all pointed to the fact that RBV provides a link between the internal characteristics of a company and its performance. It is also pointed out that RBV provides a basis for the competitive advantage for a company as it considers both tangible and intangible resources. Many contributions to the study of supply chain have looked at supply chains through the lenses of RBV and have argued that it provides a basis on which it can be concluded that distinctive visibility is required in a supply chain linkage to achieve a sustained competitive advantage for the firms involved in the linkage (Hoyt & Huq, 2000; Barratt & Oke, 2007; Caridi et al., 2010). Visibility across the supply chain is a key element in achieving supply chain competitive advantage and having high performance in areas such as delivery as such all members of a given chain should have access to updated information and performance figures regarding the main processes of their partners (Caridi et al., 2010).

The RBV theory therefore can be argued as a pivotal theory underpinning supply chain competitive advantage based on companies' tangible and intangible resources. In order to create a competitive advantage the resources incorporated by the organization must fulfill the criteria of "being valuable, rare, imitable and non-substitutable" (Bohnenkamp, 2013, p.6). The RBV enables firms to determine their core competencies and develop metrics (whether strategic, operational or tactical) that are critical to the organization's competitive advantage (Espino- Rodríguez & Padrón-Robaina, 2006). Another benefit of RBV and one that could be considered the greatest benefit to supply chain is the fact that it allows an organization to integrate its internal and external capabilities. The concept of dynamic capabilities was firstly referred to by Teece, Pisano, and Shuen (1997) and is discussed further by Bohenkamp (2013), in their research dynamic capabilities is defined as the "firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments" (p.6). With this definition in mind the constructs of production, resources, organizational competencies as well as core competencies are developed, all of these constructs enables the usage of firm specific assets in clusters including groups and individuals. This means that competencies are not only valid internally, competencies may also be of value outside the firm. In addition to this, Eisenhardt and Martin, (2000) view dynamic capabilities as processes within firms, using resources and creating a market change, and argue that through these, new resource configuration can be achieved. See Table 2.5 for the constructs extracted from the literature on this theory.

Table 2.5.: RBV constructs for supply chain visibility and on-time delivery

Theory- RBV	Construct	Source Adapted
RBV	Production Capabilities	Bohnenkamp (2013); Wang & Wei (2007)
RBV	Resources	Bohnenkamp (2013); Wang & Wei (2007); Chen & Paulraj (2004)
RBV	Organization Competencies	Bohnenkamp (2013); Chen & Paulraj (2004)
RBV	Visibility	Caridi et al. (2010); Iyer et al.(2004); Wang & Wei (2007); Chen & Paulraj (2004)
RBV	Delivery Performance	Caridi et al. (2010); Iyer et al. (2004); Wang & Wei (2007); Chen & Paulraj (2004)

2.4.1.4. Game Theory

Game Theory (GT) is a very old strategic decision making theory which looks at the conflicting and cooperative behaviors of two intelligent and rational decision makers for different scenarios (i.e.: win-win, win-lose, lose-win and lose-lose). Game theory improves strategic decision-making by providing valuable insights into the interactions of multiple self-interested agents and therefore it is increasingly being used in business and economics and has now become applicable to supply chains. According to Gibbons, 1992 GT is a collection of tools for predicting outcomes, in the realm of supply chains this is used to predict the outcomes of uncertainty and demand changes which results in implications for inventory and delivery performance. Osborne and Rubinstein (1994 as cited in Erhun & Keskinocak, 2003) highlighted the fact that GT provides a means for understanding a phenomena that is observed and the how the decision makers interact with this phenomena. This view of GT has been the foundation for the development of a number of models and simulations (e.g. Beer Game developed by M.I.T) which focuses on supply chain inventory, delivery, flexibility, demand and uncertainty. Myerson (1997) also highlighted the use of GT in the study of mathematical models of conflict and cooperation between decision-makers. He pointed out that GT is a mathematical theory of decision making by participants in conflicting or cooperating situations. Its goal is to explain, or to provide a normative guide for, rational behavior of individuals confronted with strategic decisions. GT theory is therefore used as a tool for decision making within the supply chain. See Table 2.6 highlights the major construct derived from this theory and the sources from which they were adapted.

Table 2.6.: GT constructs for supply chain delivery and visibility

Theory-GT	Construct	Source Adapted
GT	Uncertainty	Chinchuluun et al.,2008
GT	Demand Variability	Chinchuluun et al.,2008; Cachon & Netessine,2004
GT	Delivery Performance	Leng & Parlar, 2005
GT	Flexibility	Cachon & Netessine,2004
GT	Inventory Management	Chinchuluun et al.,2008
GT	Decision Making Process	Erhun & Keskinocak, 2003

2.4.1.5. Systems Theory

Systems Theory in SCM context brings together various components of a complex supply chain (that is the human, capital, information, materials and financial resources etc.) to form a subsystem which is then part of a larger system of supply chains or network. The theory argues that for a holistic perspective ST must be employed to understand the internal and external factors that shape an organization's supply chain performance. According to Maani et al. (2007) as cited by Li & Maani (2011), a "system" is defined as "a collection of parts that interact with one another to function as a whole. However, Ackoff (1993) pointed out that though a system theory looks at how the system (in this case the supply chain) interacts with each other, the reality is that optimization of an entire system is never achievable if the individual parts of the system has been locally optimized. In other words the system has to be optimized as a whole and not as individual parts. In the supply chain context, therefore, optimization of the chain as a whole is not feasible if the individual businesses are busy maximizing their own profits, sales, and market share, while working in isolation from the other partners. Within this context (SC), systems theory points to the importance of effective supply chain relationships, as well as having the "right" technology to allow for optimal information sharing along the chain. The evidence provided by supply chain research indicates that in order to achieve effectiveness in a supply chain and based on the ST, the chain requires effective coordination, and compromises between all partners of the supply chain (especially small sized businesses) (Li & Maani, 2011). This coordination and compromise involves a depth of trust and information sharing (visibility) to allow for effective performance such as delivery. While businesses are well aware of the potential benefits, most managers are reluctant to implement such initiatives due to the investments involved and issues of sensitive trade information being exposed. Thus, the question becomes whether or not to share information and collaborate or keep all information as restricted. See Table 2.7 which highlights the major constructs taken form various literatures regarding this theory.

Table 2.7.: ST constructs for supply chain visibility and on-time delivery

Theory-Systems Theory	Constructs	Source Adapted
ST	Supply Chain Optimization	Li & Maani (2011)
ST	Customer Value	Li & Maani (2011); Lapko et al. (2014)
ST	Demand & Delivery	Li & Maani (2011); Badillo- Pina et al. (2012); Lapko et al. (2014); Iyengar (2005)
ST	Supply Chain Relationships	Li & Maani (2011)
ST	Capacity Utilization	Iyengar (2005)

The theories discussed above all provide varying perspectives of metrics that impacts the supply chain and can be used for its management. These theories are not exhaustive as they are not the only theories in SCM literatures, there are many more theories applied to SCM context. These were chosen as they are amongst the most commonly discussed in research and they are also applicable to this research paper. The problem of having multiple theories that may be applied to the supply chain is the fact that multiplicity of theories makes it very difficult for defining, implementing and studying SCM from a single point of view (Kotzab, Halldorsson, Mikkola & Skjott-Larsen, 2007). Nevertheless each of the above theories has a different aim in management and structure of supply chains so each gives a unique perspective of the SCM phenomenon. This is why it is said that there is no unified theory of SCM and there should not be (Chen & Paulraj, 2004). Because SCM is so broad and big it should be split into smaller parts such as Operational SCM, Strategic SCM, Organizational SCM and Project Specific SCM etc. The underpinning theory for this research is the resource based theory as this theory focuses on the resources available to a company (such as visibility tools, processes and labour), the use of those resources and the outcome from the use of these resources.

2.5. Supply Chain Partnerships and Relationships

The development of relationships and relationships models within supply chains has grown since Handfield and Nichols (2002) conducted their research and wrote their paper in which they state that without a foundation of effective supply chain organizational relationships any effort to manage the flow of information or materials across the supply chain is likely to be unsuccessful (p.15). Supply Chain partnerships and relationship types are very important to the success of the supply chain, especially as it relates to the on-time delivery process. Depending on the type of business relationship between the supplier and customer, late deliveries may be overlooked, in other instances, it may mean a loss of contract or lead to strained business relationships. The standard definition for a relationship is “a significant connection between two or more things”, within supply chains the relationship between retailers and suppliers has to be one of utmost trust and commitment to similar things in order to achieve the desired results.

The entire supply chain including upstream as well as downstream processes must be seen as one system and must also be managed as one system; this allows for easy identification and elimination of inefficiencies and hidden operating costs. The development of appropriate business relationships within the supply chain as well as the application of appropriate contracts and technology can aid in the reduction of these inefficiencies and operating costs. It is has been stated in research that well-coordinated supply chains have the potential for companies competing in a global market to gain competitive advantage (Narasimhan, Kim &Tan 2008, p.5235). Supply chain relationships have been researched by authors some of which such as Narasimkhan et al.(2008), Parlar and Weng (1997), Lee and Whang (2000), Cachon and Lariviere (2001), Gerchak and Wang (2004). They have all examined theoretical, as well as practical, issues involving buyer–supplier co-ordination. The synchronization of the supply can thus be deduced to be a vital concept that leads to customer service improvement outside of operational factors.

Increasingly, corporate success will depend on the formation of mutually beneficial relationships with key customers and suppliers. Partnering provides a way to leverage the unique skills and expertise of each partner and will possibly also “lock out” competitors. Lambert et al. (1996), in studying supply chain relationships stated that partnership-type relationships are the most popular, Lambert et.al. (1996,) went on to define partnership as tailored business relationship based on mutual trust, openness, shared risk and shared rewards that results in business performance greater than would be achieved by the two firms working together in the absence of partnership. It is also implied that the type of supplier- customer relationship that exists within the supply chain impacts operational efficiencies and supply chain performance. Sadiq Jajja, Hassan & Ali Brah (2012) in their research on supply chain relationships stated that “in a strategic partnership, suppliers work to improve their delivery arrangements to meet buyer’s scheduled and urgent needs on time”(p.12). Sadiq Jajja et al. (2012), further stated in their research that the strategic relationships also helps to enhance transportation systems making it quicker and more flexible thus enhancing supplier capability to deliver their products on time and with less lead time. They further hypothesize that supplier delivery reliability or performance positively impacts the organization performance through the focusing on the supplier relationships. Supply delivery reliability, in turn, has important implication on buyer cost, quality, and timely delivery reliability. Short lead time discourages buyers to purchase in bulk and enable to save in inventory cost (Li et al., 2006).

2.5.1. Supply Relationships and Delivery Performance

In today's globally competitive supply chain, companies are constantly strategizing how to achieve the optimal performance from their supply chain. Managers constantly try to re-engineer the business and its processes to achieve this optimum, they try to achieve this through "increased information sharing, supply chain planning tools, collaborative forecasting and replenishment, as well as third-party logistics solutions" (Selldin & Olhager, 2007, p. 42). However, before we can decide how to operate efficiently and measure performance, one has to look at the design of the supply chain as to whether or not it facilitates these performance measures and operational techniques. Cohen and Fine (1998) and Fine (1998; 2000) as cited by Selldin and Olhager, 2007 discussed in their research the fact that supply chain design is something separate and a part form product and process design . Hayes and Wheelwright (1979 & 1984), went further in their research to develop a product-process matrix, indicating that there is a best fit for the type of products developed and sold within the supply chain and processes needed to ensure these products flow efficiently upstream and downstream of the chain. The model developed by Hayes and Wheelwright is one of the most recognized and tested concepts as it relates to supply chain management and strategy, it has been empirically tested by (for example, Spencer & Cox,1995; Safizadeh et al., 1996; McDermott et al., 1997; Ahmad & Schroeder, 2002) as cited in (Selldin & Olhager, 2007).

Supply chain relationships whether it be a partnership type or arm's length can impact delivery performance in a supply chain. The idea that there could be optimization of the operations through cooperation between customers and suppliers was first initiated Goyal (1976), later research such as that Monahan (1984), Lal and Staelin (1984), Lee and Rosenblatt (1986), Banerjee (1986a, b), Joglekar (1988), and Dada and Srikanth (1987) further reinforced this idea. These researchers emphasized the importance of a spirit of co-operation between suppliers and customers, which is essential for successful implementation of on time delivery along the supply chain. Traditionally the focus of supply chain partnership or relationships has been on delivering products in an environment of uncertainty such as demand, quantities and price, this resulted in high levels of finished goods inventory (Kohli & Jensen, 2010). However with research and new technologies companies are taking a new approach to supply chain relationships and coordination as they now realize that better relationships and coordination leads to improve on time delivery of products, reduction in variations of quantities being delivered and goods are delivered at the right quality (Kohli & Jensen, 2010). Supply chain partnerships, relationships and collaboration “is an approach that leads to increased information flows, lower level of uncertainty” and ultimately more profitable and efficient supply chain (Lotfi, Mukhtar, Sahran & Zadeh, 2013).

2.6. Customer Service Satisfaction

Customer service is important to all organizations especially those seeking to do business on a global scale and according to world class standards. Customers along the supply chain can be located globally or domestically as such managing their satisfaction can be tedious at times. Conversely, the lack of satisfaction of customers can be detrimental to a business as “word of mouth” bad press can ruin a business. According to Gunasekaran et al. (2004); Lee and Billington (1992) and van Hoek, Harrison and Christopher (2001), all emphasized that successful supply chain performance is intertwined with good metrics, but in order for metrics to work they have to have their foundation on customer satisfaction. Customer satisfaction encompasses flexibility. Some flexibility measures include (i) product development cycle time, (ii) machine/toolset up time, (iii) economies of scope and (iv) the number of Inventory turns (Christopher, 1992, p.264-266).

Being flexible refers to making available the products/services to meet the individual demand of customers. Flexibility has increased and has become possible as a result of the development of technologies such as flexible manufacturing systems (FMS), group technology (GT), and computer-integrated manufacturing (CIM). Bower and Hout (1988) discussed the fact that Toyota has used the principle of flexible manufacturing systems to ensure that they have high responsiveness level, when it comes to their customers’ needs. Stewart (1995) highlighted that there is a strong correlation of supply chain response time and flexibility. Gunasekaran et al. (2001) felt that, by defining flexibility as a metric and by evaluating it companies will be able to respond rapidly to their customers.

Customer satisfaction is also affected by the customer query time; this time refers to the time it takes for a firm to respond to a customer enquiry with the required information. This customer query may include the status of an order, stock availability, delivery or any other issues that may arise with their order. Thus using technology to provide online information, or increasing visibility between customer and supplier becomes very important. “To measure customer service, questions “what are the response times”, and “what procedures exist to inform customers” should be considered (Gunasekaran, et al., 2001 p. 79). The processes and activities that constitute the supply chain do not end when the goods are provided to the customer. In order to achieve continued customer satisfaction post transaction activities such as invoice reconciliation is important. Post transaction activities play an important role in customer service and provide valuable feedback that can be used to further improve supply chain performance (Gunasekaran et al., 2004, p. 338).

2.7. Supply Chain and Logistics Cost

Metrics are important to businesses because in order to ensure that targets are being met, and shareholders' returns on their investments are being managed one has to measure performance. According to Chou (2004) in his thesis, " we cannot improve what we cannot measure" and "measuring performance is the first step in the decision-making process for managers"(p.6) . Therefore, it can be said that metrics are important to the supply chain as it allows us to evaluate the performance of the business, performance of our suppliers and also to measure customer satisfaction. The business performance will allow us to measure our operational targets and well as financial targets, while customer satisfaction and supplier performance will mainly impact our financial targets.

The metric of supply chain logistics cost is a financial measure which also ties in as an operational metric, as it can be used to assess he efficiency of the supply chain (Gunasakeran et al., 2004). Financial and operational measures are important and necessary metrics as they allow the organization to assess its strategic goals and practices, focusing on whether or not these contribute to the efficient flow of products along the supply chain both upstream and downstream. Logistics function is one that cuts across departments and boundaries within a company and as such " care must be taken to assess the impact of actions to influence costs in one area in terms of their impact on costs associated with other areas" (Cavinato, 1992 as cited in Gunasekaran et al. 2004, p. 338).

Logistics costs as discussed in Gunasekaranet al. (2004) is also affected by the supply chain assets, supply chain assets include assets include accounts receivable, plant, property and equipment, and inventories. With the decline in most economies globally and the pressures by stakeholders to improve returns on investments, companies are forced to improve to improve the productivity of capital. With this in mind keeping costs low becomes a high-priority, as such each cost associated with the assets within the supply chain has to be assessed to arrive at their impact on total cash flow over time. One way of addressing logistics cost is by expressing as a percentage of revenue, that is average days required to turn cash invested in assets employed into cash collected from a customer (Stewart, 1995, p. 42). This means that total cash flow per unit time can be taken or listed as a metric that can be used to determine the productivity of assets in a supply chain.

Customer service requirement is a metric that constantly changes and increases therefore having the required inventory in stock are crucial to the supply chain as this allows for efficient operation (Slack et al., 1995). The flow of products along a supply chain includes the total costs of operation according to (Stewart, 1995; Christopher, 1992; Slack et al., 1995; Lee and Billington, 1992; Levy, 1997). These costs can be grouped as: Opportunity cost- consisting of warehousing, capital and storage, cost associated with inventory at the incoming stock level and work in progress, service costs, consisting of cost associated with stock management and insurance. The cost of finished goods including those in transit; risk costs, consisting of cost associated with pilferage, deterioration, and damage. The other costs include cost associated with scrap and rework; and cost associated with too little inventory, which accounts for lost sales/lost production information processing cost this includes costs such as those associated with order entry, order follow/updating, discounts, and invoicing.

Surveys conducted by various industries and the data collated and stated in the research paper by Stewart (1995), identified information processing cost as the largest contributor to total logistics cost. Visibility tools can be identified as a part of these technology costs, as the role of technology usage within supply chain shifts and becomes more popular, researchers are finding that technology usage and integration within supply chains is no longer about databases, but has developed into advanced tools. These modern tools can provide "timely, accurate, and reliable information, has led to a greater integration of modern supply chains than possible by any other means" (Naim, 1997, p.13-16; Benjamin & Wigand, 1995, p. 62-72 as cited in Gunasekaran et al., 2004, p.337).

2.8. The Importance of Performance Metrics

Metrics are applied across various types of business for management and efficient operation, they are applied within the supply chain management industry as means of ensuring that various operational, costs, delivery (among others) targets are met. To assess the performance of the company there are a few important questions that a manager has to ask in order to develop the key metrics (Chou, 2004, p.8), these are:

> "*What is our core business – what is that we say we do or are capable of doing?*
> *How well is the company performing within its establish market/sector – financial and operational?*
> *How can the company document how well it is doing- how does the company demonstrate to others its performance*"?

These questions can be answered based on the strategies and targets the company would have developed and conveyed to its shareholders, and departments within the company and its employees. In order to completely answer these questions, managers have to define the metrics and collect relevant data in the field or organizational operation and assess the data in order to decipher the company's performance. Metrics are usually developed based on the company's strategies and from this the major drivers are developed, the specific drivers are explicitly linked to the strategies guiding the organization's operations and managerial decisions. Chou(2004) in his thesis document, states, that the value of metrics can be weighed according to their impact or ability to:

> "*Define the present status of the organization, looking at all areas so as to facilitate decision making.*
> *Provide feedback on processes so as to allow for continuous improvement.*
> *Identify trends in performance through the tracking of metrics over time.*
> *Provides the means through which a company is able to align its strategic activities to its strategic plans.*
> *Provide actual data for reward and recognition.*
> *Allow managers to identify best practices in one aspect of the organization and apply them to other aspects of the business.*
> *Allow for benchmarking with external organizations*". (Chou, 2004 p. 9).

The existing literature offer insight into the common misconceptions of metrics and their application to supply chain management. Current supply chain metrics are indicative of evaluating the entire organization or supply chain as a whole, rather than looking at individual supplier, department or aspects of the business' performance. Often times, it is better to break the whole into smaller elements or evaluate individual aspects of the business or the supply chain. This allows for more detail analysis of current and potential problems. This study will, therefore, look at the specific metrics needed for supply chain performance, in or next section.

2.9. SCM Performance Measurement and Metrics

In this section, the performance measurements and metrics relating to supply chain management are reviewed. The metrics discussed are those that are most frequently mentioned as important metrics for supply chain management and its successful operation. Gunasekaran et al., (2001, 2004) and Stewart (1995), defined the following metrics as means of measuring supply chain performance, 1) order planning, 2) supply link performance, 3) production level performance, 4) delivery, 5) customer service satisfaction, and 6) supply chain and logistics cost. Each of these is described below in details.

2.9.1. Metrics for Order Planning

Metrics for order planning are described under three sub-headings below:

2.9.1.1. The Order Entry Method

This metric focuses on the methods and extent to which customers' specifications and requirements are converted into useful and accurate information along the supply chain. The accuracy of the information conversion will help to determine the accuracy of the services or products delivered along the supply chain (Gunasekaran et al., 2004, p. 333-347).

2.9.1.2. Order Lead Time

Christopher, (1992) and Gunasekaran et al., (2004) pointed out that the time between receiving a customer order and the delivery of the completed order to customers is regarded at as the order delivery tine or order cycle time. The existing literature has shown that reduced order cycle time is directly proportional to the reduction in the supply chain response time; hence, it is a very important metric to supply chain management. It is an important measure of the success in managing this metric leads to success in customer retention, hence improvement in business competitiveness.

2.9.1.3. Order Route (Customer Order Path)

Order routing outlines the steps an order takes, or the path it travels to arrive at the customer. That is, this measure looks specifically at the time an order spends at the different supply chain channels prior to arriving at the customer. This is an important metric, as it can be used to assess bottle necks and other issues within the supply chain channel. By assessing the order path, "non- value added activities can be eliminated" (Gunasekaran etal., 2004, p. 336; Sharma, Giri & Rai, 2013, p. 32), thus improving efficiencies and delivery time within the supply chain.

2.9.2. Supply Link Assessment

Modern supply chain management and supply chain research have moved away from seeing supplier performance as just the meeting of delivery time (on time delivery), price competition, quality, and reliability just to name a few. According to Gunasekaran et al., (2004), suppliers are now being assessed according to the tactical, strategic and operational metrics of the organization. Fisher (1997) made reference to the fact that suppliers must be analyzed as to their performance in meeting the organization's long-term strategic objectives. Ellram (1991) and van Hoeck (2001) pointed out the importance of supply chain relationship between supplier and buyer as being important to the success of the supply chain organization. Lambert et al., (1996), in their research highlighted the importance of partnerships and relationship management between suppliers and buyers. Lambert et al., (1996) believed that the partnership model was needed to foster success in supply chain performance such as on time delivery. Most of the existing research indicated that in order for partnership relationships to be effective they have to be long term, provide a means for problem solving and encourage mutual planning (Maloni & Benton, 1997; Lambert et al., 1996). Supplier partnerships have been reviewed by a number of practitioners and researchers (Macbeth & Ferguson, 1994; Ellram, 1991; Graham et al., 1994 ; Gunasekaran, 2004; Sharma, Giri & Rai, 2013). All have pointed out the importance of partnership formation in supply chain operations and as such allow for efficient and effective sourcing.

2.9.3. Production Level Metrics

At this level, the foundation of performance measurement and metrics is built on product cost, quality, and speed of delivery, reliability and flexibility (Mapes, New & Szwejczewski, 1997; Slack, Chambers,Harland, Harrison & Johnston,1995; Gunasekaran, 2004). Gunasekaran et al. (2004) argued that production level metrics are those that allow for continuous improvement and measurement of the production needs. These include but are not limited to the range of products produced by the company, capacity utilization (Slack et al., 1995). Also of importance to productivity is the level of skill and expertise involved in the scheduling of activities along the supply chain. Little, Kenworthy, Jarvis and Porter,1995 spoke of the importance of using scheduling tools such as ERP (Enterprise Resource Planning), MRP (Materials Requirement Planning) and JIT as a means of improving and ensuring scheduling activities are efficient and at their optimum. These metrics once managed efficiently will ensure that productivity levels are at optimal levels, thus meeting customer needs.

2.9.4. Delivery Performance Metrics

Delivery time is one of the most important metrics in a supply chain; it has the greatest impact on customer loyalty, revenues and the overall efficiency of the entire supply chain. It is believed to be “a primary determinant of customer satisfaction; hence, measuring and improving delivery is always desirable to increase competitiveness” (Gunasekaran et al., 2004, p. 337). The precision of delivery to customers is an example of a quantitative measurement, delivery precision measure how many orders that are delivered in time. In time means the date that has been stated on the order-acknowledgement or the date that has been agreed on between supplier and buyer. A number of researchers have developed metrics to be used to measure delivery performance, Stewart (1995) indicated that delivery performance can be measured if we look at reducing lead time attributes as cited in Gunasekaran et al., 2004). According to Christopher (1992) delivery performance is linked to “on time order fill” which is a measure of order delivery reliability and the completeness or accuracy of the order.

The accuracy of delivery performance is also linked to the accuracy of the invoice(s) generated and the flexibility of the supplier in adjusting orders, delivery dates and time, quantities as well as invoicing, but still being able to meet the agreed schedule (Novich, 1990). Thomas and Griffin (1996) highlighted the importance of logistics and distribution costs to delivery performance. In that study Thomas and Griffin (1996) felt that measuring and understanding each individual costs associated with delivery will allow suppliers and buyers to make trade off decisions. These decisions include factors such as planning of routes, distribution of goods etc., but at the end of the day delivery performance is still met.

2.10. Supply Chain Metrics for Delivery

Delivery performance has become a very important metric for supply chains. Researchers have looked at delivery in relation to flexibility, cost, responsiveness as well as defining the metrics associated with delivery performance. More and more companies are focusing on the importance of effective supply chain management; with this advent, there is an increase in demand by suppliers, researchers and customers for delivery performance to become a foundational metric of success. As global supply chain management increases, and the global reach of supply chain expands there is an increasing need for technology and other systems to manage the diversity in cultures across the globe, technical standards and the logistics of movement of goods across great distances. Vachon and Klassen (2000) pointed out that when difficulties with delivery performance are present, problems tend to quickly cascade forward through the supply chain. The traditional response by organizations and its management has been to alleviate delivery issues through the build-up of buffer stock, this result in increased storage costs, handling costs and inventory costs or an expanded lead time. In this section I will review existing literatures relating delivery performance and assess the existing metrics used to measure delivery performance.

Delivery performance can be assessed through lead time as it has been found that increasing or improving delivery performance is directly correlated to the reduction in lead time, Stewart (1995). One of the most important aspects of delivery performance is on-time delivery. On-time delivery measures whether or not perfect delivery has taken place, that is whether or not the goods delivered are of the right quantities. On-time delivery also takes into consideration whether or not the goods delivered are the items that were requested, it also looks at invoicing and billing thus we can say on time delivery is a measure of customer satisfaction (Gunasekaran et al., 2004). Most researchers have found that when issues arise with delivery performance and this parameter becomes unreliable; the effects are felt throughout the supply chain as the problems tend to quickly cascade forward through the supply chain. When these situations arise, the typical response of management has been to increase buffer stocks or expand lead times. These alternatives, in turn, leads to increase inventory, holding and storage costs thus increasing the overall operation costs of the supply chain and reduces customer responsiveness and satisfaction. In a recent paper, Vachon and Klassen (2000) showed that there has been limited research on delivery performance in supply chain as such researchers have not been able to state confidently what the impacts of poor on-time delivery are. In their paper Vachon and Klassen (2000) stated that:

> "*While delivery performance is generally recognized as important, a review of the literature identified few attempts to empirically assess the extent to which supply chain factors impacted performance. Researchers such as Brown and Vastag (1993) suggested that the lack of literature was, in part, reflective of the fact that delivery is the culmination of a whole set of upstream operations and managerial decisions. In addition, downstream operations, such as poor logistical arrangements, can negatively impact delivery performance. Thus, rather than consider delivery performance from the isolated perspective of a single manufacturer, explicit recognition is needed of the upstream and downstream supply chain*"(p.218).

Another important concept that was found to contribute to supply chain delivery performance is that of on-time order fill rate. This concept was first introduced by Christopher (1992) where order fill rate was described as the completeness of order delivered combined with the fact that the orders are filled at the same time for each request. In other words the reliability of the order delivery, reliability is referred to as the ability of a system or component to carry out is required function under specified conditions and within a specified time frame. Order fill rate as it relates to the reliability of delivery speaks to the fact that the order is delivered complete (quantities, volume etc.) within the specified time frame and within the conditions outlined by the customer. Another metric of importance to supply chain delivery is the volume of finished goods in delivery transit or the percentage of finished goods in transit. This quantity, according to Novich (1990), gives an indication of inventory levels. Novich pointed out that if stock levels are low at the distribution warehouse and delivery turns are low or customers are not receiving delivery on-time this could be due to low delivery speed, unreliable drivers, the location of the warehouses and frequency of deliveries all of which leads to poor management of the company's capital. Novich further states that if there is an increase in delivery efficiency the opposite effects will be seen within the supply chain. An increase in efficiency in these areas can lead to a decrease in the inventory levels (Novich, 1990).

The number of faultless notes invoiced is another metric used to assess delivery performance within supply chains. An invoice may be described as a document which shows the delivery date, time, and condition under which goods were received (Gunasekaran, 2004). Comparison of the deliveries made against the previously agreed order can be used to determine whether or not a perfect and complete delivery have been made; the invoices allows for these areas of discrepancy to be identified and improvements as well corrections made. Also of importance to delivery performance is the flexibility of delivery system (Gunasekaran, 2004). The term flexibility refers to the ability of the supplier to meet the customers' needs through the meeting of "a particular customer delivery requirement at an agreed place, agreed mode of delivery and with agreed upon customized packaging" (Gunasekaran, 2004, p. 265-268). Novich (1990) implied that the ability of a supplier to be flexible through the meeting of these customer requirements can lead to better retention of customers, and can also influence the customers' decision to continuously place orders as well as retain a particular supplier for a long period of time.

2.11. Supply Chain Visibility

Supply chain visibility has become an area of increased interest within supply chains, but despite this the subject matter still remains an area that is not clearly defined or clearly understood. Its impact on supply chains has been researched but mostly in regards to types of technologies to be used within the supply chains. The concept of visibility has been seen as technology that is used for inventory management, process management and demand management but it has not been thoroughly researched regarding clear measures and impacts on these areas. It has been assumed by companies and researchers that "if companies across supply chains have visibility of demand, inventory levels, processes, etc., that organizational performance improves" (Barratt & Oke, 2007, p.1217). However, this assumption has not been clearly analyzed and proven. Barratt and Oke (2007) in their researched pointed out that there are clear differences in visibility achieved across different types of supply chains and these differences are based on factors that are both technology based and non-technology based. They went further in their research to focus on resources as a means of identifying the factors that allow for competitive advantages to supply chain when visibility is incorporated.

In recent times the retail supply chain especially food retail supply chains have benefitted tremendously from advances in technology (Sahin & Robinson, 2005), there has been a growing trend for organizations to create external linkages based on the sharing of information (e.g. point of sale data (POS), inventory levels, forecasts, etc.) in order to gain increased visibility of their customers and/or suppliers' operations and activities (Mabert and Venkataramanan, 1998; Shore and Venkatachalam, 2003; Fiala, 2005). The main driver and purpose of achieving visibility and implementing visibility tools has been primarily for the improvement of their own internal decision making and operating performance (Rungtusanatham et al., 2003; Kulp et al., 2004). Day (1994) and Lee et al., (1997; 2000) implied that improved visibility is critical to improving supply chain performance including delivery performance.

The proof as to whether or not improved visibility leads to improved competitive advantage within supply chains is still unclear and constantly being researched

, models are constantly being developed and determination of the exact competitive advantage being determined through the extant literature (Hoyt & Huq, 2000; Eylon & Allison, 2002; Subramani, 2004). According to Chan (2003) "visibility for a supply chain is important for accurate and fast delivery of information and products"(as cited in Maghsoudi & Pazirandeh, 2016 p.126). Lee, Padmanabhan and Whang (1997) as cited Bartlett, Julien and Baines (2007, p.2) stated that, "the lack of accurate information can cause certain negative consequences such as the 'bullwhip-effect' in supply chains" . A number of authors of research papers have acknowledged the importance of evaluating the benefits of visibility in terms of operations (e.g., Kulp et al., 2004; Wang & Wei, 2007) as well as in terms of planning effectiveness (e.g., Petersen et al., 2005). However, a clearly defined model designed to measure the benefits of improved visibility is still missing (Caridi et al., 2010 as cited in Caridi et al., 2014). Visibility needs to be defined and measured as it relates to impact on supply chain performance as this will enable suppliers and customers to evaluate whether or not their investments in visibility tools are translating into a competitive edge, improved efficiencies and increased revenues.

2.11.1. Supply Chain Visibility and Delivery Performance

The main aim of visibility implementation in any supply chain is to improve the company's performance (Wang & Wei, 2007; Pidun & Felden, 2012), visibility tools are also used to enhance and support the decision making process of management upstream and downstream along the supply chain (Kulp et al., 2004). Managers have to make decisions regarding inventory, delivery, order patterns, demand variability product variability just to name a few. Supply chain visibility can enhance these processes through the sharing of information and the use of technological tools that allows for a "clear picture" of what is available and what is not along the supply chain. Several researchers have looked and initiatives to incorporate supply chain visibility into the operation of companies for performance improvement, Choi and Sethi (2010), have looked at visibility to improve performance, Vaagen et al., (2011) has looked at visibility as a tool to improve response time in the supply chain, Wood (1993) researched efficient consumer response through information sharing and the incorporation of visibility tools response, Marques et al. (2010) researched technological tools for vendor management and Yao and Dresner (2008) looked at the continuous replenishment between supplier and customers through the use of visibility tools.

Kulp (2002);Lee and Wang (2000) ; and Yu et al. (2001) all have studied the effects of visibility on cost, quality, service level replenishment, flexibility and timeliness of operations within supply chains(see Table 2.7 which highlights major research papers and researchers who have focused on the impact of visibility on supply chain performance), but most research papers have been highly theoretical as to the advantages or competitive edge that visibility provides to the supply chain. The main performance indicators affected by visibility improvements have been identified, but most studies focus on only one or on a subset of the impacted performance indicators (Caridi et al., 2014). Most scientific papers on the benefits of visibility have attempted to assess the benefits between manufacturers and retailers not retailers and their end customers (Li et al., 2005), and even in these cases only a few benefits have been measured quantitatively thus pointing to the limitations of these existing research papers. Smaros et al. (2003), postulated in their paper that the three main reason for implementing supply chain visibility are, it improves operational efficiency such as preventing stock outs and increasing productivity, visibility also improves the planning processes upstream and downstream of the supply chain (Petersen et al., 2005 also supports this) and most importantly it reduces lead times and increase delivery promptness and accuracy. These factors affect the supplier's performance tremendously and as such improvements through visibility can enhance the competitive edge of the business. Table 2.8 highlights major research studies that have addressed the impact of visibility on supply chain performance.

Table 2.8.: Major Research Papers on Supply Chain Performance and Performance Metrics Linked To Visibility

Performance Factor	Performance Metric (s)	Research Papers
Cost	Distribution Cost	Bartlett et al. (2007), Gustin et al. (1995)
	Inventory Cost	Barratt and Oke (2007), Beamon (1999), Chen et al. (2000), Ding et al. (2011), Gavirneni (2002), Lee et al. (2000), Ryu et al. (2009), Sahin and Robinson (2005), Yu et al. (2001), Wu and Cheng (2008), Zhang et al. (2011)
	Stock Out Cost	Clark and Hammond (1997), Kulp et al. (2004)
	Shortage Cost	Lee et al. (1997a, 1997b, 2000, 2004), Yu et al. (2001), Disney and Towill (2003a, 2003b)
	Back Order Penalty Cost	Cachon and Fisher (2000)
Quality	Supplier Quality	Bartlett et al. (2007)
	Internal Quality Standards & Processes	Bartlett et al. (2007)
	External Quality (Customer)	Tse and Tan (2012)
Service Level	On-Time Delivery	Beamon (1999), Prajogo and Olhager (2012), Zhou and Benton (2007)
	Product Availability	Beamon (1999), Zhou and Benton (2007)
	Delivery Window (Time Agreed with Customer)	Barratt and Oke (2007), Ryu et al. (2009)
Flexibility	Volume Flexibility	Beamon (1999), Prajogo and Olhager (2012)
	Product Mix Flexibility	Beamon (1999)
Time	Suppliers' Lead Time	Handfield andBechtel(2002), Jayarametal.(1999)
	Responsiveness	Barratt and Oke (2007)
	Cycle Time (to customers)	Kulp et al. (2004)

Source: Adapted From Caridi et al. (2014, p.3)

2.12. SCOR Model

The Supply Chain Operations Reference (SCOR) model was developed and introduced by the Supply Chain Council which was established in 1997. The SCOR model is an assessment tool and does not necessarily evaluates performance of operations in a supply chain, the model "assists companies in increasing the effectiveness of their supply chain by providing a process based approach to SCM" (Stewart, 1997 p. 62-63). It provides benchmark metrics that are directly linked to the organization's bottom line, through prioritizing of these metrics the supply chain's performance and profitability can be improved (L.Li et al., 2011). Figure 1.1 (taken from L.Li et. al, 2011, p. 35)provides a schematic of the SCOR model taken from the Supply Chain Council (2009). The figure illustrated the supply chain inter-relationships, and the application of the SCOR model as a means of improving quality performance within supply chains. From this study, Li et al. concluded that the five decision areas of the SCOR model (Plan, Source, Make, Deliver and Return) can be integrated within a company in the same way ISO 9000 metrics are integrated and this will lead to improve performance for the business.

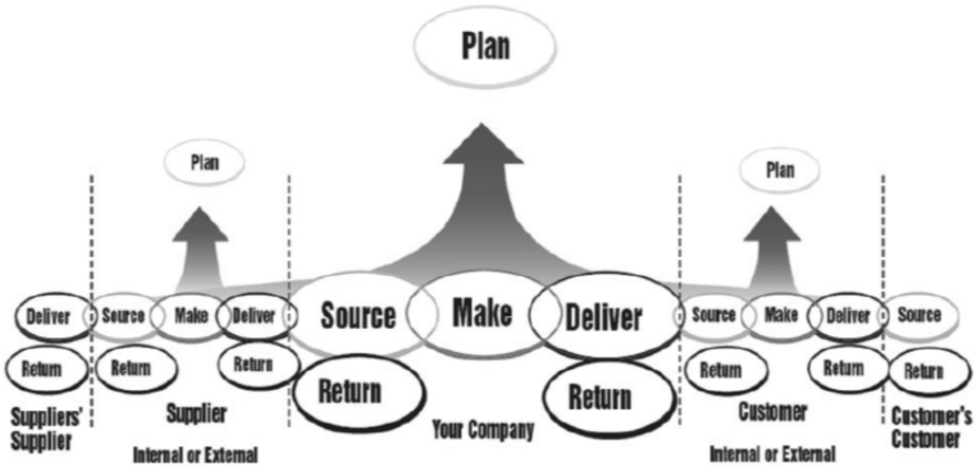

Figure 2.1.: Supply chain decisions mapped to the SCOR model -9 variables Source:L. Li et al. (2011, p. 35)

The Supply Chain Council (SCC) states that the SCOR-model integrates the concept of business process re-engineering, benchmarking, and process measurement into a cross-functional framework (L.Li et al., 2011). Organizational benefits of adopting the SCOR model (according to SCC's website, n.d.) include:

- *"Rapid assessment of supply chain performance*
- *Clear identification of performance gaps*
- *Efficient supply chain network redesign and optimization*
- *Enhanced operational control from standard core processes*

- *Streamlined management reporting and organizational structure*
- *Alignment of supply chain team skills with strategic objectives*
- *A detailed game plan for launching new businesses and products*
- *Systematic supply chain mergers that capture projected savings"*

The SCOR model provides a framework for measuring and understanding current supply chain conditions and performance and creates a foundation for improvement. The model can also be used by managers to evaluate cost, performance and trade-offs between each. The model can also be used to develop strategies in line with meeting customers' expectations, the model also allows for quick response to changes in the domestic as well as global market. The metrics that falls within each category of the SCOR model is used by organizations in conjunction with other performance attributes, allowing companies to compare their performance against other supply chains and their strategies. The SCOR Model version 11 (released in 2012) is the 13th release and uses concept of a building block that provides five core "blocks" upon which it is recommend that supply chains be built. The five core processes are plan, source, make, deliver, and return altogether called level 1 process which has metrics that can be used to develop performance measures. The SCOR 10 and 11 versions have introduced two new areas people and practices, these two areas have been introduced out of the recognition that people with specific skill sets are needed for supply chains and there needs to be metrics surrounding these skill sets, and practices such as software solutions and management practices also needs to be measured to ensure success of the supply chain (www.supply-chain.org).

The "plan process" looks at demand and supply that best meets the sourcing, manufacturing, and delivery requirements. The "source process" provides processes and metrics to monitor goods and services to meet planned or actual demand. The "make process" transforms a product to a finished state to meet planned or actual demand. The "deliver process" provides finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management. The "return process" is associated with returning or receiving returned products for any reason (Theeranuphattana & Tang, 2008).

As stated in a research paper by Theeranuphattana & Tang (2008)

> "*The SCOR model is divided into three standardized levels of process details. The top level (level 1) defines the scope and content of the SC by using the five core processes. The configuration level (level 2) specifies configuration of the SC at the process level by using a tool kit of process categories. At level 2, processes are configured in line with operations strategies. For example, "make" can be configured into make-to-stock, make-to-order or engineer-to-order .The process element level (level 3) defines a process flow diagram with process elements or specific tasks for each process category in level 2. The SCOR model advocates*

hundreds of performance metrics used in conjunction with five performance attributes: reliability, responsiveness, flexibility, cost, and asset metrics. Note that quality is excluded here. Hausman (2004) explained that in modern SCM, quality is taken as a given and that factors in quality management and improvement are somewhat separate from those in SCM development" (p.127).

Figure 2.2 and Table 2.9 shows the metrics and attributes used in the SCOR model for assessment of supply chains. Appendix C also has further definition of each metric found in the SCOR model. Appendix C contains a table showing other SCOR parameters. The SCOR model was used to provide guidance to research as the model provides information regarding the processes that occurs at various levels of a supply chain business. Figure 2.2 indicates for example that at upper level (level 1) of the supply chain the scope of the business should be defined, that is the process involved in planning, sourcing, making and delivering of the products. This information provided clear indicators as to what areas should be assessed at the case study company. Therefore the managers at the case study company were interviewed during the exploratory stage of the research , in this stage information regarding all the activities and step by step processes of the company were explained. This information gathered using Figure 2.2 and Table 2.9 was used to guide the simulation developed as well as assist in the identification of key areas and parameters for the customer and case study site questionnaires. Table 2.2 was reviewed and used in the development of key factors for the customer questionnaire as this table identified performance metrics for the areas of delivery, costs, supply chain responsiveness and asset/resource management. Mahdi Rezaei, Mohsen Shirazi and Behrooz Karimi (2017) in a critical evaluation of the SCOR model regarding performance metrics, pointed out that the modeling of operation processes and strategies from the SCOR model along with the use of the AHP technique provides a analysis of SCOR model incorporated with the AHP provides a good framework for selecting the best scenarios regarding supply chain performance metrics. Both the SCOR model and the AHP technique, were incorporated in this research as assessment an tool to arrive at visibility and performance factors for the research case study company.

G.A. Akyuz and T.E. Erkan (2010) in critically reviewing literatures on the SCOR model, pointed to the growing use of the model as a means of developing supply chain parameters regarding supply chain performance metrics. They went further in their 2010 paper, to state that the model provides a "standardized way of viewing ten supply chain (it provides a cross-industry standard" (p. 5152). The model therefore can be analyzed as a means of providing performance metrics for the management, assessment and operation of FMCG SME's, as the metrics provided in the model are applicable across various supply chain industries (Akyuz & Erkan, 2010) . The model emphasizes the processes needed within supply chains and the corresponding performance metrics linked to the processes, thus enabling cross industry benchmarking (Akyuz & Erkan, 2010). Lockamy and McCormack (2004), Cai et al. (2008), Hwang et al. (2008) and McCormack et al. (2008) all clearly support the importance of the SCOR model as a base in current SC performance measurement (as cited in Akyuz & Erkan, 2010 p. 5152).

Figure 2.2.: Hierarchical Process of SCOR- Outlining Description of Each Level of the Model

	Level		Examples	Comments
	#	Description		
Within scope of SCOR	1	Process Types (Scope)	Plan, Source, Make, Deliver, Return and Enable	Level-1 defines scope and content of a supply chain. At level-1 the basis-of-competition performance targets for a supply chain are set.
	2	Process Categories (Configuration)	Make-to-Stock, Make-to-Order, Engineer-to-Order Defective Products, MRO Products, Excess Products	Level-2 defines the operations strategy. At level-2 the process capabilities for a supply chain are set. (Make-to-Stock, Make-to-Order)
	3	Process Elements (Steps)	• Schedule Deliveries • Receive Product • Verify Product • Transfer Product • Authorize Payment	Level-3 defines the configuration of individual processes. At level-3 the ability to execute is set. At level-3 the focus is on the right: • Processes • Inputs and Outputs • Process performance • Practices • Technology capabilities • Skills of staff
Not in scope	4	Activities (Implementation)	Industry-, company-, location- and/or technology specific steps	Level-4 describes the activities performed within the supply chain. Companies implement industry-, company-, and/or location-specific processes and practices to achieve required performance

Source : Supply Chain Council (www. supply-chain.org, 2012, p. 3)

2.13. Conclusion

There are a number of techniques and models that can be used for the assessment and development of supply chain performance and performance metrics. Supply chain performance metrics are very important as these metrics allow for a means of measuring and monitoring the supply chain allowing for competitive advantage and profitability. There are many similarities and differences between these performance measurement techniques for example TQM and SCM, could both be viewed as management philosophies that allows for unlimited scope and application

Table 2.9.: SCOR Performance Attributes and Level 1 Metrics Used for Assessment of Each Attribute

Performance attribute	Performance attribute definition	Level 1 metrics
Supply chain delivery reliability	The performance of the supply chain in delivering the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer	Delivery performance Perfect order fulfillment Line item fill rate
Supply chain responsiveness	The velocity at which a supply chain provides products to the customer	Order fulfillment lead time
Supply chain flexibility	The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage	Supply chain response time Production flexibility
Supply chain costs	The cost associated with operating the supply chain	Cost of goods sold Total supply chain management costs Value-added productivity Warranty/returns processing costs
Supply chain asset management efficiency	The effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all assets: fixed and working capital	Cash-to-cash cycle time Inventory days of supply Asset turns

Source: Cirtita & Glaser-Segura (2012, p. 301)

within supply chains. However, in reality implementation is difficult as some metric is not clearly defined among supply chain leaders. On-time delivery is one of those metrics that debated as to whether or not it is as important as or more important than delivery flexibility within the supply chain. These debates make it difficult to decide how each performance metric is measured and how to apply the measurements across the supply chain. Everyone within supply chains as well researchers do agree though, that supply chain performance metrics are very important to the success of the supply chain as we cannot manage or monitor what we cannot measure.

Also of importance in deciding on techniques or models for supply chain delivery performance is the establishment of underlying theories that forms the foundation of supply chain management, on-time delivery and performance metrics. The theories examined such as network theory, resource based view theory, systems theory among others discussed, indicated that the tools such as ERP systems, MRP systems and other visibility tools are supported by the resource based view theory and network theory. These theories provides underlining principles regarding the adoption and usage of technology based tools and the resources needed to support them (Hwang & Min, 2015,p. 7). The principles and factors used to guide this research was shown in this chapter to be grounded in a number of theories which provided a road-map as to the approach needed (in regards to the main factors to be used in the questionnaires etc.) to arrive at a conclusion regards the use of visibility tools in FMCG SME's.

Supply chain management requires a performance measurement system that can operate not only at several different levels but also can link or integrate the efforts of these different levels to meeting the objectives of the supply chain. Hence, researchers have also looked at the SCOR model and balance score card as means of managing or applying metrics across the supply chain. The major benefits of SCOR is that it gives supply chain partners a chance to integrate across all departments of the organization, it provides a basis for integration by providing them, often for the first time, with something tangible to talk about and work with, while balance score card provides concepts to improve the performance measurement systems being applied within the supply chain. The SCOR model has weaknesses in that the validation of the model during his testing and developmental phase was only carried out in 125 North American manufacturing firms (Zhou et al. 2011). The model is currently used across the world and in various industry as a framework for metrics for supply chains, despite the fact that it was only validated in manufacturing companies. The SCOR model is also limited as it is based on a mathematical model. It instead is based on the usage of "indicators to analyze, compare and get the best improvement strategy, guidelines or standards" (Salazar, Caro & Cavazos, 2012, p.39).

3. Research Conceptual Framework

3.1. Overview

One of the fundamentals of supply chain performance is having the right information available at the right time and at right place, that is having visibility within the supply chain. In this chapter the theoretical framework will be presented. The application of various theories used in the development and implementation of this research will also be presented. This chapter briefly describes the basics of supply chain management. It describes how the concept has developed and the importance of supply chain management and supply chain visibility to Small, Medium Enterprises (SME's), with a special focus on those operating within Fast Moving Consumer Goods (FMCG) sector. The chapter provides a theoretical context for the body of the research and development of following chapters, which are more focused on the studied topic. Supply chain visibility, its metrics, and its impact will be further elaborated upon in the following chapters. Since the purpose of the research is focused on investigating the concept of supply chain visibility this was the starting point. However, to fully understand its origins and meaning, closely related concepts were also reviewed. Also the benefits that can be achieved from supply chain visibility and the related concepts will be reviewed in order to further understand why the concepts are interesting to the case study company.

3.2. Supply Chain Visibility and Related Concepts

Theoretical and or conceptual frameworks are developed in order to allow for the formulation, explanation, prediction and understanding of a phenomena, it allowed for the gaining of new insight into existing knowledge boundaries and as such challenge these existing assumptions and bring forth new knowledge that benefits a research (Mohamed, 2016., p.329). The theoretical or conceptual framework introduces and describes the theory from which the research problem for this paper has been formulated, the conceptual framework consists of "concepts and definitions that are interrelated" these are typically taken from existing studies and forms the basis for the new research focus (Mohamed, 2016, p. 329; Nyamu, 2016, p. 51) . The concept of supply chain visibility is still fairly new and has such the available research has been limited thus far, in the scientific literature. The research information is especially limited as it relates to small and medium sized supply chains mist available research has focused on large supply chains such Wal-Mart or the automotive industry. Despite this, there are still sufficient resources as it relates to the concepts of supply chain management and supply chain visibility and their relationship to delivery time. This study will therefore not only discuss the available research on supply chain visibility, but will also touch upon some other close lying concepts in general, to further understand the context of and the importance of different aspects of supply chain visibility in particular. The concepts presented and their relationships as derived by the researchers are shown in Figure 3.1 below. The framework as displayed below was developed from concepts derived from existing studies on supply chain visibility, supply chain performance metrics and delivery performance within supply chains.

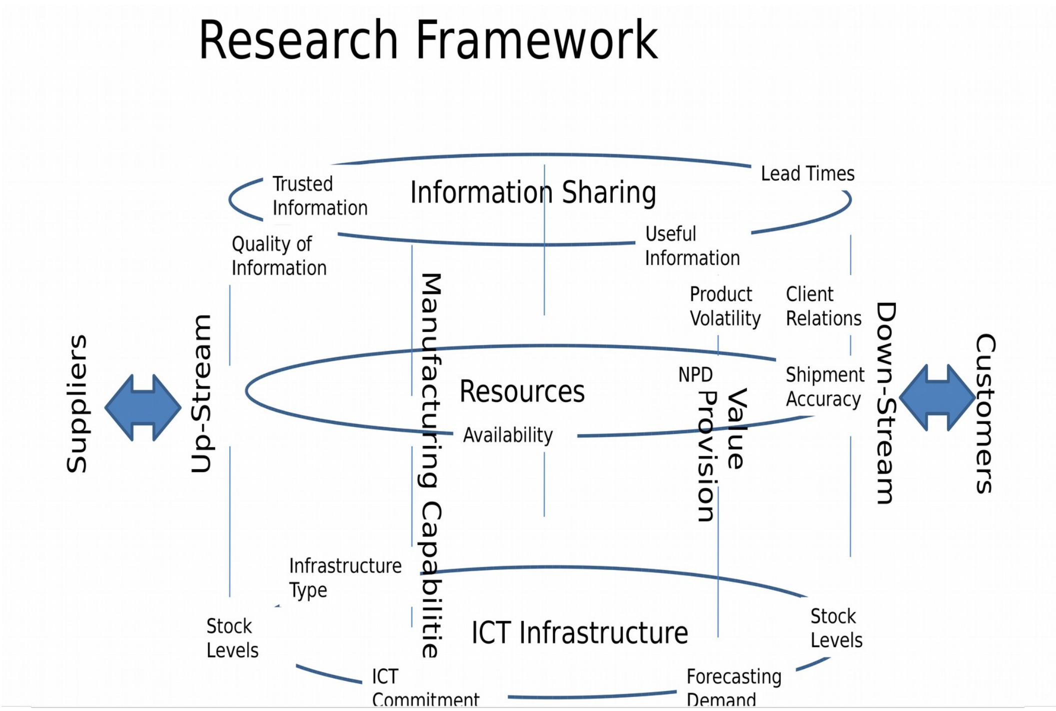

Figure 3.1.: Conceptual Framework of This Study

This research focused on the performance indicators, operational parameters and structures needed to achieve supply chain visibility and on time delivery along a supply chain. The various metrics and parameters were assessed both upstream as well as down stream as indicated in Figure 3.1. The environments and contexts within which companies operating presently are constantly evolving, as this occur companies have become more process oriented in the way they produce and distribute goods and services. As such their manufacturing capabilities become very important, in order to manage this process effectively their information and communications technology (ICT) as well as available resources are important parameters to monitor at the suppliers end of the chain. The traditional organizational structure of most organizations has been functional approach. In the typical functional organization, the various functional departments have had clearly divided responsibilities and tasks and a functional manager that is responsible for each department. But according to Adielsson and Gustavsson (2011), in order to deliver value to the company's customers all functions and departments need to contribute to the value in a chain of activities. It is with the value chain perspective in mind that this paper was designed to focus on performance indicators and operational requirements that would meet the customer's needs and requirements as it relates to visibility and on time delivery. It is said that when too many "actors" or managers gets involved in a chain like this (where value proposition for customers is high priority) there is a risk of increased lead times and less ability to quickly adapt to market changes. With competition and globalization there is a demand for shorter lead times and more flexible organizations the drawbacks of the traditional view have become more obvious. This has led to the need of a more flow oriented organizational structure. (Mattsson, 2002).

The new globalized organization is built up with processes which all represents a flow of material and information, downstream and upstream the chain. The functional boundaries are wiped out and clearly despite significant interest in the matter, having access to accurate and timely information is a challenging issue in global SCs. In this regard, a key role is played by new Information and Communication Technologies (ICTs) (Moinzadeh, 2002; Nudurupati & Bititci, 2007). With the growth of new ICTs the adoption of several technologies has become important to efficient supply chain management (SCM), e.g. Radio Frequency Identification (Balocco et al., 2011; Ramudhin etal., 2008), Enterprise Resource Planning(Green et al., 2007) and Electronic Data Interchange (Choe, 2008; Perego & Salgaro, 2010; Balocco et al., 2010). These new technologies is said to have the possibility of increasing the level of visibility along the chain, leading to a strong interest in these solutions in recent years (Choi & Sethi, 2010).

Most companies have to devote a lot of resources to the introduction of information systems within the supply chain organization, managers need to fully understand the benefits for the company in order to be confident that the investment will be worthwhile. Several empirical studies have been conducted since the1950s (Ackoff, 1958), and a large number of tools and techniques have been proposed to help companies assess the value of ICT investments (Anandarajan & Wen,1999; Bassioni et al., 2005; Brun et al., 2006; Dehlin & Olofsson, 2008). According to Brun, Caridi, Salama and Ravelli (2006), the value of ICT introduction to the supply chain may be assessed (value assessment, VA) using a methodology that allows for the evaluation of impacts such as costs and benefits of a certain ICT solution, thus assisting managers to select the technology that best suits their specific situation. Several authors and published literatures have acknowledged the importance of evaluating the benefits of visibility (ICT tools) in terms of operations and SC outcome improvement (Kulp et al., 2004; Wang & Wei, 2007) as well as in terms of planning effectiveness (Petersen et al., 2005). However, a model designed to measure the benefits of improved visibility is still missing (Caridi et al., 2010).

The grounds for the rising interest of supply chain management in the past decades are due to a multitude of changes in the business context, such as globalization, understanding and technological innovation (Van Wheele, 2005). The traditional view on supply chain is that it s a fragmented system and each entity within the supply chain acts independent of the other. This view and mode of operation has led to slow flows of materials, information and products both upstream and downstream the supply chain. The lack of material and information data results in increased uncertainty in both supply and demand (also refereed to as the bull whip effect by researchers). In order to reduce uncertainty and variability in materials and information flow and to keep demand constant inventory and safety stocks are increased in most cases. As a consequence carrying costs increase, lead times increase and difficulties to responding proactively to real-time changes which all together have decreased profits and weakened customer goodwill (Mason et al., 2003). However, the understanding of how information sharing and increased visibility impacts supply chain and improves delivery and customer service levels, have become a new research focus, as it is believe that with research new solutions can be found to the existing problem of not being able to meet the agreed delivery parameters, whether that be delivery time, delivery quantities or delivery invoicing.

The development of the conceptual framework for this research is extracted from different supply chain visibility and on time delivery theories, which was highlighted in the previous chapter.

This framework is built primarily on the combination of theoretical perspectives of supply chain relationships and information exchange, supply chain management and the management of transactions along the chain, supplier network responsiveness and supply chain performance measurements as described and derived from the SCOR model. These theoretical perspectives provides the platform upon which this research seeks to identify the impact visibility tools (information exchange / relationship management) has on performance improvement (namely on-time delivery) within the supply chain. From amongst these theories research has shown that the theory of most significance is that of supply chain management as this perspective encompasses all other theory and/ or perspective.

3.3. Relationship Amongst Concepts

Supply chain management within the FMCG/Food sector can be characterized by the fact that it is strongly impacted by time based competition, competition between large and small companies and as such success depends on the responsiveness of companies to their customers' needs. Szegedi, Vinogradov, Domjan, Störkel, and Valentiny (2014) stated that the competition in the FMCG sector is such that "the quicker one devours the slower ones, rather than the bigger ones eating the smaller ones" (p. 475). There is an enormous competition between the supply chains operating within the FMCG sector (e.g. Tesco, Auchan, Cora, Metro, Lidl, etc.), generated by large multinational corporations (dominant channel members) (Szegedi, 2008). In relation to FMCG chains whether they are food related or non food related, the large companies tends to determine what enters the chain that is they influence production and technical development. They also determine how to satisfy customers demands and modify those demands (they determine delivery times, product variability etc.) (Szegedi, 2014). Goh, Zhang, Wei and Tan (2009) in their study highlighted the fact that supply chain visibility (SCV) "is related to the collaborative decision making between the partners in a supply chain" (p. 2546). Barratt and Oke (2007) conceptualized visibility from a resource-based strategy perspective as a capability that is the outcome of information sharing. The antecedents of information sharing are external linkages that influence it through non-technology- and technology-enabled deployment of resources which are idiosyncratic to a specific relationship. Barratt and Oke (2007), further posited that the strength of information sharing depends on the relationship building time, informal procedures, trust and commitment of the partners. Information sharing contributes to the distinctive visibility that in turn contributes to improved performance and sustainable competitive advantage.

Figure 3.2, shows concepts that are used to analyze the supply chain management environment and the relationships between these concepts. In chapter 2, foundational theories regarding this research were analyzed, from this analysis the relationship between key concepts were arrived at. The figure is a graphical representation of the relationships that must exist to arrive at supply chain visibility. From the resource based theory outlined in chapter 2, it was deduced that supply chain processes impacts the supply chain ordering processes employed by a company. It was also shown that the ICT infrastructure of a company impacts the ordering processes, and the supply chain performance overall, ICT also has a relationship with supply chain resources, as pointed out by Ackoff (1993) in the discussion relating to systems theory. The concept of supply chain management and the information technology required for success is also an area that has been extensively researched and has been shown to be important to the overall performance of the supply chain. As illustrated in Figure 3.2 all of these areas are relevant to the supply chain and they also contain common factors or performance indicators that inter-relate leading to the success of supply chain visibility (SCV). Table 3.1 provides definitions of all the relationship concepts considered and applied to the research in regards to the FMCG SME supply chain environment. For example it is shown that supply chain visibility (as shown in Figure 3.2), is achieved through the interaction of supply chain performance which focuses on the metrics used to measure whether or not operational and financial targets are being met (Chou, 2004). Supply chain visibility can also be measured through the use of technology and quality and trustworthiness of information shared The level of visibility achieved is also impacted by the processes and resources incorporated along the supply chain, especially on the outbound side of the supply operation (fulfilling of customers orders) (Caridi et.al, 2013).

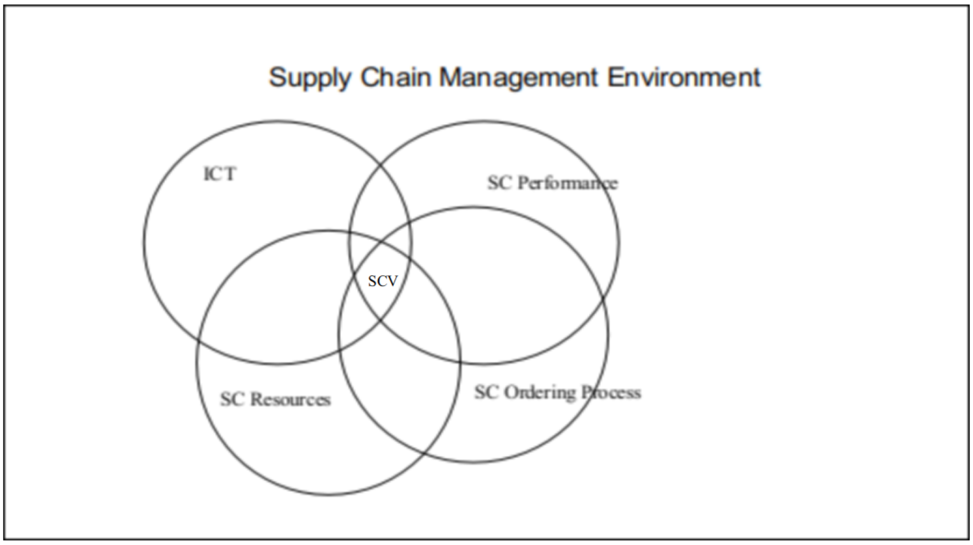

Figure 3.2.: Relationships of the Concepts within the Supply Chain Environment

Table 3.1.: Definitions of Relationship Concepts and their Source Adaptation

Supply Chain Concepts	Definition	Source Adapted
ICT	Information communication technology looks at the types of technology used in supply chain and the infrastructure that supports supply chain visibility and on-time delivery	Galaskiewicz,(2011); Borgatti, (2009); Giannakis, (2011); Sahin and Robinson, (2005); Mabert and Venkataramanan, (1998); Shore and Venkatachalam, (2003); Fiala, (2005)
SCV	Supply chain visibility- as the technology that is used for inventory management, process management and demand management but it has not been thoroughly researched regarding clear measures and impacts on these areas. Level of information shared along the supply chain between all parties.	Barratt & Oke,(2007); Chan (2003); Kulp et al., (2004); Wang and Wei, (2007); Caridi et al., (2014)
SC Resources	A firm's resources and capabilities are its most important assets, so the primary concern of supply chain resources is to obatin acess to another firm's core competencies to gain competitive advantage based on the utilization of its availbale resources(technology, people, capital)	Kulpetal., (2004); Wang and Wei, (2007); Jsairat, (2011); Caridi et al., (2010); Bohnenkamp, (2013).
SC Ordering Processes	How the system (in this case the supply chain) interacts with each other, the steps processes involved in fulfilling and delivering custoemrs orders to meet on-time delivery.	Pohja, (2004);Giannakis, (2011); Hearnshaw & Wilson, (2013); Schwabe, (2013)
SC Performance	Supply chain performance allows for the measurement of operational targets as well as financial targets.	Chou, (2004); Gunasekaran et al., (2001) and (2004), Stewart (1995).

3.4. Supply Chain Management Constructs for Visibility and Delivery

The aim of supply chain and supply chain managers is to achieve the ideals of fully integrated efficient and effective supply chains, capable of creating and sustaining competitive advantage and the organization is constantly striving to achieve these goals (Christopher & Towill, 2002). The goals are not always achievable due to the complexities of the supply chain, so to this end managers must balance downward cost pressures and the need for efficiency, with effective means to manage the demands of market-driven requirements such as customer order variability and known routine supply chain failures such as inaccurate order fulfillment and late deliveries. Better management of the supply chain and control of internal processes together with more open information flows within and between organizations can do much to help.

Supply chain management has also been defined in relation to logistics, Ballou, Gilbert and Mukherjee (2000), defined SCM as the result of evolution and the extension of logistics. Cooper, Lambert and Pagh (1997), describe the SCM in the context of logistics, but they went further in that study to distinguish SCM from logistics they indicated that SCM involved “some level of coordination of activities and processes within and between organizations that extend beyond logistics” (p. 3). The Global Supply Chain Forum (GSCF) defined SCM as “the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders” (as cited in Nabavi, 2006, p. 17). The goal of SCM is therefore sees as the process to improve customer service by shifting from control and efficiency to establishing solution based relationships. With this in mind research has therefore moved away from the traditional views and construct of supply chain and instead assess the constructs of an integrated SCM which includes design, management, and integration of company’s own supply chain with its suppliers and customers (McCormack & Johnson, 2002). Figure 3.3 shows the link between the traditional supply chain views and the integrated supply chain, hence the constructs that are used to assess SCM.

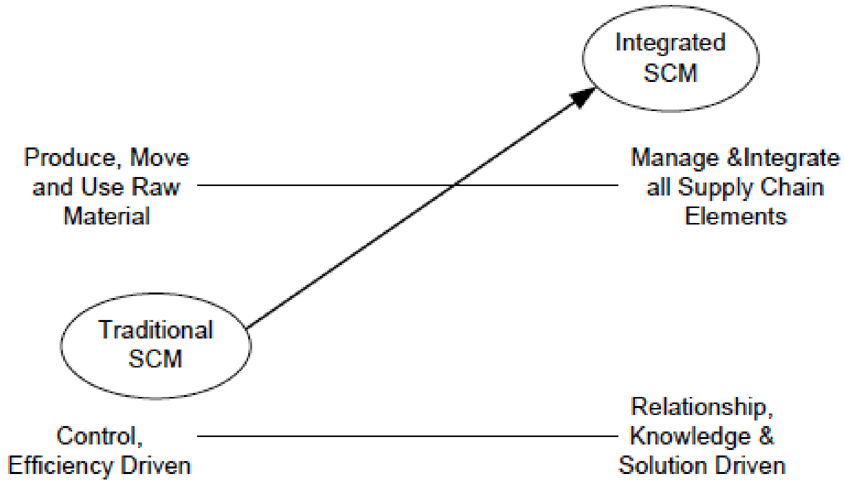

Figure 3.3.: Traditional SC Constructs vs. Integrated SC Constructs
Source: McCormack & Johnson, 2002, p.2

From the theories discussed in section 2.3.1.1- 2.3.1.6 the researchers selected those constructs that have been proven to impact visibility and delivery whether it be in supply chains of any size, food manufacturing and/ or distributing supply chains and small and medium supply chains. According to Arntzen, Brown, Harrison and Trafton (1995); Li & Obrien (1999) and Nassar (2011), visibility of information is an antecedent for real-time systems, responsive and reliable supply chains. In providing the relevant information needed organizations faces the challenge of sorting relevant information and making it available to the various “agents or actors” within the supply chain. If the information is not sorted and selected appropriately as well as interpreted and shared in the right way, there can be variations and uncertainty in the supply chain (Siems, 2005).

Researchers in strategic management have also shown the relationship between strategic management and supply chain management. The approach has been to use the classical approach has been to show the link between the two, in strategic management research applicable to supply chain management these researches are divided into the concept of strategy, which is divided into two distinct aspects: process (how strategy is formed) and content (what is decided). In the present literatures numerous researchers focused on either process or content and investigated the relationship between certain strategic variables and performance (Ketchen et al., 1996 as cited in Wagner & Bode, 2008).

Despite the importance of distinguishing between process strategy and content strategy, most research papers have not focused on content and process as well as the internal and external environment of the supply chain (Pettigrew & Whipp, 1993). In their research they also pointed out that the supply chain environment plays an important role in the decision making process and framework of supply chain management (Wagner & Bode, 2008). Ketchen et al. (1996) as cited in

Wagner & Bode (2008) also highlighted this perspective of developing supply chain metrics based on process, content and the internal and external environment of the chain. This view is supported by contingency theory that builds on the central assumption that high organizational efficiency and performance result when firms consider the context in which strategy is crafted and implemented.

The theory of SCM has also been linked to logistics management as pointed out by Lamming (1996) but he pointed out that SCM should include relationship issues which are not considered as a par of the literature or research on logistics. Larson and Halldorsson (2004) discussed four unique perspectives on the relationship between logistics and SCM, Tan et al. (1999, 2002), as well as Akkermans et al. (1999), all indicated in their research the importance of customer orientation, SCM integration (upstream and downstream) and internal performance systems to the operations of a supply chain system. The importance of interactions between different parties is presented and discussed by Salvador et al. (2001). However, these interactions were never analyzed critically and their link to SCM identified. The assessment of the various theories of SCM conducted in this study led to the conclusion that is not built on the belief that there might be no "right" theory for the management of supply chains, this view of "no right theory" has also been highlighted by Jraisat (2011), where it was pointed out that the theory of SCM is such that it allows for the incorporation of multiple theories and different approaches to research providing varying perspectives on SCM.

Within the food supply chain literature, Wilson (1996) has suggested that the competitive advantage (Porter, 1985) of northern European food supply chains lies in building these supply chains through the networking of the supply chain actors and the building of relationships according to supply chain management (SCM) principles and paradigm. This view of food supply chains comes out of the network theory where the effectiveness of the supply chain comes from the network actors' ability to learn from each other and adapt to market changes increase coordination, which leads to structural changes (Hingley & Lindgreen, 2002; Hollingsworth, 2004; Wilson, 1996). The issue of coordination within food supply chains concerns essentially the effectiveness and efficiency of the chains in the wider globally competitive environment. These relationships and structures are invisible, but there effects can be measured through SCM performance assessments. However, the coordinative relations and structures within supply chains are basically invisible. As such the relational theory as well as network theory becomes very relevant to food supply chains.

In reviewing the various theories the researcher of this paper selected the following parameters as research constructs for this paper, as shown in Table 3.1. It is from these constructs that the research framework shown in Figure 3.1 was developed. The theories as well as existing research literatures regarding supply chain visibility, delivery performance, fast moving consumer goods and small, medium supply chains re reviewed and used as a means of selecting the relevant constructs for this research framework. From the review of existing literatures, it was found that the present supply chain performance measurement frameworks based on the discussed theories, can be classified as: result based (e.g. balanced scorecard, kpi's) (Kaplan & Norton, 1992; 1996; 1997); hierarchical (such the decision making levels within the company, relationships internal and external to the chain) (Gunasekaran et al., 2001; 2004) and process based (supply chain operations reference, SCOR model) frameworks.

Research has also identified supply chain information visibility and supply chain delivery flexibility as major advantages provided through the application of various IT resources, IT is also a means to support integration of supply chains through relationship building (Noordewier, John & Nevin, 1990; van Hoek, 1998; Sahin & Robinson, 2002). As it relates to IT and visibility, the presumption is that as information is demand by all actors in the supply chain, accurate up-to-date information of the critical activities and processes are provided. IT allows information such as purchasing, manufacturing, and distribution to be shared (Gustin, Daugherty, & Stank, 1995).

Supply chain visibility is a cornerstone principle for the management of interfirm as well as intra-firm cooperation (Lee, Padmanabhan, & Whang, 1997) and can also be used to improve business process and enable strategic organizational changes (Straub, Hoffman, Weber, & Steinfield, 2002; Saeed, Malhotra, & Grover, 2005).

From these constructs the researchers identified the major foundational concepts for supply chain visibility, which were identified as Supply Chain Relationships, Supply Chain Visibility, and Supply Chain Processes with emphasis on the delivery process. The Supply Chain Operations Reference Model (SCOR) and Information Communication Technology(ICT) were also identified as foundational principles upon which supply chain visibility and delivery is built. This approach was taken as most researchers often focused on a single area of visibility performance measurement, while research on a combined approach for the whole impact of supply chain visibility and performance of supply chain management have been relatively neglected (Beamon, 1999; Gunasekaran et al., 2001; Chan & Qi, 2003; Otto & Kotza, 2003; Huang et al., 2005; Aramyan et al., 2007; Berrah & Cliville, 2007; Jammernegg and Reiner, 2007; Yeh et al., 2007; Zhu et al., 2008; Chae, 2009; Chia et al., 2009; Lin et al., 2010). This research, and the constructs and concepts chosen is intended to provide a more holistic approach to the study of supply chain visibility performance measurement by assessing both supply chain macro processes , relationships, technology and decision making processes.

Table 3.2.: Constructs Used to Develop Conceptual Framework of Research

Theory	Constructs Adapted	Source Adapted
Transaction Cost Economics	Delivery Lead Time, Information Visibility, Supply Chain Relationships	Schwabe (2013); Banihashem & Liu (2012); Revilla et al. (2011); Hoyt & Huq (2000); Wang & Wei (2007)
Network Theory	Supply Chain Relationships, Information Visibility, Resources, Material Flow	Halldorsson et al. (2007); Jsaira, (2011); Hearnshaw & Wilson (2013)
Resource Based View or Resource Dependency Theory	Visibility, Delivery Performance	Caridi et al. (2010); Iyer et al.(2004); Wang & Wei (2007); Chen & Paulraj (2004)
Systems Theory	Customer Value, Demand & Delivery, Supply Chain Relationships	Li & Maani (2011); Lapko et al. (2014); Badillo-Pina et al. (2012); Iyengar (2005)
Game Theory	Demand Variability, Uncertainty, Delivery Performance, Flexibility, Inventory Management, Decision Making Process	Chinchuluun et al. (2008); Cachon & Netessine (2004); Leng & Parlar (2005); Elmaghraby & Keskinocak (2003)
Principal Agent Theory	Relationship Length, Information Sharing, Costs, Uncertainty	Fayezi et al. (2012); Plambeck & Gibson (2010); Shi et al., (2011); Omachi (2012)

3.5. Hypothesis Development

Hypothesis as defined by Kothari (2004) is defined as a formal question that a researcher intends to answer, prove or disprove. Kothari went further to state that hypothesis allows a researcher to “suggest new experiments and observations”. Collis and Hussey (2013) went further to define hypothesis as a set of research questions that assists the researcher in identifying relationships between the dependent and independent variables of the study or experiment. From chapter 2 the research gap was identified from the review of extant literature in the area of supply chain visibility and delivery. From the analysis of previous studies the researcher noted that various scholars of supply chain research suggested that supply chain visibility can facilitate supply chain delivery performance in SME’s (Holcomb et al., 2011;

Barrat & Oke, 2007; Lambert et al., 1998).

Moreover, researchers highlighted that there is lack of empirical studies on supply chain delivery and visibility in SME's especially those in relation to the delivery of FMCG. According to Thakkar, Kanda and Deshmukh (2008), the present research studies on SCM and visibility have mostly focused on large companies, small companies are only discussed as 1st and 2nd tier suppliers in the supply chain. This situation is specific to research focusing on FMCG, however the researchers pointed out the need for more research on SME's as most FMCG and automobile industry companies are dependent on SME's. According to Chloe Smith a UK MP, in her cabinet report for 2015 she stated that, there is a need for research focusing on SME's in the UK as these companies constitute 99.9% of the 4.5 million business within the country.

This section integrates factors from extant literature on supply chain visibility, supply chain relationships, ICT and supply chain delivery performance to develop the research hypotheses. These hypotheses were tested to provide the researcher with a clear understanding as to supply chain visibility in a FMCG SME at the organizational level facilitates on time delivery performance, supply chain relationship and information technology tools usage (ICT) and requirements. This section will focus on hypotheses relating to the precursors of supply chain visibility, supply chain relationships, on time delivery and information technology usage .

3.5.1. Hypotheses Relating to the Precursors

The factors identified from extant literature in relation to the achievement of on time delivery through the use of visibility tools have been identified as : ICT infrastructure(IT Usage) , supply chain relationships, supply chain processes and those parameters that focuses on meeting on time delivery such as delivery window, invoice completeness, delivery lead time, order accuracy etc. In this section the hypotheses relating to each precursor will be developed.

3.6. On Time Delivery Performance Metrics

On-time delivery is a primary determinant of customer satisfaction in a supply chain (Li et al., 2008). One of the aims of any business is to increase its overall competitiveness within the sector in which it operates, as such measuring and improving delivery performance and its metrics becomes a desirable objective for all modern business within a supply chain. According to Stephens (2001), the Supply Chain Operations Reference model (SCOR) delivery performance metric is one of the five important supply chain processes that governs the management of the business. One of the important factors to measure delivery performance in a supply chain is that of delivery lead time, this is defined as the "elapsed time from the receipt of an order by the supplier to the receipt of the product by the customer" (Bushuev & Guiffrida, 2012 p.226)and is composed of a series of internal (manufacturing and processing) lead times and external (distribution and transportation) lead times found at the various stages of the supply chain (Bushuev & Guiffrida, 2012). Bushuev & Guiffrida (2012) also highlighted the number of research papers that has focused on the importance of delivery to customers, they pointed out that the "timeliness of delivery is a key concern to customers" and they went on to list the numerous empirical studies have documented the importance that on-time delivery plays in the operation of the supply chain (da Silveira & Arkader, 2007; Iyer, Germain & Frankwick, 2004; Salvador, Forza, Rungtusanatham & Choi, 2001). Their research however linked delivery performance directly to delivery time windows (whether the order was delivered late or early); they did not focus on the impact visibility tools/technology had on improving delivery performance.

The supply chain delivery process is one that is important to study for several reasons, as stated by Bushuev & Guiffrida, 2012 one of the major importance is that delivery performance helps a company to establish its competitive performance and set metrics. Porter (1980) and Stalk (1988) stated in there study that as a time based measure, delivery performance to the final customer in a supply chain is firmly based on the foundation of the overall supply chain performance. The Second point stated by Bushuev and Guiffrida (2012) is in relation to the direct impact timely delivery has on customer satisfaction. From the literature, it is safe to deduce that the researchers were pointing out that there is a direct correlation between on-time delivery and customer satisfaction, this point is also one that this research seeks to verify and to measure. Improvement in the delivery performance process is one that is imperative to any supply chain and is equally important to managers within the supply chain and logistics sector, (Forslund & Jonsson, 2009).

Lastly, Bushuev and Guiffrida (2012) pointed to the fact that several researchers have examined the relationship between delivery performance and supply chain operations. Some of the authors named were Anderson, Coltman, Devinney and Keating (2011) who presented empirical evidence on the importance of delivery performance in the selection third party logistics providers. Delivery performance and supplier selection has been investigated by Shin, Benton and Jun (2009), Morgan and Dewhurst (2008) and Ernst, Kamrad and Ord (2007). Lane and Szwejczewski (2000) investigated the link between delivery performance and production planning and control systems; these are all important relationships between delivery and supply chain performance, as previously stated there has been limited work carried out in the area of visibility and its impact on the performance of the supply chain.

Supply chain delivery performance can also be measured by its complexity as identified in literature written by Vachon and Klassen (2002). Vachon and Klassen identified complexities through the linkages of technology application, variety of the product and organizational variables. The authors felt that these factors affected could be grouped together as "complex" metrics which affected the degree of delivery accuracy within the supply chain. In their study, Vachon and Klassen directly linked the use of technology with impact on delivery time whether negative or positive. In this thesis study, the researcher seeks to define these technological tools as “visibility tools” and to arrive at a conclusion of their impact on delivery time/ performance. Vachon & Klassen believed that complexity can be increased or decreased based on managerial action or inaction and external factors such as delivery windows and buffer inventory which are both driven by external competitive pushes. This thesis study also seeks to demonstrate the extent to which external factors such as delivery windows (time frame for delivery) and internal factors such as technology usage and management support helps to improve delivery performance.

3.6.1. Delivery Window

A delivery window is defined as the difference between the earliest acceptable delivery date and the latest acceptable delivery date (Guiffrida & Nagi, 2006). Delivery windows are important to the measurement of on-time delivery as most researchers have pointed out that this factor assists companies in managing its operational costs. Global supply chains operate within a competitive business environment, and as such customers require dependable on-time delivery from their suppliers. Delivery windows allow for the assessment of deviations from the specific timeframe agreed for delivery between suppliers and customers. The deviations from earliness and lateness of the targeted delivery date are disruptive to supply chains (Guiffrida & Nagi, 2006). Researchers have pointed out that both early and late deliveries introduce waste to the supply chain, if a company is focusing on being lean. The waste due to early deliveries may lead to excess inventory and holding costs, late deliveries as stated by Guiffrida and Nagi (2006) may lead to production stoppages and loss of goodwill. Both of these factors can affect the profitability and competitiveness of a business, hence the importance of maintaining delivery within the specified and agreed timeframes.

Within the UK and other supply chains across the world, it is becoming more of a common practice or a rule for conducting business between suppliers and customers, for customers to penalize their suppliers for early as well as late deliveries (Schneiderman, 1996). This is practice is very pronounced when conducting business with major chain suppliers within the UK. This practice has also affected the case study research company making the need for on time delivery of high priority to companies that are similar in nature to the case study company. In a 1989 research conducted by Burt, the study noted that at Hewlett-Packard the reduction in deviations of early deliveries led to reduction in inventory holding costs amounting to $ 9 million US.This research supports the hypothesis postulated by other researchers that on-time delivery or reduction in delivery windows may lead to cost savings for companies. These existing research though did not go further to assess how the incorporation of visibility tools further impacted the supply chain delivery performance, hence operational costs. Automotive manufacturer Saturn has a policy of levying fines of$500 per minute against suppliers who cause production line stoppages (Frame, 1992) and Chrysler fines its suppliers $32,000 per hour when an order is late (Russell & Taylor, 1998). When delivery are done within the delivery window and on time delivery achieved the subsequent operational costs incurred are seen as normal operational costs as no extra costs are incurred due to penalties (Guiffrida & Nagi, 2006).

In a 1996 research paper written by Grout, he looked at the use of incentives that are pre-defined in the contract between suppliers and customers, as a means of improving on-time delivery. He found that if companies are given incentives for meeting performance metrics, they are likely to meet the delivery schedules agreed upon in their contracts, thus minimizing the fluctuations in the delivery windows. Guiffrida and Nagi (2005) in their paper suggested that managers have a tendency to over inflate their inventories and production flow buffers in order to protect their companies against untimely deliveries. This means that rather than having to pay high fines relating to late deliveries or untimely deliveries, companies are still facing high costs associated with inventory and storage, which would still make them less competitive in their given markets. In today's global business environment, companies and their managers needs to be proactive in order to be successful in their business, the usage of buffer stocks can be considered a reactive approach, hence leading to inefficiencies. There is a number of available research that points to the importance of delivery performance to supply chains; this metric is also used for continuous improvement and lean manufacturing implementation within supply chains.

The typical operation or application of a delivery window follows the process of an order being placed by a customer when this occurs an agreement is made between customer and supplier as to a fixed promised date for delivery. Under the concept of delivery windows, the customer would also supply the earliest date for delivery and a latest date for delivery, this time, difference prescribes the delivery window within which delivery must be made otherwise the supplier is deemed to have not satisfied its customer. Several researchers advocate the use of delivery windows in supply chain management and time-based manufacturing systems (Jaruphongsa et al., 2004; Lee et al., 2001; Fawcett & Birou, 1993; Corbett, 1992 as cited in Guffrida & Nagi, 2006). Johnson and Davis (1998) also state that supply chain metrics that are developed based on the concept of delivery window actually captures the most important aspect of supply chain reliability process.

Figure 3.4 highlights the delivery window and is adapted from the research paper by Guiffrida and Nagi (2006).

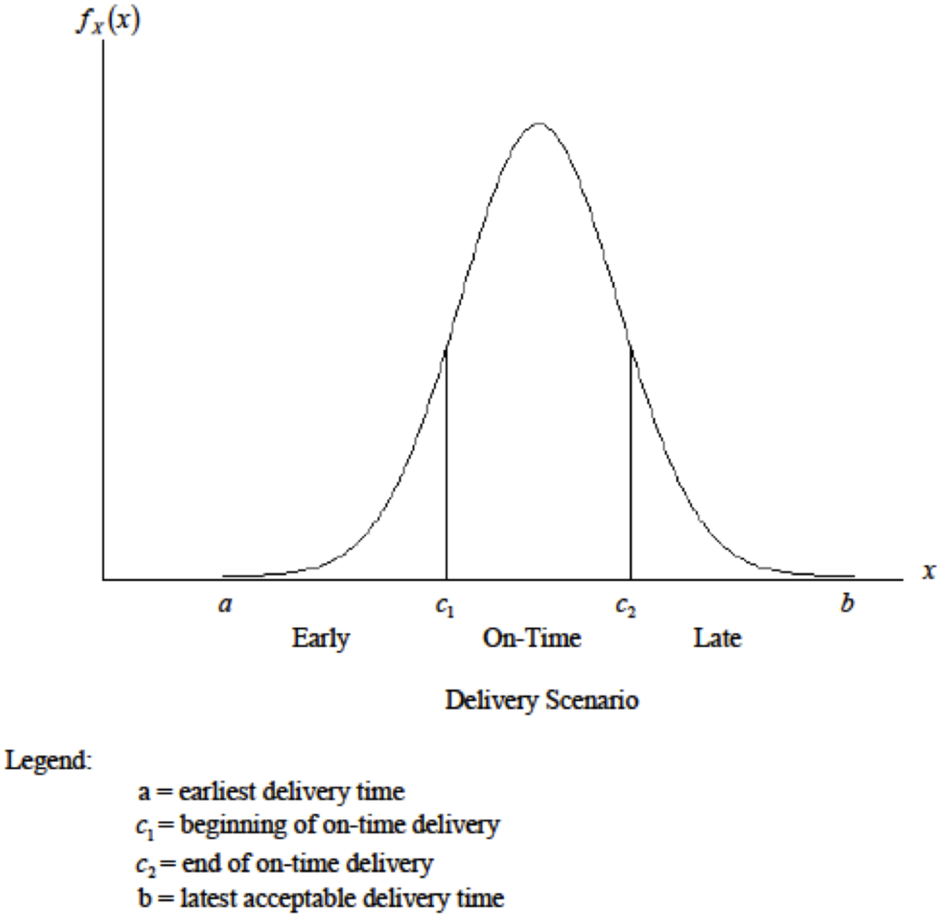

Figure 3.4.: Delivery Window for a Normally Distributed Delivery
Source : Guiffrida & Nagi, 2006

The Figure above is based on the assumption that delivery lead time follows a normal distribution curve; the lead time, is therefore, a random variable X, with a probability density function f(x). The paper further postulated that the on time delivery portion can be represented by the equation c2 – c1, therefore ideally c2 – c1 should equal zero (0) for us to be making on time delivery. The extent to which c2 -c1 > 0 may be measured in hours, days or weeks depending on the industry. Guiffrida and Nagi (2006), however, did not determine in their paper the mean delivery time, standard deviation or allowable variance that would still allow for on-time delivery, they instead looked at these factors in relation to penalty costs. The question therefore still remains is there an acceptable mean, variance and standard deviation that still allows a company to meet its on-time delivery?

3.6.2. Delivery Lead Time

Supply chain delivery lead time in a logistics context is typically defined as the elapsed time between recognition of the need to order and the receipt of goods (Blackstone & Cox, 2005). And as a result on-time delivery becomes the extent to which the lead time, and as a consequence, the delivery date, and the delivered quantity corresponds to what has been confirmed/ordered (e.g. Forslund & Jonsson, 2007; Kallio et al., 2000). Delivery lead time can be deduced from these researches, to contribute directly to on time delivery, the extent to which lead time is reliable or flexible will determine the extent to which a supplier is able to meet it's on time delivery schedule. Delivery lead time has also been defined by other studies as the "average actual time that elapses from the placement of an order to its delivery to a customer" (Milgate, 2001, p.111) in this case transportation time is not taken into consideration as a part of the delivery lead time. These researchers are assuming that when a transport leaves its distribution point for delivery, the order will be delivered on the required day without delay, as such transportation time does not affect lead time or on time delivery. This has not been proven to be completely accurate as in reality at times there delays as it relates to transportation time to customers, these unexpected delays can contribute to late deliveries hence the paying of fines or not meeting the delivery time.

3.6.3. Delivery Order Accuracy

Delivery order accuracy is of importance to on-time delivery as it speaks to the level of deliveries that are made without errors and complete. If orders are delivered as required and are considered complete then if delivered within the agreed time, the order can be considered to have been made on time. When inaccuracies occur, errors are measured to calculate accuracy. When incorrect or unusable products are delivered, goodwill and brand name are negatively impacted (Chan, 2003), and suppliers have to pay fines. The delivery of inaccurate orders may also affect the supplier-customer relationship which is very important to the success of a business. Errors also include improper condition of the shipment, late shipments, shipment of incorrect items, or damage to the products (Gunasekaran et al., 2004). Most problems can be identified by analyzing parameters in the distribution and billing activities. Management uses data obtained internally for this performance measure (Elrod et al., 2013). It is said that "Product availability (order completeness and accuracy) is often the single most important factor of the customer service mix" (Collins et al., 2001, p.7). This means that the degree to which a company responds to its customers with an accurate or complete order can "make or break" the customer-supplier relationship, it is, therefore, imperative that deliveries to customers are complete and accurate.

3.6.4. Flexibility and Agility of Delivery

Delivery flexibility refers to the degree in which a supplier/customer can accommodate changes to the agreed delivery date and time. In other words, the degree to which uncertainty in delivery is accommodated without affecting the customer or supplier and accruing penalties or affecting the supply chain relationship between the parties involved. Das and Abdel-Malek (2003), discussed in their study the fact that delivery and volume flexibilities were found to benefit from both supplier responsiveness to delivery changes as well as supplier involvement in product design. This means that in order to improve the flexibility of delivery times as well as quantities suppliers have to be intricately involved in determining the types of products their customers' needs as well being able to respond to any uncertainty that may develop on the customers' part. Flexibility and more specifically delivery flexibility is an important aspect of a supply chain, it plays a major role in the chain (Das & Abdel-Malek, 2003). There are a lot of articles focusing on flexibility, however, the focus of those research papers have not focused on the entire supply chain, but instead have focused on flexibility in relation to the supplier or the customer. Swamidas and Newell (1987), in a study confirmed that flexibility improved performance in uncertain environments. Olhager and West (2002), in their study discussed the importance of extending flexibility beyond the boundaries of manufacturing and also looking at linking flexibility to market requirements and meeting customers' needs. On-time delivery is a customer requirement hence managing flexible can also be considered to be an important requirement for satisfying the needs of customers within the supply chain.

Flexibility can also be defined as the "degree to which a company is able to adjust the time in which it can deliver goods "(Prater et al., 2001, p. 823-839). This definition is used in research papers that focus on the agility or responsiveness of a supply chain and is mentioned in numerous research papers as an important criterion to a firm's responsiveness to its customers. The terms flexibility and agility are sometimes used interchangeable and at times in research, they used to define different aspects of the supply chain. Flexibility is felt to represent the internal operations of the supplying company, operations such as purchasing, manufacturing and distribution while agility speaks to the speed of response. While "flexibility is related to adaptability and versatility" (Kidd, 2000), "agility focuses more on the speed" (Swafford et al., 2008) as cited in Khan and Pillania(2012, p. 1511). As such it is felt that agility relates to outcomes at the competitive level (Goldman et al.,1994), outcomes that fall in the categories such as market responsiveness, delivery reliability, and the frequency of product introductions to the market. Agility, therefore, represents organizational-level abilities. Put in another way, agility is a measure of reaction time, while flexibility is a measure of reaction capabilities (Swafford et al., 2008).

3.6.5. On-Time Order Fill Rate

The order fill rate measures how often a particular product is ordered for delivery within the supply chain is available. As it relates to customer service in a supply chain, order fill rate is sometimes expressed as the percentage of time customers receive the items they require. If order fill rate is high then on-time delivery can be assumed to be high as there will be no delays due to unavailability of items to customers. Whenever customers place orders to suppliers, they want to be assured that their orders will arrive at the agreed time, on-time. If there is uncertainty while awaiting their order delivery customers may want to update their order delivery status, especially if they order is late or they need to change delivery date. This makes on-time delivery and the need for visibility very important, as timely updates will ensure that order fill rates are kept at high percentages or with benchmark ranges for competitiveness. The result of meeting these requirements may be dissatisfaction, confusion, and goodwill (Lee & Billington,1992).

In modern global supply chains companies publish their agreed response times to their customers, whether via contract or through the purchase order system. However, sometimes these published times may not be the actual response time, lack of information along the supply chain prevent the retrieval of set shipment date when changes are made. Companies should track delivery performance and keep customers apprised of their order status. Chae (2009), in his research referred to the importance of order fill rate for evaluating manufacturing performance, this was extended further to say this metric is also of importance to supply chain on time delivery performance. There are different ways to evaluate the order fill rate, the most common approach is to evaluate or compare the customer's requested delivery date with the date of delivery committed by the company's order management system or personnel, or Enterprise Resource System (ERP). For example, if a customer places an order with required delivery date of May 10, if the promised date for delivery is no later than May 17 (for example with an allowance period of seven days) the delivery is considered a hit due to the added allowance period.

The concept of having the perfect order, being delivered on time is not just for supply chains; it is not just a supply chain concept. One only has to look at the competitiveness of business within the global context to see that on-time delivery is a major customer expectations. The management of customer expectations and the assessment of metrics of how well a company is fulfilling these expectations, brings to the fore the importance of meeting on-time delivery and reducing its associated costs. As the future of any company depends on meetings its customers' expectations, it's also important to try to reduce the cost of operations so that high return on investments (ROI) can be achieved through being able to fulfill orders accurately, completely, on time and with no damage (Chae, 2009).

Figure 3. 5 show the hypotheses relating to supply chain on-time delivery performance in an FMCG SME organization.

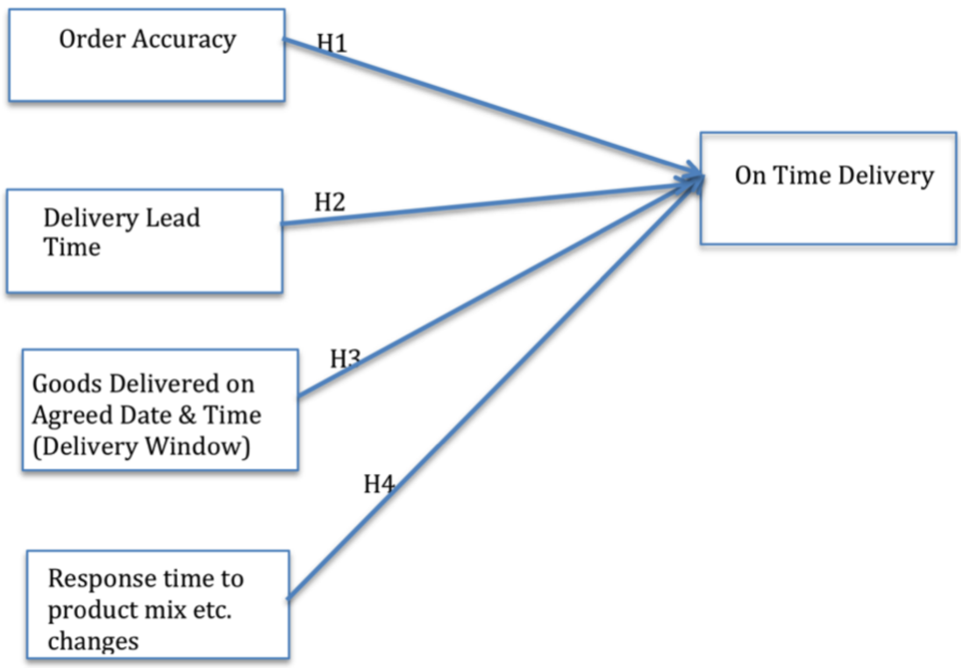

Figure 3.5.: Hypotheses Relating to On Time Delivery

Therefore it is hypothesized that:

H1: Order Accuracy has a positive effect on FMCG SME organization's on-time delivery

H2: Delivery Lead Time has a positive effect on FMCG SME organization's on-time delivery

H3: Delivery Window has a positive effect on FMCG SME organization's on-time delivery

H4: Response Time to Product Change Requests has a positive effect on FMCG SME organization's on-time delivery

3.7. Research Constructs for Supply Chain Visibility and Delivery

The constructs identified as important to SCV, on time delivery and FMCG were built on the supply chain concepts (as shown in Figure 3.2) of supply chain relationships, SCOR model, ICT, specifically IT usage in supply chain and the supply chain processes involved in achieving visibility and high delivery performance.

The foundational theories of transaction cost, principal agent theory, resource based view, game theory, systems theory and network theory were also used to develop the constructs for the research framework. These will be looked at individually in the preceding sections. From these concepts major constructs were identified which were used to develop the research questionnaire and conduct the case study analysis.

3.7.1. Supply Chain Relationships

Supply chain relationships play a significant role in supply chain management and a number of theories have been used to explain its relation and impact on supply chains. If the relationships between supplier, buyer and customers are weak, they impede the emergence of a high performance supply chain within the FMCG market. Supply chain relationships have been reviewed from the perspectives of relationship marketing theory, network theory and transaction cost theory. The conceptual framework is built by offering a central proposition that specific dimensions of relationships, networks and transactions are the key antecedents of information sharing, which in turn influences supply chain delivery performance in supply chain management. Supply chain partnership is defined as a strategic coalition of two or more firms in a supply chain to facilitate joint effort and collaboration in one or more core value creating activities such as research, product development, manufacturing, marketing, sales, and distribution (Jraisat, 2011). Concepts for supply chain relationships have also been derived from the resource based view theory and the social theory, from which the concepts of political-economy relationships have been considered, social orientation of the supply chain relationships, asset availability, uncertainty and organizational processes have all been identified as having an impact on the nature supply chain relationships, delivery and visibility performance (Fynes et al., 2008). The objective of supply chain partnership and other supply chain relationship types is to increase benefits to all partners within the chain by reducing total cost of acquisition, possession, and disposal of goods and services (Maheshwari et al., 2006; Li et al., 2006). Hence visibility and delivery becomes influenced by the type of supply chain relationship that exists amongst all partners.

The network theory also forms a theoretical context for supply chain relationships. Supply chain relationships may be of varying nature they may be a strategic alliance, or some other form of relationships. Strong relationships allows companies to be responsive to market changes and their customer needs . Supply chain companies are embedded in interdependent and sometimes complex network relationships with their various supply chain partners, such as suppliers and customers (Håkansson and Snehota, 1995). These relationships and networks influences the economic performance and actions of the supply chain companies (Pohja, 2004). Theories such as the transaction cost theory and social exchange theory have also been used by researchers "as separate and complementary theories to explain the antecedents and dynamics of supply chain relationship success" (Kwon and Suh, 2004; Kingshott, 2006; Hawkins et al., 2008; Zhao et al., 2008; Liu et al., 2009 as cited in Ambrose, Marshall & Lynch, 2010, p. 1270). The network theory also speaks to the fact that a "network can be defined as a set of nodes linked by a set of social relationships of a specific type"(Gulati, 1998; Pohja, 2004). Granovetter (1985) as cited in Pohja (2004) argued that close relationships have been seen by researchers as a linkage between theories for joining economic and social approaches to organizational theories. Pohja (2004) went further and stated that social connections of a company assists in determining the types f partnerships formed between companies and other supply chain players.

Supply chain partnership is designed to influence the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits (Stuart, 1997). Relationship marketing theory based on the network theory offers researchers a useful perspective as it explains and provides explanations of several processes or dimensions (e.g. commitment and cooperation) that are significant in studying the interrelationships between certain phenomena of the buyer-seller relationship (Wilson, 1995). The theory also provides constructs that shows the interconnections between information sharing in supply chain management and relationship types (Toften & Olsen, 2003). This theory can also be used to explain relationship types within the FMCG sector as the buyer-supplier relationships are atypical to other types of supply chains. It offers the explanation of FMCG buyer-seller relationship and the need for information sharing, the theory also offers explanations for the several types of supply chain relationships, the dimensions in relationships, such as the rationale for, process of and structure of relationships that can be applied within the supply chain.

According to Wilson, 1995 and Dash et al., 2007 the key theoretical dimensions that are often focused upon as it relates to relationships and supply chain management includes trust, communication, cooperation, collaboration, and information sharing. Tomkins (2001) explains that trust leads to increased information between firms in business, pointing to the fact that there is a link between supply chain relationships and information sharing (visibility). Trust and information sharing is said to have a functional association and this allows for positive relationships over the lifecycle of the supply chain's existence (Tomkins, 2001). Commitment and trust are important to the success of the relationship and are developed and fostered at different times within the lifecycle of the supply chain. Commitment is seen as the desire to continue and foster the relationship and is usually developed within the mature stage of the lifecycle while trust is developed in the early stages of the relationship (Wilson 1995).

Cooperation is another key element in achieving or forming successful supply chain relationships/partnerships in order to ensure that both parties can gain benefits (Wilson, 1995). Shaw and Gibbs (1995,) pointed out in their research the importance of cooperative relationships in the food supply chain especially the supply of supply fruit and vegetables (an example of an FMCG sector) in the required quantities and of the required quality to the target markets. Collaboration offers the FMCG businesses a competitive advantage as they work together to achieve success, collaboration also helps to define the type of relationship (arms length, partnership) each business will agree to be a part of for their individual business (Simatupang & Sridharan, 2002).

Communication is also a necessary dimension to the success of supply chain relationships, as good communication practices enhances knowledge sharing and provides for "rich" knowledge creation (Veludo et al., 2004). The sharing information not only enhances communication, it also helps to improve commitment and cooperation among all parties within the supply chain, and helps the buyer and seller through the adaptation of new processes (Kalafatis et al., 2000; Pedersen & Andersen, 2006). Sharing the right information between the members of the supply chain group provides them with the opportunity to review the credibility of the other party, which assists in making decisions regarding whether or not to form binding relationships for business (Dash et al., 2007). Strategic partnership with suppliers enables organizations to work more effectively with a few important suppliers who are willing to share responsibility for the success of the products (Anderson & Katz, 1998; Li et al., 2006).

From the theories and literatures the relationship concepts underpinning this research were identified as; relationship type (such as leverage, arms length, partnership), trust, delivery time, accuracy of delivery, communication channel both internal and external to the business, customer value, Cost, quality product range. These factors were identified as key contributing concepts to the building of successful relationships and visibility within SME businesses.

Therefore in relation to the SCOR principle and theory of supply chain relationships this researcher developed the following research question:

RQ1 : Will having a good relationship between supplier and customers influence on-time delivery?

RQ2: Do supply chain relationship influences the level of visibility achieved within the supply chain?

3.7.2. Supply Chain Visibility

The concepts of supply chain visibility and delivery are inter-twined, it has been stated that the main function or primary purpose of SC visibility is to improve the performance of the supply chain; this includes improving delivery performance metrics (Wang & Wei, 2007; Pidun & Felden, 2012). Several researchers have pointed out the success of initiatives and programs that incorporates the concept of visibility and have shown its impact on performance such as delivery (Choi & Sethi, 2010), others have highlighted response time as another performance metric that is impacted by visibility which also impacts delivery time (Vaagen et al., 2011), Wood (1993) highlighted that visibility improves the response to consumer's queries and delivery requests, vendor management and inventory is also identified as a metric which is linked to delivery and is improved through visibility (Marques et al., 2010) and Yao and Dresner (2008) pointed out that replenishment of stock to meet delivery time is also greatly impacted by the use of visibility tools.

Supply chain visibility has its foundation grounded in the resource based theory, according to Barrat & Oke (2007) there is a link between an organization's resources and its performance, this performance also includes the achievement of high visibility within the supply chain. Barrat & Oke also stated in their study that the resource based theory is suitable for the study of supply chain visibility as this theory allows for intangible factors of visibility and delivery performance to be considered in the assessment process.

Supply chain visibility and delivery performance is also supported by the information processing theory (IPT), according to Fan, Li, Sun and Cheng (2016) the IPT "sees organizations as information processing systems " (p. 65). These systems when supported by the required resources can lead organizations into achieving high levels of information sharing of the right information and the right time thus influencing visibility.

Delivery performance as it relates to the theoretical perspective of resource, systems, game theory and strategic choice is seen as a metric that is affected by uncertainty, lead time, and the customers ordering pattern as well as the company's internal and external capabilities. As such delivery performance is a very important metric as it relates to supply chain performance and it is postulated that it can be greatly impacted by the use of visibility tools. The factors for delivery performance considered by this research are; order fill rate, demand flexibility, on time order delivery, order and delivery reliability. These factors were used to guide the development of the research instrument and to guide the research process. From these concepts relating to supply chain visibility Figure 3.6 was developed to display the hypotheses relating to supply chain visibility .

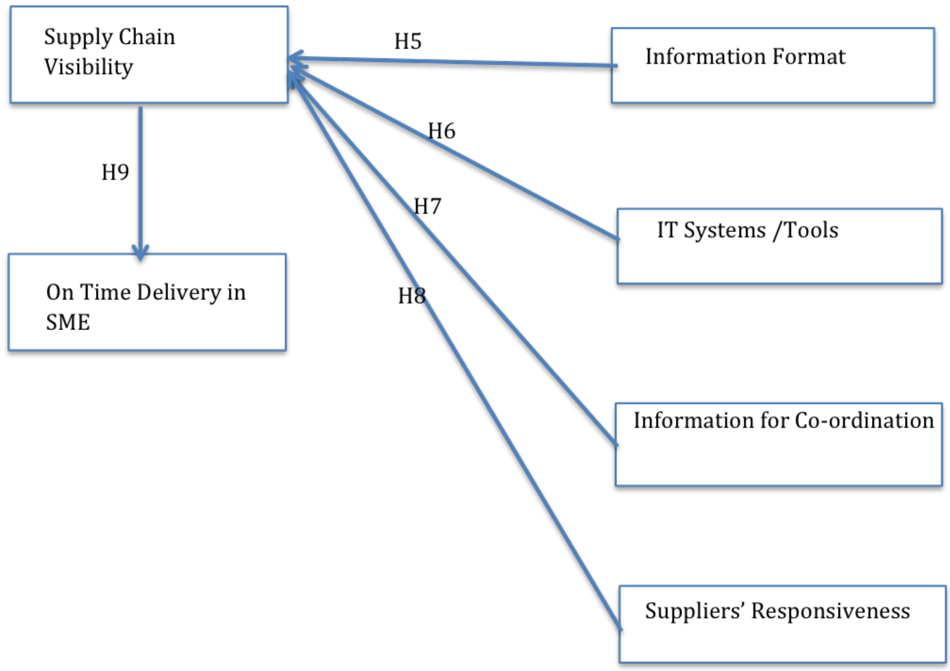

Figure 3.6.: Hypotheses Relating to Supply Chain Visibility

Therefore it is hypothesized that:

H9: Supply chain visibility positively influences on time delivery in FMCG SME Organizations

H5: Information format positively influences supply chain visibility

H6: IT systems and tools used in FMCG SME influences positively influences supply chain visibility

H7: Information shared for co-ordination positively influences supply chain visibility

H8: Suppliers' responsiveness positively influences supply chain visibility

3.7.3. Supply Chain Management

The theory and perspective called supply chain management (SCM) has been developed to allow for the incorporation of management theories and logistics perspectives as it relates to the management and control of supply chains. With the intensification of global competition, the onslaught of technology, new product development and the shrinking of product life cycles, supply chain management has become important to the success of supply chain operations. With the rapid changes in demand of goods and with product variability on the increase businesses have been compelled to pay attention to their supply chain operations. The advent of information communication technologies (ICT) has allowed for enhancement in supply–buyer collaborations and with information visibility across organizational boundaries there is less hindrance to information sharing (Ho et al., 2011). The overall processes of supply chain management are supported by various theories such as network theory, game theory and other relationship theories.

The evolution of Internet and electronic commerce applications has allowed businesses to use ICT to manage various complex supply chain activities, thus creating a strong drive to create competitive advantage. SCM allows companies to reshape their reshape their attitudes toward their relationship with suppliers, manufacturers, agencies, retailers, and customers. The introduction of SCM principles has allowed for increased operational efficiency and enhancing cooperation among their business partners (Ho et al., 2011). Though SCM focuses on the total integration of the supply chain, Tan et al. (1999) pointed out that “ most supply chains are too complex to have full integration’ it is therefore recommended that supply chain organizations should instead focusing on meeting the needs and integrating with key suppliers and customers (Choon Tan et al., 2002).

SCM provides the metrics by which organizations can develop their integration strategies whether it is from a strategic perspective or based on transaction and networking theories. As such SCM provides the foundational metrics for integration such as metrics for optimization and efficiencies of the supply chain, logistics metrics, delivery metrics, visibility metrics and relationship metrics. It is based on these metrics that the researchers of this paper identified the dimensions of delivery, relationship and visibility tools as key areas on which to focus this research.

3.7.4. Supply Chain Operations Reference (SCOR)

The concept of SCOR has been extensively researched and linked to supply chain performance, one f the key area of the SCOR model is delivery, and as such the researchers of this paper believed that this model/process was important in regard to the development of delivery metrics and the performance of SME FMCG’s. The Supply-Chain Operations Reference (SCOR) model was developed by the Supply-Chain Council (SCC), it was developed with a focus of assisting supply chain businesses in increasing their efficiencies and effectiveness, making them more competitive and also to provide a process-based approach to SCM (Stewart, 1997). The SCOR model provides business with a common process oriented communication language which allows for easy and simple communication supply-chain partners. The communication focus or metrics are based on the following decision areas: PLAN, SOURCE, MAKE, DELIVER and RETURN.

Through the SCOR model any type of supply chain including SME FMCG’s can develop common communication metrics between the organization, its suppliers and customers, thus enhancing efficiencies. This paper focuses on the enhancement of the deliver parameter as it is believed to be an important metric for the improvement of business among small and medium enterprises. This is due to the fact that these small and medium businesses are usually impacted by high penalty costs for their failure to meet contractual delivery parameters. The SCOR model also impacts the various processes of supply chain as it focuses on the supply chain from the “top end” (the metrics relating to the plan, source, make processes and functions) across to the downstream functions of delivery and return of goods and services.

The SCOR model and supply chain processes are important to the supply chain’s performance as these foundational concepts provides theoretical as well as practical guidelines for the improvement of the supply chain’s overall performance. The model is a business process model, it links processes with metrics, best practices and technology (Stephens, 2001), which makes this concept applicable to the current study. As the focus of this research is on delivery focusing primarily on the interface between the supplier and its customers and secondarily on the supplier and its suppliers, the delivery- source interface of the SCOR model becomes the main perspective on which focus is placed in this paper. In the SCOR model these are primarily the level 1 metrics that relates to order fulfillment cycle, perfect order fulfillment, lead time and the total supply chain management cost. At the level 2 of the model supply chain visibility and integration metrics are identified which leads to the ability and type of competitive strategies a company implements (level 3 and 4) in order to be effective and efficient. Therefore the main focus for this study would be the level 1 metrics are identified in Table 3.3. These are mapped to develop the level 2 (processes) needed to achieve the goals of the organization (levels 3 & 4). Figure 3. 7 depicts the mapping and development of metrics between level 1 and the other levels.

The SCOR model and its parameters or metrics outlined below can be linked to supply chain visibility and applied within the context of FMCG SME’s in that , these SME’s have to reliable, responsive and flexible in order to compete and retain customers. The Supply Chain Operations Reference (SCOR) model has been shown to be one of the most referenced framework as it relates to supply chain performance metrics (Wang, 2012 p.57). The framework was studied to aid in the identification of performance metrics relating to on-time deliver and supply chain processes. The framework aided this research paper as the level 1-3 metrics shown in Table 3.2 and Figure 3.7 was used in the development of sections C & E of the customer questionnaires administered in London. The framework provided clear guidelines as to the performance metrics that needed to me measured in relation to delivery performance and supplier priorities. Table 3.4 provides explanation of each SCOR factor and the sources form which these factors were adapted and analyzed for this research paper.

Table 3.3.: Level 1 metrics Adapted from SCOR Model

Level	Performance Attribute	Description	Metric
1	Supply chain delivery RELIABILITY	The performance of the supply chain in delivering: the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer	Delivery performance: This measures the quality of the company's performance to its Promised Order Delivery Date Fill rates: is used when delivery is made from inventory and represents the percentage of orders shipped from stock within 24 hrs (or agreed time) of order receipt. This shows how quickly your company can respond to customer orders in the situation where your company has decided to produce in a make-to-stock environment. Perfect order fulfilment: is defined as the right product, delivered to the right place, at the right time, in the right condition and packaging, in the right quantity, at the right cost, to the right customer.
1	Supply chain RESPONSIVENESS	The velocity at which a supply chain provides products to the customer	Order fulfilment lead times: defined as the time from receipt of customer order to customer order receipt
1	Supply chain FLEXIBILITY	The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage	Supply chain response Time: The ability to react purposefully and within an appropriate time scale to significant events, opportunities or threats (especially from the external environment) to bring about or maintain competitive advantage in the marketplace. Production flexibility downside: The percentage order reduction sustainable at 30 days (or some agreed time frame) prior to delivery with no inventory or cost penalties
1	Supply Chain Costs	The costs associated with operating and managing the supply chain	Total Supply chain management costs including costs fro warranty and returned goods.
1	Supply Chain Asset Management efficiency	The effectiveness of organization to manage assets to support demand satisfaction. This includes technological applications implemented for demand and support management.	Cash-to cash cycle time: The time it takes for the firm to get cash back from its investment in inventory and accounts receivable, considering that purchases may be made on credit Inventory days of supply: The number of days it takes to get goods produced and sold; it is called shelf life for retail and wholesale trade.

Source: Theeranuphattana and Tang (2007, p. 133)

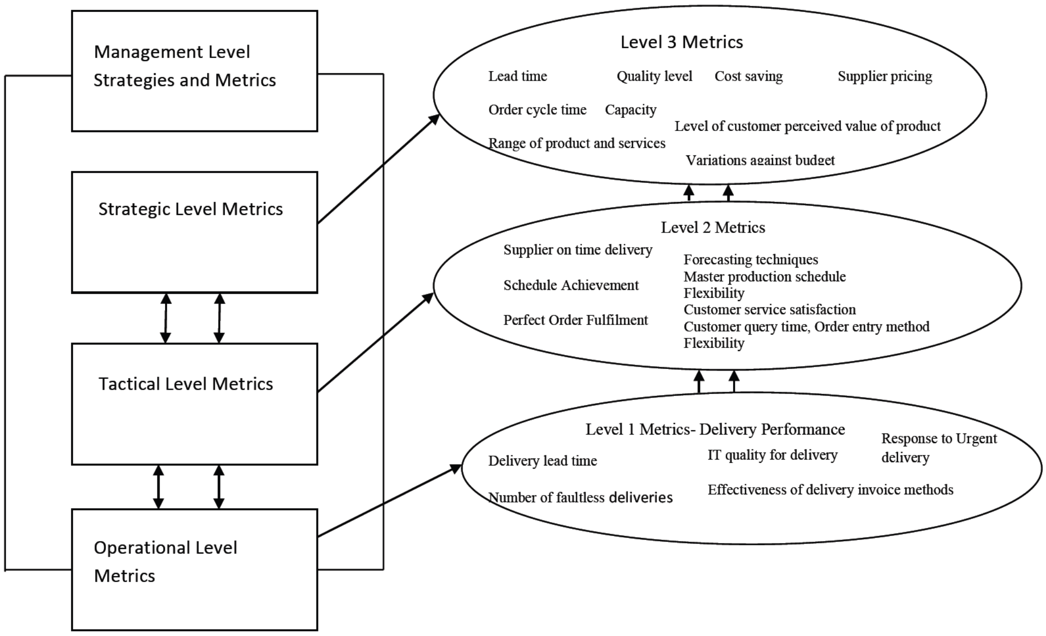

Figure 3.7.: Relationship of Metrics at Each Level of Business

Table 3.4.: Explanation of SCOR Factors and their Source Adpatation

SCOR Factor	Definition	Source Adapted
SC Delivery Reliability	The performance of the supply chain in delivering: the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer	Gunasakeran et al., (2004); Bushuev & Guiffrida, (2012); Elrod et al., (2013).
SC Responsiveness	The average actual cycle time consistently achieved to fulfill customer orders. The velocity at which a supply chain provides products to the customer	Prajogo and Olhager (2012); Vicedo et al., (2011)
SC Flexibility	The number of days required to achieve an unplanned sustainable 20% increase in quantities delivered .The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage	Slack et al., (1995); Beamon (1999); Prajogo and Olhager (2012); Swafford et al., (2008); Rohof (2013)
SC Costs	The sum of SC cost to deliver goods and services to the customer. It comprises both direct and indirect costs of the supply chain	Fayezi et al., 2012; Bartlett et al. (2007); Barratt and Oke (2007); Gunasakeran et al., (2004)
SC Asset Management Efficiency	The effectiveness of organization to manage assets to support demand satisfaction. This includes technological applications implemented for demand and support management.	Iyengar (2005); Bohnenkamp, (2013); Wang & Wei, (2007); Chen & Paulraj, (2004).

In light of these metrics and parameters the hypotheses regarding supply chain processes is shown in Figure 3.8

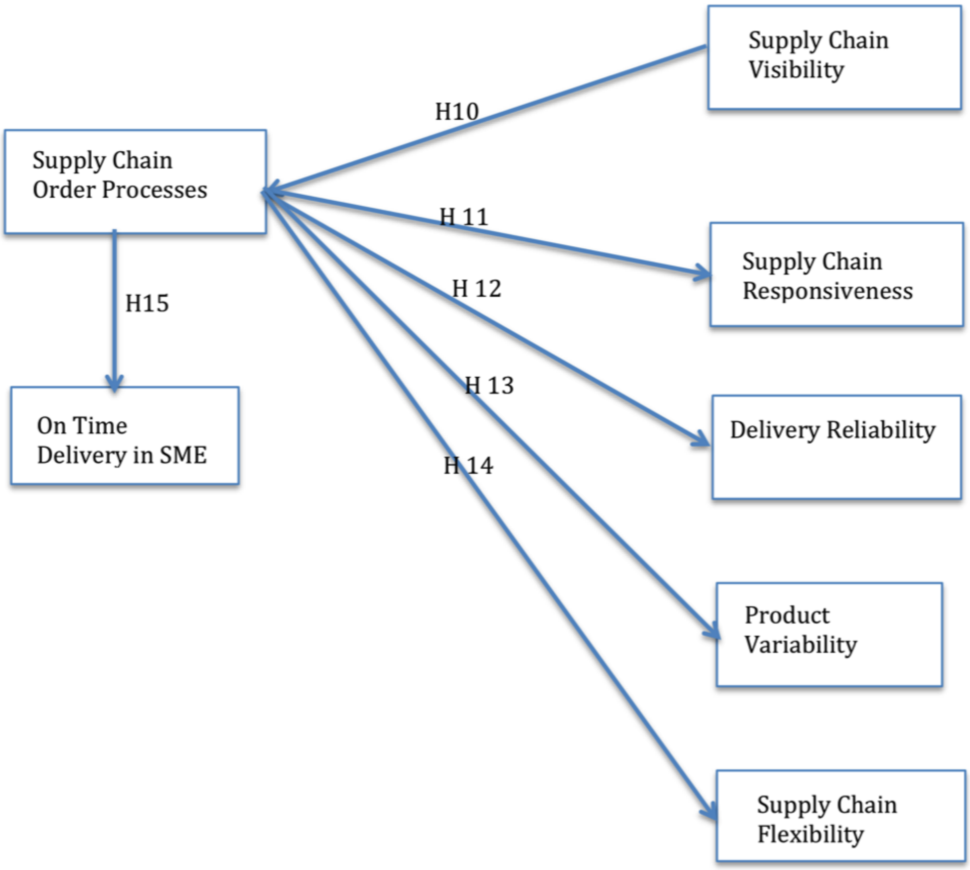

Figure 3.8.: Hypotheses Relating to Supply Chain Processes

Therefore it is hypothesized that:

H15: Supply chain order processes positively influences on time delivery in SME Organizations

H10: Supply chain visibility positively influences supply chain order processes

H11: Supply chain processes positively influences supply chain responsiveness

H12: Supply chain processes positively influences delivery reliability

H13: Supply chain processes positively influences product variability

H14: Supply chain processes positively influences supply chain flexibility

3.7.5. Information Communication Technology (ICT) and Information Technology Usage

Information Communication Technology (ICT) is very important to the success of delivery performance and the incorporation of visibility tools within the supply chain. In order to achieve a high level of coordination of processes and activities across the supply chain there is a requirement for the efficient exchange of information between companies involved in the supply chain (Krmac, 2011). The processes needed to achieve efficiency within a supply chain is not concentrated within one company, instead it involves collaboration among all the organizations within the supply chain as such collaborative systems and technologies are needed within the supply chain. These systems ensure that the interests of all parties within the chain are realized, sustained, and/or improved (optimized).

To improve communication, data, information, and the exchange of documents between the supply chain's customers and suppliers there needs to be a proper and effective means of communication or the gathering of relevant data. Information and communication technology (ICT) is a necessity and is generally seen as supportive technology (a tool) to human activities or human performance of business actions (Krmac, 2011). Choosing as well as using the appropriate ICT tools enables increased visibility within the supply chain, it also allows for more efficient and faster completion of tasks and activities, it accelerates data preparation and transmission times, increases reaction speed as it relates to delivery to customers. As it relates to the study of ICT within supply chains there have been different theoretical views and approaches, the transaction cost theory has been used to explain the organization structure in regards to the incorporation of ICT for production of goods and services whether in house or through outsourcing and the "speed" with which these goods gets to market. The theory looks at technology and its application to achieve integration to achieve reduction in transaction cots relating to communication, contracting, sourcing and coordination across the chain (Kivijarvi, et al., 2012).

The implementation of new ICT technology is generally seen as a means to create such kinds of organizational structures that will allow the different components of the transaction costs to be reduced (Kivijarvi et al., 2012). One such component used to reduce transaction cots is the use of visibility tools and technology, late deliveries carries a penalty and as such the implementation of ICT can assist in managing delivery and by extension reduce costs (Damiani et al., 2011). Another perspective relating to ICT and its application in improving visibility and delivery is the theoretical perspective of strategic decision making and management, and the economic theory of an organization based on the resource theory. This approach suggests that supply chains should think and position their businesses strategically through the use of value proposition, products and services and their resource capabilities.

According to Wade and Hulland (2004 as cited by Kivijarvi et al., 2012), IS for supply chain can be placed into eight categories, among which IS for managing external relationships and cost management for operations are of high importance. IS for relationship management allows for the management of linkages between the IS function and stakeholders outside the supply chain. While IS for operations aims to manage resources and reduce costs while increasing business value. ICT resources are applied for e-invoicing and has been shown to improve the way linkages to suppliers are managed and reduce the cost involved for supplying and delivering of goods (Kivijarvi et al., 2012). The primary aim of entering into e-invoicing is to increase the effectiveness and efficiency of inter-organizational financial governance in order to achieve business value that may not otherwise be available without the use of ICT.

Through research the following metrics have been identified as being effective to the success of supply chain especially as it relates to delivery and visibility. The metrics are as adopted from Auramo et al.(2005) are: responsiveness of the ICT system, information availability, information visibility, extent of supply chain collaboration enabled through ICT, decision making based on total supply chain information and provision for single point contact for data. The metrics can therefore be arranged in the ICT research framework model in Figure 3.9. This diagram indicates the metrics and their relationship with SCV and hence delivery performance. These metrics are integrated to form the overall research framework highlighted at the start of this chapter.

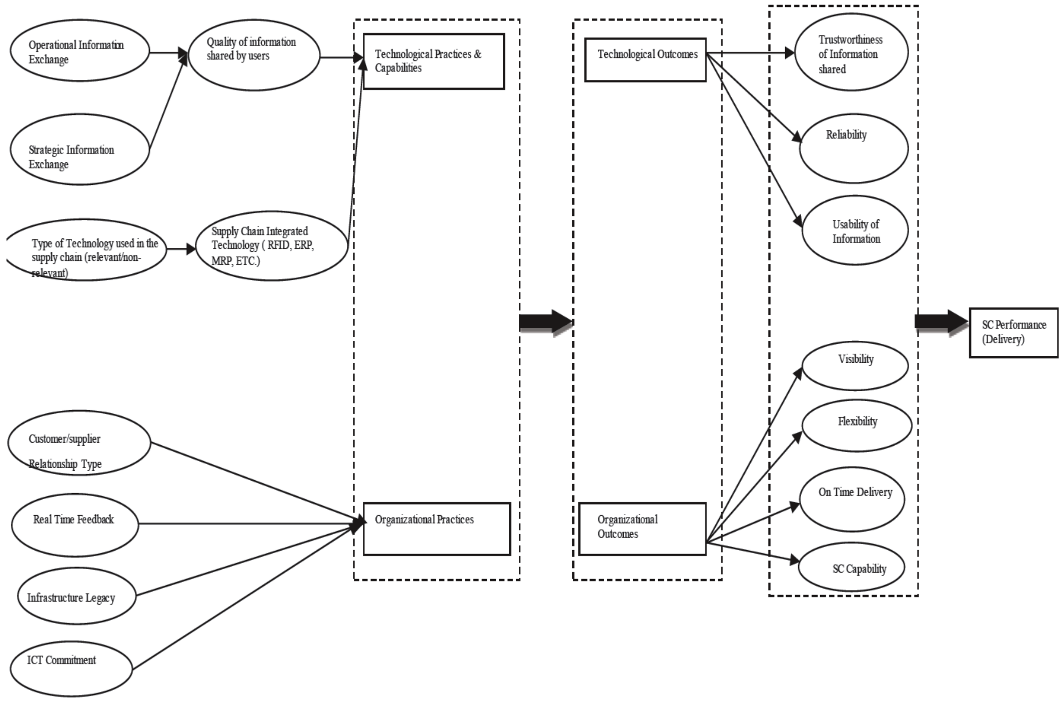

Figure 3.9.: Metrics for ICT and their relationships to Delivery and Visibility Performance

ICT can be said to play a pivotal role in the enhancement of SCV and delivery performance, form literature it has been shown that ICT plays and will play a critical role in supply chain now and in the future. According to Auramo et al. (2005) ICT plays a crucial role in supply chain especially for those in the fast moving sector and where flexibility and agility is needed. Auramo et al. (2005) also pointed to the type of supplier relationship being an metric for the measurement of ICT impact, thus concurring with this study that supply chain visibility and delivery are likely to be impacted by the type of supply chain relationship that exists and can be improved through the ability of suppliers within SME FMCG to model and select the type of relationship appropriate to their individual businesses. From the extant literature the hypotheses relating ICT for supply chain visibility and on-time delivery is shown in Figure 3.10.

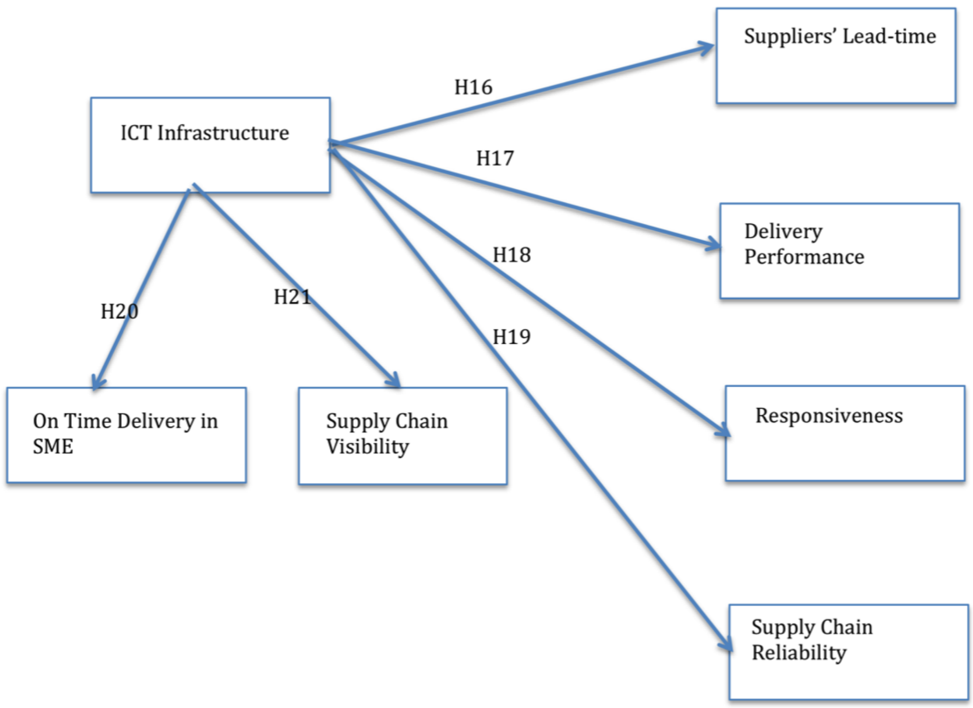

Figure 3.10.: Hypotheses Relating to ICT Infrastructure in SME's

Therefore it is hypothesized that:

H20: Supply chain ICT infrastructure positively influences on time delivery in FMCG SME Organizations

H21: Supply chain ICT infrastructure positively influences supply chain visibility

H16: Supply chain ICT infrastructure positively influences suppliers' lead time

H17: Supply chain ICT infrastructure positively influences delivery performance

H18: Supply chain ICT infrastructure positively influences suppliers' responsiveness

H19: Supply chain ICT infrastructure positively influences supply chain reliability

3.8. Research Parameters Developed

Section 3.6 to 3.7 of the research discussed the hypotheses that were developed from each supply chain visibility research parameter/precursor. From these hypotheses the model below was developed to identify the potential predictors of supply chain visibility in SME's. From the hypothesis specific parameters were developed to be tested in regards to the research focus areas of supply chain processes, ICT usage, on-time delivery and supply chain relationships. The research model focused on the fact that from previous literature and from the hypotheses as discussed, it was found that electronic ordering and visibility tools are predictors to the on-time delivery of the supplying company. These parameters are from hypotheses H1 and H2 and were identified to be the main predictor to internal on-time delivery.

The model further indicated that supply chain processes, ICT usage, internal on-time delivery and supply chain relationships are factors that will predict the level of responsiveness, product variability, lead time and reliability that will be achieved. These factors in turn predicts the level of on-time delivery and visibility achieved by the customers of the supply chain. The model also indicated that internal on-time delivery of the supplier will impact the level of supply chain visibility and delivery achieved at the customers' business location. These factors are identified as the main hypotheses, these along with others identified above were tested to ascertain the level of visibility and on-time delivery achieved by customers.

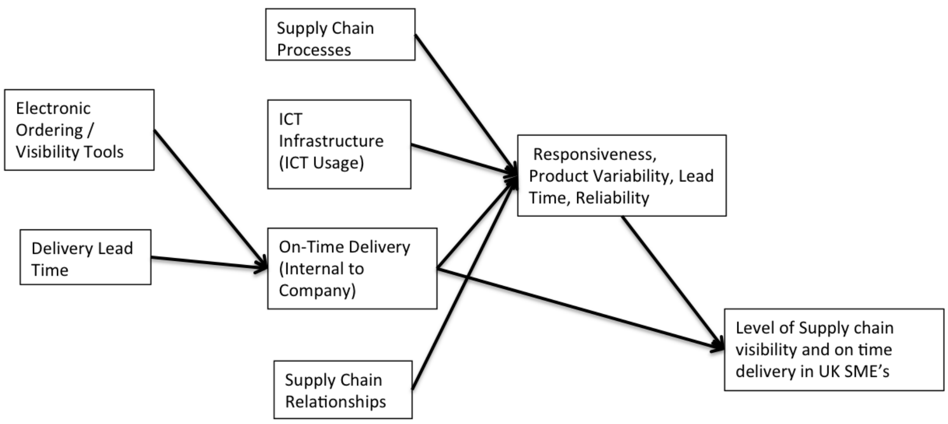

Figure 3.11.: Model Showing Research Parameters Developed for Testing in Research

3.9. Conclusion

In this chapter, the conceptual framework was formulated, based on the existing supply chain theories such as the SCOR framework, Supply Chain Management, Resource Theory, Transaction Cost Theory, Resource Theory, Game Theory, Systems Theory and Strategic Choice Theory. All the metrics and factors in the framework model were extracted from related literatures and theories relating to supply chain, supply chain visibility, supply chain performance metrics and supply chain delivery, which provide the base to design the questions contained in the questionnaire. Furthermore, this chapter helped to develop the different hypotheses and research questions which are addressed in the data analysis and findings chapter so as to ascertain whether or not the research theses is supported and the research questions and have been answered.

The next chapter provides an explanation of the different approaches and methods for conducting the research, and how data were collected and analyzed.

4. Research Methodology

4.1. Research Design and Questions

This chapter reviews different research approaches and processes to explain and justify the chosen methods used in this research. The discussion covers different research methods that are used in relevant studies. The chapter also discusses the design of research instrument, strategy, sample selection, pilot testing and other concepts. In order to conduct a successful study, it is important for researchers to develop a plan and schedule of activities that need to be performed. This allows for the performance of different activities within the time and budgetary limitations of the research project in order to achieve the study aims.In this chapter, the research methodology for this study is presented. Figure 4.1 highlights the steps that the were taken in designing the research study and obtaining results for final analysis and conclusion.

A case study design was used to investigate a Fast Moving Consumer Goods (FMCG), Small Medium Enterprise (SME) located in the United Kingdom. The study was conducted in phases. The first phase focused on the review of existing literatures concerning supply chain visibility, performance measurements of supply chains, SME's and the FMCG sector. The literature reviews were narrowed to focus on the impact of supply chain visibility on supply chain performance. The second phase of the research involved a case study approach, there is extensive literature existing regarding the use of case studies in the area of research regarding performance measurements (Hamel et al., 1993; Yin, 1993, 1994, 2003). Yin (2003) provided information on clearly established case study methodologies that can be used in the analysis of supply chains. With the case study approach, the use of multiple (qualitative and quantitative) data techniques for the collection of data was possible (Eisenhardt, 1989).

This design was used because case studies are frequently used in supply chain research because it addresses the how and why of the supply chains research questions (Yin, 2003; Ellram, 1996 p. 98; Meredith, 1998 as stated in Kotzab et al., 2005 p. 241). Most cases in existing research describe improvements of supply chain management practices and these improvements typically are arrived through the focusing of problem areas within the specific case or cases being study. According to Kotzab et al, (2005) one of the shortfalls of most case study research is that they only highlight the improvements in the supply chains but not the failures. This research also highlighted any failures that existed in the case study being assessed as highlighting these reduces questions surrounding the "theoretical replication" of the research (Eisenhardt, 1989). However, on the other hand, case studies do not require control of behavioral events and typically focuses on contemporary events (Yin, 2009). This means that case studies can be used to analyze a variety of current, changing events that researchers wishes to query.

Insights from previous research indicated that one of the main operational foundation of supply chain performance is delivery performance (Peng & Lu, 2017 p. 2), on-time delivery to be specific. The existing literatures focused on overall delivery but not specifically the requirements needed for on-time delivery, past researchers also did not focus on the improvement of on-time delivery in the context of the use of visibility tools for SME's . Visibility is instead looked on in regards to billing, inventory and other supply chain issues but not its direct impact on meeting timely deliveries of the right quantities at the right place. In reality different factors impact supply chain delivery such as relationships within the supply chain, visibility tools among others. Thus, the research questions to be addressed in this study are:

1. What percentage of companies uses information technology as a support for visibility tools for the transaction, supply, purchasing and delivery business within the supply chain?
2. To what extent are companies satisfied with the delivery performance of their suppliers within the supply chain?
3. What is the lead time for companies who conduct business using information technology (visibility tools) ?
4. To what extent can factors (order accuracy, delivery lead time, goods delivered on agreed date, time, response time to product mix changes, information format, IT systems/tools, information for coordination, and suppliers' responsiveness) be used to predict on-time delivery, and visibility?

4.2. Research Approaches/Paradigm

4.2.1. Research Aims and Research Objectives

The main aim of the study is to determine the effectiveness and impact on on-time delivery of supply chain visibility tools used by small to medium FMCG supply chain companies. From this aim, the following objectives were derived to guide the study:

1. To determine to what extent are information technology tools for visibility deployed by FMCG SME supplier companies.

2. To determine what aspects of supplier operations have the greatest influence on meeting the agreed lead time.

3. To determine if the use of technology and visibility tools were of high priority in meeting on time delivery and determine whether or not visibility can predict on-time delivery

4. To determine the extent to which certain factors (order accuracy, delivery lead time, goods delivered on agreed date and time, and response time to product mix changes) can be used to predict on-time delivery.

5. To determine the extent to which certain factors (Information format, IT systems/tools, information for coordination, and suppliers' responsiveness) can be used to predict supply chain visibility and to use ICT infrastructure to predict supply chain visibility, delivery performance, responsiveness, supply chain reliability, information for coordination, and on-time delivery.

6. To ascertain if supply chain order processes can predict supply chain responsiveness, delivery reliability, product viability, and supply chain flexibility and use supply chain responsiveness and information coordination to predict supply chain visibility.

7. To determine the extent to which supply chain visibility can predict supply chain order processes and order processes cannot be used to predict on-time delivery.

From the developed objectives the following null hypotheses were tested: .

Ho1: Order accuracy, delivery lead time, goods delivered on agreed date and time, and response time to product mix changes cannot be used to predict on-time delivery

Ho2a: Information format, IT systems/tools, information for coordination, and suppliers' responsiveness cannot be used to predict supply chain visibility.

Ho2b: Supply chain visibility cannot be used to predict on-time delivery.

Ho3a: Supply chain order processes cannot be used to predict supply chain responsiveness, delivery reliability, product availability, and supply chain flexibility.

Ho3b: Supply chain visibility cannot be used to predict supply chain order processes.

Ho3b: Supply chain order processes cannot be used to predict on-time delivery

Ho4a: ICT infrastructure cannot be used to predict suppliers lead time, delivery performance, responsiveness, supply chain reliability, information for coordination, and on-time delivery.

Ho4b: Responsiveness and information for coordination cannot be used to predict supply chain visibility.

The main hypotheses were be tested through the development of hypotheses for each foundational paradigm on which the research theoretical context and model is built.

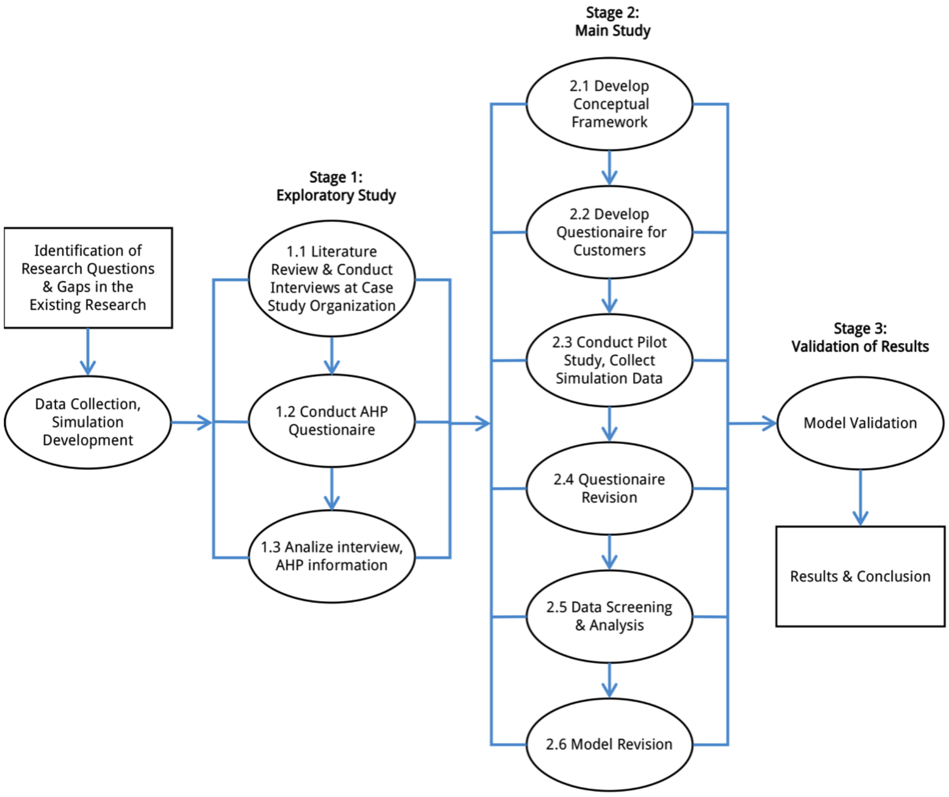

Figure 4.1.: Steps for Research Design used in this Study

4.2.2. Positivism vs. Interpretivism

There are different approaches and paradigms that can be taken when conducting a research and designing a test instrument to be used for a survey. The three main approaches used by researchers in various studies are analytical, system and actor approaches. There also approaches which focuses on positivism as against interpretivism, and deductive vs. inductive approaches.Each research approach has their advantages and dis-advantages in deciding how to design and develop a research instrument.

The positivism and interpretivism approaches are two distinguished and recognizable research approaches used quite often in social scientist studies (Blumberg et al, 2008; Collis & Hussey, 2009). Positivism is adopted from the natural sciences and draws references and inferences from phenomena, patterns or associations from the social environment in order to arrive at variables for testing and arriving at conclusions (Blaikie, 2000; Orlikowski & Baroudi, 1991). Positivism approaches also allows for the combination of qualitative and quantitative methods for research data collection and analysis, this is becoming more popular as researchers are incorporating mix methods in their research (Blaikie, 2000). Some researchers have pointed to the fact that positivism is suited for research that involves experiments, questionnaires or relies heavily on quantitative methods (Hair et al., 2010), while others have pointed to the fact that the approach can be applied to research that combine both quantitative and qualitative methods, but quantitative is the dominant research methodology being used (Myers and Avison, 2002).

On the other hand, researchers of the interpretivism paradigm postulates that research methods which applies statistical analysis and correlations cannot be used as stand alone analysis for social science research, as such these analysis must be supported with participant's observations and meanings of their actions and environmental realities (Blumberg et al, 2008; Collins & Hussey, 2009). In addition, the interpretive approach is associated with qualitative methods that are deemed to be dis-organized, this leads to instruments such as s participants' observation studies and in-depth interviews being used for data collection (Blaikie, 2000). Interpretivism is also applied when researchers are conducting exploratory studies, which tends to be in the early stages of a research, allowing researchers to be subjective in the data gathering as they interact with their research environment (Orlikowski and Baroudi, 1991). Interpretivism approach is mainly used in qualitative researches (Saunders et al, 2012). Table 4.1 represents a comparison between the positivism and interpretivism approaches.

Table 4.1.: Comparison between positivism approach and interpretivism approach

Positivism	Interpretivism
Uses large data sample	Uses small data sample
Concerned with hypotheses testing	Concerned with generating theories
Generates precise quantitative data	Focuses on generating theories
Allows for generalization of results from the population sample	Allows for generalization of results from one setting to another similar setting
Researchers objectivity of views supported	Researchers subjectivity of views supported
Results based on statistical analysis	Results based on individual's interpretation of the phenomenon
Deductive Approach	Inductive Approach

Source : Adapted from Collis and Hussey (2009) as cited in Yearworth and Edwards (2014, p. 55)

4.2.3. Deductive vs. Inductive Approach

Deductive and inductive are other fundamental paradigms that are typically applied in social sciences and business research. Inductive research involves theory developed from observations of empirical reality (Collis & Hussey, 2009). Deductive method involves a conceptual and theoretical structure elaborated and tested by verifiable observations (Collis & Hussey, 2009). A deductive research approach is most suitable for testing existing theories, and theoretical frameworks it is typical not applicable to creating new science (Arlbjørn and Halldorsson, 2002). It is also used for quantitative method research which involves statistical testing of hypotheses from random sampling methods (Saunders et. al, 2009).

Inductive approach involves the study of relationships between theory and research. The inductive approach follows the bottom up approach and is largely used for qualitative research (Daff, 2011). First it identifies the specific information then this is used towards the development of generalized findings of the results. Inductive approach does not focus on creating hypotheses; rather the researchers applying this approach work with the theories and models present in regards to the research topic (Saunders, Thornhill & Lewis, 2009). Inductive research involves the use of research data to develop theory and is also used to reflect current and past experiences (Fletcher, 2008). Table 4.2 indicates the differences between the deductive and the inductive research approaches.

Table 4.2.: Differences between deductive and inductive research approaches

Deductive	*Inductive*
Scientific principles	Understanding of the meanings humans attach to events
From theory to data	In-depth knowledge of the topic
Quantitative data collection	Qualitative data collection
Highly structured approach	More flexible structure

Source: Adapted from Saunders et al.(2009, p.127) as cited in Nouara (2015, p.73)

4.2.4. Systems vs. Analytical Approach

The *systems approach* focuses on system theory and as such this approach assumes the entire system differs from the individual sum of its elements. In using this approach in research one assumes that relationship between the individual elements is important as well as individual properties of each element (Adielsson & Gustavsson, 2011). In other words, this approach is interesting when investigating something where you expect to have synergies between elements in a system (Arbnor & Bjerke, 1994). The systems approach as indicated in Figure 4.1 involves the assessment of the interaction of all elements of the system, rather than assessing each element individually. This approach was incorporated in the development of constructs and conceptual design of this study. The elements of supply chain relationship, supply chain visibility, supply chain resources and the SCOR model were analyzed in how they interact with each other within the entire supply chain, rather than being analyzed as stand alone elements of the supply chain.

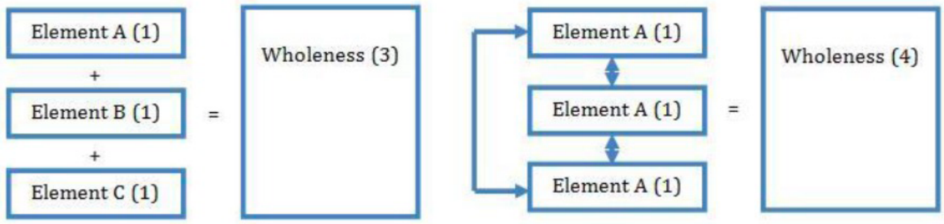

Figure 4.2.: The analytical research approach (left) vs. the systems approach (right).
Source: Adielsson & Gustavsson (2011, p.25).

The analytical approach is interested in cause and effect relationships, and takes a bottom up approach which assess the whole study as a sum of individual elements . It assess each element individually then aggregates them to form the conceptual or theoretical design of the research study (Mammela, 2008).

The actors approach involves the collaboration of the persons being researched, this is done in an effort to resolve problems that are specific to the group being researched (Berg, 2004). The research focuses on the use of participatory techniques and strategies to allow "people to examine reflectively their problems or particular issues affecting them or their community" (Berg, 2004, p. 197).

This study did not involve the use of the actors approach, despite the fact that the research focused on a particular "community", that is FMCG SME's. Action research would have required the step by step involvement of managers and other participants of the case study company, their participation would have been required in the assessment and resolving of the issues through coordinated actions devised from the research (Coughlan & Coghlan, 2002). The conceptual framework was instead, developed through the use of the system approach. This approach was found to be appropriate, as this approach looks at the interaction of all the elements of a system being studied (Figure 4.1). This paper applied this approach through the assessment interaction of concepts relating to information sharing, resources and ICT infrastructure (as shown in the conceptual framework in Figure 3.1) and parameters relating to manufacturing capabilities (upstream end of the supply chain) as well as parameters relating to the value added provision of the supply chain (downstream end). This allowed for the assessment of all elements of the system, the systems approach is said to be a valid approach in supply chain research as it allows for a "methodological and structured approach" in analyzing the "systemic environments within the larger system" (Ghadge, Dani, Chester & Kalawsky, 2013, p. 523).

The analytical approach was used in the assessment of theories to develop and support the theoretical perspective of this study, it was also incorporated in the explorative AHP analysis of this study. This approach allowed multiple levels of the case study company to be reviewed. The AHP and analytical approach allowed for the analysis and assessment of the theories and concepts for each level of the supply chain (e.g the factors underpinning delivery). From these theories the resource based theory among others were identified as the base theories for this study. The analytical approach allowed for the assessment of each theory as a standalone theory, and to review their combined foundation principles and application at the case study company.

The Analytical Hierarchy Process(AHP) technique incorporated the use of a repertory grid, this was carried out in the early exploratory stages of the study. The AHP process was conducted in order to identify the factors the suppliers considered important to maintain their supplier/ customer relationships. The grid was developed through research of existing items on supply chain relationships and its impact on performance. From this, a repertory grid as well as supply chain relationship model were developed, both of which are discussed in detail in the paper. The AHP and repertory grid techniques is used a lot in case study research for supply chains as it is seen as a decision making tool that “can help describe the general decision operation by decomposing a complex problem into a multi-level hierarchical structure of objectives, criteria, sub-criteria, and alternatives” (Sharma et al., 2008, p. 258). The AHP technique allows for decision making when the case being researched or modeled is complex and may contain multiple attributes such as delivery frequency, delivery location and product variety.

This study incorporated both the systems and analytical approach through the review of extant literature. This information was used in the identification of the research constructs and subsequent formulation of research questions and hypotheses. Questionnaires were used to gather information from a data sample of 100 SME’s, thus allowing for testing of the hypotheses and assessment of the research questions, through the use of SPSS version 20 statistical software.

4.2.5. Quantitative, Qualitative and Mixed Methods

Quantitative research methods according to Creswell (2009) are those methods that involve the collection, analyzing and interpreting of data to be used in writing up results. These methods are focused specifically on survey and experimentation strategies that relate to identifying a sample and population and using this sample to collect the research data. Quantitative research method is associated with the use of induction research techniques, it is a strategy that emphasizes the quantification of the data collected and according to Creswell et al., (2003) this method allows researchers to develop variation of causes for their research questions. Information conveyed in numerical form is quantitative. The focus of quantitative research is on measurement and analysis of variables and identification of causal relationships between variables by empirically testing a priori hypotheses (Denzin & Lincoln, 2000). Quantitative research methods is said to have its foundation in natural science research, and methods for data collection when using quantitative technique, includes the use of questionnaires and experimental techniques (Myers & Avison, 2002).

On the other hand qualitative research methods are defined as approaches that incorporate purposeful sampling, the collection of open ended data which included the analysis of photos, videos, and text. This method allows for personal interpretation of the data gathered (as it is not experimental) and findings can be represented as figures or tables which all inform qualitative procedures (Creswell, 2009). Qualitative methods have been used extensively in studies geared towards a greater understanding of a research phenomenon ,the use of qualitative research offers subjective evaluation of a topic as it can capture the words communicated by people during the research (Creswell, 2003; Nouara, 2015). Qualitative data collection approaches include interviews, case studies, focus groups and observations.

Mixed methods are research methods which facilitates the combination of both qualitative and quantitative research methods. According to Johnson et al. (2007) as cited by Nyamu (2016) mixed research method as "a type of research in which a researcher integrates aspects of qualitative and quantitative research methods for the broad purposes of breadth and depth of understanding"(p. 75). The mixed method approach was incorporated into this study, as the topic of FMCG SME supply chain visibility and on time delivery has not been widely explored in the existing research literature. The mixed this research method can adopt the approach of being purely mixed between qualitative and quantitative methods or can adopt the form of either qualitative (QUAL + quan research) or quantitive (QUAN + qual) research being the dominant method applied in the research (Johnson et al., 2007).

According to Creswell (2014), qualitative data tends to be open-ended without predetermined responses while quantitative data usually includes closed-ended responses such as found on questionnaires or psychological instruments. Creswell further states that in order to incorporate mixed methods approach, the enquiry in the research material may start with qualitative research method if the field of study has not been explored much in the extant literature then use the information gathered from this method to develop further research evaluation techniques that are more quantitative in nature. In this study, quantitative measurement was used to assess the qualitative data, which allowed the to gather more information on those measures to represent the population being studied. Yin (2013) as well as Creswell (2014) describes mixed methods as an approach that provides richer and stronger depth of information that may have been found to be difficult to gather by the use of a single research approach. Table 4.3 highlights the features of each research method, that is quantitative, qualitative and mixed methods.

4.2.5.1. Instruments Used with Each Method

Questionnaires

Table 4.3.: Comparison of quantitative, qualitative and mixed methods

Quantitative	Qualitative	Mixed Methods
Large data sample	Small data sample	Data sample may be large or small
Pre-determined	Emerging methods	Both predetermined and emerging methods
Associated with scientific research	Associated with social and cultural research	Associated with social, scientific and cultural research
Used to test hypotheses	Used to explore new occurrences	Used to test both hypotheses and new occurrences
Statistical analysis	Text and image analysis	Statistical and text analysis
Closed ended questions	Open ended questions	Both closed and open ended questions
Statistical interpretation	Themes, patterns interpretation	Across database interpretation
Performance data, observational data, attitude data and census data	Interview data, document data, observation data and audiovisual data	Multiple forms of data drawing on all possibilities

Source: Adapted from Creswell (2013)

This data collection method is widely used in surveys that are considered normative, that is to gather facts and aid in the improvement of the study. Questionnaires are systematically prepared documents that are comprised of with specific questions designed to elicit the information or data required for the study. This data or information provides insight into the problem under study. Grbich (2012) pointed that questionnaire is a widely used data collection method, and is used for conducting academic research. The answers provided by the respondents constitute the data for the report. Questionnaires can be used for research on wide and diverse range of topics, and is typically completed by the participants/respondents of the population under study.

There are two main types of questionnaires, structured which uses “yes or no” responses, multiple choice or Likert scales, and as such is also called a closed form questionnaire. The second type is unstructured or open form, this type of questionnaire allows the respondents to answer freely in his/her own words, thus giving participants a greater voice to their own thoughts and opinions (Zikmund et al, 2012).

Interviews

According to Collis and Hussey (2003, p.167),“interviews are associated with both positivist and phenomenological methodologies”. Collis and Hussey went further to state that interviews are a methodology used to collect data, it allows the selected participants to answer questions asked in order to find out what they do, think or feel. Interviews may be conducted in face-to-face format, it may also be conducted with individuals or a group of individuals called focus groups. It may also be structured, unstructured, semi-structured or standardized open-ended interviews. The method makes data analysis through the comparison of responses very easy. Creswell (2013) stated that interviews are useful when the interviewees are able to provide historical information and provides control in regards to the questions asked as the research is conducted. Hiebl (2014) state that interviews conducted on a one-on-one basis allows for extraction of data on a one-on-one basis, but group interviews can also be beneficial in that it allows examining of analogous judgements from the group.

According to Rubin and Rubin (1995) "interviewing is a way of uncovering and exploring the meanings that underpin people's lives, routines, behaviors, feelings etc (Arskey & Knight, 1999, p. 32). According to Rubin & Rubin (2011), interviews are widely used to collect primary data directly from the source, this data allows the researcher to examine the facts and arrive at new evidences. Interviews are used to reveal new aspects of a concern, and provide precise and comprehensive data that are dependent on an individual's experience. However, according to Collis and Hussey (2003), some problems that arises from the use of interviews are mainly due to the fact that the process can be time consuming and expensive, and in some cases a short questionnaire may be more appropriate. Smith (2005), however stated that the interviews are considered to be dependable and sound as a data gathering technique, as it provides quality information obtained by the interviewer from the interviewee. The interviewer has complete authority and control of the process and thus is able to direct the interview towards achieving relevant information, which may at times also be assessed numerically (Hiebl, 2014).

Case Study

Yin (1984, p. 23) defines the case study research method "as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used." This method is a preferred method of researchers when they seek to answer yes and why questions in their study. It can be considered a robust research method particularly when a holistic, in-depth investigation is required. According to Kothari (2004), the case study method is a very popular form of qualitative research assessment, and it involves careful and complete observation "of a social unit, be that unit a person, a family, an institution, a cultural group or even the entire community" (p. 113). It is a method of study that leads to depth of knowledge rather than breadth, as it places more emphasis on the full analysis of a limited number of events or conditions and their interrelations.

The case study is recognized as a tool in many social science studies, deals with the processes that take place and their interrelationship. Thus, case study methodology can be seen as an intensive investigation of the particular unit under consideration. The object of the case study method is to locate the factors that account for the behavior-patterns being studied, in relation to the given unit as an integrated totality. The case study approach involves the use of a variety of research methods for capturing multifaceted reality under examination (Yin, 1994). The use of case study approach provides reliable and solid results. Through case study methods, it is possible to go beyond the quantitative statistical results and understand the behavioral conditions through the actor's perspective. By including both quantitative and qualitative data, case study helps explain both the process and outcome of a phenomenon through complete observation, reconstruction and analysis of the cases under investigation (Tellis, 1997).

Simulation

Simulation allows for researchers to analyze the complexity of organizational systems and processes. The approach allows researchers to analyze the artificial world, and focus on answering what if questions in research. According to Dooley (2002), simulation allows researchers to understand the complexities inherent to the organization or organizational system under study. Dooley went further to state that while other methods answers research questions such as "What happened, and how, and why?" simulation helps answer the question "What if?"(p. 2). Simulation allows researchers to focus on the complexity of systems and organizations, as it allows for "looking into the future" through observations, this provides practical and "real time" feedback to researchers. One of the major issue with simulation methodology is the fact if the research focuses on real world issues, modeling through simulation to arrive at a solution may prove difficulty as this method is not able to replicate the issues exactly (Moshirvaziri & Benli, 2008).

4.3. Research Paradigm Adopted for this Research

According to Collis and Hussey (2013) the identification of the appropriate research approach or paradigm is fundamental and for every researcher this is an important task that may be daunting at times.The aim of this research is to the fast moving consumer goods SME;s in the UK and understand how the use of visibility tools impacts or improves on time delivery for these organizations. Maxwell (2008) and Yin (2013) also stated that the identifying the research paradigm or approach is fundamental to the success of a research study, as this helps in the process of answering the research and research questions as well as guide the collection analysis of data. As highlighted in section 4.3, there are different research approaches, namely, positivism, interpretivism, inductive, deductive, systems and analytical . There are also a number of methods to use for research as discussed in section 4.3. After considering the research paradigms, systems approach was adopted for this research where mixed research method was used where quantitative method was dominant (QUAN + qual research). Since a case study company was used in this study as well as the collection of data through the use of questionnaires and interviews, this approach and method was deemed the most appropriate.

In this study, extant literature on SME supply chains, fast moving consumer goods supply chains, visibility ,on time delivery performance and organization collaboration was examined to identify the appropriate research approach and methods that might be used. Relevant material for the study was scattered across various journals, in order to identify relevant information mostly academic journals and to a minor extent peer reviewed conference papers and theses were included in the study. Consequently, the following online journal databases were searched to provide a comprehensive database of literature for the study, journals such as : ABI Inform, EBSCO, Emerald , JSTOR, Springer and Google Scholar. These databases were chosen because of their wide access to valuable academic supply chain journals as well as business journals, and because of the researcher's online access to these. It should be noted that there could be other essential databases providing information relevant to this study, for this paper there was only limited access to databases etc.

Thakkar, Kanda and Deshmukh (2007), stated that SCM assessment is best done through the systems approach as it allows for the assessment of the organization's processes from a strategical, tactical and operational perspective. In designing the questionnaire for this research the systems approach was incorporated, as such questions were developed to allow for analysis of various "parts" of the supply chain. The main aim of the instrument was to assess the impact of each system component (technology) on other components (delivery performance metrics). Other approaches that are of importance are the difference between qualitative and quantitative research as these also influence the design of the instrument used in the collection of data.

This paper, it is believed fits closely with the system approach because the questionnaire was developed to assess every link between elements within the case study company's operation. The first step taken in developing the questionnaire was a review of existing literature. The review of existing literature was used as a guidance regarding present performance metrics considered best practice for supply chain. The case study company was intricately involved in the development of this research, as the company was met with to conduct initial interviews as well as administered a preliminary questionnaire, from which the relevant issues affecting the company's delivery performance were identified.

The case study approach, which is a form of mixed methods research approach was also taken along with the use of interviews and questionnaires as it was proven by other researchers to be an acceptable approach to this kind of study. Easterby-Smith et al. (2008, p.59) place the "case study method" in the quadrant for a social constructionist approach where the researcher is detached from the subject under investigation. Yin (2009) supports this choice in that he views the case study approach as being suited to answering 'how and why ' type questions in a contemporary or social setting. In modern research the case study approach has become fairly established and quite popular as method of research for logistics and supply chain management (Dinwoodie & Xu, 2008).

To reach the ultimate goal which was to design two questionnaires to capture all the data needed to provide accurate analysis regarding visibility, visibility tools and delivery within the supply chain a number of steps were taken. The steps taken to develop the case study and the two questionnaires followed the steps highlighted by Eisenhardt (1989), these are a) getting started, b) selecting the case to be studied, c) crafting instruments, d) entering the field, e) analyzing data, f) shaping hypothesis, g) developing literature, h) closing. This research followed similar steps to those identified by Eisenhardt except that the research did not follow his steps exactly; as such the research questions were developed after identifying the case to be studied rather than developing the questions then identifying the case study.

In business and management studies, there are four research strategies: experimental, action research, survey and case study (Saunders et al., 2007). Case studies uses previously developed theoretical propositions to guide data collection and analysis (Yin, 2009). This strategy provides a deep rooted understanding of the context within which the respondents operate; this is deduced through interaction which allows for an understanding of their experiences and feelings (Yin, 1994; Bryman & Bell, 2007). According to Yin(2009), case study research also allows researchers to gather information through literature reviews, which we did throughout the research and development of this paper. It also allows exploratory work to be carried through interviews, which was also conducted in the early phase of this research. Also the approach of using and inductive study in the early stages of the research can be seen in Hofstede's (1984) study of the cultural differences between members of a large scale multinational organization, the inductive study was done using quantitative data (Bryman & Bell, 2011). The early stages of Hofstede's research involved using surveys to collect data, the data was then used to guide the research. In this same manner, interviews were conducted and questionnaires used for the early exploratory study, to guide and develop the research, a customer questionnaire and research questions in the later stages of this study. stages.

In addition, the case study approach can be taken as a single approach or one where multiple case studies are assessed and triangulated to arrive at a conclusion; this is the flexibility of conducting case study research. A single case study is undertaken when the case is critical, longitudinal, representative, typical, extreme and unique or based on a well-formulated theory (Yin, 2009). Case studies allow for the use of surveys and questionnaires, survey is the most popular strategy associated with the deductive approach (Saunders et al., 2007). It gathers data from a sizable population in economical steps, using a questionnaire. A case study is the investigation of a real-life phenomenon within its real-life context (Yin, 1994), in which the boundaries between the phenomenon and the context are not very apparent. In regards to the supply chain being investigated, the influences or impact of visibility was not clear and definitive, so too the impact and processes regarding delivery performance and as such the case study approach was felt to be the most suitable.

Furthermore, the case strategy focuses on examining a phenomenon in its natural setting using techniques such as interviews and observations used for exploratory and explanatory research (Yin, 2003). Multiple case studies can also be used when researchers need to gather a lot of results and have the time and resources to analyze multiple cases (Saunders et al., 2000). In this research there was limited time and funding, hence a single case study analysis was conducted.

4.4. Research Design and Data Collection

In the first stage of the study exploratory research was conducted, the exploratory stage of the research involved the use of the analytical hierarchy process (AHP) and interviews conducted at the case study company. Exploratory research is typically conducted to determine and explore the nature of the research problems, it is not intended to provide conclusive evidence but rather to assist the researcher in having a better understanding of the problem and to be able to identify knowledge gaps (Dudovskiy, 2015). According to Saunders, Lewis and Thornhill (2009), exploratory studies is a " valuable means of finding out what is happening" (p. 170) in regards to the research topic, it also assists in gaining new insights on the phenomena being researched. In this study, exploratory study was carried out for organization visibility tools usage, and the supply chain management operations of the case study company. This was done to allow for the gaining of understanding of the overall supply chain operation and to learn more regarding the usage of visibility tools within FMCG SME's and how this affected their on-time delivery. The interviews were conducted in the respondent's facilities with a national (UK) wide geographic perspective. An interview guide was created from the level of visibility model (developed from existing literature) to make sure all interviews were conducted the same. The interview guide was constructed from the on-time delivery model to make sure that the proper quantity and quality of information was collected. Each interview was carried out during two hours and was conducted over a two week period. All interviews were also transcribed to ensure the reliability of this thesis (Yin, 2009).

In stage two, empirical data gathered from stage one as well as from the extant literature was used to develop a conceptual framework for this research, and a questionnaire which was administered at the case study company. The results of the AHP study was used to develop a relationship model and to assess the type of supply chain relationship best suited the case study company, in order to achieve visibility and on-time delivery, it was also used to develop a questionnaire which was administered at the case study company. The developed framework and AHP results were presented at Edinburgh University, UK, Computer-Aided Production Engineering (CAPE 21st) where experienced scholars in the field of supply chain management and information technology innovation gave some feedback. One of the feedbacks was to assess the impact of third party logistics providers as a moderating factor for on-time delivery. However, on carrying out the main field study, it was observed at the time that this was not a factor for this case study company as they had not incorporated the use of third party logistics providers in their delivery to customers. The results were refined and were later published in a peer reviewed journal. A simulation study using ProModel was also conducted at this stage. Simulation studies on the bullwhip effect and inventory management has been conducted by a number of researchers such as Simchi-Levy, Kaminsky and Simchi-Levy (2000) and Joshi (2001). Researchers have also used simulation studies for the analysis of IT usage and other performance measures in supply chains.

This allowed the for the study of the impact of several factors that caused inventory backlog and thus impacted on time delivery at the case study company. According to Riddalls, Bennett and Tipi (2000), simulation allows for the modeling of supply chain dynamics when the research characteristics does not allow for analysis using analytical or other models. They are useful to understand complex systems when stochastic variables are to be incorporated. Simulation models do not optimize a supply chain, instead they are used to allow analysis and to determine performance of the particular supply chain lay out and operation being investigated (Simchi-Levi et al., 2000).

The third stage involved the development of a questionnaire that was administered in London, to SME's in the FMCG sector. The questionnaire comprised six sections They are as follows: 1) company profile (highlights revenue generated by company, number of employees etc.), 2) information sharing (medium used, frequency etc.), 3) information usage, 4) supply chain relationships, 5) supply chain visibility and 6) plans for future development by the company. The questionnaires were administered in person at the company as it was felt that this allowed for interaction with the respondents. This method also allowed for feedback to be received in regards to issues that affected on-time delivery that may not have considered in the questionnaire. The respondents to the questionnaires were the managers of each department within the company, customer service representatives, warehousing personnel as well as other members of staff, who were involved in the decision-making process within the company, those who were involved in the usage and implementation of visibility tools, and those who were involved in meeting the delivery performance criteria.

The information provided in the questionnaire regarding visibility and on-time delivery allowed for an assessment to be made regarding the impact of supply chain visibility on delivery performance. Questionnaires were developed by extracting factors from the exploratory study as well as factors from extant literature in the area of supply chain visibility and on-time delivery. A pilot study was carried out in Jamaica where FMCG SME's were engaged in the study. Though the customers' questionnaires were administered in the UK, the fact that case study company received its products from Jamaica and the pilot tested companies operated in a similar manner to those in the UK, it was felt that the feedback from these companies would be able to assist in improving the final questionnaire. Also it would have been costly to administer the test in the UK, in person, as their were financial constraints. The information from the pilot study was used to refine the final questionnaire administered in the UK in order to receive feed back from FMCG SME's. The results from the pilot study and those gathered from the questionnaire administered at the case study company were presented at a Brunel University research seminar to obtain feedback from academics within the field. The questionnaire was amended and preceded to main field study where 63 SME's in London participated in the field study. The results were analyzed using SPSS.

4.5. Exploratory Study

Barrat & Oke (2007) and other leading scholars in supply chain visibility and on-time delivery have pointed out in their various research the lack of clear definitions, performance measurements, theories and extant literature on the subject of visibility and on time delivery in supply chain. Further, there is less literature focusing on FMCG SME's and as such most research regarding SME' are conducted through exploratory studies (Lakri & Dallery, 2014). Shields and Rangarajan (2013), stated that in cases where there are limited and not established literature and understanding of a topic, exploratory study becomes necessary. Therefore, the need to carry out an exploratory study was necessary so as to understand the case study's organizational operation, collaboration and relationship with its suppliers and customers, visibility tools usage and its delivery processes.

4.5.1. Analytical Hierarchy Process (AHP)

The AHP method can support managers in a broad range of decision making processes and complex problem solving, such as supplier-selection decisions, supply chain relationships, facility-location decisions, forecasting, risks, logistics, IT and delivery and so on (Partovi et al.,1989). Routroy (2009), used analytic hierarchy process (AHP) to analyze and categorize supply chain performance indicators and other significant categories. The exploratory phase of the study was carried out through the use of the repertory grid technique which is a form of AHP. The AHP/ repertory grid process considers both qualitative and quantitative constructs and combines them into a single elicitation interview enabling participants to share their views and discuss the topic under study. The elicitation of responses is done spontaneously and without any "prodding" of the interviewee.

The repertory grid is a technique for identifying the ways that a person construes (interprets or gives meaning to) his or her experience or understanding of the elements/ constructs that is being used to elicit responses. The repertory grid techniques was developed by an American clinical psychologist George Kelly in 1955 (Kelly, 1955). AHP/ RepGrid technique can be used to elicit responses from the decision makers of the organization or those persons who have expert knowledge of the subject matter(Cheng & Li, 2001). The technique has two main advantages. First it incorporates pair-wise comparison, that is in conducting the assessment the interviewee compares two objects or elements at one time, and uses judgement to provide a weighting. Secondly, this method is said to be more accurate than other methods as it achieves a higher level of consistency, as the more a person knows about the subject under study the higher the level of consistency in their responses (Cheng & Li, 2001). RepGrids have previously been used for various studies in various fields. Sachan and Datta (2005), discussed the use of the repertory grid technique for logistics research, Warrington et al. (2000) studied the application of AHP for supply chain relationships. The RepGrid/AHP technique can be categorized as full, partial or fixed. RepGrids can be full, partial or fixed. This study used partial RepGrids as this allowed the interviewees to be supplied with the elements that were considered important to the research study. This also allowed for the comparison of grids which contained common items usually with the objective of creating a consensual grid (Tan & Hunter, 2002; Wright & Cheung, 2007).

The AHP technique was used in stage 1 of the research (the exploratory study). The AHP was used to identify factors suppliers and customers of the research FMCG SME considered important in order to have a good business relationship and meet on-time delivery, hence leading to trust and improvement in supply chain processes. The analysis was conducted using Idiogrid version 2.4, written by James W. Grice, Ph.D, full professor of psychology at Oklahoma State University, it is provided online as a free open source software.

4.5.1.1. Participants Selection, Construct Development and Results

Specific participants with knowledge of the case study organization's IT infrastructure and usage, delivery operation, supply chain relationships, overall supply chain operation and general company operations were selected to take part in the study. The participants were individuals based at the case study company in London, and were mainly managers and heads of departments, who have adequate knowledge an information regarding the company's technology usage, supply chain relationships and the other constructs being assessed.To carry out the exploratory study, 20 participants were recruited into the study. Each participant was allocated one partial RepGrid which was completed manually, the participants were also allowed to have dialogue with some of their main suppliers and customers, to determine responses to the constructs being assessed as the research sought to capture responses from the suppliers as well customers. The AHP/RepGrid title (Supplier Relationships and Priorities for On -Time Delivery) was supplied. The elements and constructs used in the study were supplied jointly with the participants. Extant literature regarding supply chain relationships, as well as feed back received from the interviews at the case study company, was used to supply the elements and constructs to be used across the study. This minimized the risks of omitting some elements or constructs, and to allow for proper comparisons between the research constructs/elements (Jankowicz, 2004). The uniformity of the elements and results allowed for meaningful quantitative statistical analysis (Edwards et al., 2009), for this study only qualitative analysis was conducted from the repertory grid results.

The AHP/RepGrid technique facilitates the use of small sample sizes in comparison to other techniques, researchers are still able to derive meaningful analysis using this technique despite the sample size, (Wright & Cheung, 2007). This study's sample size was small, but was within the size considered acceptable for the RepGrid technique (Siau et al., 2010). According to Tan and Hunter (2002), a sample size of between 15 and 25 participants is sufficient to reach the saturation point of the study. Dunn , Pvavlak and Roberts (1987) went further and stated that saturation is typically arrived at on the tenth interview. It has also been stated that for repertory grid analysis there is no "priori determination of sample size done", instead several approaches are used and tested until saturation of categories is achieved. Another alternative is a sample rule of thumb of 15 to 25 participants to reach category saturation (Kachmann & Burk, 2017, p.2). Therefore, with this in mind the sample size of 20 was deemed adequate to collect data and achieve saturation. Saturation point in this study was reached after the

The participants were given a 3-point Likert scale to rate the constructs developed against the elements. Figure 4.3 & 4.4 presents a matrix of all the four constructs and generated responses. A sample of the AHP Questionnaire can be found in Appendix A4.

The data collected from the participants was analyzed using the Idiogrid software, the data was analyzed using Principal Components Analysis (PCA), Multiple Group Components Analysis among others. This was done to ascertain weightings for the constructs as well as to determine relationships between constructs and elements. The analysis in Idiogrid indicated that in terms of the weightings of the constructs on-time delivery was ascertained to be very important with a weighting of (0.97). High quality products were deemed as an important factor to low performing and high performing supplier, all types of suppliers considered meeting on-time delivery to be of priority, and all suppliers considered having shared values to be of high priority, but this factor was considered most important for high performing and low performing supplier. Communication was also considered to be of importance to the all companies but was elicited as being most important to average performing suppliers. These data were arrived at after conducting multiple analysis including ANOVA assessments. The data can be found in Appendix A4. These results of the elicited constructs were included in the final questionnaires administered at the SME customers' sites in London. The constructs guided the factors and questions developed for various sections of the questionnaire.

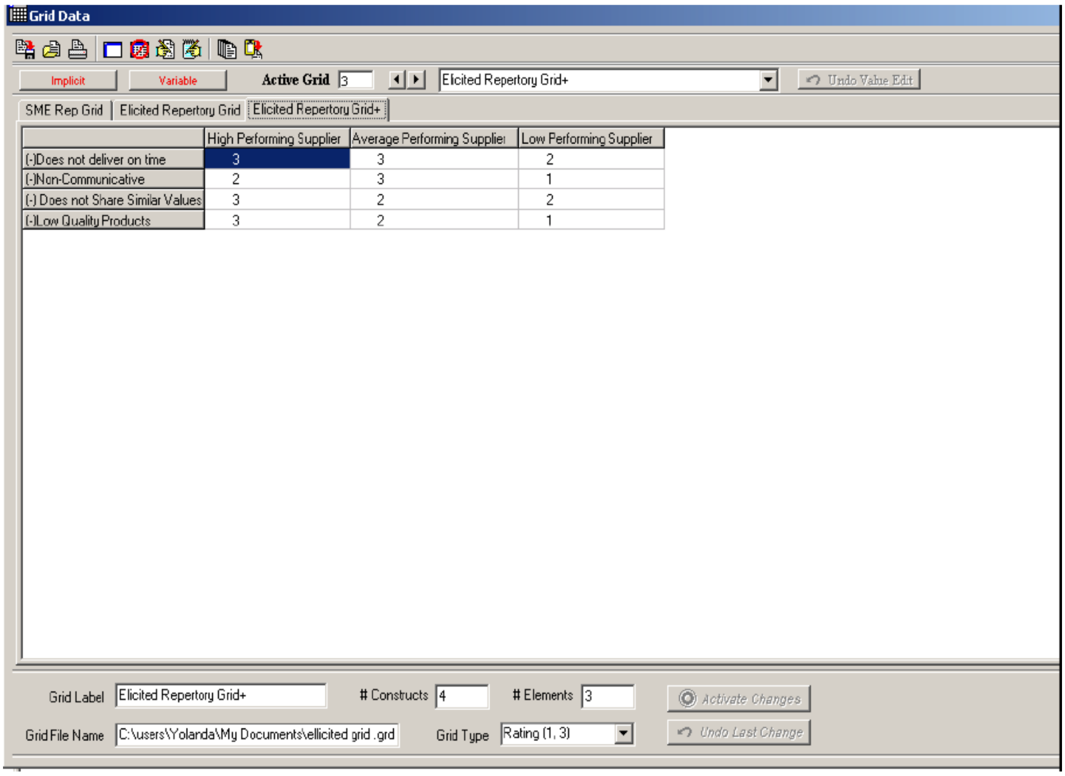

Figure 4.3.: Screen Shot of Exploratory Study Elicited Constructs

4.5.1.2. Interviews at Case Study Company

Interviews have been used by a number of supply chain researchers and is typically used for exploratory studies. Interviews can be structured or unstructured or semi-structured and allows for the collection data "in which selected participants are asked questions in order to find out what they do, think or feel "(Collis & Hussey, 2003, p.167). Structured interviews typically has closed questions which are prepared prior to the interview, unstructured and semi-structured typically has open ended questions and allows for explorations of answers in more depth (Collis & Hussey, 2003). Semi-structured and unstructured interviews are generally more difficult to analyze but can assist in providing depth of understanding of the research topic. Collis and Hussey (2003) points out that the advantage of unstructured or semi-structured interviews is that the method leads to open discovery. The interviews were conducted by the researchers after the interviewees were identified through dialogue with case study company. The interviewees were notified of the dates and times of visits at the case study company prior to the visit, so as to ensure that a mutually convenient time could be agreed on by all parties. The interviews lasted between 15 and 30 minutes for each person, the responses were transcribed by hand into a note book.

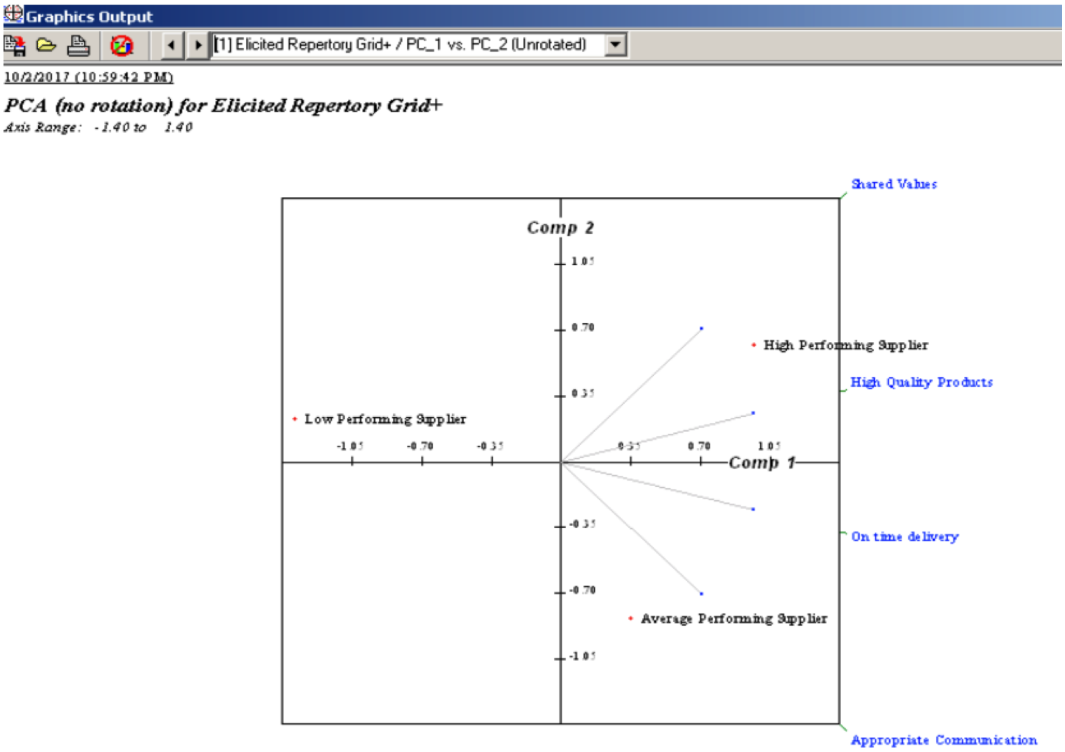

Figure 4.4.: Principal Components Analysis of Elicited Constructs

Brief semi-structured interviews were conducted with the participants in relation to case study company. Semi-structured was used as some questions were developed previously from the review of extant literature, but wanted to provide the interviewees and opportunity to discuss issues and content specific to the case study company that may not be linked to current literature on SME's. The interviews were conducted with the aim of identifying the important factors to the business regarding supplier/customer relationships. The interviewee was conducted with 20 persons, consisting of managers, supervisors, warehouse staff, suppliers and customers.The interviews allowed for comparison of the views of suppliers and customers within the FMCG/retailer sector regarding what factors they consider important to keeping the business relationship at its highest and beneficial to both parties. The questions asked were developed based on literature reviews and based on discussions with other managers/customers of similar organizations. Participants were asked questions similar to those used on the case study company's questionnaire but were allowed to elaborate and express their views in more detailed. Further more, in-depth interviews along with data extraction from the ERP-system were conducted. Their responses were transcribed and where there were any ambiguities respondents were allowed to clarify. See Appendix A5 for sample table of interview questions.

4.6. Simulation Study

Simulation and modeling techniques have been widely used in supply chain research as a tool to facilitate decision making (AbuKhousa, Al-Jarood, Lazarova-Molnar and Mohamed, 2014). This study used the ProModel software to design and model the operations of the case study company's warehouse. ProModel software is designed for discrete event system simulation which represents the chronicle sequence of events (ProModel-Corporation 2006). Figure 4.2 represents the characteristics of a discrete event during the simulation of the case study company.This result was obtained from using specific equipment and locations of the case study company's operation and products movement in a specific time period. The result can illustrate the utilization period of the location, resources etc. under study and also the unavailable period including idle time, maintenance down time and down time shift. The time scale resolution in this software can be adjusted in the range between 0.1 hours to 0.00001 seconds. The simulation was conducted to replicate the activities within the supply chain (with a large emphasis on the warehouse activities) over a period of one year. The simulation encompassed normally working days at the case study location which was typically Mondays through Fridays 8 am to 4pm. The simulation software provided by ProModel allows for the designing of the supply chain system or operation with useful data analysis and realistic animation graphics.

To study the impact of product movement based on delivery times from suppliers, on the timely delivery to customers discrete event simulation was most suitable, this is in accordance with other researchers such as Maloni and Benton (1997), who in their research discussed the use of discrete vent simulation as a means to critically assed supply chain partnerships, relationships and delivery. Simulation models provides a lab environment that allows for convenient testing of the various factors under study in the research.In addition, the simulation study allowed the input of data specifically from the case study company and experts within the company, thus making the results more robust. To be able to construct a simulation model that was as realistic as possible the simulation study was conducted in conjunction with the fast moving consumer goods case study company to ensure the model reflected their operations at their Welwyn Gardens warehouse and distribution center. In the model, each "company's operation was simulated, that is a model for Chadha was developed, one for Enco, one for Funny Bones and Grace foods UK. A simulation model of each supply chain was set up, including inputs via shipping or land transportation, the flow of goods throughout the warehouse to include stacking of shelves and movement of goods to the delivery trucks. The end customers' demand/ order requests were also replicated and the orders and frequencies of orders placed by the case study company to their suppliers was also replicated in the simulation model. The simulation modeled the end-to-end information availability and end-customer demand at all echelons in real time. The model was modified for each "company" within the case study company, so that physical inventory and order patterns were aligned in each time setting for each model, this eliminated inventory inaccuracies, and allowed for comparison of each "company" within the case study company. For each specific setting of the supply chain, at least 20 runs were conducted in order to get robust results as proposed by Swaminathan et al. (1998) and to determine whether or not the model worked in terms of consistency of results. Demand, orders and other variables related to the physical flow of products are continuous variables. End-customer demand is independently and identically normally distributed. The sample data used to develop the simulation can be found in Appendix C1, the data shows a sample product with dates ordered from supplier and customer and their respective delivery dates. There are three tables in the appendix, these tables contained the orders placed by the case study company to their suppliers, and the orders delivered by the case study company to their customers, the tables in the appendix contain information for the frozen foods business (Funny Bones), one for the ethnic side of the business(Enco) and one for the Oriental side of the business (Chadha). Sample results of the simulation can be found in Appendix C.

4.7. Questionnaire Design

A questionnaire can be classified into two main groups: the *structured interview* including, face to face interview, and telephone interview, while a *self-administered survey* includes internet survey and mail survey where the persons conducting the research is not present as it is completed. The use of questionnaires for the exploratory stage of the research as well as for the main study was preferred over other methods as it consists of "carefully structured questions, chosen after considerable testing, with a view to eliciting reliable responses from a chosen sample"(Collis & Hussey, 2003, p. 173). The aim in using a questionnaire to collect data is to use a method that will allow for the thinking or feeling of the research group /population/sample in regards to the research topic. Questionnaires were also chosen as data collection method as they are said to be an economical method for data collection (Frankfort- Nachmias and Nachmias, 2008), they are also an "easy" method to use to collect information form respondents especially when they are busy (Mengesha et al., 2014).

Two questionnaires were designed for this study, one for the initial phase of the research. The first questionnaire was administered to 20 persons at the case study company the persons targeted were managers and key personnel within the company, as the supplier/distributor is made up of semi companies operating under one umbrella; these were administered along with the conduction of interviews of management and key personnel at the company. The second questionnaire was administered to customer and likely customer population of the case study company. Each questionnaire was designed taking into consideration the research questions and framework, the questionnaires were developed by determining variables that relates to on time delivery, visibility, supply chain relationships and supply chain management.

Questionnaire for Distributor/Manufacturer/Supplier

The questionnaires for the case study supplier were drafted containing six sections. The questionnaire used in this study was developed using the extant literature and factors elicited from the exploratory study interviews. The first section allowed participants to provide demographical information such as their role (position held) within the organization, number of employees belonging to each section of the company, types of products sold by the company and annual sales. Each of these items was open ended questions allowing participants to write in their responses.

The second section consisted of both open ended questions as well as those having a box requiring participants to tick the appropriate response. Those that required participants to select a response were scaled using the Likert scale of very effective to not effective and very unique to not unique in response to items regarding the company's information sharing capabilities.

The third section focused on information usage and was scaled using both Likert scale and closed ended questions (Yes or No), participants were required to select the appropriate response or record their responses. Section four focused on the participants regarding supply chain relationships. Participants were allowed to share their views by responding to open ended questions and one Likert scale question assessing the importance of information sharing between partners and the case study company, participants could choose from a scale of very important to low importance.

Sections five and six focused on supply chain visibility and future development for the business respectively. The items were a mix of open ended questions, closed ended questions and those following the Likert scale. Participants were asked to share their views regarding the importance of supply chain visibility to the business and their future plans for visibility tools and the development of the business including new products. A copy of the questionnaire can be seen in Appendix A1.

Questionnaires for Customers

The questionnaires designed for the customers comprised of five sections, section A through E. The front page of the questionnaire comprised of an information sheet describing the purpose this study and the confidentiality information. A 5-point Likert scale was used to rate various measures used in the questionnaire. The 5-point Likert scale has been used previously by a number of researchers previously in the area of supply chain visibility and on time delivery (Li et al., 2006; Bichanga & Mwangi, 2014 ; van der Vaart & van Donk, 2008). The 5 point Likert scale has also been pointed out to be more suitable, as Likert scales above 5 such as 7 have not been found to increase the reliability of the questionnaire, reliability tends to level beyond a 5 point scale (Srinivasan and Basu, 1989). A copy of the questionnaire can be found in Appendix A3.

Section A of the questionnaire contained demographic items, such as name of the participants (customers of FMCG suppliers), the items were designed to ascertain information such as company name, type of company, this was important as there was interest in the specific type of business the customer was involved in(for this paper), such as whether or not the business was a pub, supermarket or ethnic restaurant. This was important as these are the types of business served by the case study company. Respondents were also asked the number of employees in the business because the focus of the research is on small and medium size businesses.

Section B contained items focusing on IT usage, respondents were asked to tick their answers. The scale used was a mixture of Likert scale with ranks from very high with rating of “5” and very low with a rating of “1”, and open ended questions which allowed respondents to share their views. Section C had a mix of Likert scale and mix of open ended and closed ended questions. The focus of these questions was to elicit the respondents view regarding delivery lead time and delivery performance.

Section D had items focusing on supply visibility measures, the items were ranked using a Likert scale of never ranked at “1” to always ranked at “5”. The items were designed to allow respondents to rate their views on visibility measures such as the ability of the respondents to make electronic payments to their suppliers; the respondents selected their response by a tick. These items allowed the researchers to ascertain from the respondents the degree to which they and their suppliers were integrated through the use of visibility tools. The final section E, contained items focusing on supply priorities using a Likert scale of significant decrease ranked at “1” and significant increase ranked at “5”. These items were designed to ascertain what areas of supply chain performance were considered a priority to the respondents. Table 4.5 provides a synopsis of the areas on the customer questionnaire and their link to the research questions for the study.

4.8. Ethical Considerations

According to Bryman & Bell (2007), and Collis and Hussey (2003) as it relates to research ethical issues tend to associated with the collection, analysis and reporting of data especially in the area of natural sciences such as medicine. Collis and Hussey went further to state that for business related research, ethics and ethical considerations are mostly in the hands of the researcher and research supervisor. In order to meet ethical requirements, a covering letter was attached with the questionnaire that explained the purpose of the study and the contact details of the research student . Ethical approval from the ethics committee at Brunel University was not needed, as the case study company had previously employed the research student and had given permission for the research to be conducted and provided access to the required data and information. Participants details were not revealed to anyone outside the research, this ensured security fo data and maintained the ethics of the research. The participants were told that their information would be

Table 4.4.: Research Questions & Questionnaire Links

Research Questions	Questions from Questionnaire
1. What factors do companies within the Fast Moving Consumer Goods (FMCG) supply chain consider a priority to meeting On Time Delivery of their goods and services?	Section B
2. To what extent are companies satisfied with the delivery performance of their suppliers within the supply chain?	Section C and Section D, Question 3
3. What percentage of companies uses information technology as a visibility tool to transact supply, purchasing and delivery business within the supply chain?	Section D and B
4. What is the lead time for companies who conduct business using information technology (visibility) tools?	Section E

treated with the utmost confidence, and that they could withdraw from participating if they desired to do so. Data will be stored in a password-protected personal computer accessible only to the researcher. All information submitted to Brunel University is also protected on their servers and is also protected according to the required laws.

4.9. Administration of Questionnaires

The initial questionnaires for the supplier were administered in July 2010 and 2011, these questionnaires were administered by the researchers and were efface to face. Of the 20 questionnaires administered 18 were completed on site and two were returned electronically (some respondents were absent during the two site visits). There was a 71% response rate as eight questionnaires (which were sent at a later date for absentees) were never returned to the researcher. The period chosen to administer the questionnaires was in the summer as the research student resides outside of the UK and as such the questionnaires and interviews were administered in the summer during the researcher's visits to the UK. Arrangements were also made to have questionnaires completed electronically for those persons who were not present during each visit, which totaled 10 over a two week period.

The customers' questionnaires were administered in July 2013 and were conducted by a data collector hired and trained by the research student and research supervisor. The data collector visited restaurants, pubs, supermarkets, wholesales and small shops located within Central London and had respondents complete the questionnaires. The questionnaires were administered over a three-week period as some respondents required return visits and more time to complete the questionnaires. The purpose of study was explained to the participants both via the cover page of the questionnaire but also orally as the questionnaires were distributed. This allowed participants to better understand their role in the study and the importance of this study to the field of supply chain research; they were also allowed to object if they did not wish to participate. The early elimination of unwilling participants helped to increase the response rate of the questionnaires. It took each respondent approximately 20 minutes to complete the questionnaires.

4.10. Pilot Study

According to Leedy and Ormrod (2001), a pilot study helps researchers to determine whether or a research study is feasible. Creswell (2008) also pointed out the importance of conducting pilot testing in mixed methods research, he stated that conducting these early testing of questionnaires and the interviews or any other research instrument allowed the researchers to determine whether or not the prospective respondents in the sample are capable of completing the questionnaires and understanding questions being asked in the research. For these reasons, the questionnaires and the interview schedule were pilot tested before they were used in the main the study.

To pilot test the customers' questionnaires, 15 respondents from FMCG companies similar in nature to the case study company were contacted, they were also informally interviewed. These participants were located in Jamaica as well as in the UK those persons in the UK were contacted via various Linkedin pages (such as persons at Tesco, Asda and other companies). The participants chosen were not random, as FMCG companies were specifically targeted, this was done as to allow for feedback from specific types of businesses. They were informed through emails about the research and their participation requested. The questionnaires were emailed to the participants as well as posted on a number of Linkedin pages. The respondents were asked to complete the questionnaire as well as to provide feedback regarding the items. These questionnaires were posted and emailed in early July 2013, within the first week of the month, 12 questionnaires were returned giving a response rate of 80%. Participants were asked to complete the questionnaire within a week and were also sent reminders to ensure they completed the questionnaires as well as to provide clarity to any questions they had. According to Creswell (2008), the participants were asked to "mark any problems on the survey, such as poorly worded questions that did not make sense, or if it takes an excessive amount of time to complete the instrument" (p. 402). Based on the feedbacks from the participants, items in the questionnaires and the completion time for the questionnaires were revised in the main study.

The participants provided feedback such as, Quoting respondent A: "The questionnaire is too long and required too much time to be completed, people are busy at work and would not have the time to complete such a long questionnaire". The participant went further to state that most persons would only be able to spare ten minutes to complete both a questionnaire and an interview combined. Quoting respondent B: " Section D - Visibility Tools needed a definition as to what was meant by visibility tools", the respondent also provided corrections regarding spelling and grammar on the questionnaire, and also stated that persons would not have time to do both a questionnaire and interview in one sitting. Quoting respondent D: " Question 20 should say make payments to suppliers internationally" this was not modified as it was felt that suppliers can be both local and international. The respondent also made corrections to typographical errors for questions 26 and 27. Basing on these comments, the questionnaire was amended, the modified questionnaire was resent to 2 previous respondent who felt it was much better than the previously administered questionnaire. The edited version of the questionnaire was used for the main field study, this included the addition of items and restructuring of the overall questionnaire, also for the main study interviews were not conducted, this was based on the feedback received during the pilot study. The sample pilot study questionnaire can be found in Appendix A2.

4.10.1. Pilot Study Reliability Test

According to Chen and Paulraj (2004) Cronbach alpha values of 0.7 or higher are typically considered adequate in most research, however values of 0.6 and slightly lower are permissible for newer scales. The Cronbach alpha method is used to assess internal reliability of a scale, in supply chain research it has been found that alpha values may decrease to 0.6 and lower especially for exploratory research (Ibrahim & Hamid, 2014) . Pallant (2013) has recommended an acceptable value of 0.7 for alpha values, however researchers such as Nunnally and Berstein (1994) indicated that values lower than 0.7 (ranging from 0.5 to 0.6) are acceptable especially for early stage research. The alpha values for this pilot study ranged from 0.5 to 0.7, a decision was taken to continue with these items (with some modification as suggested) as they were not very low and also the number of respondents was only 12.

The concept of reliability is important to research as it indicates that the research methods, design, data collection are reliable (Yin 2003). Table (4.6) indicates the measurement scales of reliability for the pilot study. Based on the reliability test results, supply chain visibility and visibility tools, visibility for coordinating an integration and performance dimensions were on the lower reliability scale (below 0.6) while the items of reliability measures and delivery performance all met the reliability assessment criteria (0.6 - 0.7). According to Nunally (1978), Cronbach's alpha values more than 0.5 are considered adequate for an exploratory study, Yusoff (2012) stated that alpha values within the range of 0.5 - 0.7 are considered acceptable. Therefore, with these acceptable alpha values progression was made to main field study.

Table 4.5.: Reliability Values for Pilot Study

Test Factors	Cronbach alpha (α)
Performance Dimensions	0.545
Delivery Performance	0.682
Reliability Measures	0.680
Visibility for Coordinating and Integration	0.554
Supply Chain Visibility	0.556
Visibility Tools	0.583

4.11. Main Field Study Sample Size- Selection of Participants

Sekaran (2003) defined sampling is the process of selecting the right individuals, objects, or events for study, while Thietart, Royer and Zarlowski (2001) defined it as a set of subjects from which data is collected. The final sample size of 63 was used as it has been proven that qualitative researches generally use smaller sample sizes than those of quantitative studies. There are a number of techniques that can be used for sampling, they are usually broken into two categories probability sampling techniques and non-probability sampling techniques. Probability sampling is seen as a representative sample (Denscombe, 2007; Sekran, 2003), as it easy to generalize a probability sample to the overall population using statistical techniques. Non-probability sampling on the other hand is seen as a judgmental sampling technique especially because the sample size can be very small and is not necessarily analyzed statistically at all times (Denscombe, 2007; Sekran, 2003).

Non-probability sampling is mostly used with qualitative research, it does not involve a random sampling method and as such there is no predetermined chance or probability that people or events can be chosen as a sample or a representative of the population (Nassar, 2011). The primary purpose of qualitative research sampling is to collect specific cases, events, or actions that can clarify and deepen an understanding of a phenomenon (Neuman, 2006), while for quantitative research sampling is used to acquire information that can explain, describe and/or predict a phenomenon. It is important to indicate that the use of the case study approach should not be seen as just a sampling of data for research (Tellis, 1997). The use of case study research allows for the analysis of a smaller number of parameters that are fundamental to the particular system being analyzed (Tellis, 1997).

Convenience sampling is simply a sample available to the researcher based on accessibility (Bryman & Bell, 2011) the most common of which is interviews conducted on the streets. It is a haphazard technique and provides quick, non-representative information regarding a group being investigated or public opinion regarding a matter being researched.

Purposive sampling involves sampling with a purpose in mind, it sometimes involves the use of quota such as sampling carried out by market researchers or what is called the snowball approach is used, this where a small of group of people relevant to the research are contacted and used as the sample. These snowball groups are then used to make contact with other persons for the research. Purposive sampling can be used in research where a targeted audience needs to be reached. It is said that with purposive sampling "you are likely to get the opinions of your targeted population" (Trochim & Donnelly, 2008, p.47).

purposive sampling technique was adopted for this paper, using the sub category of critical sampling which allowed for focus on a select population to be used for logical deductions regarding the research focus questions. Purposive sampling is used by researchers for small sample and population sizes, or when generalizability of data is not possible, but reflecting the diversity of the research population is important (Barbour, 2001). Purposive sampling is also useful when the research focus on a specific group of individuals, type of organizations or when resources are a constraint (Teddlie and Yu, 2007; Blumberg et al., 2008). Purposive sampling can be broken into a number of categories one of which is called critical sampling. Critical sampling is generally applied in exploratory research, research with limited resources as well as research where there are a small number of cases being assessed. Critical case sampling allows researchers to be decisive in exploring and explaining the research questions or phenomenon, thus critical sampling is used to make logical generalizations about a research sample (www.dissertation.laerd.com). The population for the primary data of this research is based on FMCG SME's based in London, the internet was used to locate information regarding these companies. Three hundred and forty (340) possible businesses in London were identified, due to time and financial constraints the decision was taken to collect data for locations in Central London (as the data collector was not able to travel to other locations across London). Creswell(1998) recommend a sample size of 20-30 participants for highly quantitative research grounded in theory, while De Beuckelaer and Wagner(2012) pointed out that most supply chain management research "rely on rather small samples" (p. 618). With these view in mind it was decided that 100 questionnaires would be sufficient to capture the views of the research target population. As stated by Endacott and Botti (2007) "ensuring that the sample accurately represents the larger population is more important than the size of the sample in quantitative research"(p. 235). The actual survey, shown in Appendix A3 is similar to the survey structure used in the pilot study except for corrections made based on feedback. The data collector administered 100 questionnaires of which 63 was returned, thus the final sample size was 63 responses.

4.11.1. Main Field Study Sample Profile- Description of Study Site

A "population" consists of all the subjects you want to study(Yount, 2006, p.1). A population comprises all the possible cases (persons, objects, events) that constitute a known whole (Yount, 2006). For this research study, a Fast Moving Consumer Goods company located in London was selected for the study. The customers it serves within the Central and South East London region were selected for the second phase of the study. The case study is considered a small medium enterprise because it has approximately 500 employees across its locations.Field (2013) defines a sample as a smaller (but hopefully representative) collection of units from a population used to determine truths about that population. Additionally, Gill and Johnson (2002) argue that engaging all members of a population in a study is not practical. Collis and Hussey (2013) define a population as a body of people or collection of items under consideration for statistical purposes. In a study on organization research, Bartlett et al. (2007) argued that inappropriate, inadequate or excessive sample sizes influence the accuracy of a research. Therefore, identifying a reasonable sample size is needed before the survey responses can be used to represent the population as a whole

The population chosen for the study were 298 Chinese Restaurants, 34 traditional pubs, 63 pubs, 93 bars, four major chain supermarkets having a number of locations across London, 67 Caribbean Restaurants, and 60 small family owned Caribbean small shops and approximately 100 oriental and other ethnic restaurants including Mexican as well as 23 supermarkets that were not affiliated with the five major brands supermarkets in the UK , these supermarkets also have a number of locations across London. To narrow the population size the decision was taken to focus on those business located within Central London, this was due to the fact that it was easier to access these business for data collection as transportation to the locations was centralized, also it was less costly and fitted with the timeframe that was available. The population size was (N=340) shown in Tab. 4.6. These businesses were narrowed down to smaller population and were chosen based on the type of goods manufactured and distributed by our case study company, as such these business fell into the population of their different types of customers. The case study company delivers outside of London also, but for the study only London was considered in terms of population size. Because restaurants, supermarkets and pubs were the largest of the population the decision was taken to try to access as much data form these companies as was possible during the time frame for data collection. The companies from which data was gathered were Asda, Tesco, Lidl, Waitrose, Slug and Lettuce Restaurants, Marks & Spencer , The Red Lion Pub, CostCutter Stores, The Bell House Restaurant, Sainsburys, Millenium Health Foods Ltd., Dominoes Pizza, Quality Foods Ltd. , Ocado Retail Shop, The White Harbor Pub among others.

Table 4.6.: Population and Sample of Participants

Type of Business	Participants	Population (N)	Sample (n)
Major Brand Supermarkets and other supermarkets	Store Managers, Purchasing Managers	50	20
Restaurants	Managers	200	20
Wholesale/Retail Store	Owners, supervisors	20	8
Local Shop Store	Owners	20	5
Pubs and Bars	Managers/Supervisors	50	10
Total		340	63

4.12. Reliability

Trochim and Donnelly (2008) defined reliability as the “consistency or repeatability of the research measures”(p.80). Creswell (2009) stated that for qualitative case studies reliability indicates “that the researcher’s approach is consistent across different researchers and different projects” (p.190). Creswell also stated that reliability means that the “scores from an instrument are stable and consistent” (p. 169). Yin (2003) as stated in Creswell (2009 p. 190) for case study research to ensure reliability researchers should document the procedures of the case study and document as much of the steps of the research and data collection procedure as is possible. It is also suggested that a detailed case study protocol and database is established during the research to ensure reliability of the information collected and analyzed.

The Cronbach’s alpha method was used to estimate the reliability of the items for the customers’ questionnaire, pilot study and questionnaire administered at the case study site. The overall Cronbach alpha for the pilot study, customer questionnaire and case study site were 0.570, 0.583, 0.597 respectively. Forza (2002) stated that in broadly defined constructs Cornbach alpha values of 0.5 -0.6 are acceptable, Pallant (2010) went further and stated that when there a small number of items for the research constructs the alpha value can be quite small. The alpha values for the three questionnaires were all close to 0.6, the acceptable value for small sample size research, thus these values were accepted.

4.12.1. Reliability Test of Data for Case Study Company and Customers

According to Lee and Hooley (2005), coefficient alpha is used to measure the internal consistency of a scale. Lee and Hooley, also stated that in the case of estimating the reliability of a multi-item scale, coefficient alpha can be used to provide an indication of the internal consistency of a measurement scale used to conduct research data collection. Coefficient alpha has been widely used in many areas of research such as psychology, sociology and it is widely accepted in technical research and other fields for the assessing of reliability when developing a multi-item scale. In particular, it can be used for testing with partial credit and for questionnaires using a Likert scale.

Reliability is the " degree to which measures are free from error and therefore yields consistent results"(Peterson, 1994). Cronbach alpha which was developed by Lee Cronbach in 1951, is typically expressed as a number between 0 and 1 (Streiner, 2003; Tavakol and Dennick, 2011). In this study, reliability test was calculated by determining the Cronbach alpha using SPSS version 20 software. Hair et al. (2010); Bryman and Cramer (2011) have all recommended values of 0.7 as acceptable, but researchers such as Nunnally and Berstein (1994) have indicated that values ranging from 0,5 to 0.6 are acceptable, especially for conceptual, exploratory and early stage research. However, Keszei, Novak and Streiner (2010) argue that reliability is a function of the test instrument being used, the group being assessed and the circumstances of the assessment, therefore very high values may be a reflection of duplication of content across items and may indicate redundancy and not homogeneity of data.

Keszei et al. (2010) as well as Peterson (1994) indicated in their research that for small sample sizes the alpha values tend to be low, a low value of alpha could be due to a low number of scale categories, poor interrelatedness between items or heterogeneous constructs . A low alpha value will also be obtained if the sample size is small or the scale used for assessment is small (e.g., for Likert scale a scale of between 5 & 7 responses is usually recommended) as was the case with this early stage survey conducted at the case study company. Nunnally and Bernstein (1994) indicated that 0.7 should be used as a cut-off point for alpha values but they went further to state that values between 0.5 and o.6 are also satisfactory. Panayides (2013) discussed the effects of sample size, number of items and data type on alpha value and concluded in the research that a high alpha does not necessarily concludes that the data is reliable.

Other researchers of similar papers regarding supply chain visibility have found that alpha values for this type of research tends to be low. For example Koh et al., 2007 used Cronbach alpha values of 0.63 and 0.8 to access the factors of strategic collaboration and lean practices (supply chain relationships) and outsourcing and multiple suppliers (delivery performance, technology etc.) for the supply chain SME's they researched. These values were accepted in peer reviewed journals despite being below the cut off of 0.7. Therefore, a maximum Cronbach alpha value of 0.5 was accepted by this researcher.

Table 8.2 shows the reliability coefficients for the factors tested on the questionnaire administered at the Case Study company. This first questionnaire was administered in order to understand the visibility tools used at the company in their current operation. The overall operational factors and how these affected or contributed to on-time delivery also needed to be understood. For the case study company as shown in Table 8.2, three factors were below the 0.5 cut off point and not considered valid for the research, all other four factors met the 0.5 and higher alpha value.

Table 4.7.: Reliability Values for Case Study Company

Reliability test for test factors – Case Study Company (N= 20)

Factors	Cronbach Alpha
Information Sharing	0.110
Information Usage	0.514
Supply Chain Visibility	0.492
Supply Chain Partnerships	0.548
Future Development	0.669
Information Visibility & Information Sharing (Combined)	0.433
Supply Chain Partnership & Supply Chain Visibility (Combined)	0.548

Table 8.3 shows the reliability of each factor used in the field study questionnaire administered at the Case Study company's customers site. Factors that were deemed important in assessing the visibility and on-time delivery impact at the customers' locations were identified. Table 8.3 displays the alpha values for the test factors assessed at the customers' sites, as shown one factor did not meet the required reliability factor, all others were 0.5 and higher.

Table 4.8.: Reliability Values for Data Relating to Customers

Reliability Test Factors for Case Study Customers' Site (N=63)

Factors	Cronbach Alpha
Information Technology Usage	0.062
Suppliers' Lead Time	0.536
Supply Visibility Measures	0.689
Supply Chain Priorities	0.585

4.13. Validity

Validity of a research method as defined by Creswell (2009) is said to be the "process by which the researchers checks for the accuracy of the findings of the research by employing certain procedures"(p.190). While Trochim & Donnelly (2008) states that validity is the "best available approximation of the truth of a given proposition, inference or conclusion"(p. 56). According to Gall, Gall, and Borg (2007), researchers should be able to claim that the responses collected from the respondents represent their true opinions of what was asked. Validity checks provided assurance that the items used in data gathering accurately represents the construct being measured, in the case of this research the impact of visibility on supply chain delivery performance. It is with this mind that a description of how the validity of the data collection instrument was estimated ad was provided. Validity is inherently more difficult to establish within a single statistical measure. If a questionnaire is perfectly valid, it must measure in such a way that inferences drawn from the questionnaire are entirely accurate.

In this thesis, content validity as well as internal validity was the main focus. This was done as the research followed the system approach as such internal validity is of high importance when using this research approach. Good internal validity will be ensured through interviews with several persons where the same questions are asked. To avoid the risk of unprepared answers, which can contain errors and misunderstandings, the interviewees was be given the possibility to read the questions well in advance to ensure valid answers. All information given in the interviews was to the extent possible validated through secondary sources such as data of a similar nature contained in peer reviewed journals. This is especially important in the cases where only one interviewee has given information.

Content validity for this paper was achieved through the use of a table of specification in which the items for the questionnaire were cross referenced to the main research questions. This was done to ensure that each item answered the research questions. Content validity was also achieved as an the assistance of an expert in item construction was sought, the expert also commented on the quality of the items in the questionnaire as well as to assist in developing the questionnaire.

4.13.1. Normality Test

According to Tabachnick and Fidell (2013), normality checks allows researchers to determine whether or not the variables being assessed follows a normal curve. Tabachnick and Fidell went further and stated that statistical techniques required for the assessment of data, is built on the premise of the data following a normal distribution curve. Multiple regression analysis is also built on the premise, that is the analysis of the relationship between dependent and independent variable is carried out based on the assumption that the variables are linear in nature. If the relationship is not linear, the regression analysis will not yield effective results (Pallant, 2010).

According to Pallant (2011), variables that are not normally distributed can have a negative effect on the values obtained in regression analysis. Pallant (2011), suggested that checks such as skewness, kurtosis and data plots can be used to determine normalcy of data. The normality assumption could be checked with the help of probability plot such as scatter plots (Pallant 2011; Field , 2005). The distribution of residuals must be normal. Pallant (2011) and Tabachnick and Fidell (2013), went further to describe skewness as the level of symmetry of a distribution, positive skewness indicates that most variables are below the mean, while a negative skew indicates that most variables are above the mean. On the other hand kurtosis is used to describe the level of peakedness of a distribution, and the typical acceptable range of kurtosis for normal distribution is between ± 1 (Pallant, 2013; Hair et al.,2010; Tabachnick & Fidell, 2013). Other researchers such as Trochim and Donnelly, (2006); Field, (2000 & 2009); Gravetter and Wallnau, (2014), have stated that ± 2 or ± 3 is an acceptable range for skewness and kurtosis. Pallant (2011), stated that variables that exhibit a large departure from normality can be transformed by either using square root transformation, log transformation or inverse transformation.

Table 8.4 displays the skewness and kurtosis values for the test factors of the main field study data (customers data) for this research. As shown in the table all values were in the range of ± 1 and as such the data was accepted as normal. Linearity checks using Q-Q plots was also conducted, these can be found in Appendix F. The normality scores for the questionnaire administered at the case study company indicated large skewed values and kurtosis, outside the accepted range, as such these results were assessed using non-parametric analysis. Normality test was not conducted for the data gathered at the Case Study company, as the design of the questionnaire was for exploratory data collection and as such was not designed to conduct normality test and other checks.

Table 4.9.: Skewness and Kurtosis Scores for Factors Relating to Customer Questionnaire

Skewness and Kurtosis Scores

Variables	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Information Technology Usage	-.091	.302	-.683	.595
Suppliers' Lead Time	-.542	.304	-.140	.599
Supply Visibility Measures	-.520	.304	-.618	.599
Supply Chain Priorities	-.745	.302	.059	.595

4.13.2. Outlier Test

Outliers are defined as scores that have significant differences from the rest of data under analysis (Field, 2013), they can arise from incorrect data entry, the failure of the researcher to identify errors among other reasons. It is important to assess for outliers and identify whether or not these needs to be removed or transformed. Outliers affects the ability of the data to be analyzed using parametric testing techniques (Pallant, 2013). Tabachnick and Fidell (2013), also stated that if outliers are present during parametric analysis, this will affect the researcher's ability to generalize his/her results. Though this research paper did not provide for generalization of the results, checks for outliers were considered important to ensure that testing and analysis of results would be accurate. In this research, respondents rated the questions outlined in the customers' questionnaires on a 5-point Likert scale, questionnaires administered at the case study company were not designed using a Likert scale. To assess the outliers in the data set of this research, box plots were generated using SPSS software.

The presence of outliers has an effect on the results obtained in conducting regression analysis, however it is not necessary at all times to remove outlier. If outliers are not being removed, they can be transformed through the square root transformation, log transformation, and inverse transformation methods. Pallant (2013), suggested that if outliers are not being removed, they be transformed as this helps to improve normality results. Scatter plots are generally used to indicate the presence of outliers in the study data, values with standardized residuals greater than +3.3 or less than -3.3 indicates the presence of outliers (Pallant, 2010; Tabachnick & Fidell, 2006). Outliers in data will also appear as small circles outside the minimum and maximum ranges of the box plots (Pallant, 2013).

The scatter plots are shown in Appendix F and the box plots in Appendix G, these are for the main field study data, as the data collected at the Case Study company was not analyzed for outliers. From the box plots shown in Appendix G, scores lying outside the minimum and maximum value of the box plots for the predictors information technology usage, supply visibility measures and supply priorities were not identified. An outlier was identified for suppliers' lead time, but according to Pallant (2011), if the trimmed mean and the mean values of the data are very different further investigation should be carried out, if they are close in value the data can be accepted despite the outlier. The trimmed mean and mean for the factor, supply priorities were (34.12, 34.03) respectively, these values are very similar as such the the data set was retained as part of the analysis. Figure 8.1 shows the boxplot for suppliers' lead time and shows the single outlier.

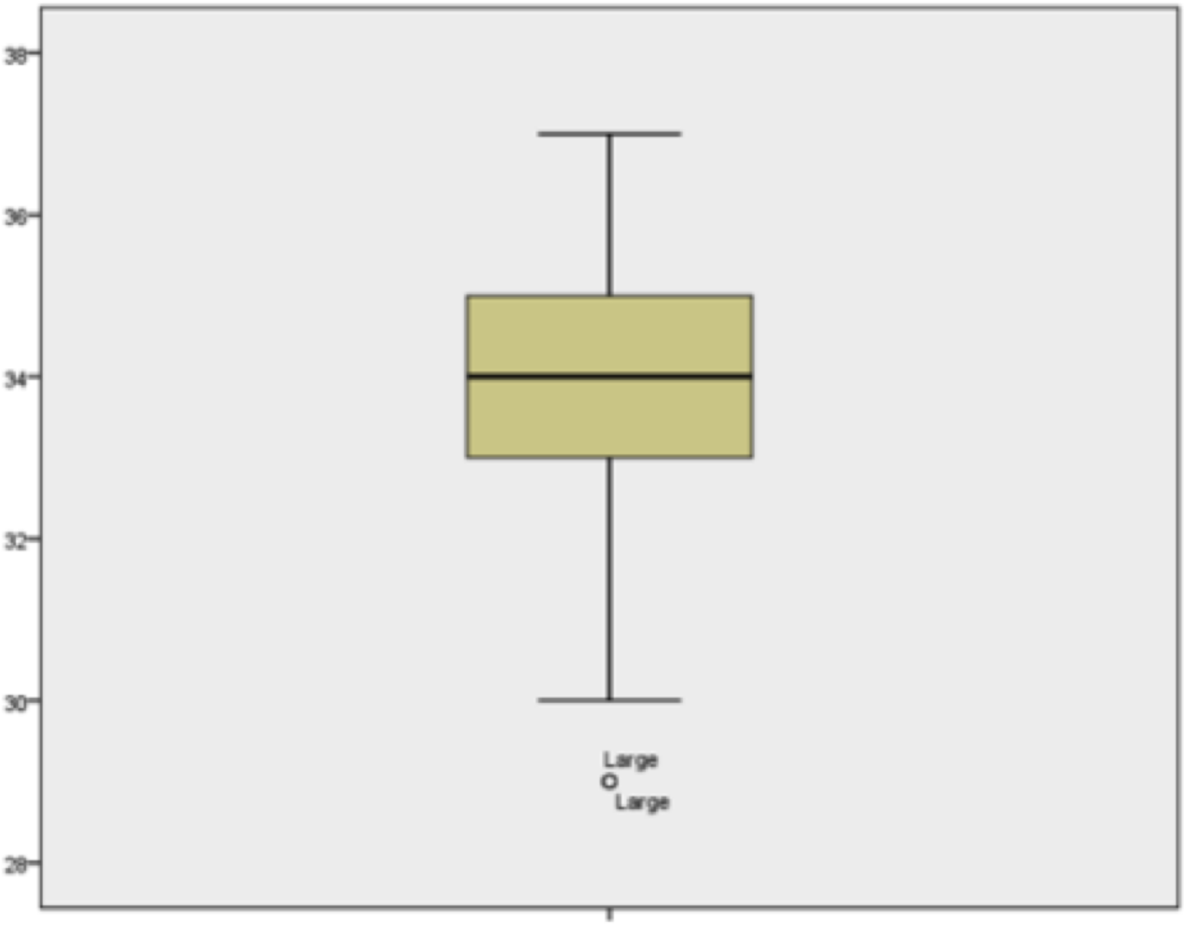

Figure 4.6.: Boxplot for Precursor Factor (Suppliers' Lead Time) showing One Outlier

4.13.3. Multicollinearity Test

The purpose of regression analysis is to estimate the dependency of parameters, not to determine interdependency relationships (Farrar & Glauber, 2005), multicollinearity analysis allows for the assessment of relationships of the variables to be used in the regression analysis for the study. Multicollinearity affects the results of regression analysis and as such data checks must be conducted to ensure this is not present, its presence results in data that is sensitive to model changes and the sample coverage (Farrar & Glauber, 2005). Multicollinearity also results in P values of the independent variables that are outside the acceptable range. P-values allows researchers to tests the null hypothesis, if the value is <0.05, the null hypotheses can be rejected.

According to Pallant (2011), multicollinearity also indicates a high degree of correlation between independent variable, this occurs when ($r = 0.9$ and above). Pallant also discussed the fact that high correlations between variable provides a difficulty for the assessment of importance of each individual variable. It is extremely difficult to treat variables that are highly correlated, as individual entities (Bryman and Cramer, 2011). Variables with high multicollinearity displays high standard errors and significance levels, as such Pallant stated that acceptable values of tolerance and VIF are 0.1 and 10 respectively (Pallant, 2011). As can be seen in Tables (8.5 and 8.6), the values of correlation for the variables are less than 0.9 ($r < 0.9$), therefore the multicollinearity assumption is not violated. the strongest correlation is seen between suppliers' lead time and supply visibility ($r = .678$). This is also supported by the VIF value, which is less than 10 for each variable. See Table 8.6 for Tolerance and VIF values.

Table 4.10.: Pearson's Correlation Matrix

Variables N= 63	Co. Size	IT Usage	Supp. Lead Time	Supp. Vis. Meas.	Supp. Pri.
Co. Size	1	-.034	-.107	.204	-.207
IT Usage	-.034	1	.201	-.084	.147
Supp. Lead Time	-.107	.201	1	.678**	.426**
Supp. Vis. Meas.	.204	-.084	.678**	1	.603**
Supp. Pri.	-.207	.147	.426**	.603**	1

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

Table 4.11.: Tolerance and VIF Values

Variables N = 61	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig	Tolerance	VIF
Constant	4.733	2.342		2.021	.048		
IT Usage	.094	.050	.222	1.880	.065	.807	1.239
Supp. Lead T	-.217	.065	.-521	-3.352	.001	.466	2.144
Supp. Vis	.248	.047	.939	5.284	.000	.357	2.805
Supp. Prio.	-.343	.077	-.609	-4.432	.000	.597	1.676

Dependent Variable: Size of Companies

4.14. Triangulation

Triangulation as defined as the using more than source or type of data and data collection methods to ensure validity or credibility of data collected on the same topic (Saunders, Lewis & Thornhill, 2015). However, the purpose of triangulation is not necessarily to cross-validate data but rather to capture different dimensions of the same phenomenon. Denzin (1970) refers to the approach as using multiple observers, theoretical perspectives, sources of data and methodologies for a research (Trochim & Donnelly, 2008). In qualitative research, triangulation is mostly achieved through the use of observations, interviews, and surveys. The traditional triangulation approach was employed for this thesis, where questionnaires were used along with interviews and document reviews (peer reviewed journals and texts), these methods focused on similar research questions/ topics so as to increase the confidence level in the research findings. Also the fact that questionnaires were administered to both suppliers and customers allowed for areas of convergence as well as divergence to be identified.

4.15. Data Analysis

In this section the methods used for data analysis is described. These methods were based on the data collection methods.

Questionnaire data analysis. Researchers have identified the processes or steps that are critical to the analysis of data gathered through the use of questionnaires. Creswell (2008) outlined three main steps to be followed when analyzing research questionnaires, the first step involves identification of response rates and response biases, and this is done by recording frequencies and percentages into a table. Secondly, the data to be analyzed was read through and organized, this steps also includes the coding of the data. According to Bryman and Bell (2011) coding is a crucial stage in the process of content analysis in research, coding is enhanced through the use of a coding manual or codebook which contains a list of the variables used in the questionnaire along with codes that the researcher uses score the responses from the questionnaire. For example the researchers used a code of 999 to represent missing response for the questionnaires. Data were missing because responses were not provided by some respondents. For the closed- ended items ordinal scales were used to represent strongly agree (5) or strongly disagree(1) as well as very important(5) or low importance (1) and significant increase (5) or low increase (1). After coding, the data was entered into the SPSS program (version 20). The data was then 'cleaned" or inspected to ensure that they were within acceptable ranges, according to Creswell, cleaning the data is the "process of inspecting the data for scores (or values) that are outside the accepted range" (p. 189). This was achieved through visual inspection of the data set as well as through the use of descriptive statistics such as frequency distribution, mean etc.

The third step involved selecting and conducting statistical tests. This was done through the use of descriptive statistics to ascertain trends from the data. Before descriptive statistics analysis is carried out inferential statistical analysis is carried out and depending on the research questions and type of data collected, at this stage interpretation and summarization of findings may be conducted, if needed. The final step involves the analysis of the data through the use of descriptive statistics (frequency and percentage) as well as inferential statistic (Cronbach's Alpha, regression analysis and ANOVA) was used to analyze the items in the questionnaire.

Multiple and single regression analysis were conducted, through the use of SPSS version 20. Pallant (2013), stated that multiple regression technique can be used to analyze the relationships between one dependent variable and a number of different independent variables. While single regression analysis allows for the testing of one independent variable and one dependent variable. Pallant further stated that regression techniques allows for relationship analysis that have sound theoretical or conceptual foundations. Therefore, the number of respondents for this research is (N=63)

Interview and open-ended questions data analysis. The responses to the open ended questions provided on the questionnaires (customer, case study company and pilot study) and interviews were read, and as best as possible followed followed guided steps in analyzing these responses. Taylor-Powell (2003) recommended five steps in the analysis of open ended questions and interviews for qualitative analysis. The researcher followed closely these steps, as such the responses were transcribed, read and re-read to ensure the researcher understood the data and to remove biases. The next step involved the organization of the responses into categories and sub-categories where necessary, patterns or connections were identified between the categories, some responses were then coded and entered with other data into the SPSS analysis. Those responses that could not be coded for computer analysis were instead interpreted for meaning and used in writing the research narrative.

Simulation Data Analysis (ProModel). Data gathered from the case study company (the data represented two years of product movement from supplier to customers) was used to build a simulation model, the model was built using the ProModel Software Student Version. Each product was assessed for frequency of orders to supplier, shipment or trucking duration to case study company, duration for shelves stocking in the warehouse, duration for order picking and frequency of delivery to customers. The data was used to simulate the processes that occur within the supply chain of each section of the case study company.The model allowed for the illustration of equipment utilization within the case study warehouse, check idle time of equipment, unavailable time and percentage of time delivery trucks were filled, idle or empty. To develop the model, there are four common objects in the software (ProModel) that was employed: Location: location in this system refers to as a place that is assigned to process/perform and storage entities or even determine decision making. Entity: any objects that are processed in the model are called entities. For this research the entities represented products being moved through the system. Resource: resources represent an object that is used for one or more of the following tasks: conveying entities, supporting operations on entities at locations, operating maintenance on locations or other resources. For this research the resources were forklift, loaders and unloaders, trucks etc. Process: process were used to determine the routing of each product throughout the supply chain system (that us from supplier, delivery to warehouse, movement through the warehouse to the point products are loaded on to delivery trucks). Figure 4.5 displays a sample result for an off-loader used in the warehouse. This data indicated that for the movement of goods in the warehouse for the Oriental products (Chadha) the equipment offloading goods from shelf to trucks was idle only 20% of the time, the equipment was utilized/in operation 80% of the time. These results were replicated for the other sections of the business (Enco, FunnyBones and Grace Foods) the information relating to how the goods flowed through the warehouse and were delivered to the customer, was used to identify the fact the supply chain processes played a part in meeting delivery times. As such a section of the main questionnaire focused on supply chain processes, hypotheses were also developed to test the influence and/or impact of supply chain processes on meeting on-time delivery. ProModel Simulation is capable of indicating that a problem exists in the system being modeled, but the simulation is not capable of saying what the issues are or what specifically causes the issues, hence conducting further analysis through questionnaires allowed issues to be identified in the research.

AHP Questionnaire analysis. Responses were read through and assessed according to frequency of responses for each pair of items listed on the questionnaire. the questionnaire was short and contained only four pairs of items to be selected by respondents, hence frequency of responses was appropriate and a simple way of assessing the data.

4.16. Limitations of the Study

Due to personal contact to all of the managers at case study company the usual accompanying problems with accessing primary data and having low response rate did not occur for the first set of questionnaires and interviews. The research however, was impacted by response rate for the customer questionaries; of the 100 questionnaires administered the response rate was approximately 63%. This is considered good but the an 80% percent response rate was the aim for this thesis.

4.17. Chapter Conclusion

In this chapter, various research methodology, paradigms and tools have been discussed. This chapter highlighted the research plan, methodology tools used within the research to collect and analyze data for this study. The total respondents to the main questionnaire totaled 63, the next chapter will discuss further the findings and data obtained from the various data gathering tools. The next chapters also covers data analysis using ANOVA (analysis of variance) and the regression analysis.

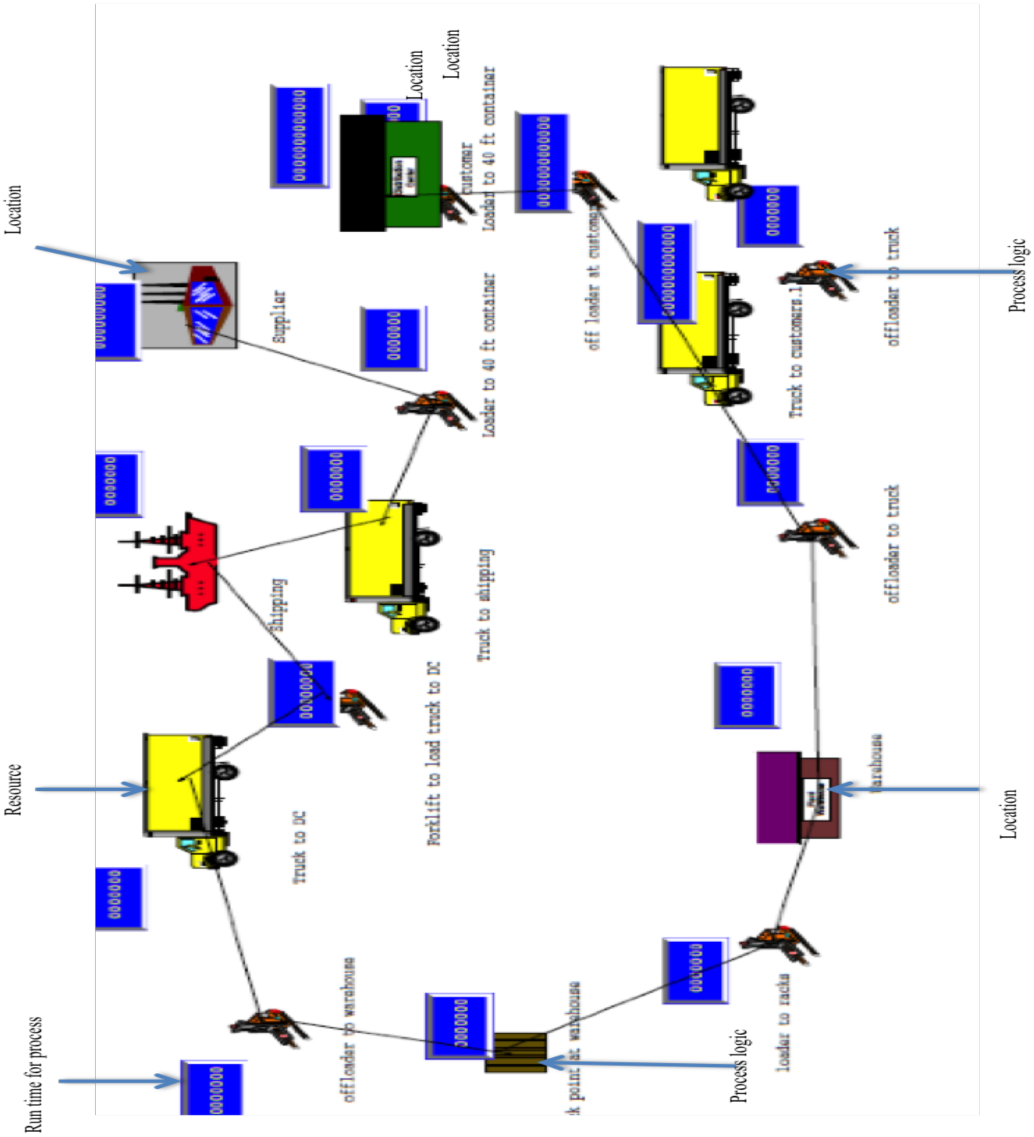

Figure 4.5.: Time Weight Simulation Model of the Case Study Company Using ProModel

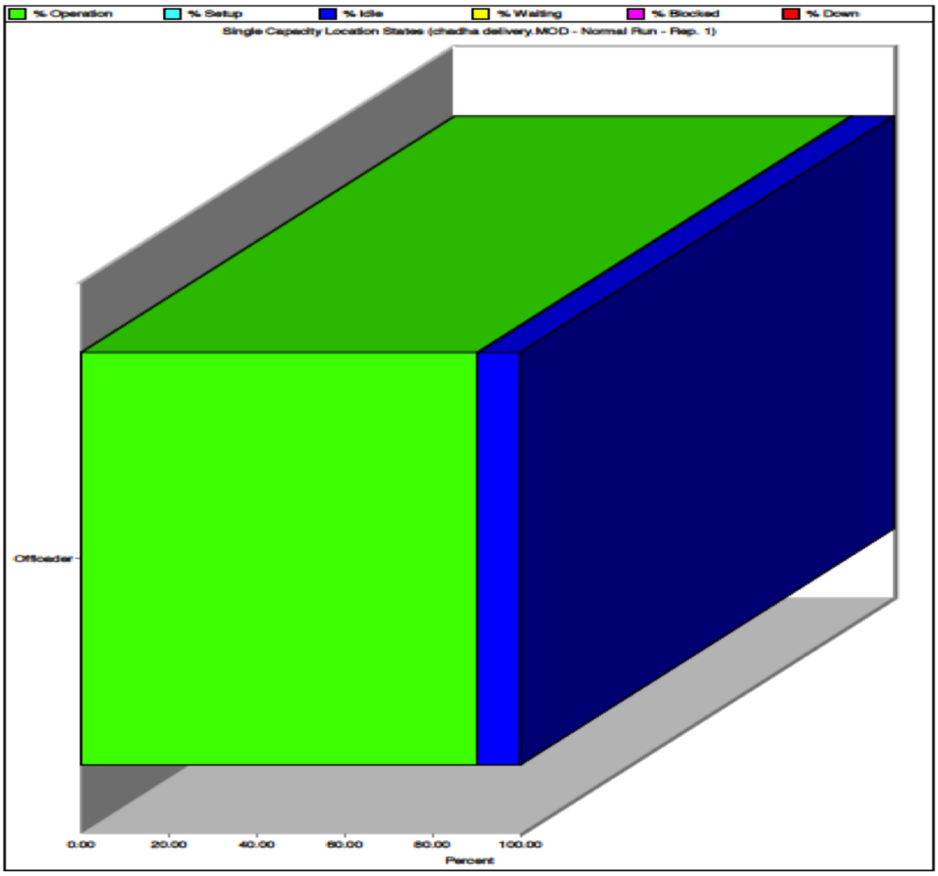

Figure 4.7.: ProModel Result Showing Idle Time on OffLoader in Warehouse-Chadha Company

5. Preliminary Case Study Research

5.1. Introduction - A Case Study of a UK SME Food Distributor

An analysis of a FMCG case study company located in London, UK was conducted, from this analysis the outcome and findings of implementing visibility measures by an SME was presented in the the Journal of Arts, Science and Technology, (2012, 5, p.126-147). The published work was an early analysis of the impact of visibility tools as this research went further to also assess the impact of visibility tools from the customers perspective. The published paper presented data and findings from the supplier's perspective(case study company in London). Supply chain visibility and its impact on supply chain performance have been gaining interest in the area of research, but it has remained ill-defined and vaguely understood when assessed specifically in the area of on-time delivery performance. This research focused on a non- traditional supply chain, consisting of three independent companies operating with resource dependencies to achieve visibility and delivery performance. The research work was able to show the positive impact of supply chain visibility on delivery performance; the study shows some promising results in regards to improving operational efficiencies within SME's with the use of visibility tools. The analysis and presentation of findings on the case study company was done as a part of the exploratory study (stage 1 in Figure 4.2) for the overall research.

5.1.0.1. Background on Case Study Company

The case study company used to in this research is based in the United Kingdom; the company is made up of a manufacturing arm as well as a distribution arm. The distribution side of the company is made of three independently operated companies. These three companies supply fast moving consumer goods (FMCG) to three different target markets within the United Kingdom. The focus of one company is the distribution of frozen foods to pubs; the second company distributes oriental items to small corner shops and the third distributes Caribbean food products via major retail chain supermarkets.

The operation of three companies independently, yet depending on the same resources of people, transport, finance, equipment makes operation somewhat unique and as such provided unique challenges. This operation is not a typical linear supply chain but instead is made up of a number of tiers. The major challenge faced by the company was the integration of technology to allow its staff to have access to every point of the supply chain of each company while meeting its cost measures and customer satisfaction parameters. As such, the company invested in the use of various visibility technologies such as supplier management software, customer order interface software and warehousing and distribution software. This provided a means of interfacing with their suppliers as well as customers along the supply chain, the overall aim of this investment was the improvement of delivery time, as this was costing the company a lot of money annually. Failure to deliver on time to the major retailers within the United Kingdom incurs a penalty, and over the years, this charge has been very costly for the company, as they had not been meeting delivery requirements. Thus, the need for this research, to provide a means of assessing the impact the installation and use of visibility tools have on the improvement of delivery time.

The diagram shown in figure 5.1 outlines the operation of the case study, data was gathered from the main entities of the case study company, the data gathered was used further to assist in the development of the AHP questionnaire, the analysis and data gathered was also used in the development of the simulation study as explained in the framework diagram Figure 4.2.

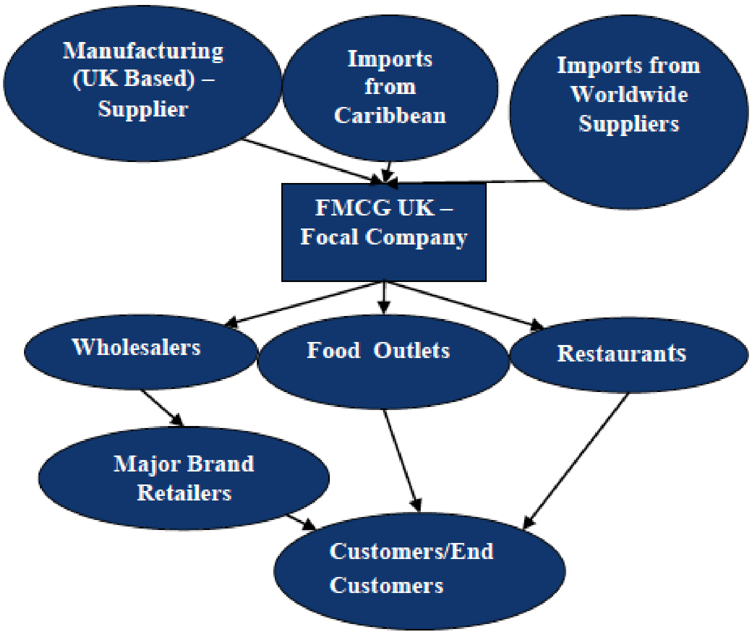

Figure 5.1.: Schematic Layout of Case Study Company

5.1.0.2. Visibility Measures for SME's in the FMCG sector (using case study Company as reference)

The measurement of the impact of visibility on delivery time within the case study company follows the trend of research regarding supply chain performance measurement. The issue of measuring a company's performance whether it is a small company or a large one has been found to be even more important today than in the past due to globalization, market competitiveness, reduction in product life cycle and the volatility of the present markets (Caridi et al., 2010). The success of on-time delivery has to take into account delivery lead time, this is defined as the elapsed time measured from the point in time an order is taken to the time of delivery to the customer (Guiffrida and Nagi, 2005). Visibility is of importance to supply chain performance as it said to provide three major improvements, first it is said to improve operational efficiencies as it reduces stock outs; secondly, it improves the planning process through the reduction of inventory and safety lead times. It also improves delivery time and accuracy, and it improves competitive advantage (Caridi et al., 2010). The impact of visibility on delivery time has always been focused on linear supply chains and as such this performance metric (on time delivery) has mostly been measured within this scope of analysis (Caridi et al., 2010).

According to Silvera and DeCoster (2012), the impact of on time delivery on an SME supply chain is linked to the overall strategic goals of the organization, the commitment to deliver on time affects the performance measurement associated with the costs of product lateness. In the case of the case study company there is an associated cost of ₤100 per case of product delivered late to the major brand retailers, this has amounted to as high as a ₤100,000 in one month and a low of ₤17,000. It has been found that on assessment of the impact of visibility on the strategic goals of an organization, that there is clearly an impact on delivery performance whether it is positive or negative, this is so as delivery time forms part of the framework of the organizational strategic goals for a supply chain (Silvera and DeCoster, 2012). In order to assess the effect visibility has on delivery time; it is necessary to outline the linkages between visibility and the performance factor of delivery time. Silvera and DeCoster were of the view that the FMCG Company deduced the following strategic goals as being important to the success of the application of visibility tools (see Figure 5.2).

In Figure 5.2, Silvera and DeCoster (2012) outlined the important visibility factors used for investigation of the case study company. The factors were the quality of information garnered this meant whether or not the information shared among the supply chain partners was accurate and free from errors. Information usefulness was also identified as an important factor as well as the trustworthiness of this information garnered. Information usefulness spoke to the fact that the information shared among the supply chain partners should be what is needed to ensure it can be used to meet the needs of all parties. The information should also be trusted in that once shared the supply chain partners can be confident that the

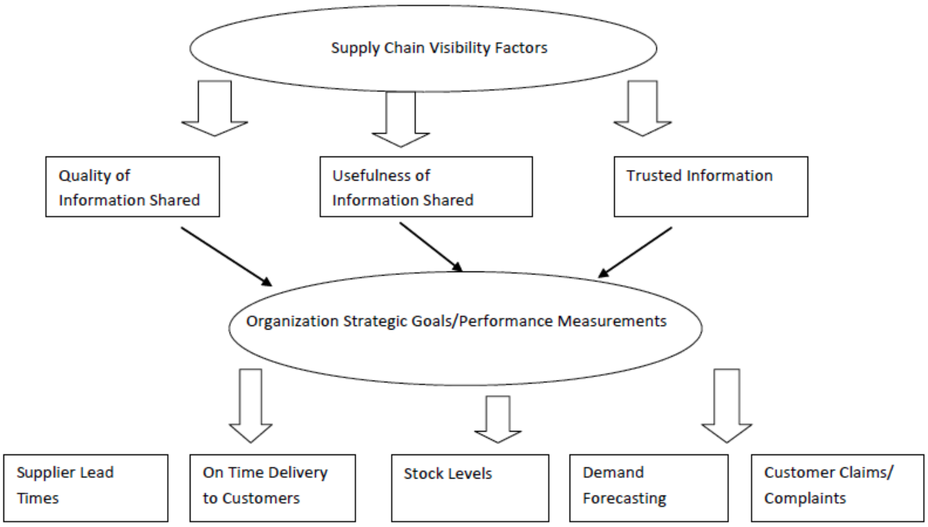

Figure 5.2.: Performance Variables& Strategic Objectives needed for Supply Chain Visibility.

information is correct and be used to enhance operation. These factors determined whether or not the information gathered through the use of various technologies provided visibility for the company (Silvera and DeCoster, 2012). The organization assesses the level of visibility obtained through its performance measures; it is said the higher the visibility achieved from the visibility factors, the greater the organization's perceived performance (Holcomb et al., 2011). The factors of: quality of information shared; usefulness of information shared and trustworthiness of information is analyzed within the case study company, from this their organizational operational strategies and performance metrics were derived. These are derived on the basis that they provided visibility to all the parties in the chain, hence allowing for efficient and effective operation and the meeting of customers' needs. In the case of the case study organization the performance factors of importance were:

suppliers lead time(time it takes form the pacing of an order by the case study company to its various suppliers and the time takes for said ordered to be delivered in London);

on-time delivery to customers (meeting the agreed date and time for delivery with customers, orders are delivered complete and accurate);

stock levels (having the required inventory to maintain and meet customers' demand) and

demand forecasting, as well as the monitoring of claims and customer complaints(predicting demand based on past trends as well as future orders and resolving customers' issues sufficiently and quickly to maintain customer relationships) (Silvera and DeCoster, 2012).

The quality of the information shared, the usefulness of the information shared and the trustworthiness of the information all have varying impact on these performance variables, their research paper focused only on delivery. For the delivery component, it is important that the organization is flexible and responsive, that is the company is able to deliver at short notice if required and is able to adjust order levels as required by the customer. If the output to customers is unacceptable, there is the likelihood that customers will turn to other suppliers. In a business environment that changes rapidly, supply chains must be able to respond to change, and do so efficiently (Beamon, 1999). From the performance variables highlighted, the research went further to identify the factors of importance to delivery performance for the case study company and to postulate that these factors are of importance to other SME supply chains in the FMCG sector. The delivery performance variables are shown in Figure 5.3.

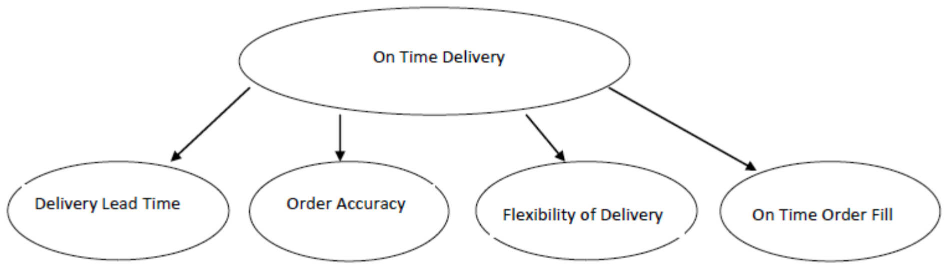

Figure 5.3.: On time delivery performance variables

As shown in Figure 5.3, the factors used by Silvera and DeCoster (2012) in their research, to determine how efficiently and effectively a company is performing as it relates to on-time delivery to customers. They highlighted that delivery lead-time speaks to the delivery window agreed upon between the customer and the distributor. Within this lead-time, the order is processed; the items picked from the warehouse, packaged for trucking and delivered to the customer. Order accuracy ensures that the right quantities of products ordered are delivered, the time and date delivered is accounted for, and the condition of the products are at the quality standard agreed on. The flexibility in order delivery describes the ability of the distributor to be responsive to the requirements of a customer; these requirements may be in regard to a specific place of delivery, a specific time for delivery or an agreed mode of delivery (Silvera and DeCoster, 2012; Gunasekaran et al., 2004). On time order, fill rate is a measure of the reliability and completeness of an order, this measure speaks to the dependability of the delivery process from the distributor to the customer. The methodology and data analysis of this research are discussed in the appropriate sections of methodology and data findings of this doctoral thesis.

Figures 5.2 and 5.3 highlighted factors for supply chain visibility and on-time delivery, these factors were garnered through review of literature as well as from the interviews conducted at the case study company as part of the exploratory stage of the research. From this further development of parameters for the AHP questionnaire (stage 1.2 of Figure 4.2 in framework diagram), this allowed the AHP development to focus on “real” factors that impacted visibility and on-time delivery for this particular type of FMCG SME.

5.2. Conceptual Basis of Research on Case Study Company

According to Maloni and Benton (1997), there has been an increasing number of conceptual literature focusing on supply chain partnerships. They went further to indicate that “theoretically within a supply chain partnership, traditional competitive barriers between supply chain members are mitigated to create mutually beneficial relationships, thus leading to increased information flows, reduced uncertainty, and a more profitable supply chain” (p. 419). Research has shown that one of the major benefits of supply chain partnerships is the increase in information sharing among all parties of the supply chain. However most research has focused on traditional supply chains and large supply chains, therefore, the existing literature has assumed that the typical supply chain partnership will apply to small and medium enterprises. According to Silvera and DeCoster (2010) in a paper presented at the Computer Aided Production Engineering Conference (CAPE) held in Scotland, supply chain partnerships needs to be tailored to “match” the size of the organization, the design of the organization and the type of products being distributed by the organization. Silvera and DeCoster in their paper postulated that the non-traditional supply chains have varying requirements from their suppliers and customers and as such the relationship needs to be tailored specifically for the organization.

The focus of existing literature on relationship models has been critically reviewed, and it has been found that there needs to be a different approach in terms of a relationship model for small suppliers and major brands companies within the UK FMCG sector. Silvera and DeCoster (2010) pointed out that “due to the power of the major brands this relationship will not necessarily evolve into a partnership, relationships will instead provide a platform on which both parties can operate leading to business leverage for all parties” (p.1). It has been shown by a number of researchers that the traditional relationships between supply chain organizations have mostly been “arm’s-length” type relationships, which have mostly functioned in adversarial roles rather than co-operative roles (Duffy and Fearne, 2004). Organizations have operated very “selfishly” in that they have focused on the achievement of profits and cost reductions at the expense of their buyers and/or suppliers (Duffy and Fearne, 2004), for small businesses this business approach can prove detrimental. The leveraging of costs, which at times proves to be difficult to absorb by small businesses, can lead to the failure of these businesses as it becomes more difficult for them to operate within the “big” supply chain market. This approach of adversarial or arm's length relationships cannot be applied to all types of businesses within the supply chain as it can lead to one business being successful and the other failing. The information presented at the conference by Silvera & DeCoster was deduced from information gathered at a FMCG SME in London. Along with interviews and the development of an AHP questionnaire for their exploratory early stage research, a partnership model was developed and presented at the CAPE conference to academia and supply chain professionals.

Researchers such as Lamming (1993), Christopher (1998) and as cited in Duffy and Fearne (2004), have pointed that companies that are best in class in supply chain management have recognized that the "transfer of costs up and down the supply chain does not make firms any more competitive as ultimately all costs make their way back to the final marketplace."(p.1). Instead, firms that engage in co-operative long-term partnerships, that help to improve the efficiency of the supply chain as a whole for the mutual benefit of all parties involved, are more likely to be successful. The UK food industry has seen a concerted move in recent years towards fewer and more co-operative buyer-supplier relationships as retailers have attempted to gain more control over their supply chains. This has been done to ensure the integrity of their own label products, in terms of quality and safety issues, and to reduce supply chain costs in an effort to increase their competitiveness in a highly competitive retailing environment (Fearne and Hughes, 1999; Duffy and Fearne, 2004). Retailers have shifted the focus of the relationship types a means of ensuring that they have more control over their supply chains. The relationship type and the increase control offered by varying relationship models allows companies to be confident in the integrity of their own label products (especially major brands companies such as supermarkets and retailers), in terms of quality and safety issues, and to reduce supply chain costs in an effort to increase their competitiveness in a highly competitive retailing environment (Fearne and Hughes, 1999; Duffy and Fearne, 2004; Silvera and DeCoster, 2010).

5.3. Supply Chain Management - FMCG within the United Kingdom

In the United Kingdom the FMCG industry is localized within supermarkets/ grocery stores. In the year 2000, approximately 42,000 grocery stores existed in the UK and of this amount the three major brands retailers occupied 60% of the market share. These major brands retailers are the bench-markers in relation to the general framework of operation for the FMCG sector within the United Kingdom, Silvera and DeCoster (2010) analyzed the existing framework of the relationship styles between these small, medium companies within the FMCG sector and their suppliers. Silvera and DeCoster also pointed out that the main focus of most major brands retailers within the fast moving consumer goods industry within the UK has been on marketing themselves and building loyalty by selling items labelled with their "own" brand names. In the world of the retail industry, major brands tend to market their product as high end, high quality as such consumers pay more while others are marketed as economical brands where consumers are still purchasing items of high quality but at a lower cost (Silvera and DeCoster, 2010).

The tight restriction, monopoly or gatekeeper roles that the major retailers enjoy within the FMCG sector is achieved through controlling access to consumers, this means that they are in an increasingly powerful position as manufacturers and suppliers have no other viable means of setting up distribution that offers the same scale and economic benefits (Duffy and Fearne, 2004). This relationship structure is one that offers advantages to one player within the supply chain at the disadvantage of another. The power relationship structure or style that exists between two firms has implications for the development of partnerships as several researchers suggest that the structure of the power-dependence relationship determines the level and features of a trading relationship and the performance outcomes achieved (Frazier and Antia 1995; Kumar et al., 1995; Gattorna and Walters, 1996; Duffy and Fearne, 2004).

The grocery retail industry within the U.K. and across the world is one that is highly competitive; customer satisfaction is very important to all the players within this industry as everyone competes to maintain their customer base and in essence profits. As such, a lot of focus is now being placed on understanding how retailers can satisfy their customers; prior to this the emphasis was on quality, retailers are now realizing the importance of relationships to their success. Within the UK the largest major brands retailers and the most successful within the sector have competed on quality, not price. These large retailers in 1995 accounted for about 50% of national total sales (Robson and Rawnsley, 2001 as cited in Silvera and DeCoster, 2010).

Relationships within the UK retail industry, where the market is dominated by a small number of retail customers, are likely to differ from those in other food sectors, such as processing or food service where the number of customers is much larger and the market less concentrated resulting in a different market power structure and relationship style (Duffy and Fearne, 2004). Silvera and DeCoster (2010) therefore, pointed out that in order to assess the FMCG sector within the UK, it is necessary to analyze the varied relationships between the major brand retailers and their suppliers. Each major brand retailer employs a different strategy in terms of relationship with their suppliers, if the relationship/operational model of Marks and Spencer is examined it is seen that the company has developed what is called its "Global Sourcing Principles" (www. corporate.marksandspencer.com). The emphasis of these principles are on the commitment by Marks and Spencer to its customers that the company will at all times provide them with "quality and value without exploiting the people who work for their suppliers" (Marks and Spencer, 2005, p.2). The Global Sourcing Principles is, in fact, the only terms on which suppliers to Marks and Spencer are allowed to operate. What this means is that Marks and Spencer have the leverage in this "relationship" (Silvera and DeCoster, 2010).

Though these major brand companies have established contracts with their suppliers, the main focus of these contracts is to ensure the image of these companies are maintained through the quality and pricing of their "own" labelled items. The small and medium FMCG suppliers have to, at times, sign contracts that ensures that these major brands' image and profits are kept intact, but at times the SME FMCG's are conforming to these policies while paying huge fines and penalties for various "infringements" as stipulated by the major brand retailers. The SME's in essence at times operate at a loss, while their large counterparts grow and are profitable.

In the examination of new competitiveness criteria, it has become clear to companies that the importance of partnerships and alliances between chain members is increasing (Todeva and Knoke, 2005). What this means is that it is becoming more difficult for suppliers outside the major brand alliance or chain, to conduct business with customers within the major brand alliance. This is due to the fact that the businesses within the alliance will tend to do business with other companies within the alliance due to agreements and relationships forged. With competition across the time now being based on "on time delivery" and other time-based factors, one of the major motivations for establishing close partnerships is to shorten the "cycle time" of the supply chain by way of co-operation. In recent decade, a number of trends and changes have occurred which have made co-operation even more important, including internationalization and globalization, outsourcing and the reduction of the number of suppliers, the prominent role of research and development, and a drastic shortening of product life cycles and the cycle times of business administration processes in general (Todeva and Knoke, 2005). As a consequence of all these factors, a company cannot compete alone at the competitive marketplace: strategic allies must be found and formed. Obviously, this implies drawbacks in addition to benefits (interests are prejudiced e.g. by disclosing certain types of market information to partners); however, international surveys show that eight out of ten companies do not wish to leave an already operational supply chain (Herz and Alfredsson 2003; Szegedi et al., 2014).

5.4. Supply Chain Partnerships and Visibility Impact

To compete in the new age of global manufacturing and global supply chain management, the individual supply chain organization and other members of the supply chain must be capable of delivering goods and services to consumers as quickly and inexpensively as possible (Lee, 2004; Holcomb et al., 2011). In addition to on-time delivery companies must also be able to meet their strategic objectives through operational excellence, and being able to manufacture and distribute a product in the variety and volume needed by customers. Companies must also display the capability of operating at a high standard in multiple supply chain channels and markets while focusing on customer value (Chikan and Gelei, 2010). In order to achieve these objectives in the most efficient and effective manner possible, information sharing (information visibility) regarding all aspects of supply chain activities becomes extremely necessary and important to all supply chain members. However, the availability of such information, the quality of the information shared and the depth of information shared is determined by the nature of the supplier-buyer relationship that exists within the supply chain.

Ideally the information flow should be co-ordinated such that it flows upstream and downstream the supply chain in a seamless manner from end to end and is available on a real-time (or near real-time) basis and visible to all members to create the desired value (Lee, 2000; Holcomb et al., 2004; Holweg and Pil, 2008; Holcomb et al., 2011). Therefore, visibility becomes the key to the success of the business relationship; the level of information sharing becomes a marker for the level of trust established between parties in the supply chain relationship agreement. The ability to “see” from one end to the other in the supply chain implies a clear view of upstream and downstream inventories, demand and supply conditions, and production and purchasing schedules (Holcomb et al., 2011); this ability to “see” is making reference to visibility within the supply chain.

The typical supply chain process transaction begins with an order being negotiated, placed, fulfilled, shipped, and delivered to a customer. Each of these activities generates one or more information flows (www. emmansonme.wordpres.com). In an environment where the general goal is achieving integration across the supply chain, the level of connectivity between the different organizations within the chain is extremely important. Connectivity enables the “internally integrated focal firm, its suppliers, logistics providers, and customers to share the transaction and other data related to the supply chain event” (Holcomb et al. 2011, p.32). The shared data becomes the basic building block that will be used and aggregated to provide information for planning purposes, such as delivery schedules and order cycle time. In a study of U.S. manufacturers, it was reported that eight out of 10 participants have disparate systems that make it difficult to coordinate with their supply chain partners (Bradley, 2002 as cited in Holcomb et al., 2011). The large figure of disparate systems was shown to be due to the lack of trust and the type of supply chain partnership agreements used across these companies. Companies were afraid to share information and to allow their suppliers or customers to have access and clear visibility into their operational systems. It then becomes clear that type of supply chain partnership relationship used across a supply chain can be a hindrance or propulsion for the success of the supply chain in meeting its performance criteria such as on-time delivery.

The reality of supply chain partnerships and visibility is that when companies and their partners use different supply chain management applications there tends to be a lack of compatibility, this bars access to valuable external data. According to Holcomb et al. (2011), this lack of data access means there is “no visibility into the supply chain” (p.33). The presently reality faced by organizations is the fact “only limited information is exchanged between supply chain entities in a network”

(Christopher and Peck, 2004; Holcomb et al., 2011, p.33). Most supply chain oriented company are forecast driven rather than demand driven this is due to lack of visibility, this lack of visibility forces them to make decisions in isolation of other supply chain members. This modus operandi of isolation can lead to mistrust and deterioration of the supply chain relationship, making the business inefficient and costly. The presence of organizational functional silos also inhibits the flow of and access to data and information. Lee et al. (2000) as cited by Holcomb et al. (2011) stated that “the benefit of information sharing lies in the manufacturer’s ability to be responsive to the retailer’s needs.” (p.33). Simply put, business relationship and visibility goes “hand-in- hand” when it comes to a supply chain being responsive to its partners’ needs. Responsiveness and good business relationships can best be achieved through knowledge sharing of each retailer’s inventory levels and visibility of “real” demand. There has been a number of research suggesting that visibility is a critical capability for improving supply chain performance (Lee et al., 1997, 2000; Simatupang & Sridharan, 2002). Information sharing is regarded as the “glue” that holds all the activities and resources together along the supply chain from raw materials procurement to customer service (Kopczak, 1997; Simchi-Levi et al., 2003, Holcomb et al., 2011). Mason- Jones and Towill (1998; 1999) demonstrated in their research that “information enriched” supply chains perform significantly better than those that do not have access to information beyond their corporate boundaries (Holcomb et al., 2011).

Supply chains that are designed to be more focused on meeting market needs are noted to be more sensitive to changing and tracking trends and events, thereby enabling them to more accurately implement actions that will retain or attract customers, improve channel relations, or impede competitors. They are able to do so because they have access to timely, coherent information (Day,1994). This timely information can and will only be had based on the willingness of all parties to share information and the relationship that exists within the supply chain. Visibility is composed of multiple elements, one of which is supply chain relationships, as it involves the firm and its supply chain partners.

5.5. The Development of Relationship Models to support Visibility within the Supply Chain

The development of relationships and relationships models within supply chains has grown since Hanfield and Nichols (1999) conducted their research and wrote their paper in which they stated that “Without a foundation of effective supply chain organizational relationships any effort to manage the flow of information or materials across the supply chain is likely to be unsuccessful” (Hanfield and Nichols, 2002 as cited by Silvera and DeCoster, 2010, p.3). Since the research of Hansfield and Nichols in 2002, there has been increased focus by academics, authors and specialist within the supply chain on effective relationships within supply chains (Silvera and

DeCoster, 2010). According to Silvera and DeCoster (2010) relationship is defined as “a significant connection between two or more things” (p.3), within supply chains, the relationship between retailers and suppliers has to be one of utmost trust and commitment to similar things in order to achieve the desired results. The emphasis in the past has been on developing partnership-type relationships, but this may not be suitable for all supply chains especially those that are small or medium size businesses conducting business with major brand retailers. What is of importance to these businesses is that a proper working relationship is developed, one that will lead to leverage for all parties involved.

The traditional relationship model used by supply chains is geared towards building partnership-type relationships within the chain. At the foundation of the model is commitment and communication, commitment or trust will help to determine the nature of the relationships a retailer has with its suppliers and will help to determine its competitive advantage. In order for a supplier to continue investing in tooling and process improvements there would have to be a prior contractual commitment in regards to sales volume, without a contract, these improvements would not be carried out on the supplier side of the relationship. Collaborative relationships along the supply chain requires trust and commitment (Jorgen, 2017). Communication is critical across the supply chain, as this is the means by which orders are made, and payment terms are conveyed as well as other relevant information.Communication can be achieved through IT integration, as IT integration allows suppliers and customers to share information about the market and supply in order to achieve responsiveness (Sabet, Yazdani and Leeuw, 2016). However, at the centre of this model are the principles by which both the retailer and supplier operate, these principles (honesty, integrity) are accepted but usually lack implementation (Silvera and DeCoster, 2010). Change also drives communication and acceptance of principles, in supplier- customer relationships there will always be “some crisis”, thus the need for changes and improvement to the supply chain operation (Bullington and Bullington, 2005).“Appreciation or feedback fuels the process, and when communicated through both organizations, builds commitment to the relationship and the partnership process” (Silvera and DeCoster, 2010, p. 4) . This traditional model though designed to focus and demonstrate a framework for relationships within supply chains, does not focus specifically on the relationship between supplier and retailer, SME’s or the FMCG sector but instead relationships in general across supply chains. The traditional relationship model as shown in Figure 5.4 as well as the partnership model shown in Figure 5.5 were developed by experts in the supply chain field. Douglas Lambert and John Gardner (2004) have done extensive research on these models. These models were reviewed and literature assessed to allow for further refinement of information needed to finalize the focus of the AHP questionnaire for the exploratory research for this paper. The information from the review of literature on these models also provided confirmation of the factors to be used to conduct the AHP questionnaire and also contributed to stage 2 of the research (Figure 4.2) which focused on the development of customer questionnaires to assess visibility and on-time delivery.

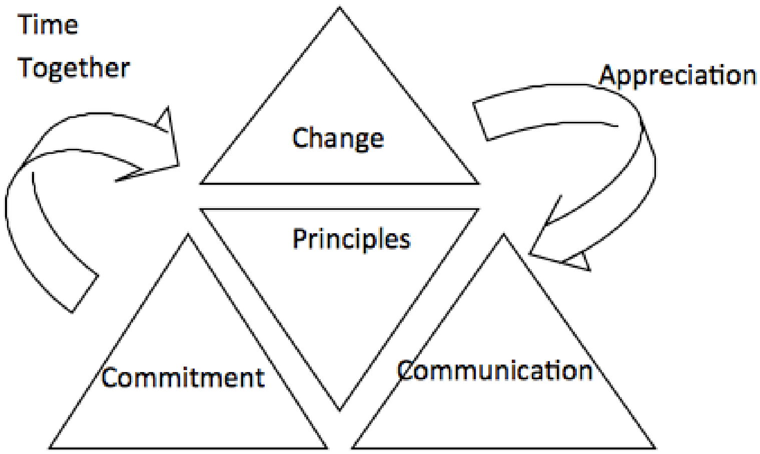

Figure 5.4.: Supply Chain Traditional Relationship Model

5.6. Partnership Model – As used by Major Brand Retailers within the United States

The Partnership Model was developed in 1996 by a team of researchers at The Global Supply Chain Forum at The Ohio State University. The aim of the model was to allow the executives and others within supply chains to be able to access a tool, which would provide them with a framework structure for business relationships within the supply chain. The model did not focus on any particular segment of the supply chain (e.g., FMCG), but its goal was on allowing companies within the supply chain to achieve better partnership relationships.

A partnership as defined by Lambert et al. (2008) is "a tailored business relationship based on mutual trust, openness, shared risk and shared rewards that result in business performance greater than would be achieved by the two firms working in the absence of partnership" (Lambert et al., 2008, p.257). Partnerships are important especially in a highly competitive environment as it allows for greater strengthening and integration of the overall operations of the supply chain and makes it easier for the major brand retailers to block their competitors' advances into their market share. This model provided the basis on which the proposed relationship model for FMCG SME’s was developed. The steps in assessing the type of partnership to be developed between supplier and customer, typically follows the steps identified in the flow chart diagram in Figure 5.5. A review of the existing literature on this model as well a review of the operation at the case study company led to the development of a proposed relationship model as shown in Figure 5.6. This model was presented at the CAPE (2010) conference.

5.6.1. How Does the Partnership Model Work?

The model operates by placing the main areas of focus for partnership into four major areas to allow for management attention. The four areas as outlined by Lambert are:

- Drivers- these are the compelling or underlying reasons that would cause an organization to partner with another.
- Facilitators – these are characteristics or “personality” of the companies wishing to form a partnership, these can either assist or hinder the formation of the partnership.
- Components – these are the elements of the partnership that can be controlled by management and can be implemented at various levels depending on the type of partnership.
- Outcomes – these are used to measure the extent to which each company is able to achieve its main “desires” or drivers from the partnership. (Lambert et.al, 2008 p. 257-258)

5.7. Building Effective Supplier Relationship for SME FMCG‘s within the UK

In assessing the existing research studies, it has been found that the focus of these have not been targeted towards the development of a framework tool for suppliers and retailers within the major brands FMCG sector within the United Kingdom. It has long been argued that relationship management is very important to all aspects of the supply chain including the marketing of the goods and services being offered within the chain. Silvera and DeCoster (2010), proposed a framework that not just considers the business aspects of the supply chain relationship but also the people aspect of the relationship, which supports visibility and leads to improved delivery and other key performance factors. They proposed that the first step in building a visibility supported relationship model involves conducting a psychological analysis of the all relevant persons within the supply chain; this was done using the repertory grid technique. The grid is widely used to determine people’s understanding of situations and other people. This helps to determine how

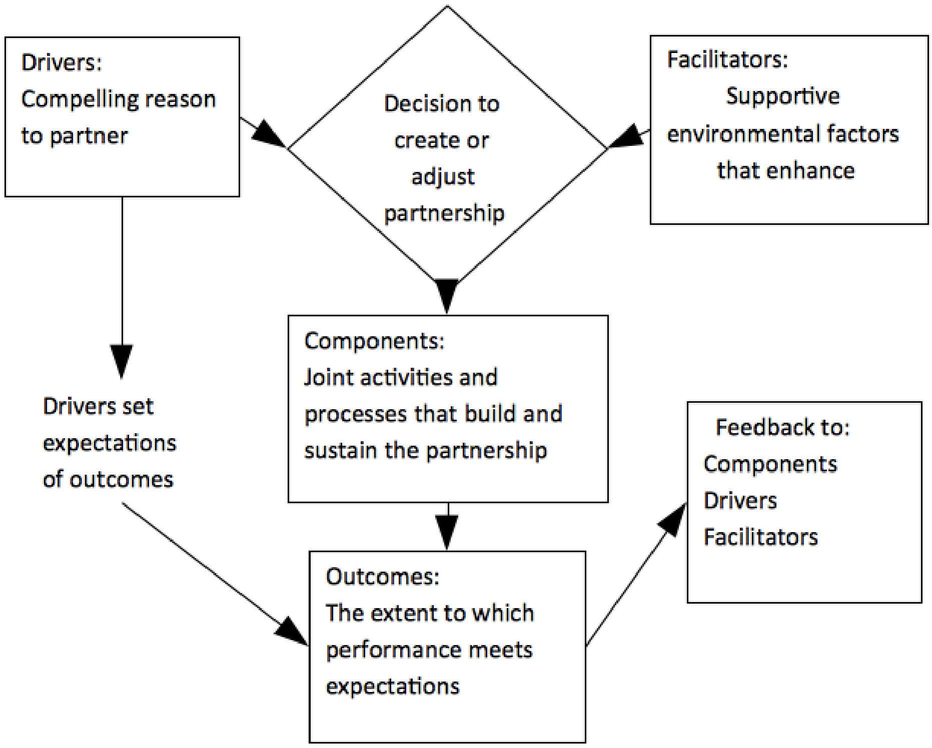

Figure 5.5.: The Partnership Model

the individuals will act in the particular situation, a sample grid for FMCG retailer/ supplier relationship is shown below in Table 5.1. The AHP questionnaire factors were identified from the existing research literature on supply chain relationships and partnerships type. Information or the AHP was also gathered through interviews in the early stage of this research. Table 5.2 explains the meaning of each factor used in the AHP questionnaire and also provides reference literatures used to derive these factors.

To facilitate the development of a strong relationship Silvera & DeCoster proposed several key areas of focus that leads to success for a supply chain especially SME's They are: Delivery Criteria (delivery time, accuracy of delivery, etc.), Communications Criteria (internal, external), Value Criteria (what customer values, delivery of greater value than the competition) and Product Criteria (Cost vs. Quality, Product Range). In their preliminary research, they identified performance indicators for these four categories, the KPI's chosen were based on those identified from existing research as being critical to the success of supply chains. These criteria were used to determine the focus of a research questionnaire which was then used to design a repertory grid; these are called constructs. Once the constructs are identified and the assessment grid developed, it provided a means for both suppliers and retailers to express their "feeling" regarding the importance of each construct (e.g. on time delivery).

The repertory grid technique was chosen for this paper as it allows for all parties to agree on the areas of focus prior to the administering of the assessment. The method is also easy to use and can be conducted by an independent person removing biases. In assessing the grid as administered by Silvera and DeCoster (2010) it has showed that the constructs of On-Time Deliveries and Share Similar Values are seen in a similar manner by retailers and suppliers. This research showed that they all parties had bought into the importance of delivering on time and respecting values such as environmental issues. The grid also showed that there were no clear relationships between the other constructs (Appropriate Communication, Non-Communicative, High-Quality Products and Low-Quality Products). This showed that even though there were four constructs, the retailer may be inconsistent/ inaccurate in how assessment of each supplier is carried out and as such may be engaged in inconsistent and incorrect partnership agreements. It may also mean that the retailer has a different understanding of appropriate communication and the term high quality than the supplier has. If the supplier has KPI's that are important to the business but these are not important to the retailer, the relationship becomes one that serves one party and not the other.

The second phase of the framework involved the selection of the appropriate relationship type that will "fit" each supplier, as such a general "contractual" agreement or application of corporate policy is not applied by the major brand retailers to each and every supplier. The aim is to allow both parties to have leverage in the supply chain.

Table 5.1.: Repertory Grid Questionnaire for SME FMCG in the UK.

	High Performing Supplier	Average Performing Supplier	Low Performing Supplier	
On Time Deliveries	✓	✓	✓	Does Not Deliver On Time
Appropriate Communication	×	✓	×	Non-Communicative
Share Similar Values - e.g. Environmental Issues	✓	✓	✓	Does Not share Similar Values
High Quality Products	✓	×	×	Low Quality Products

5.8. The Role of Relationships & Visibility in the Firm and the Supply Chain

Most supply chain systems have evolved over the years, moving from the traditional mode of manufacturing, warehousing and distribution to systems that have integrated customer satisfaction and other factors regarding performance. Supply chains are no longer operating as functional systems, and this evolution has led to many disconnections along the supply chain as it relates to the supply chain processes employed and the information shared along the chain (Romano, 2003). This lack of information greatly hinders the ability of the firm and the supply chain as a whole to achieve end-to-end seamless visibility. Research indicates that significant opportunities exist for companies to become more integrated with their suppliers and customers (Fawcett and Magnan, 2002 as cited in Holcomb et al., 2011). Although the concept of visibility and information sharing is sometimes used interchangeably in the literature, they are two different views (Swaminathan and Tayur, 2003). Barratt and Oke (2007) suggested that information sharing is an activity and visibility is an outcome.

According to Riddalls, Bennett and Tipi (2000), an optimized system does not exist among the organizations that operate using channel partners (The goal of channel partners in the supply chain is to create mutual participation based upon planned collaboration and co-operation) (Rajagopal, 2006). Rajagopal (2006), have pointed out the fact that an example of a constraint within the supply chain would be the logistics needed for the production process at the manufacturers' facilities. While manufacturing facilities favors large batch production, supermarkets have been shown to prefer very small inventories allowing them to minimize costs and remain flexible. This situation again shows the need for the establishment of specific business relationships to meet the needs of the specific organization especially those that are small or medium sized family operated businesses.

Silvera and Decoster (2010) used the repertory grid technique to identify perceptions of needs at the retailer level and the supplier level. These perceptions were assessed and placed in two categories so that they would be understood by the retailer and supplier. Key perceptions or priorities of the retailers and suppliers were identified and placed them in two groups namely, those that are shared by both parties and those that needs clarification (these are the business priorities). The researchers suggest that prior to deciding on the type of partnership relationship the organization should engage, there should be sensitization done to ensure that those perceptions that need clarification are discussed to ensure that both parties understand what each other views as priority or value to the business. Once both parties arrive at an agreement the specific relationship type that will allow leverage and profitability for both supplier and retailer are used to conduct business throughout the supply chain (this is called the business environment for operation). As such this relationship will be specifically designed for each supplier/ retailer relationship within the chain, one that is not a partnership agreement but is still built on commitment and trust and as such will be profitable. The figure below is a partnership model as developed by Silvera and DeCoster (2010), this model still takes into consideration the traditional approach of building relationships on shared values, the research went further to incorporate values that are not shared and business environments that are not similar across the supply chain. The development and presentation of the results and analysis of the proposed model in Figure 5.6 and the AHP assisted in the development of the customer questionnaires administered in stage 2 of this research as well as the development of the conceptual framework of the research (see Figure 4.2).

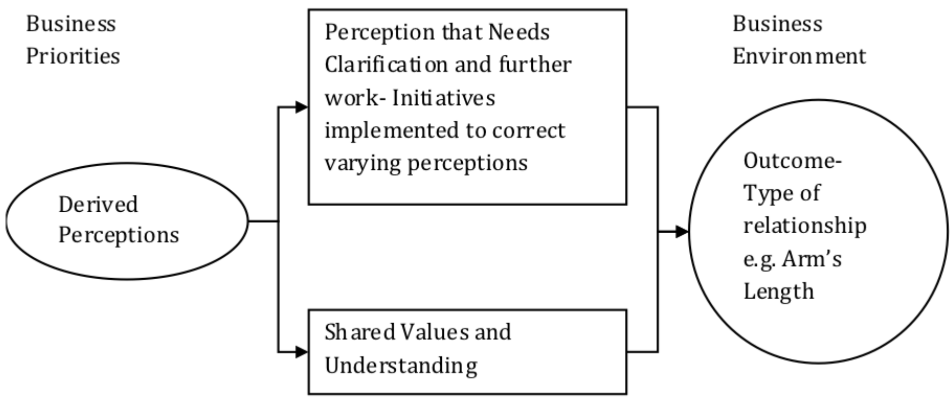

Figure 5.6.: Proposed Relationship Model for FMCG's SME's within the UK

5.9. Conclusion

There are a number of research papers and models developed pointing to the importance of supply chain relationship types and the quality of information shared along the supply chain. Silvera and DeCoster (2010) pointed out that the environment within which suppliers operate within the FMCG sector in the UK and by extension other SME'S in the FMCG sector is an important contributor in determining the relationship model to be incorporated into the supply chain. Silvera andDeCoster in their research developed and proposed a model, that incorporated conducting an assessment and developing a proposed framework of psychological indicators prior to assigning a supply chain relationship between suppliers and retailers. Silvera and DeCoster's research pointed to the fact that visibility depends on a relationship type that allows for trust and a depth of sharing of information.

Silvera and DeCoster's study showed that a partnership agreement is not applicable at all times for a supplier/ retailer relationship. In the case of major brands' retailers the relationship can become one-sided and as such it is important to have a framework from which a leveraging relationship can be built, especially in the FMCG sector as this sector has a large number of these retailers. Duffy and Fearne (2004) alluded to the fact that large firms appear to better able to invest in their supplier/ customer relationship, which at times, in the long run provides advantages for the large suppliers rather than the customers, or both parties. In essence, the larger the major brand company, the less likely the relationship will provide mutual benefits for all, and there is also a limitation in regards to the quality and depth of information shared by these major brand or large companies. Duffy and Fearne (2004) also highlighted in their research the growing trend in the UK, where suppliers are increasing their critical mass through the building of supply chain relationships. However, focusing on only a small number of suppliers to build relationships and increase visibility also have its limitations, by allowing specific suppliers to become sole or dedicated suppliers in the chain can mean total dependence on that supplier thus eventually leading to an unbalanced relationship which can also affect visibility.

The relative power advantage that a customer may perceive that they have over a dependent supplier can also become risky and can leave the supplier vulnerable to the demands of the customer (Duffy and Fearne, 2004). Research has shown that for small and medium size businesses that are struggling to serve multiple customers it may be more advantageous to focus on only one or two customers. Recently, research on supply chain management has focused on a debate regarding the need for a closer relationship between the customer, supplier and other relevant parties in search of a competitive advantage. There is evidence of benefits accruing to the proponents of closer relationships sometimes called supply partnerships (Lamming, Caldwell, Harrison and Phillips, 2001). The earlier studies of supply chain partnering, however, were focused on cases in the United States (Ghobadian, Gallear and Li, 2000; Whipple & Frankel, 2000; Craighead and Laforge, 2002), and Europe (Andersen, Fagerhaug, Randmoel, Schuldmaier and Prenninger, 1999) and have all shown that through the building of relationships the extent of information sharing and visibility can be improved within the supply chain.

Table 5.2.: Factors Used in AHP Questionnaire -Explanation and Paper Adaptation

Factors	Meaning	Paper Adapted
On-Time Delivery	Delivery done within agreed date and time, invoice is accurate, order delivered is accurate, delivery lead time	Li et al (2008); Bushuev & Guiffrida, (2012); Vachon and Klassen (2002); Prajogo and Olhager (2012)
Appropriate Communication	Medium used to convey relevant information, relevance of information shared, accuracy of information shared, usability of information shared	Wislon (1995); Dash et.al., (2007); Veludo et al., (2004); Tomkins (2001)
Shared Values	Having similar understanding and agreement on issues such as responsiveness, service level, Flexibility (volume and product), environmental issues, customer service etc.	Li and Maani (2007); Lapko et al.(2014); Beamon(1999); Zhou and Benton (2007); Prajogo and Olhager (2012
High Quality Products	Supplier quality standards, customer quality requirements and internal external quality standards (including processes). Standards set regarding product (such as packaging, shelf life, taste, costs etc).	Bartlett et al.(2007); Tse and Tan (2012)

Table 5.3.: Factors for Proposed Relationship Model for FMCG SME's

Factor	Meaning of Factor in Research	Research Papers used for Adaptation of Factors
Derived Perceptions	Understanding of supply chain factors and their importance to suppliers and customers. What each party perceives as being important to achieving a successful supply chain relationship leading to efficient performance	Silvera and DeCoster (2010); Lambert et al. (2008)
Perceptions that Needs Clarification	From the derived perceptions, suppliers and customers communicate with each other to ensure "grey" areas are clarified and all parties understands each others needs and agrees on the processes to meet those needs.	Silvera and DeCoster (2010); Lambert et al. (2008)
Outcome-Type of Relationship	From the agreed perceptions the relationship type needed to foster mutual benefit is agreed and applied to the supply chain. Relationship types such as partnership, arm's length or contractual.	Silvera and DeCoster (2010); Lambert et al. (2008); Bullington and Bullington (2005)
Shared Values and Understanding	Having similar understanding and agreement on issues such as responsiveness, service level, Flexibility (volume and product), environmental issues, customer service	Silvera and DeCoster (2010); Lambert et al. (2008); Bullington and Bullington (2005)
Business Priorities	Overall goals and objectives of each company within the supply chain	Silvera and DeCoster (2010); Lambert et al. (2008); Bullington and Bullington (2005)
Business Environment	The context within which the company operates e.g. FMCG or Major Brand Retailer	Silvera and DeCoster (2010); Lambert et al. (2008); Bullington and Bullington (2005)

6. Data Results & Findings

6.1. Introduction

In this chapter the findings connected to each proposition along with a discussion regarding the major constructs used for analysis will be presented. Based on the results of the questionnaires administered, AHP analysis and simulation model, the findings are presented, comparisons between the case study and the existing literature on visibility and delivery in SME FMCG sector are also discussed.

Before continuing to the analysis of the case presentation, some aspects need to be illuminated. The authors are aware that the selected case study company (SME FMCG distribution/manufacturing company and the staff) might not be a good representation of the entire SME FMCG business segment. For example, as discussed previously, the case study company comprises a number of individual companies which operate under one “umbrella” company, also each individual company focuses on serving a specific part of the FMCG sector and act as independent companies in their decision-making processes while sharing resources such as ICT tools, staffing and delivery methods. The main factors of this thesis was kept in mind but questions have also been asked (on the questionnaire) to underline the differences between special cases and the general situation. Using the conceptual framework, discussed in chapter 4 and the research design indicated in Figure 4.2, an analysis model was created which focuses on the testing of the hypothesis and verification of data regarding the research questions. The various hypotheses models and research models tested using ANOVA and other statistical methods, may be found in chapter 3.

The research questions and hypotheses developed in the previous chapters were tested through the analysis model and the use of statistical analysis.

6.2. ProModel Simulation Analysis of Case Study Company

Models and or simulation analysis have been used over the years to enhance supply chain management research. Charles C. Poirier in his book titled “Using Models to Improve Supply Chain” pointed out that models and simulation can be used for the improvement of online visibility and delivery in supply chains. The author advised that “when defining the scope of a supply chain effort it is advisable to adopt a broad definition, that way the most process steps can be included for improvement” (p.3). For this analysis the the SCOR model was used and other research literature to guide the process of developing the simulation model for analysis. Thus parameters relating to delivery cycle to the case study company and their customers were the focus of the model.

The model contained routing locations which are fixed places in the system (e.g. machines, queues, storage areas, work-stations, etc.) to where parts or entities are routed for processing, storage or simply to make some decision about further routing. Parts or entity (for the model) refers to the items being processed in the system. These include raw materials, piece parts, assemblies, loads, WIP, finished products, etc. The term path networks are used to describe the possible paths for the entities and resources These may be optional or defined paths that they may travel when moving through the system. Within the model resources may be a person, tool, vehicle or other objects that may be used to:

- Transport materials between the various routing locations.
- Perform an operation on material at a location
- Perform maintenance on a location or other resource that is down.

The processing (routing) element defines the processing sequence and logical flow of entities between routing locations. The operation or service times at locations, resource requirements, processing logic, input/output relationship, routing conditions, and move times or requirements (relating to movement and processing within the model) can be described using the processing element. The arrivals (or production schedule) are used to model deterministic, conditional, or stochastic arrivals, it allows for the importing of external files including production schedules or arrival data. Shifts (or work schedules) is a powerful feature that provides the ability to define custom work and break schedules (with their resources if needed). Appendix C2 shows the layout for the frozen foods supply chain of the case study company. The lines in the diagram represents the routing paths (flows) of materials, people etc. within the supply chain. The case study company is made up of three companies which operate independently and dependently (as they share warehousing space and other resources.). Each section of the case study company was modeled independently of each other, as they each had unique products being shipped from suppliers (specific to each company) and they all delivered to specific customers for each business. The oriental (pub) business and frozen food sections had a similar model while the section of the company which focuses on delivery to supermarkets, small shops and major chain companies had its own model which is shown in Figure 6.1. (this company received shipments by ship and trucks from international suppliers, while the oriental and frozen foods companies received their shipments by trucks only.

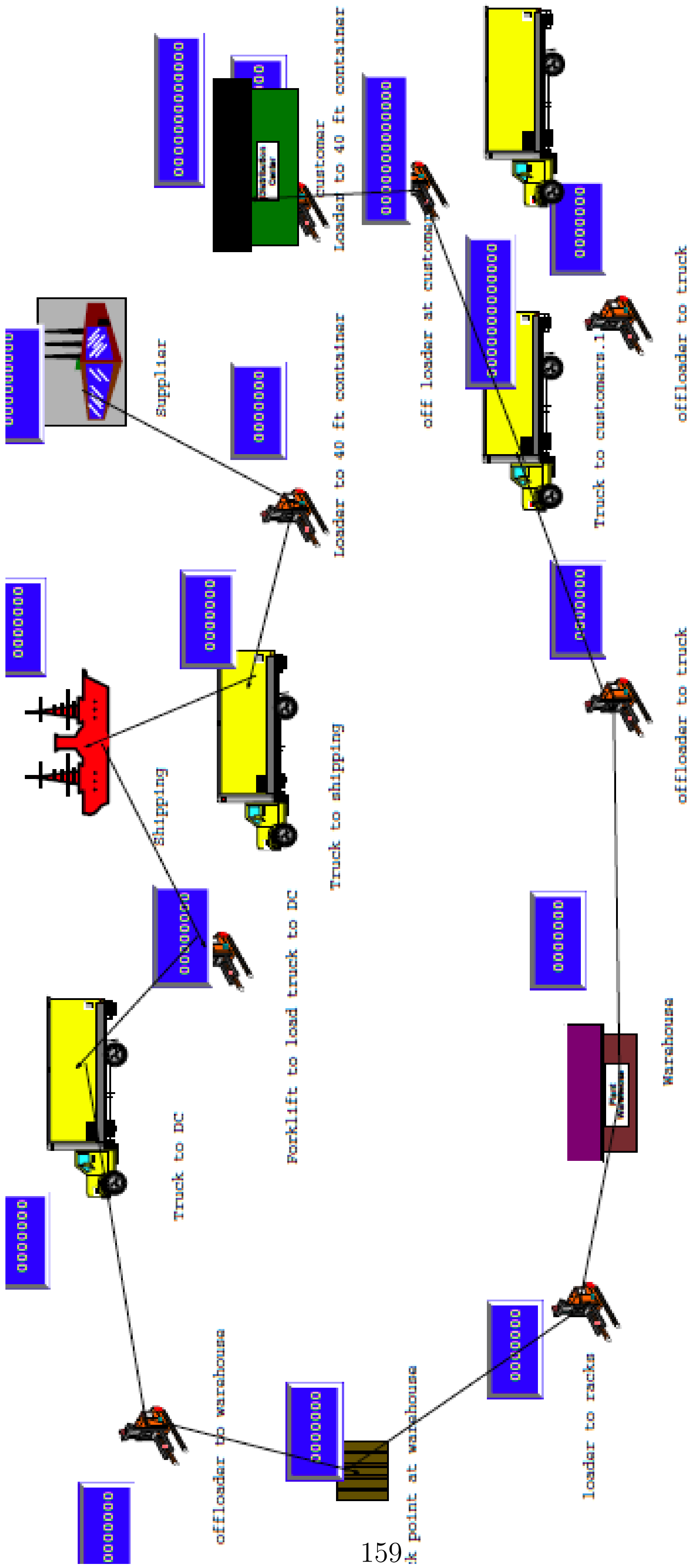

Figure 6.1.: Model of section of Case Study Company focusing on Large SME's.

The simulation was conducted to replicate the activities within the supply chain (with a large emphasis on the warehouse activities), the simulation replicated one year of delivery activities within the warehouse and to customers. A sample of the data used to build the simulation is found in Appendix C1. The simulation encompassed normally working days at the case study location which was typically Mondays through Fridays 8 am to 4 pm. The analysis of the flow of materials within each supply chain indicated that 85% of the products for the frozen foods section of the business was blocked (meaning the products were not able to flow through the supply chain from one point to the other as they were waiting on another location to become available to allow for movement to occur). The findings from the simulation also indicated that the oriental foods section had 0.14% of its products blocked and the section of the business that catered to Caribbean/ ethnic products had its products being blocked 42% of the time. The frozen foods section also had 2.62% of its products in waiting while only 11.87% was in operation (flowing through the supply chain). The Oriental business had 98% of its products in operation and 1.85% of its products in waiting. The ethnic/Caribbean side of the business had 57.7% of its products in operation and 0% in waiting. These results of 42% of ethnic products being blocked in the warehouse aligns with previous studies such as that by Li (2014), in that paper it was stated that for a supplier to provide customized products to its customers (such as those specifically developed for the ethnic market)is susceptible to variations in demand and logistics issues. This evaluation can be seen in the fact that the ethnic side of the business had issues moving its products efficiently through the warehouse, these products were sourced outside of the UK and as such may have been impacted by this variation in supply.

From the data generated in the simulation it was also found that the flow of inventory through the supply chain of the ethnic/Caribbean division of the business did not follow any of the traditional distributions (that is exponential, normal, lognormal etc.).The pattern of flow for the items in this section of the business also did not have a valid p value and as such was rejected. The run tests on on the "raw " input data (meaning prior to running the simulation for the full duration) had an acceptable $p > 0.05$ .The oriental aspect of the business was found to follow a lognormal distribution with a correlation value of 0.384 and had an acceptable $p > 0.005$ and for the run tests of its input values it had a $p > 0.05$. These data values are represented in Table 6.1.

Table 6.1.: Statistical Values from Pro Model Simulation

Value Measured by Simulation	Oriental (Chadha)	Caribbean (Enco)	Frozen Foods (Funny Bones)
P – value	p> 0.05	p>0.05	P<0.005
% items blocked	0.14	42	85.51
% items waiting	1.85	0	2.62
% items in operation	98	57.7	11.87
Type of Distribution Pattern	Lognormal	none	none
Level of significance of Input data	0.05	0.05	0.005
Correlation	0.384	0.002	0.432

In essence, ProModel was able to provide insights into the likely “bottlenecks” in the case study supply chain. This information can be further analyzed and along with the analysis of data at the end of the supply chain (customers’ questionnaires) recommendations can be deduced for improvement of the case study supply chain’s on time delivery and information flow. Appendix C , Figures C3- C6 provides data regarding the performance of each entity within the simulation. The values represents entities of performance for the supply chains of the frozen food, ethnic food and Oriental foods sections of the company. These tables indicate at each point of the supply chain and for each equipment or warehouse location the level of activity that occurred during the year of the simulation analysis.

The findings indicated that for the frozen food section of the business approximately 94% of the time the trucks to take the goods to customers were only partly occupied and 5% of the time they were empty. This meant that the case study company either had to send the trucks to deliver without having a full truck load or delay the delivery time to acquire sufficient items for a full truck load of delivery to various customers. While for the ethnic/Caribbean section of the business, the containers form their various international suppliers arrived 99% all the time, between the duration of clearing the containers, delivering to the warehouse and scheduling delivery to customers, the trucks to the customers had to be delayed sometimes. This section of the business was able to have trucks filled with goods at 95% of time, depending on the overseas shipment delivery their were times when the customers delivery trucks were only 63% full which meant delays in delivery. The delivery trucks to the Oriental customers were found to be empty between 100% and 9% of the time. This was due to the fact that these orders were of small quantities and would not be sent for delivery without having at least 80% capacity truck load.

The findings also indicated that as it related to the utilization of the resources (such as trucks, forklifts etc.) by the case study entities, for the Oriental company it was found that while the warehouse space was being utilized fully , while the suppliers had a maximum utilization rate of 4% (this was due to the sequence of orders to suppliers, the lead times and frequency of orders) . This meant that for the Oriental business, over the 12 month period based on the capacity of the suppliers (manufacturing capacity) the orders placed for goods by the case study company utilized only 4% of their capacity. The utilization of warehouse space, trucks etc. was affected by the lead times and scheduling of goods from suppliers and finished products to customers. The findings indicated that there were times of over utilization of the delivery trucks from suppliers , as high as 300%, while the delivery trucks to customers had a low utilization rate . This was due to the fact that the orders from the customers of the oriental business were infrequent at times and in small quantities. While at other periods the order volumes were very high. While for the frozen food section of the business the delivery trucks to the customers over the 12 month period had an average utilization rate of 75% . Appendices C2 and C3 indicates these data as well as the data used for the development of the simulation of the case study company. Figure 6.2 provides an example of the utilization rate of the delivery truck a, warehouse and other processes carried out for delivery to customer, this sample is for the Oriental side of the business. The figure indicates that within the Oriental company of the case study company, the delivery truck delivering to customers was over utilized, while the picker used within the warehouse was under-utilized. This was based on the number of trucks the company had available to them (which was approximately 5), what it meant for the business was that trucks were always full with goods to be delivered to the customers, but the trucks had to make multiple trips from the case study company (the distributor to the customers) based on the number of deliveries that had to be fulfilled in one day. The data also indicated that on most occasions the warehouse space used for storing Oriental items was under-utilized, this was due to the fact that as the goods arrived from the suppliers, to the case study company they were used to fulfill outstanding and current orders, the goods did not spend a-lot of time on the shelves in the warehouse, the case study company also carried small inventories of the Oriental products at any given time. The carrying of small inventories (the shelf on these items e.g fortune cookies was very short) meant that the shelf space in the warehouse was not always filled with products, hence delaying deliveries to customers.

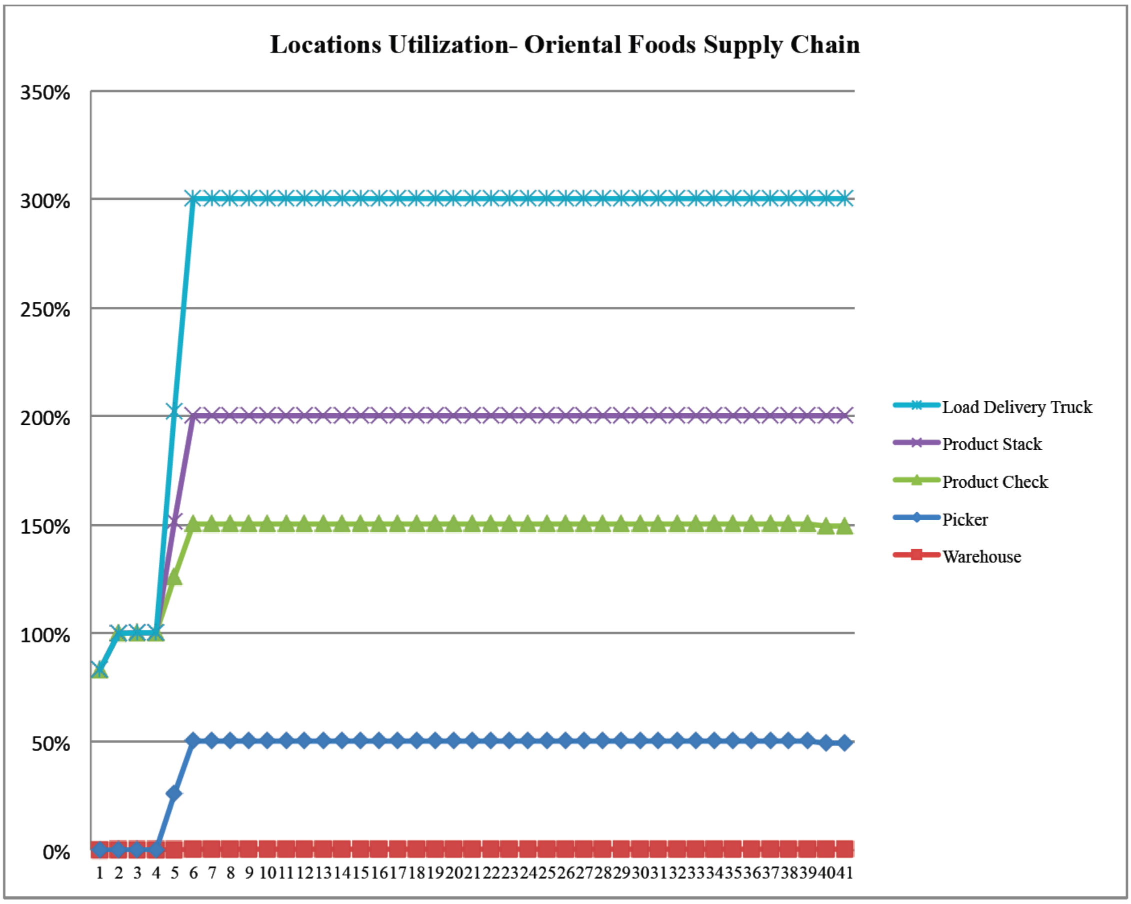

Figure 6.2.: Utilization of Locations to Deliver to Customer - Oriental Side of the Business

The simulation brought to the fore the performance of the entities within each "arm" of the supply chain. This information was gathered using data gathered prior to the installation of visibility tools and six months after the installation of limited visibility tools within various areas of the supply chain. With the simulation being done for a period reflecting one year, the data gathered provided insights into the utilization of the various resources of each supply chain and evaluate the impact these had on performance. Surveys were also conducted at the end of the supply chain, with customers served by various businesses which comprise the overall case study company. The analysis of the questionnaire administered to the case study company's customers and its findings are discussed in section 6.5.

6.2.1. Logistics a Key Issue to On Time Delivery Performance

Logistics within the supply chain involves all the activities that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements. The use of the Pro-Model simulation allowed for the analysis the case study company's operations in regards to the efficient movement of goods and information into and out of their warehouse to their customers and suppliers. Gunasekaran, Patel and Tirtiroglu (2001), and Baker (2008), pointed out that visibility tools may enable companies to design their logistics operations to allow for rapid response to their customers, which can lead to improvement in supply chain performance such as delivery time.

The analysis of the case study company's logistics operation through the use of ProModel simulation indicated that only one of the case study distribution "company" followed a distribution pattern (lognormal), two companies followed no specific pattern(see Tab. 6.2). The data is shown in Table 6.2 , some of which was previously discussed in was 5.4

Type of Company	Distribution Pattern	P-value (p <0.5)	Correlation Values	% Part Occupied (Supplier)	Percent Trucks Occupied (Customer)
Oriental Foods	Lognormal	0.084	0.384	85.92%	45.26
Frozen Foods (Pubs)	None	0	0.432	99.76	15.85%
Caribbean/Ethnic Foods	None	0.477	0.002	62.24%	10%

Table 6.2.: Simulation Performance of Case Study Company Branches

The simulation provided information that indicated that of the three "companies" that exists within the set up of the case study, the company which focused on the distribution of oriental products followed a lognormal distribution, while the ethnic and frozen food company did not follow a mathematical pattern of distribution. The lognormal distribution has been conformed by other researchers (Chakravorty & Atwater, 1996; Engelstätter, 2009; Robinson, 2004) discuss the fact that lognormal pattern points to a distribution system with multiple multiplicative effects (factors) and high variability.

The lognormal pattern is one which is frequently analyzed in supply chain systems when assessing costs, transportation, logistics and delivery. Therefore the conclusion was drawn that the case study company's distribution system replicates that of other FMCG businesses. The two companies that did not follow any of the usual mathematical patterns, can be deemed to have unusual delivery patterns which made it difficult for the simulation to determine a mathematical pattern. There is evidence that the lognormal pattern is also seen in research cases where the focus is on information sharing, if there is variation to the length of conversations the lognormal pattern is usual used to analyze the pattern, it also fits well when analyzing historical data for phone all durations.

The Pro-Model analysis indicated that as it relates to logistics at the case study company, there were issues at the warehouse. The goods arrives form various suppliers within the UK and internationally, the goods arrived at varying time and in varying quantities for each entity within the case study company (that is the ethnic section, frozen food and Oriental foods). All three entities shared the warehouse space and resources and at times shared transportation. It was found that the greatest bottleneck occurred during the process to move goods from the warehouse to the suppliers. The lognormal function in delivery simulation also indicate that there are no negative return flows (that is imaginary return of goods to the warehouse), this has been confirmed in research by Biehl, Prater and Realff (2007). The Lognormal distribution provides, in many cases, an adequate distribution that allows closed form solutions when the coefficient of variation is large.

In analyzing demand and delivery practically it has been shown that in practice actual demand from customers for some products may be better modeled with an asymmetric, or skewed, probability distribution. The log-normal PDF is an example of a skewed probability distribution and appears as the function with the long right tail in the fig below , which also displays a familiar bell-shaped normal distribution (Cobb, Rumi & Salmeron, 2013). The authors also discussed in their research the fact that the lead time for lognormal distribution in demand and delivery led to high variability along the supply chain, hence modeling a lot size or demand pattern becomes difficult. This scenario was also studied by Tadikamalla, 1979; Kamath and Pakkala, 2002; Dohi, Kaio and Osaki, 1995; among others all focused on lognormal demand patterns and its effect on delivery and lead-time in supply chains. The fact that this case study company also followed lognormal patterns is an indicator that variability is present within the chain hence would lead to variation in delivery times along the supply chain. The fact that the supply chain followed a lognormal pattern confirms the perspective that there is a need for the incorporation of visibility tools to improve delivery, as there is high variability along the supply chain. This variability has been researched in the past as the bull whip effect, it has been shown that reducing this effect is key to achieving lower inventories, improving delivery accuracy and improving capacity utilization, (Smaros, Lehtonen, Appelqvist & Holmstrom, 2003). The results attained from the ProModel simulation became the starting point and indicator that the case study company needed to reduce bullwhip or variability in order to achieve high on time delivery, and the use of visibility tools can lead to this improvement.

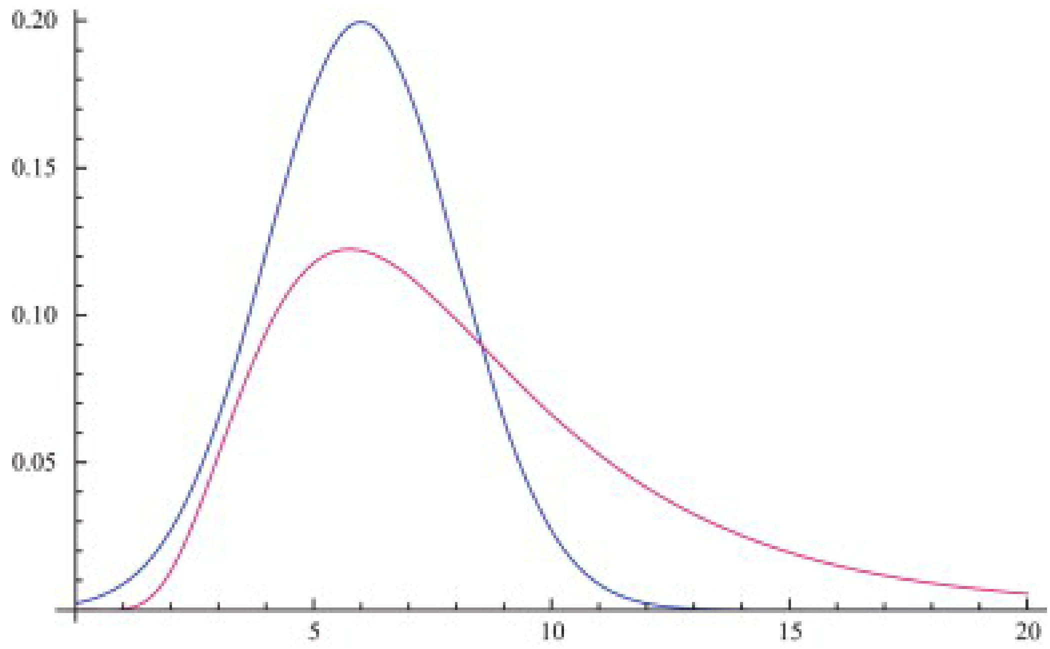

Figure 6.3.: Lognormal and Normal probability distributions for supply chain demand (adopted from Cobb, Runi & Salmeron, 2013)

6.3. Sample Analysis of AHP Repertory Grid and Interviews

The sample for the pilot study contained (20) respondents at the distribution case study company within the U.K. (Sample questionnaire contained in Appendix A4 and was previously discussed in chapter 5 page 152). As previously stated 15 -25 participants is considered acceptable for exploratory studies and for the RepGrid technique (Siau et al., 2010). The repertory grid technique, questionnaires as well as interviews were used to gather the information. The respondents were identified as high performers (based on delivery performance, feedback from customers and fees paid for late deliveries), medium performers and low performers. The respondents were asked to identify the importance of various metrics relating to on time delivery; they were also interviewed in relation to their performance within their respective supply chains. From the repertory grid it was determined that among the high performing suppliers of importance was on-time delivery, having shared values amongst their company and that of their customers and other players within the supply chain. Also providing high-quality products to customers was of high priority.

For the average and low performing suppliers, it was found that they did not consider the provision of high-quality products (major branded products) being of high priority but they both considered on time delivery to be of great importance to the success of the supply chain. Also of similarity amongst high, average and low performing suppliers are the need to have shared values amongst their customers and other supply chain partners. Both high performing and low performing suppliers did not consider appropriate communication to be critical, while average performing suppliers believed this metric was critical to the supply chain. From this repertory grid, questionnaires were developed and used for further research regarding on-time delivery, this will be discussed in section 6.5 and chapter 7 .

6.4. Analysis of Questionnaire Administered at Case Study Company - Demographic Characteristics

The AHP Analysis was used to develop a questionnaire which was administered at the case study company. This questionnaire was developed with the aim of finding out the level of visibility tool being used at the company as well as to develop a model using ProModel of the company's delivery pattern. The delivery pattern would also allow researchers to ascertain bottlenecks and likely areas where visibility tools could be deployed for improvement to the supply chain. As stated earlier the case study company consists of four companies which operate separately but also together in that though they had their individual managers, they shared facilities such as warehousing space, customer service and I.T. Each company has their own niche market, one focuses on the oriental and ethnic market (Chadha), the other on supplying Tex Mex and pub food (Enco) , the other frozen foods to major chain supermarkets and other stores (Funny Bones). The oriental and ethnic section of the business is also responsible for supplying ethnic Jamaican and other Caribbean foods to supermarkets, major brand retailers, small shops to name a few (the overall parent company is called Grace Foods UK). Table 6.2 highlights the frequencies of responses from each section of the case study company.

Table 6.3.: Company Identification

Company Name	Frequency of Response	%
Chadha	5	25
Enco	5	25
Funny Bones	5	25
Grace UK	5	25
Total	20	100

Twenty-eight questionnaires were administered of which twenty was completed and returned for assessment. . Twenty completed questionnaires were collected from the managers, warehousing, finance, sales and IT personnel within the company, as it was felt that these key persons could provide insight regarding the technology being used and their effectiveness. The sample size was small but was deemed sufficient based on the fact that the aim of the thesis was to try understand the operation of the company's supply chain, and would be able to use the information for further research. The questionnaires assessed the types of supply chain visibility tool used and their effectiveness, the impact of the visibility tools on delivery and the overall impact of visibility on delivery times. Analysis of data was done using SPSS software (version 20). The completed questionnaire upon analysis was found to be divided across all sections of the company, with five questionnaires each being completed by the four sections of the organization.

The findings (as indicated in Table 6.3) showed that the information sharing and visibility tools used by the company were Sage Database, Lynx System, email, telephone, person-to-person and paper. Sage Database was the most used tool with 30% of the respondents identifying this as their medium for communication across the supply chain. The Lynx system and telephone were used approximately 20% of the time respectively. One respondent to the questionnaire indicated that" *the Sage system is still fairly new and has not been set up for all areas of the business. He went further to state that customers are still getting use to being able to do online purchase orders, rather than calling in their orders*".

Table 6.4.: Medium Used for Information Sharing at Case Study Company

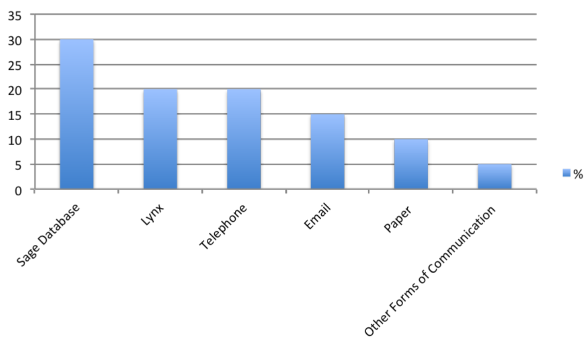

Table 6.4 further indicated that the respondents felt that the tools being used by the company were only 30% effective, while 60% felt they were somewhat effective in providing appropriate information sharing across the supply chain. The Lynx System is an integrated system that provides the sales personnel with customers' information regarding order quantities, delivery times and other pertinent information regarding sales orders. This database was in use prior to the installation of the Sage Database, but the decision was taken to continue its usage on a small scale.

Table 6.5.: Effectiveness of Medium used for Information Sharing

Effectiveness of Medium Used for Sharing of Information	Frequency	%
Very Effective	6	30
Somewhat Effective	12	60
Not Effective	2	10
Total	20	100

The findings also indicated that despite having access to the Lynx system and Sage Database the information retrieved or shared was used mainly for the picking of orders with 35% of the information shared used for this purpose. Thirty percent of information shared was used for the purpose of producing sales invoice and 25% of information shared was used to solicit sales from customers as shown in Table 6.5 Also noteworthy is the fact that despite the availability of visibility tools such as the Lynx system and Sage Database, 65% of information sharing, communication across the supply chain was via emails, 15% was via the Facsimile service (see Table 6.6).

Table 6.6.: Information Usage within Case Study Company

How Information Shared is Used within Case Study Company	Frequency	Percent
Order Picking	7	35
Invoicing	6	30
Sales to Customers	5	25
Other Usage	2	10
Total	20	100

Table 6.7.: Format of Information for Communication and Operations

Format of Information Shared in Case Study Company	Frequency	%
Email	13	65
Verbal	1	5
Telephone	2	10
Fax	3	15
Total	18	100

Sixty percent of the respondents felt that the information being shared currently by the company was adequate to achieve visibility and did not require improvement, while 35% did not provide a response to the question. Forty percent of respondents felt that the most important benefit the sharing of information provided was that they were able to provide more accurate information to their customers (such as goods availability, make arrangements for delivery) (see Appendix D for data tables regarding these information). Also 35% percent of respondents felt that impact from information sharing was felt more in the area of improved availability of stocks while 30% felt that the impact was felt in the improvement of delivery to customers, (see Figure 6.3). This 30% feedback is important as it is a "marker" that the case study company is seeing an impact in their delivery due to improved information sharing across the supply chain.

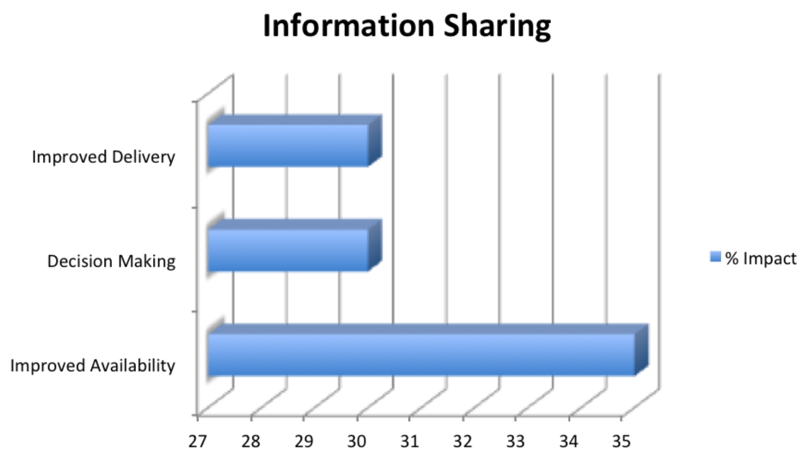

Figure 6.4.: Impact felt from information sharing

The findings also indicated that 65% of respondents felt that having enhanced visibility was very important to the success of supply chain partnerships while 35% felt this was only moderately important. However 60% of respondents felt that the sharing of information through the various tools has led to significant improvement in the enhancement of visibility, while 35% of respondents indicated that there was only moderate improvement in visibility enhancement through the sharing of information See Figure 6.4. However of concern is the fact that only 15% of respondents felt that the information shared has led to improved on time delivery, 40% felt there was no improvement and 45% stated that the improvement gained in delivery was low (See Figure 6.4) . The data analysis also indicated that 15% of respondents felt that the visibility gained has impacted on time delivery, 40% stated that there was no improvement and 45% felt the companies had gained some strides in on time delivery but these gains were low (See Figure 6.5). Appendix D also contains tables indicating data findings at the case study company.

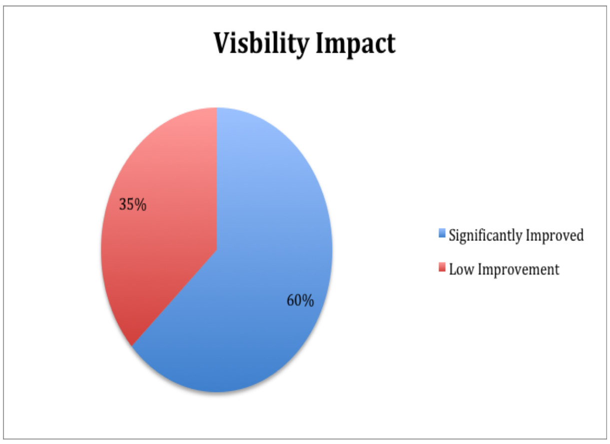

Figure 6.5.: Impact of Visibility Within Case Study Company Supply Chain

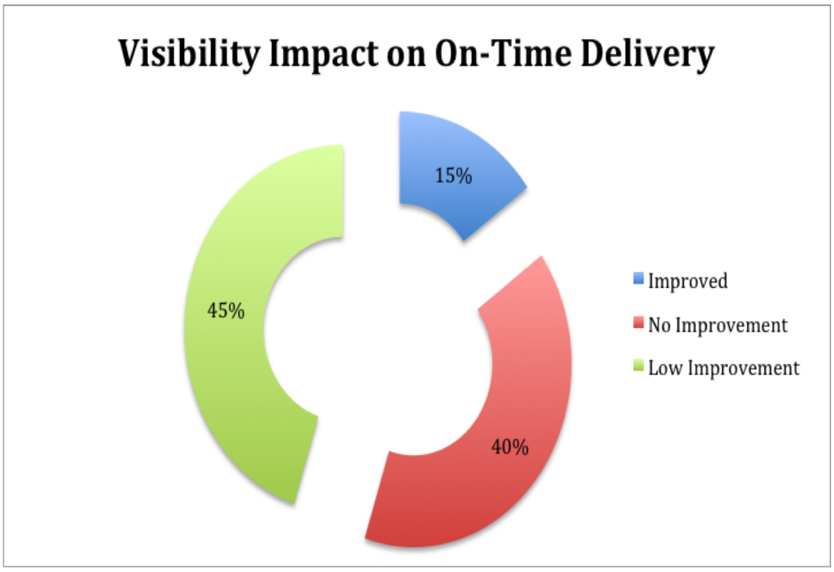

Figure 6.6.: Impact of visibility on On time delivery

6.4.1. Correlation Analysis of Data - Case Study Company

According to Pallant (2011), correlation analysis allows researchers to determine the strength and direction of relationships between two variables. Spearman rho can be used for assessment when it is found that the data is not suitable for the typical Pearson's correlation assessment.

This section assesses the data analyzed for the questionnaire administered at the case study company. The data was analyzed using non-parametric statistics, as initial analysis indicated skewness and kurtosis values outside the acceptable ranges. The data indicated that there were significant correlations between the various case study companies and the information medium used for communication. Correlations were also detected between the factors of information medium and the effectiveness of the information gained through the use of the particular medium. Visibility gained through information sharing was detected to be correlated to benefits gained by the overall business, it was shown to be negatively correlated to medium through which information was shared across the case study company.

The data also indicated that there was strong correlation between frequency of information shared and the information used for visibility purposes. Information that benefited supply chain partners was shown to be correlated to the information medium used. Table 6.7 indicates some of the major correlation detected from the assessment.

Table 6.8.: Correlation Values - Factors Assessed at Case Study Company

Factors	Co. Type	Info Med.	Info Eff.	Vis. Gained	Ben. Gained	Freq. Info	Info Usage	Info SC Partners
Co. Type	1							
Info Med.	-.679**	1	.					
Info Eff.	.321	.517**	1					
Vis. Gained	-.595**	-.460*	-.294	1	.			
Ben. Gained	.314	-.265	-.314	.749**	1			
Info Freq.	.639**	.358	-.081	.375	.358	1	.	
Info Usage	-.020	.105	.596**	-.131	.282	.416	1	
Info SC Partners	-.422	.540*	.063	-.261	-.092	-.385	-.057	1

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

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

Table 6.9.: Table of Abbreviations Listed in Table 6.7

Factors	Meaning of Abbreviation
Co. Type	Company Type
Info. Med	Information Medium
Info Eff.	Information Effectiveness
Vis. Gained	Visibility Gained
Ben. Gained	Benefits Gained from Using Visibility Tools
Info Freq.	Information Frequency
Info Usage	Information Usage
Info SC Partners	Information Shared with Supply Chain Partners

This research indicated that over 50% of the customer responded that the use of information technology and visibility tools was a high priority in achieving on time delivery. Omar et al., (2010) in their research as well as research papers from other supply chain researchers all pointed to the fact that customers felt that information accuracy, quality etc. were of very high importance in order to achieve accurate and complete deliveries of their orders (on-time delivery). Omar et al., (2010) in their research of Malaysian manufacturing organizations, showed that these companies had high mean scores (3.56) and high rankings to the customers based on their delivery performance and use of IT. This research therefore has a similar findings to existing research as it relates to information technology and it is importance and usage for on time delivery. Also it was shown that all companies within the case study company had made investments in IT infrastructure and the improvement of visibility in order to improve their on-time delivery performance. As stated by a manager during the validation interview " all companies have invested in information technology and have deemed supply chain visibility is important to them meeting their on-time delivery and meeting customer satisfaction".

6.5. Questionnaire Administered to Customers of Case Study Company

The analysis of the case study company, analysis of the data gathered from conducting the simulation as well as the assessment of past research in the area of supply chain visibility and on time delivery was used to identify areas of importance to customers. These areas of on-time delivery metrics as well as information garnered regarding visibility, and visibility tools were used to develop a questionnaire, which was administered to customers within the London area. The questionnaires were administered to 100 customers, 63 completed the questionnaire . The questionnaires were used to gather information regarding the use of visibility tools by the customers; these tools should allow for communication with the case study company. Questionnaires were also designed to assess whether or not the customers were impacted in terms of improved delivery, through the improvement of visibility applications with the case study company. SPSS software version 20, was used to analyze the questionnaires and data gathered from the customers

The analysis of the data in SPSS showed that based on the spread of respondents and their responses, their software would not be able to provide for thorough analysis. It was found that in some categories the numbers of respondents were very small and also the responses were very close between respondents. As such the categories were regrouped as small, medium and large size business and the analysis was conducted in that format. As shown in Table 6.9 the frequency of responses based on the type of company surveyed were very small in some cases, for example only one Food Store completed a questionnaire , due to this some frequencies were very small, as such the companies were merged into the categories of small, medium and large supply chain businesses, which still remained suitable for the focus of this research. From a research based in the United States it was found that small business are those that has 20 to 99 employees, those that are considered medium sized have 100- 499 employees, large enterprises have employees from 500 upwards (Paik, 2011) This guideline was used to regroup the organizations surveyed into the categories of small, medium and large. There were 63 respondents, of which approximately 40% were found to be large supply chain enterprises, approximately 29% were medium sized entities and approximately 32% were small businesses. The regrouped companies' frequencies are shown in Table 6.10.

Table 6.10.: Demographics of Customers' Companies Surveyed

	Frequency	Percent
Supermarket	19	30.2
Retail shop	7	11.1
Restaurant	18	28.6
Local Shop Store	4	6.3
Major Retail Shop	2	3.2
Food Store	1	1.6
Restaurant/Pub	2	3.2
Pub	5	7.9
Restaurant/Retail Shop	1	1.6
Wholesale	4	6.3
Total	63	100

Table 6.11.: Companies Regrouped Categories According to Employee Numbers (Size)

	Frequency	Percent
Small	20	31.7
Medium	18	28.6
Large	25	39.7
Total	63	100

6.5.1. Impact of Information Technology Usage

Table 6.11 shows that over 50% of the respondents indicated that the use of information technology was of a very high priority in order to achieve delivery speed. Analysis of data also indicated that shows that 59% of those persons surveyed felt the information technology was of high priority to achieving delivery dates and times. These findings are similar to previous studies such as Gonzalvez (2010), where it was pointed that ICT is a high priority for SME's especially those involve din manufacturing. The data achieved pointed out that ICT is a high priority as it was seen as a means of achieving and fostering business relationships, reducing cost, improving delivery and reducing time in information transmission.

Table 6.12.: Delivery Speed Priority based IT Usage

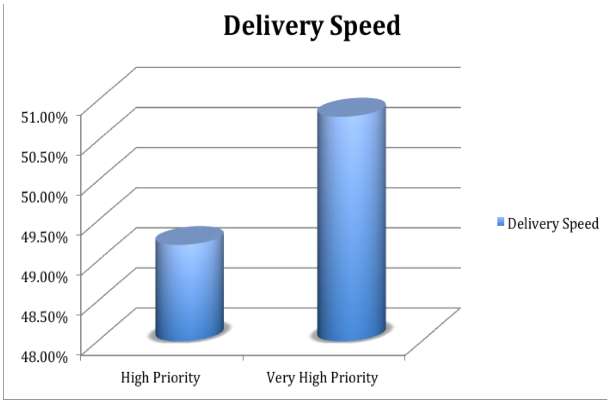

Figure 6.6 shows that 65.1% percent of of the business used the SAGE platform for their electronic data interchange (EDI) activities across the supply chain, and 22.1 % percent used MAS9O for their EDI activities. For their enterprise resource (ERP) activities such as inventory and warehouse management, it was found that 44.4 % percent used SAP while approximately 23.8 % percent used the Oracle platform for these activities (see Figure 6.7). Also of importance is the fact that 81% percent of respondents did not use radio frequency identification (R.F.I.D) technology despite its popularity in industry . Forty -four percent of respondents felt that the most important reason for employing technology in the supply chain is to achieve quality targets, not delivery targets Wisner (2003), pointed out that one of the main reason for the incorporation of ICT in SME's is the achievement of customer service satisfaction and quality in the goods and services offered. Authors such as Lin, Huang and Lin (2002); Clark and Lee (2000) have pointed out the benefits of ICT for the achievement of delivery responsiveness and flexibility, relationships and cost reduction.

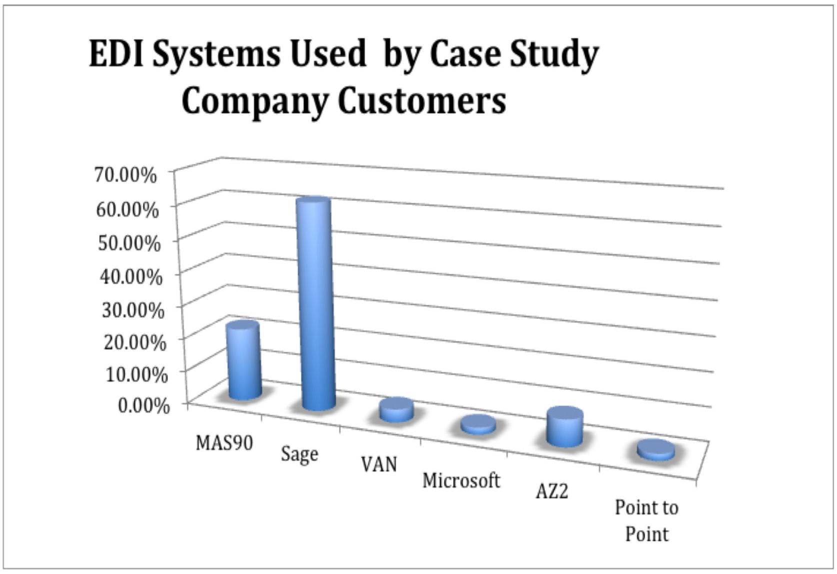

Figure 6.7.: Types of EDI Technology Used at Case Study Company Customers

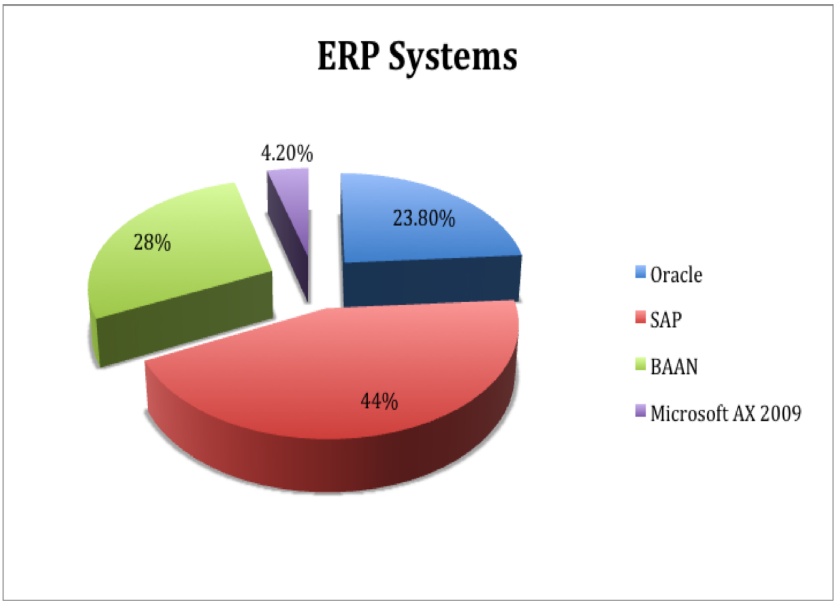

Figure 6.8.: Types of ERP Technology Used at Case Study Company Customers

6.6. Suppliers' Lead Time Importance

The findings showed that on average the lead time for orders placed by customers was one to five days (1-5), with minimum lead time being one day and maximum five days. The data also indicated that 85% of respondents had their orders being acknowledged on time . Ninety-Eight percent of respondents felt that their suppliers were an extension of their organization and stated that they were willing to work with their suppliers to improve the delivery processes over the long term.

6.6.1. Delivery Performance

In assessing the data it was found that 84% of respondents stated that they almost always receive on time delivery from their suppliers, while 14% stated that they always receive on-time delivery. Seventy-one percent of respondents stated that their suppliers are almost always willing to be flexible with delivery schedules in order to meet their needs while approximately 18% stated that their suppliers are always flexible as it relates to the delivery schedule to meet their needs. As it relates to the customers' ability to receive their order correct the first time, the findings indicated that approximately 64% of respondents almost always received their order correct the first time while 30% always received the correct order from the first delivery. Approximately 48% of respondent indicated that their suppliers are almost always willing to offer product variety mix in delivery and 52% of suppliers almost always respond favorably to quantity variations in demand in order to allow the case study company to respond to its customers' needs.

6.6.1.1. On time Delivery Reliability Measures

The data analyzed in regards to this parameter (from the questionnaire) and shown in Table 6.12, indicated that as it relates to the reliability of on-time delivery, the respondents indicated that as it relates to the reliability of suppliers one of the measures that is important to them is the delivery of goods on the agreed date. The findings also showed that approximately 37% of respondents indicated that they always received their goods on time, that is on the agreed date and considered this to be reliable delivery. Fifty- four percent of respondents indicated that they almost always receive their goods on time, thus they considered the suppliers to be unreliable. Kumar, Singh and Shankar (2015), in their research on SME's in India pointed out that one of the factors SME's considered a measure of reliability for their supply chain, was the fact that their suppliers delivered their orders on time (in the agreed timeframe), the findings of this research are similar to findings of other researchers focusing on SME supply chain. Having a short delivery time was also considered to be important to having reliable on-time delivery, 38.1% of respondents indicated that their suppliers always have short delivery times. Short delivery times are important, as at times customers require their suppliers to respond to change in demand quite quickly, in order to allow them to achieve their sales and satisfy their customers' needs. Also of importance to achieving reliable on-time delivery, is the ability of suppliers to provide product mix when requested, 46 % of respondents indicated that they always receive product mix whenever they requested same from their suppliers.

Table 6.13.: Reliability Measures for On-Time Delivery

Items	Measures	Frequency	Percent
Goods delivered on agreed date	Sometimes Almost Always Always	5 34 23	7.9 54 36.5
Total		62	98.4
Supplier has short delivery time	Sometimes Almost Always Always	6 32 24	9.5 50.8 38.1
Total		62	98.4
Supplier provides product mix when requested	Sometimes Almost Always Always	4 29 29	6.3 46 46
Total		62	98.4

Delivery performance along the supply chain is said to be governed by parameters such as the delivery lead time (delivery window), responsiveness, flexibility, product variability and availability. da Silveira and Arkader (2007), indicated in their research that on surveying a number of companies they indicated that when speed, reliability and lead-time are highly correlated to delivery performance, improvement in one area will lead to improvement in other dimensions. This research indicated that their was significant influence between lead time and delivery performance, the results went further to indicate that there is a correlation between on-time delivery, supply chain visibility as well as on-time delivery and supply chain processes. These results supports what other researchers previously stated in their research, that as improvement is seen in processes and methods used to enhance the supply chain delivery performance will also improve.

The results form case study questionnaire indicated that eighty-four percent (84%) of respondents stated that they almost always receive on time delivery from their suppliers, while fourteen percent (14%) stated that they always receive on time delivery. Seventy-one percent of respondents (71%) stated that their suppliers are almost always willing to be flexible with delivery schedules in order to meet their needs while approximately eighteen percent (18%) stated that their suppliers are always flexible as it relates to the delivery schedule to meet their needs. As it relates to the customers' ability to receive their order correct the first time the analysis of the data indicated that approximately sixty four percent (64%) of respondents almost always received their order correct the first time while thirty percent (30%) always received the correct order from the first delivery

6.7. Supply Visibility Measures

In relation to the use of visibility tools by the customers for the purpose of integration and coordination with the suppliers, the findings showed that a high percentage of customers (87%) and their suppliers incorporated the use of information technology systems to enhance the exchange of information between parties along the supply chain. Despite the availability and high usage of information technology tools, approximately 51% of customers and suppliers continue to conduct their business through informal means such as (word of mouth, notes and over the phone conversations). The customers surveyed also indicated that they used formal means to ensure coordination of their operations, a high percentage of customers used EDI and electronic invoicing see Appendix D.

6.8. Supply Priorities

This section of the questionnaires focused on those items that are considered a priority to the customers as it relates to the use of technology and on-time delivery. The customers were asked to rank whether or not they had experienced improvement in the various priority items since their suppliers and themselves have incorporated visibility tools into their supply chains. The items were ranked from significant decrease to significant increase, with other rankings in between.

The findings showed that as it relates to the customers receiving information regarding transactions such as the confirmation of their order, approximately 89% of respondents stated that they had seen an increase in this activity and 11% of respondents have had a significant increase in this activity. As it relates to receiving correct and faultless invoices from their suppliers, 57% had seen an increase, while 44% of respondents had seen a significant increase in on-time delivery since the incorporation of visibility tools and making on-time delivery a priority to their business. The data indicated that customers had a significant increase of 54%, as it relate to their suppliers having shorter delivery times, due to the incorporation of visibility tools and delivery times being a priority. There was also a significant increase of 68% for the priority of suppliers providing advance notification for late deliveries or stock outs, and a 63.5% for increased improvement in suppliers' responsiveness to their customers. See Table 7.14 for all data analyzed.

These findings are supported by researchers such as Koh, Demirbag, Bayraktar, Tatoglu and Zaim (2007); Gunasekaran et al. (2004) and Chang et al (2005) have all pointed to factors such as flexibility, reduced lead time as being improved through the use of visibility tools and of being a high priority to customers. Supply chain researchers focusing on SME's have pointed to a difficulty in assessing these performances due to lack of technology within this sector (Gumboh & Gichira, 2015). This study has identified the fact that SME's in London also considered reduce lead time and other factors to be of high priority, and felt that in some areas they had significant improvement in their suppliers performance due to the implementation of visibility tools.

Table 6.14.: Factors of Priority to Supply Chain Customers

Items	Measures	Frequency	Percentage
Transaction Information	Significant Decrease	0	0
	Decrease	0	0
	Average	0	0
	Increase	56	88.9
	Significant Increase	7	11.1
Number of Faultless Invoices	Significant Decrease	0	0
	Decrease	0	0
	Average	1	1.6
	Increase	36	57.1
	Significant Increase	26	41.3
On Time Delivery	Significant Decrease	0	0
	Decrease	0	0
	Average	1	1.6
	Increase	34	54
	Significant Increase	28	44.4
Supplier Delivery Time Shortened	Significant Decrease	0	0
	Decrease	0	0
	Average	4	6.3
	Increase	25	39.7
	Significant Increase	34	54
Supplier Provides Advance Notification of Late Deliveries or Stock Out	Significant Decrease	0	0
	Decrease	0	0
	Average	1	1.6
	Increase	19	30.2
	Significant Increase	43	68.3
Improved Responsiveness from Suppliers	Significant Decrease	0	0
	Decrease	1	1.6
	Average	3	4.8
	Increase	19	30.2
	Significant Increase	40	63.5
Total		63	100

6.9. What Factors do Companies within the Fast Moving Consumer Goods (FMCG) Supply Chain Consider a Priority to Meeting On Time Delivery of their Goods and Services?"

There are key performance indicators that FMCG SME's considers critical priorities/ metrics to their achieving on time delivery within their organization. Gunasekran et al. (2004), as well as recent research in supply chain priorities for on-time delivery by researchers such as Matsoso and Benedict, (2014); Thakkar et al. (2009) and Beamon (1999) all indicated that for SME's on time delivery is a very important internal measure which indicates the performance of the business. The priorities considered important to achieving on time delivery success are listed as perfect order fill, number of faultless invoices issued, flexibility of delivery schedule to meet customers needs and customer query time, delivery lead time. According to da Silveira and Arkader (2007), it has been found that supplier and customer interactions have very significant impact on delivery performance, but these have to be underpinned by internal coordination. These views have also been supported by authors such as Salvador et al.(2001).

Therefore in answering the research question that sought to identify the factors supply chains considered a priority, the results obtained in this research indicated that on-time delivery as a priority is very important to consumers and this factor was greatly influenced by delivery lead time. Delivery lead time was responsible for 45.8% of the variance detected in on-time delivery, The data also indicated that there is a correlation between on-time delivery and supply chain visibility, there was also correlation found between supply chain processes (that is ordering and delivery processes) and on-time delivery.

Within the category of supply chain priorities (as shown in customer questionnaire Appendix A3), it is important to note that the priorities of supplier provides advance notification of late deliveries or stock out, responsiveness of suppliers and information regarding transactions (such as order confirmation) were not seen as high priorities to meeting on time delivery. Researchers such as Gunasekaran et al. (2004) have pointed out the importance of these factors to on-time delivery in supply chain, this research study did not find that these factors played a role in on-time delivery for the case study company and their customers, based on the results of the hypotheses tested.

There are a number of potential reasons that may exist why these results opposed existing results by researchers regarding priorities or metrics that are considered important to meeting on time delivery. Firstly most existing research was conducted solely on large companies, the focus of this research was a specific small case study company. Also researchers such as Soderberg and Bengtsson (2010); Bowersox et al. (2007) and Lockamy and Mc Cormack, (2004) in their assessment looked at delivery performance in terms of financial performance of the research companies and considered this to be a leading priority to achieving on-time delivery. This research did not focus on the financials of the case study company as this was not deemed a priority to them achieving main

6.10. Analysis of Variance and T-test

ANOVA tests were also conducted as part of the data analysis in this paper, the analysis using ANOVA was conducted in order to determine the differences observed in the responses provided by respondents at the customers sites, regarding visibility tools and their usage and the level of on time delivery achieved. The thesis also assessed the significant level of differences through the comparison of means of the independent groups of small, medium and large size business. Park (2005) stated that the ANOVA test is used for statistical comparisons of more than two groups. While Field (2013) and Pallant (2013) stated that ANOVA and t-test tests are appropriate testing mechanisms for the assessment of statistical differences of data that can be used to make accept or reject decisions in research studies. The result tables of the ANOVA test are included in the Appendix D. The T-test is used to compare means of two variables. An independent T-test was used to compare the use of visibility tools between small, medium and large SME's. Algethmi, 2014 in his research stated that researchers are sometimes interested in looking at differences between groups of people rather than looking at relationships between variables. In this case the independent T-test is used to look at differences between groups of people within specific sized companies (small, medium, large). An independent sample T-test can be used to compare the mean score for two different groups of participants (Pallant, 2010). The T-test was not appropriate for this research study as the study focuses on more than two research groups, it has been pointed out by researchers that the use of the T-test to conduct cross analysis of groups that are more than two increases errors (www.jessicaaro.wordpress.com, 2012), as such the ANOVA analysis was used.

6.10.1. Analysis of Variance (ANOVA)

According to Field(2009), the ANOVA test allows for testing of multiple means of multiple items in one research study, Pallant (2010) pointed out that ANOVA test is of value for testing a category which may contain one variable that has more than one treatment and as such corresponds differently to the conditions. In this study, organization size, information usage, supplier visibility, suppliers' lead time and supply chain priorities are examined using the ANOVA test. Company size has three categories namely: small, medium and large. Additionally supply chain priorities, suppliers' lead times, supply chain visibility measures and information technology usage contained as high as ten items to be tested against company size. The subsequent sections highlight the ANOVA test carried out in this study.

6.10.2. Company Size Effects

A one-way between-groups analysis of variance is conducted to explore the differences in company size to the grouped factors of information technology usage, suppliers lead time, supply visibility measures and supply priorities. Scores for the different company sizes that is; small, medium and large are shown in column 4 (listed as significant values) in Table 6.14, which demonstrates that there is a statistically significant difference in company size scores for two groups, as $p<0.05$. There is a statistically significant difference for supply visibility measures and for supply priorities with ($p<0.05$). Please see Table 6.14 for the ANOVA analysis results.

F value in ANOVA test is the ratio of two mean square values. According to Pallant (2013) in order to determine the F value the following formula is used :

F = Variance of the group means / Mean of the within group variances.

The F test according to Bryman and Cramer (2005) is an estimate of the between groups variance and the within groups variance. Bryman and Cramer (2005) went further and stated that the higher the F ratio value, the more significant the differences there will be between means. A high significant difference between means indicates that the means values are not due to chance. Other authors such as Field (2013) have stated that an F value higher than one indicates a parameter of great significance.

Table 6.15.: One-way Anova test for the effect of company size on supply chain factors

Information Technology Usage	df	Mean Square	F	Sig.(p)
Between Groups	2	.259	.065	.937
Within Groups	60	3.987		
Total	62			
Suppliers' Lead Time				
Between Groups	2	2.083	.504	.607
Within Groups	59	4.132		
Total	61			
Supply Visibility Measures				
Between Groups	2	48.655	5.524	.006
Within Groups	59	8.808		
Total	61			
Supply Priorities				
Between Groups	2	7.701	3.812	0.028
Within Groups	60	2.020		
Total	62			

A Tukey Post-hoc comparisons test was performed in order to determine the differences in favor of any specific company size. Based on the post-hoc results shown Table 7.16 shows that a significant difference was found between medium and large companies for the area of supply visibility measures with mean scores (M= 39.3, SD =3.37) . There were also significant differences between small and medium business in the area of supply chain priorities with means (M= 26.08, SD = 1.77) , where p<0.05. Therefore, it can be agreed that the level of supply visibility measures implemented and the factors companies consider to be of priority to achieve delivery performance etc. differ across company sizes. The data did not indicate any significant differences between the companies based on size and the use of information technology and suppliers' lead time. Please see Appendix E1 for the Tukey Results for company size.

6.10.3. Information Technology Usage

The One-Way Anova analysis for the use of information technology among the various supply chain companies based on size, indicated that within the group there was significant difference in the usage of information technology for the meeting of delivery date and time , with means (M= 4.11, SD= .323). The significant level was at the $p<0.05$ level. According to this research for the factor of information usage all company sizes differed by their means values with information usage mean value for small companies being 4.25%, medium companies 4.11% and large companies 4.6%. However, the significant difference was between medium and large companies. Significant differences were also observed in the usage of RFID by companies, there were significant differences between small and large companies as well as medium and large companies in the usage of RFID within their organizations. The mean differences observed were small 2.000% , medium 1.8889% and large companies 1.600%. Please see Appendix E 2 for the ANOVA results.

6.10.4. Suppliers' Lead Time Measures

The One-Way Anova analysis of the items relating to suppliers' lead time as it relates to company size indicated that there were significant differences in the items of average lead times on orders. The differences in means significance were seen for all size companies, with means values for small companies at 1.5%, medium 1.88% and large companies means 1.875%. The means and standard deviations for average lead times based on company sizes were, small (M= 1.5, SD = .512), medium (M= 1.88, SD= .323) and large (M= 1.875, SD=.337). There were also significant differences when means are compared for medium and large companies for the factor of minimum lead time for order delivery with means for medium companies (M = 1.1667, SD=.383) and large companies (M=1, SD= .000). These were all significant at the $p<0.05$ level. There were also significant differences observed in this study, between small and large companies as it relates to the time it takes for suppliers to respond to order related queries. The response time for order delivery queries, mean level for small companies were 1.35% and for large companies 1.75% . The overall means for small companies were (M= 1.35, SD= .489) and for large companies (M= 1.75, SD= .442). Please see Appendix D2 for the results.

6.10.5. Supply Visibility Measures

The Anova assessment for the items relating to supply visibility measures indicated that there were significant differences between small, medium and large companies as it relates to visibility information technology medium of video conferencing as a means of communicating with suppliers and enhancing visibility. In comparing the means small companies had means of 3%, medium 3.94% and large companies 4.16% medium and small companies, with M = 3.94 for medium companies, SD= .725. There was also significant difference between large and small companies as it pertains to their abilities to communicate with. The overall means and standard deviations for each size company were found to be small (M= 3.00, SD= .858), medium (M= 3.94, SD= .725) and large (M= 4.16, SD =.862). It is observed from this study that based on the size of the company there were significant differences in the usage of video conferencing technology between customers and supplies in conducting supply chain transactions. Significance was at the $p<0.05$ level. For all other items, within this category (supply visibility measures), the data analysis did not indicate any significant differences in relationships. Please see Appendix D3 for the test results

6.10.6. Supply Priorities

The One-Way Anova analysis for supply chain priorities which focuses on priority items such as on time delivery, the number of faultless invoices generated and the responsiveness to the customer needs. The results indicated that there was significance in the results between medium and small companies in their means with small having a mean level of 4.1% and medium 4.55% with means (M= 4.55, SD = .511). There were all significant differences between small and large companies in relation to the number of faultless invoices received from their supplier, with small having means of 4.7% and large 4.28% , the overall mean and standard deviation being (M =4.70, SD .571) all data was significant at the $p<0.05$ level. Please see ANOVA values in Table 7.17 and Appendix D4 for the Post Hoc Test Results.

Table 6.16.: ANOVA Results for Factors Considered Priority for Supply Chain

Faultless Invoices Received	df	Mean Squares	F	Sig. (p)
Between Groups	2	1.297	5.375	.007
Within Groups	60	.241		
Total	62			
On Time Delivery				
Between Groups	2	1.094		.018
Within Groups	60	.254	4.308	
Total	62			
Notification of Late Deliveries/Stock-Out				
Between Groups	2	.724	2.987	.058
Within Groups	60	.243		
Total	62			

The results of the ANOVA test indicated that supply priorities as a performance factor, based on the size of the company, was statistically significant to the overall research model (sig = 0.12, $p<0.05$) with F value of 3.070. The results further indicated that of all the items researched under the area of supply priorities the factor of information shared for translations purposes was the most significant factor influencing on-time delivery (sig = .034, $p<0.05$) with F value of 2.295.

The standardized Beta coefficient indicates the relative importance of the indicators, supply priority had a Beta value of .426 ($p<0.05$), research based on the SCOR model and other methods have achieved Beta values for supply priority factors (as they relate to delivery performance) ranging from 0.3 to 0.69 (Lockamy & McCormack, 2004), therefore the beta values achieved by this research paper is within the ranges established by other researchers regarding delivery performance and supply chain priority factors. The Anova results can be found in Appendix E.

6.11. ANOVA Tests Summary

After carrying out the ANOVA tests, the results are presented in Table 6.16. The grouping criterion of the tests was based on the customers' organization sizes.

Table 6.17.: Summary for the Results of this section

Test	Grouping criteria	Dependent variable (s)	Level of significance (p)	Interpretation
ANOVA	Company Size: Small Medium Large	All Supply Chain Performance Factors	Significant ($p<0.05$)	A difference was detected between company size and their performance within the supply chain
ANOVA	Company Size: Small Medium Large	Information Technology Usage	Significant ($p<0.05$)	A difference was detected for the meeting of delivery dates and time. Difference was also detected for the usage of RFID technology within the supply chain.
ANOVA	Company Size: Small Medium Large	Suppliers' Lead Time	Significant ($p<0.05$)	Differences detected for minimum and average lead-time for delivery to customers. Differences also detected for response time to order related queries by suppliers.
ANOVA	Company Size: Small Medium Large	Supply Visibility Measures	Significant ($p<0.05$)	A difference was detected for the use of vide-conference technology as a means for doing transactions
ANOVA	Company Size: Small Medium Large	Supply Chain Priorities	Significant ($p<0.05$)	A difference detected in regards to the number of faultless invoices received by customer form supplier

As illustrated in Table 6.16 , significant difference were detected in all dependent areas assessed. The differences detected were assessed across the various company sizes with post-hoc comparisons indicating that the most significant difference was detected between large and small companies for the use of video conferencing technology to aid visibility and transaction processes within the supply chain ($p <0.05$). As it relates to supplier's lead time , there were differences detected based on the size of the company, differences were detected for minimum and average lead time. Differences were also detected for the number of faultless invoices received by the customer from the supplier, differences were detected based on the size of the customers' company.

Delivery performance along the supply chain is said to be governed by parameters such as the delivery lead time (delivery window), responsiveness, flexibility, product variability and availability. da Silveira and Arkader (2007), indicated in their research that on surveying a number of companies they indicated that when speed, reliability and lead-time are highly correlated to delivery performance, improvement in one area will lead to improvement in other dimensions. This research indicated that their was significant influence between lead time and delivery performance, the results went further to indicate that there is a correlation between on-time delivery, supply chain visibility as well as on-time delivery and supply chain processes. These results supports what other researchers previously stated in their research, that as improvement is seen in processes and methods used to enhance the supply chain delivery performance will also improve.

The results from the case study questionnaire indicated that eighty-four percent (84%) of respondents stated that they almost always receive on time delivery from their suppliers, while fourteen percent (14%) stated that they always receive on time delivery. Seventy-one percent of respondents (71%) stated that their suppliers are almost always willing to be flexible with delivery schedules in order to meet their needs while approximately eighteen percent (18%) stated that their suppliers are always flexible as it relates to the delivery schedule to meet their needs. As it relates to the customers' ability to receive their order correct the first time the analysis of the data indicated that approximately sixty four percent (64%) of respondents almost always received their order correct the first time while thirty percent (30%) always received the correct order from the first delivery.

The ANOVA results conducted to assess the responses of the customers indicated that the greatest significance as it relates to delivery performance was seen between large and small companies ($F= 3.82$, $p<0.05$). This was seen in the parameter of how long it took to receive a response from suppliers for order related queries. Between small and large companies the parameters of average lead time on orders, the duration it takes for order queries to be responded and on time delivery of order form supplier were found to be the parameters statistically significant. Between large and medium size companies the parameters of minimum lead time on orders was the only statistically significant parameter.

6.12. “What Percentage of Companies uses Information Technology as a Visibility Tool to Transact Supply, Purchasing and Delivery Business within the Supply Chain?”

Information technology had been ranked by researchers as an effective tool for the transaction of supply chain businesses. Golicic et al., (2002) in their research pointed out that technology usage can lead to complete visibility which allowed for improvements in delivery speed, precision in delivery, increased competitive advantage and overall improvement in the supply chain.

The analysis indicated that ICT infrastructure had a significant influence on the minimum lead time for delivery of orders, with significance ($p<0.05$). ICT was observed to be responsible for 8.2% of the variance in minimum lead time, it also had a significant variance on the reliability factor of supplier providing product mix when requested, with significance ($p< 0.05$). IT infrastructure and usage was responsible for 9.2% of variances found in supply chain reliability. Supply chain visibility was shown to be impacted by responsiveness, the level of responsiveness a company is able to achieve depends on the IT tools and visibility it has achieved.

This research also indicated that over 50% of the customer responded that the use of information technology and visibility tools was a high priority in achieving on time delivery. Omar et al., (2010) in their research as well as research papers from other supply chain researchers all pointed to the fact that customers felt that information accuracy, quality etc. were of very high importance in order to achieve accurate and complete deliveries of their orders (on-time delivery). Omar et al., (2010) in their research of Malaysian manufacturing organizations, showed that these companies had high mean scores (3.56) and high rankings to the customers based on their delivery performance and use of IT. This research therefore has a similar findings to existing research as it relates to information technology and it is importance and usage for on time delivery. Also it was shown that all companies within the case study company had made investments in IT infrastructure and the improvement of visibility in order to improve their on-time delivery performance. As stated by a manager during the validation interview “ all companies have invested in information technology and have deemed supply chain visibility is important to them meeting their on-time delivery and meeting customer satisfaction.

6.13. “What is the Lead Time for Companies who Conduct Business using Information Technology (visibility) Tools?”

Lead time has been noted to be an important factor for SME’s, this has been pointed out by a number of researchers. In the review of literature focusing on “time- based performance measures” Kurien and Qureshi (2011) pointed out that there are four time-based measures frequently used for SME supply chains, they are: new-product development time; (ii) manufacturing lead-time; (iii) delivery speed; and (iv) responsiveness to customers. They further stated that the popularity of these measures suggests that new product development, manufacturing, delivery, and customer service are key integrated strategic processes contributing to supply-chain time-based performance.

The Supply-Chain Operations Reference (SCOR) Model also makes reference to the importance of time-based measurements for supply chain performance. The SCOR model provides a common process oriented language for communicating among supply-chain partners in the following decision areas: PLAN, SOURCE, MAKE, and DELIVER. SCOR model is designed as a tool to describe, measure and evaluate any supply chain configuration (Neely, Gregory & Platts, 1995). Research papers on lead time while indicating the importance of lead time, had varying time frames for lead time depending on company type, location and size. It was found that for the garment industry lead time averaged approximately one year (Giri & Rai, 2013). In the U.K. lead times for SME (clothing) has been found to be approximately nine months, with ZARA implementing measures to reduce theirs to 20-30 days (Fernie & Sparks, 2004).

In FMCG and perishables sector, the primary focus for performance is on meeting product availability (refilling the shelves), and this has been achieved through the efficient management of lead time. Transportation is mainly by road and the lead-time of these supply chains is still as high as 9-12 weeks (Srivastava, 2006) . The customers in this research indicated that their average delivery lead-time was 1-5 days, which would be better than that indicated by previous researchers. It is also noteworthy that this lead-time is linked to the use of visibility tools (as indicated by the customers in their responses) and lead time in this research also influenced on-time delivery. Minimum lead time (1 day) was shown to have high influence on on-time delivery, approximately 90% of the respondents of this research indicated that the supplier delivered had a 1 day lead time, and this was the main factor that drove on-time delivery, the fact that this short lead time was being met.

6.14. Conclusion

This chapter investigated the case study company's profile in terms of the movement of products through each company within the organization. The chapter also focused on the profile and priorities of both the supplier and customers, regarding their views on visibility tools, on time delivery and whether or not these factors were considered a priority to the organization and customers. Further, their on time delivery performance, customer relationships, responsiveness to customers' needs (to name a few item categories) were examined using a descriptive SPSS analysis, with analysis of frequencies assessed in order to achieve greater insight as to the usage and effects of visibility tools and on time delivery to the customers' businesses. ANOVA test results were also analyzed to determine significant differences in the test parameters and based on the size of the supply chain companies.

The descriptive analysis showed differences in the case study company model factors as well as those of the customers based on the size of their businesses. It was observed that at the case study company communication was conducted most times via fax, telephone etc. despite the implementation of information technology resources. Sage technology was found to be the most used EDI technology across the case study company. While the ANOVA results indicated that their were statistical differences based on company size for all factors assessed, that is information technology usage, supply visibility measures, delivery performance and supply chain priority factors.

The next chapter will provide a brief analysis focusing on regression analysis and correlation assessments to arrive at conclusions regarding the research hypotheses. The next chapter focuses on arriving at a conclusion as to whether or not there are any direct links to the use of visibility tools and improvements in on time delivery to customers.

7. Research Parameters Testing

7.1. Introduction

This section aims at testing the hypotheses developed by examining the relationships between independent variables and dependent variable (company size). The effect of the precursors namely: ICT usage, supply chain visibility, supply priorities and delivery performance were also examined. .

The different tests adopted in the study include reliability test (Cronbach's alpha), normality test, multicollinearity test and ANOVA. All of these tests have been shown by other researchers to be of great significance to the testing and analysis of data for hypotheses and other statistical testing. Reliability test was used to test for research instrument consistency (Field, 2005), it is also important that prior to conducting regression analysis, that checks for normalcy, correlation of variables were also checked through the multicollinearity tests. Tabachnick and Fidell (2013), stated in their research that prior to regression analysis data should be checked for data set distribution, missing values, outliers and multicollinearity should be made prior to regression analysis. The next section show tests carried out prior to carrying out regression analyses. Table 7.1 indicates the different tests used in this study for screening and testing of the hypotheses and answering the research questions.

Table 7.1.: Tests Used in this Study

Test Name	Description
Cronbach's alpha	Assess inter-consistency of a set of measures that makes up a scale (De Vellis, 2003).
Normality	Assess the degree to which the distribution of a set variables follows a normal distribution (Hair et al., 2010).
Multicollinearity	Assesses the correlations between independent variables; high correlation affects the regression coefficient value and hence the significance level of a varaibale (Hair et al, 2010)
Regression Analysis	Examines the relationship between one dependent variable and a number of independent variables. (Field 2013; Pallant, 2013)
One –way analysis of variance (ANOVA)	Invetsigates and compares the scores between three or more different groups or conditions (Palllant, 2013)

7.2. Data Screening Prior to Regression Analyses

Prior to conducting the regression analysis in relation to hypotheses testing, Pallant (2013), recommends checking and collection of any errors in the primary data set. The checks are recommended to ensure that the data being used for the testing of the conceptual model is usable and valid. As recommended by Pallant (2013), statistical testing using SPSS software was conducted, as this software is sensitive in capturing errors. According to Tabachnick and Fidell (2013), screening of the primary data is necessary and important as screening improves the accuracy of data that could "produce distorted correlations". Tabachnick and Fidell (2013) also stated that data can be screened for internal consistency, missing values, linearity, outliers and multicollinearity all leading to improvement in the data analysis results. The subsequent sub-sections focus on data screening tests that were carried out on the primary data set of this research and the outcomes.

7.2.1. Missing Values Checks

According to Tabachnick and Fidell (2013), missing data is a common issue in research, and as such prior to data being entered for statistical analysis in SPSS or any other software, researchers should examine the data to determine whether or not there are missing values. Sekaran(2003) pointed to the fact that most research in social sciences and/or marketing incorporate the use of surveys, with the sample size needed in most research it has been found to be quite difficult to obtain complete data. In other words it is highly unlikely that a researcher will have all his/her survey instruments completed, and completed to the extent that all areas are completely filled. The problem of missing data is observed as situations where researchers are unable to receive completed questionnaires from all respondents. In this research, all questionnaires administered for this thesis was not returned , during the field study 100 questionnaires were distributed, 63 were returned. The 37 questionnaires which were not returned were ignored for the analysis process.

According to Tabachnick and Fidell (2013), missing data can cause difficulty in the statistical analysis process, making the assessment of reliability challenging. Pallant (2013), stated that missing data can occur randomly or non-random, while Tabachnick and Fidell (2013) indicated that non-random missing data will have an effect on researchers being able to generalize his/her results. In the case of this generalization of findings was not applied to the findings, thus the effect of non random missing data was not considered detrimental to the research. It is important to deal with missing data prior to analysis in order to arrive at credible findings, Cohen et al. (2003) argue that it is important to also consider the percentage of missing data found prior to analysis. According to Kleinbaum et al. (2007), missing data should not exceed 10% while Bryman and Cramer (2011) argued that missing data levels greater than 10% are acceptable but should be recorded as missing for the specific participant who did not complete the questionnaire or survey. In this study, the missing data check was carried out prior to performing further analysis where SPSS software was used.

7.2.2. Regression Analysis and Hypothesis Testing – Customers' Data

To test the model hypotheses, three separate discriminant models were developed. The first part of the model tested hypotheses concerning the influence of the model precursors namely: Information technology usage, Suppliers' lead time and Supply chain priorities. The second part of the model involved the testing of the influence of organization size on supply chain visibility . The third part of the model tested the influence of supply chain visibility measures on the achievement of on-time delivery and level of visibility achieved by the SME. Regression analysis is used to determine the level of influence or contribution of each predictor variable. The subsequent sections of this chapter will highlight the results of each hypotheses test carried out.

7.2.3. Regression Analysis of On- Time Delivery - Model 1

According to the model developed in Figure 3.5, multiple regression analysis was employed to test hypotheses H1, H2, H3 and H4. Based on the multiple regression analysis this section of the model showed significance for the factor of delivery lead time ($p<0.05$). The regression analysis results also indicated that delivery lead time made the most significant contribution to the variance of on-time delivery. Delivery lead time was responsible for 21.0% of the variance detected in on-time delivery, the adjusted R square value was noted since it gives a better prediction of coefficient estimation. The adjusted R square was noted to be 5.50%. The model showed high correlation between predictors as the R value was 45.8%. Pallant (2011), stated that a R value above .3 indicates correlation of variables. The data indicates a correlation between on-time delivery and delivery lead time, with a R value of 32.0%. Based on these results hypothesis H2 is supported. Table 7.2 displays the regression results for on-time delivery .

Table 7.2.: Regression Analysis for On-Time Delivery

Variable	R	R Square	Adjusted R Square	Sig.
	.458	.210	.055	.012
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		
Constant	6.214			.000
Order Accuracy	1.112	.112	H1	.388
Delivery Lead Time	-.320	-.389	H2	.012
Delivery Window	-.133	-.220	H3	.113
Response Time	-.100	-.142	H4	.280

Dependent Variable: On-Time Delivery

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The ANOVA results conducted to assess the responses of the customers indicated that the greatest significance as it relates to delivery performance was seen between large and small companies ($F= 3.82$, $p<0.05$). This was seen in the parameter of how long it took to receive a response from suppliers for order related queries. Between small and large companies the parameters of average lead time on orders, the duration it takes for order queries to be responded and on time delivery of order form supplier were found to be the parameters statistically significant. Between large and medium size companies the parameters of minimum lead time on orders was the only statistically significant parameter.

The regression analysis indicated that the delivery performance parameter (which was assessed as suppliers' lead time) had significant influence on the variations across companies based on size ($p<0.05$). It appears that where the dependent variable is the size of the company, within the item of suppliers' lead time , reliability measures and delivery performance there were no significant predictors. However, as it relates to overall performance of companies (assessing the entire model), suppliers' lead time (consisting of sub parameters of suppliers lead time, delivery performance and reliability measures) ($\beta = .256$, $p<0.05$), supply visibility measures ($\beta = .558$, $p<0.05$) supply priorities ($\beta = .403$, $p<0.05$) and information usage ($\beta =.242$, $p<0.05$) were found to be important predictors to the performance of the assessed companies, with size of company being the dependent variable.

The results therefore indicates that most customers consider delivery performance to be an important parameter to the success of their business and most of the customers were satisfied with the delivery performance of their suppliers. These results indicating that if improvement can be had in the factors that influences delivery performance, the improvement in delivery performance becomes an indicator for measuring customers' satisfaction. According to Darestani, Ismail, Ismail and

Yusuff (2010), "delivery performance is one of the most important indicators of supplier performance" (p.11).

7.2.4. Influence of Factors on Supply Chain Visibility -Model 2

This section analyzed the model shown in Figure 3.6, multiple regression analysis was conducted to test the hypotheses of H5, H6, H7, H8 and H9. The data indicated that supply chain visibility is significantly influenced by the level of responsiveness that exists within the supply chain ($p<0.05$). Supply chain responsiveness has a correlation with supply chain visibility with the R value being 37.2%. Supplier responsiveness was observed to be responsible for 13.9% of variance in supply chain visibility and adjusted R squared which is a better explanation of the variance, was 12.4%.

The analysis also indicated that information sharing for coordination, the information format used, IT systems and tools were not significant contributors to the variances in supply chain visibility as their value of significance ($p> 0.05$), was greater than the required cut off value. Therefore these results supports H8 but does not support H5, H6 and H7. The regression results for all hypotheses tested is shown in Table 7.3 and Table 7.4.

Table 7.3.: Regression Results Factors Influencing Supply Chain Visibility

Variable	R	R Square	Adjusted R Square	Sig.
	.372	.139	.124	.003
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		.000
Constant	32.825			
Information Format	.178	.245	H5	.153
IT Systems/Tools	-.050	-.069	H6	.598
Information for Coordination	1.112	.112	H7	.388
Supplier Responsiveness	1.769	.372	H8	.003

Dependent Variable: Supply Chain Visibility

7.2.4.1. Influence of Supply Chain Visibility on On-Time Delivery - Model 3

In analyzing the second part of the model shown in Figure 8.3, which depicts the influence of supply chain visibility on on-time delivery, the hypotheses of H9 was tested. The regression analysis data indicated that there is correlation between supply chain visibility and on-time delivery with an R value of 30.3%. The data indicated that supply chain visibility did not significantly influence on-time delivery ($p>0.05$). From this model it is shown that H9 was not supported.

Table 7.4.: Regression Analysis Results - Supply Chain Visibility's Influence on Delivery Time

Variable	R	R Square	Adjusted R Square	Sig.
	.303	.092	.061	.058
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		.000
Constant	6.905			
Supply Chain Visibility	-.352	-.214	H9	.058

Dependent Variable: On-Time Delivery

7.2.5. On-Time Delivery in a Case Study FMCG SME is Positively Impacted by the Use of Visibility Tools

Supply chain visibility has been shown to be supported by IT which in turn is said to leave to improved operational performance, IT supports tools that can be used to optimize visibility (Gules, Cagliyan & Beduk, 2012). The analysis indicated that the parameter that is the greatest contributor to the variances detected across company sizes was supply chain visibility (ß = .949). The results confirmed the hypothesis that usage of visibility tools and level of visibility achieved by SME's varies according to the size of the company. The data indicated that supply chain visibility is significantly influenced by the level of responsiveness that exists within the supply chain ($p<0.05$). Supply chain responsiveness is responsible for 37.2% of supply chain visibility.

The results is in contrast to Holcomb et al's. (2011) research, which pointed to no significant difference in visibility based on company size, though it must be pointed that they focused on North American companies versus European companies, while this research focused on companies within UK, who received their products mainly from Caribbean suppliers.

The research indicated that visibility tools had a direct correlation to the levels of on time delivery performance achieved by the organization. According to Pettit (2008) visibility is a clear enabler of rapid and effective operations and cession making such as those decisions and operations impacting on time deliver, especially times of shortage and other turbulent times. The data also indicated that there is a correlation between on-time delivery and the methods used for ordering (electronic ordering systems), these methods are supported by IT and can be said to enhance visibility.

The findings reveals a significant positive relationship between supply chain visibility and supply chain on time delivery. Supply chain visibility was shown to be greatly influenced by suppliers' lead time with (ß = .558), 80.2% of the variance detected in supply chain visibility was explained by this model. Lead time is the greatest influencer of on-time delivery, thus it can be deduced that visibility influences on-time delivery. The findings are consistent with (Shin, Collier & Wilson, 2000) who asserts in their research that buyers' performance was directly related to sellers performance, and one the main factors that drove suppliers' performance was that of on time delivery. The researchers went further to indicate that technology and relationships that allowed for collaboration and visibility enhanced the sellers' performance in on time delivery and other areas. Their study supports not only this research but other research that pointed to the positive impact of visibility on delivery time. The missing link has always been whether or not this phenomena would hold true for FMCG small and medium size businesses, which this research indicates that it does.

Further, these findings partly support Jacobs, Chase and Lummus (2011), whose book asserted that supply chain performance depends on how strategically firms manage the use of supply chain tools (such as visibility tools) to meet customer needs. The data supports the theory that when companies incorporates the use of technology at a high level, and it is used to assist in supply chain relationship management (sharing of information between all supply chain parties) the net effect is improved performance.

7.2.6. Regression Analysis Model 4 - Supply Chain Processes

In this section, the analysis focuses on how supply chain processes influences on-time delivery. The analysis also assessed the impact of the supply chain ordering processes on supply chain visibility, supply chain responsiveness, delivery reliability, product variability and supply chain flexibility. Multiple regression analysis was used to test hypotheses H10, H11, H12, H13, H14 and H15. Figure 3.8 highlights the model tested.

A single regression test was conducted to determine the influence of H10 on supply chain order processes. The data indicated that supply chain visibility had significant influence on the supply chain order processes ($p<0.05$). It was found that supply chain visibility explained 6.6% of the variances found in supply chain order process. The adjusted R square showed that supply chain visibility explained 5.0% of the variances found in supply chain processes, thus it shown that H10 is supported by this model. The R value was 25.6% which is close to the cut off value of 30%, and as such it can be deemed that there is also some correlation between supply chain visibility and supply chain order processes. The regression data is shown in Table 7.5 .

7.2.6.1. Regression Model 5 - Supply Chain Processes Influence on Supply Chain Factors

This section analyzed the influence of supply chain processes on the factors of supply chain visibility, supply chain responsiveness, delivery reliability, product

Table 7.5.: Regression Analysis Results for the Influence of Supply Chain Visibility on Supply Chain Processes

Variable	R	R Square	Adjusted R Square	Sig.
	.256	.066	.050	.045
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		.000
Constant	5.1999			
Supply Chain Visibility	-.077	-.256	H10	.045

Dependent Variable: Supply Chain Processes

variability and supply chain flexibility as shown in Figure 3.8. Thus testing the hypotheses H11, H12, H13 and H14. The analysis indicated that supply chain processes significantly influenced supply chain responsiveness ($p<0.05$). There was also correlation between supply chain processes and supply chain responsiveness with a R value of 39.3%, supply chain processes was responsible for 15.4% of the variances found in supply chain responsiveness with an adjusted R value of 11.1%.

There were no significant relationship found between supply chain processes and delivery reliability or supply chain flexibility ($p>0.05$), there was however correlation shown between supply chain process and supply chain flexibility with a R value of 38.9% .

Supply chain processes were also found to significantly influence the variances found in product variability ($p<0.05$) and explained 19.7% of the variances found in the model, with an adjusted R value of 15.7% . there was also high correlation between supply chain process and product variability with a R value of 44.4%. From this analysis it is shown that H11 and H13 are supported but the model does not support H12 and H14. Table 7.6 shows the results obtained from the multiple regression analysis.

Table 7.6.: Multiple Regression Analysis for the Influence of Supply Chain Processes on Various Supply Chain Parameters

Variable	R	R Square	Adjusted R Square	Sig.
	.393	.154	.111	
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		
Constant (SC Resp)	3.352			.000
SC Process	-.188	-.270	H11	.019
	R	R Square	Adjusted R Square	Sig.
	.212	.045	-.022	.615
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		.000
Constant (Del Rel)	5.365			
SC Process	-.171	-.164	H12	.615
	R	R Square	Adjusted R Square	Sig.
	.444	.197	.157	.004
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		
Constant (Pro Var)	2.938			.000
SC Process	.382	.424	H13	.004
	R	R Square	Adjusted R Square	Sig.
	.389	.152	-.015.	.531
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		
Constant (SC Flex)	3.400			.000
SC Process	.178	.245	H14	.531

Dependent Variables: SC Resp, Del Rel, Pro. Var, SC Flex.

7.2.6.2. Regression Model 6 - Supply Chain Processes Influences On-Time Delivery

This section assessed the influence of supply chain ordering processes on delivery time as shown in Figure 3.8, thus testing Hypotheses H15.The analysis showed that supply chain processes did not significantly influence on-time delivery. The significant value ($p>0.05$). However it was shown that there was correlation between supply chain process and on-time delivery with a R value of 35.7%. This means that based on the data hypothesis H15 is not supported. The regression data is shown in Table 7.7.

Table 7.7.: Single Regression Analysis Influence of Supply Chain Processes on On-Time Delivery

Variable	R	R Square	Adjusted R Square	Sig.
	.357	.127	.067	.091
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		.000
Constant	5.722			
SC Processes	-.200	-.221	H15	.091

Dependent Variable: On-Time Delivery

7.2.7. Influence of ICT Infrastructure (IT Usage) on On-Time Delivery and Other Factors - Model 7

In this section of the analysis, hypotheses relating to influence of ICT infrastructure (information technology usage) on on-time delivery is assessed, hypotheses H20. The models were tested in relation to Figures 3.6, 3.8 and 3.10, these models were tested to determine the influence of ICT infrastructure (IT usage) on the hypotheses H16, H17, H18, H19 and H21a. There was further analysis conducted for this model to determine whether or not supply chain responsiveness and information used for coordination purposes had any influence on supply chain visibility, thus testing H7 and H8 as shown in Figure 3.6.

The results indicated that ICT infrastructure had a significant relationship with suppliers' lead time ($p<0.05$). The data also indicated that ICT infrastructure explained 8.2% of the variance found in suppliers' lead time, with an adjusted R square value of 6.7% . Also there was some correlation between ICT infrastructure and suppliers' lead time as the R value was close to the cut off value for correlation (0.3). The R value for suppliers' lead time was found to be 28.7% .

There was significant relationship between ICT infrastructure and supply chain reliability, ICT infrastructure was found to explain 9.2% of the variances found in supply chain reliability. The adjusted R square value is deemed to be a better approximation of variances as such ICT infrastructure was found to explain 7.7% of the variances found in supply chain reliability. There was also correlation found between ICT infrastructure and supply chain reliability with an R value of 30.4%. All other hypotheses tested was not found to be highly significant to variances or correlation found in the model. The data results are shown in Table 7.8.

From these results it is shown that the model supports hypotheses H16 and H19. Hypotheses H17, H18 and H21a are not supported.

Table 7.8.: Multiple Regression Analysis ICT Infrastructure Influence on Various Hypotheses

Variable	R	R Square	Adjusted R Square	Sig.
	.287	.082	.067	
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		
Constant (Suppliers' Lead Time)	2.285			.000
ICT Infrastructure	-.031	-.287	H16	.024
	R	R Square	Adjusted R Square	Sig.
	.199	.039	-.023	.122
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		.000
Constant (Delivery Performance)	6.419			
ICT Infrastructure	-.055	-.199	H17	.122
	R	R Square	Adjusted R Square	Sig.
	.224	.050	.035	.077
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		
Constant (Responsiveness)	1.553			.000
ICT Infrastructure	.076	.224	H18	.077
	R	R Square	Adjusted R Square	Sig.
	.304	.092	.077	.016
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		
Constant (SC Reliability)	.663			.000
ICT Infrastructure	.095	.304	H19	.016
	R	R Square	Adjusted R Square	Sig
	.218	.047	.032	.087
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		
Constant (Info for Co)	7.512			
ICT Infrastructure	-.097	-.218	H21a	.087.

Dependent Variables: Supp.Lead Time, Del Perf., Resp., SC Rel., Info for Co.

7.2.7.1. Influence of Responsiveness and Information for Coordination on Supply Chain Visibility - Model 8

This section of the model tested the influence of supply chain responsiveness and information used for coordination on supply chain visibility as shown in Figure 3.6. The data showed that both supply chain responsiveness and information shared for coordination had string correlation with supply chain visibility. Information shared for coordination had a correlation value of 35.1%, also 12.3% of the variances found in supply chain visibility can be explained by supply chain responsiveness, the adjusted R squared value is 10.9%.

Supply chain responsiveness was found to explain 30.9% of the variances found in supply chain visibility, the adjusted R square value explained 24.6% of the variances with ($p<0.05$). Table 7.9 shows all the regression data results.

Table 7.9.: Multiple Regression of Factors Influencing Supply Chain Visibility

Variable	R	R Square	Adjusted R Square	Sig.
	.351	.123	.109	.005
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		.000
Constant	30.604			
Info for Coordination	2.200	.351	H7	.005
	R	R Square	Adjusted R Square	Sig
	.555	.309	.246	.001
	Unstandardized Coefficients	Standardized Coefficients		
	B	Beta		
Constant	25.557			.000
Responsiveness	1.871	.386	H8	.001

Dependent Variable: Supply Chain Visibility

7.2.7.2. Influence of ICT Infrastructure (IT Usage) on On-Time Delivery - Model 9

The final assessment of the model analyses focused on the analyses relating to the influence of information infrastructure on delivery time in SME as shown in Figure 3.10. A single regression analysis was used to test hypotheses 20 (H20) since one independent variable and one dependent variable were under consideration as shown in Figure 8.6. The data indicated that there were no significant relationships between ICT infrastructure and on-time delivery ($p>0.05$). Also the data did not show any significant correlation between the parameters when the model was tested. The data is shown in Table 8.15. Based on the model results hypotheses H20 was not supported. The data is shown in Table 7.10.

Table 7.10.: Regression Results ICT Infrastructure and On-Time Delivery

Variable	R	R Square	Adjusted R Square	Sig.
	.135	.018	.002	.292
	Unstandardized Coefficients	Standardized Coefficients	Hypothesis	Sig.
	B	Beta		.000
Constant	5.865			
ICT Infrastructure	-.036	-.135	H20	.292

Dependent Variable: On-Time Delivery

7.2.8. Analysis Test Parameters Influence

This section analyzed the influence of predictors of IT Usage, supply chain visibility, supply chain priority and suppliers' lead time on each other. The process of assessment in this thesis was conducted to determine whether or not the factors were influencing the outcomes of other factors being assessed. Figure 8.8 highlights the parameters influencing the major predictors being assessed in the research.The data indicated that supply chain processes is influenced by supply chain visibility, and supply chain processes is a predictor for supply chain responsiveness and information used for the coordination of the supply chain. On-time delivery is influenced by suppliers' lead time, among the parameters tested it was shown that this parameter also had most significance influence on on-time delivery with a value of (ß =.389).

ICT infrastructure was found to influence suppliers' lead time and supply chain reliability, of all the parameters tested supply chain reliability was shown to be greatly influenced by ICT infrastructure with a (ß = .304). Supply chain responsiveness was found to greatly influence supply chain visibility and had the highest Beta value of all the parameters tested (ß = .372). Supply chain processes was found to significantly influence supply chain responsiveness and product variability, product variability was the factor most significantly influenced by supply chain process (ß = .424). Table 8.16 highlights the summary of all tested hypotheses and their beta values.

7.2.9. Supply Chain Collaboration Drives On Time Delivery Performance.

Collaboration and coordination in supply chains has been deemed to be very important to the improvement of supply chain performance such as the improvement of visibility and delivery performance. Barrat & Oke (2007) discussed the impact of coordination along the supply chain, and the fact that coordination provides the missing link to information sharing which leads to visibility. The authors posited that “a high level of visibility that is characterized by the quality of useful information within a supply chain linkage is what makes the visibility distinctive’. They further contend that it is this visibility that leads to competitive advantage through collaboration and coordination, which leads to improve performance in delivery and other supply chain metrics.

This research took coordination and collaboration one step further by analyzing the suppliers and customers through the use of the AHP technique, ProModel simulation and the administering of questionnaires. Through analysis of the AHP questionnaires it was determined that the within the supply chain the constructs of on-time delivery and shared values were of high importance to all parties along the supply chain. Shared values influenced the type of relationships formed between suppliers and customers, hence leading to high or low collaboration and co-ordination in the supply chain (Silvera & DeCoster, 2010). The importance of the metrics to the businesses are ranked and re-organized and shown in Table 7.11.

Process	KPI	Rank
Delivery/Customer Service	On- Time Delivery	High
Relationship Management/Customer Service	Communication	Low
Relationship Management	Shared Values	High
Quality	Quality of Products	Low

Table 7.11.: KPI’s for Case Study Company

On time delivery is ranked high among the case study company and its suppliers and this is finding with research such as that of Caridi et al., (2014). In their research using the AHP technique to access a case study company, they found that on time delivery was ranked as the highest in terms of being an important KPI (16% of their respondent indicated this). Spare parts availability and raw materials were ranked as the next two KPI’s impacted by the use of visibility tools. This research differed from Caridi et al, (2014), in that this paper assessed relationship and the type of partnerships formed amongst the suppliers and customers along the supply chain. The researchers showed that having a strong relationship based on trust would improve the level of visibility achieved and thus improve on time delivery .

The relationship model developed by the researchers demonstrated the impact of relationship type on the achievement of visibility, this was not assessed in the past by other researchers. Typically customer service was assessed in terms of KPI's that impacted profits etc. but not in terms of relationships and partnerships along the supply chains. The case study company applied a modified version of the suggested relationship model in their business, in that for each of their customer they assessed the best type of "contractual" relationship to apply in order to allow all parties to benefit.

One of the areas pointed as being important (in the customer survey) is that of customer service, this was given high importance (listed as responsiveness to customer needs) in the analysis of the questionnaires. There was differences based on the size of the company in the level of importance for the supply priorities (customer service responsiveness, lead time, on time delivery etc.). These results supports the postulation by the researchers that partnership type has to be modified for individual businesses as they all do not have the same priorities and goals as it relates to performance (as mentioned prior in relation to the repertory grid and partnership model).

These findings are similar to that of Hoyt & Huq (2000), who in their research paper, pointed that a resource based theory and strategy –structure theory led to collaborative relationships that resulted in reduction in transaction related risks. The resource based theory led to competitive advantage especially when the relationship was based on trust, which supports greater responsiveness to customers' needs. The researchers further pointed out that collaborative performance derived from a collaborative supply relationship resulted in subsequent benefits to the customer.

According to Li, Rao, Ragu-Nathan and Ragu-Nathan (2005) further pointed out that the SCM contextual factors have to be taken as part of the context for assessment, factors such as company size, type of industry and a firm's position in the supply chain (whether they are at the start or at the end of the supply chain), will impact the level of customer relationship developed and achieved. They went further to point out that larger companies may have higher levels of supply chain practices (relationships, delivery performance etc.) as they usually have more complex supply chain systems when compared to medium or small sized companies. The researchers of this paper also indicated the difference in performance across the supply chain based on company size, thus confirming previous findings of other researchers. This research was however different in findings in that while the researchers acknowledge the effects of company size, the findings of the AHP analysis and repertory grid indicated that fact that the organizations along the supply chain considered shared value and on-time delivery a high priority, this influenced their relationship and thus was also a major factor in achieving supply chain performance(despite size of companies).

7.3. Analysis of the Effects of Company Size on Research Parameters

Further regression analysis regarding the influence of company size on the main research parameters, as well as testing the influence of the research parameters one each other. This analysis was conducted with a view of being able to answer the research questions stated in chapter 3, specifically:

1. To what extent are companies satisfied with the delivery performance of their suppliers within the supply chain?

3. What percentage of companies use information technology as a visibility tool to transact supply, purchasing and delivery business within the supply chain?

4. What is the lead time for companies who conduct business using information technology (visibility) tools?

The data analyzed indicated that

7.4. Summary of Accepted and Rejected Hypothesis

Based on the regression analysis results, all the research hypotheses examined are shown in Table 7.12 indicating the accepted or rejected hypotheses.

Table 7.12.: Summary of Accepted and Rejected Hypotheses

Independent Variable	Dependent Variable	Beta	Sig. (p)	Std. Deviation	Result
ICT Infrastructure	On-Time Delivery	-.135	.292	.74179	Not Supported
Order Accuracy		.112	.388	.35469	Not Supported
Delivery Lead Time		-.389	.012	.16273	**Supported**
Delivery Window		-.220	.113	.869	Not Supported
Response Time		-.142	.280	.16273	Not Supported
Supply Chain Visibility		-.214	.058	.17744	Not Supported
Supply Chain Processes		-.221	.091	.18907	Not Supported
ICT Infrastructure	Suppliers' Lead Time	-.287	.024	.06205	**Supported**
	Delivery Performance	-.199	.122	.26694	Not Supported
	Responsiveness	.077	.224	.05378	Not Supported
	Supply Chain Reliability	.304	.016	.18615	**Supported**
	Info for Coordination	-.218	.087	.26694	Not Supported
Responsiveness	Supply Chain Visibility	.372	.003	1.18453	**Supported**
Information for Coordination		.112	.388	.35469	Not Supported
Information Format		.245	.153	1.18453	Not Supported
IT Systems/tools		-.069	.598	.85278	Not Supported
Supply Chain Processes	Supply Chain Responsiveness	-.270	.019	.26188	**Supported**
	Delivery Reliability	-.164	.615	.14075	Not Supported
	Product Variability	.424	.004	.23448	**Supported**
	Supply Chain Flexibility	.245	.531	.16414	Not Supported
Supply Chain Visibility	Supply Chain Processes	-.256	.045	.24520	**Supported**

Total Hypothesis – 21
Supported Hypothesis – 7
Reject Hypothesis - 14

7.5. Validation of the Revised Research Model

A qualitative approach using interviews was used to validate the findings of this study. A copy of the revised model was emailed along with structured questions to three senior managers at the case study company. Telephone discussions was had with the managers regarding the research model and findings. The results validation interview questions discussed the factors in the revised research model (Appendix A6). The phone call interviews/discussions lasted approximately 10 minutes each.

7.5.1. Supply Chain Processes

The results from the field study indicated that supply chain processes (that is the processes involved in ordering, picking and delivering goods along the supply chain) influences the responsiveness of the supply chain. Supply chain processes also influenced the degree to which suppliers are able to respond and provide product variability when requested by customers. One of the manager spoken to commented that, " *I am not surprised that the data has indicated a link between processes and responsiveness. When the business started one of the issue we had, was the systems and processes used for the co-ordination of our delivery vehicles, as well as ordering from suppliers. Obviously if the processes for ordering and delivery are not working efficiently this would affect responsiveness and our ability to please our customers*".

Additionally, one of the interviewee expressed surprised that supply chain processes did not directly influence the factors for supply chain visibility, but instead it was visibility that influenced the supply chain processes, the interviewee stated that " *we have been told by our customers and consultants that we needed to upgrade our information systems to technology that allowed for visibility. We began upgrading a number of our systems to allow for electronic purchase orders etc. as such I thought the results would have indicated an impact on visibility within our company. Although I must note that we still do a lot of telephone calls and emails for transactions with some customers*".

7.5.2. ICT Infrastructure (ICT Usage)

The results from the field study indicated that ICT infrastructure (information usage) influenced suppliers' lead time and supply chain reliability. The three managers all agreed with these results as they indicated that they had invested in upgrading a number of software that the company used, and is looking at doing further upgrades. One interviewee stated that " *I do believe that the level of information technology usage and the structure for ICT we have put in place has helped us as a company to improve in our delivery reliability and better meet lead times. We formally did a lot of ordering etc. via emails and telephone but have made investments in warehouse managing systems, systems shared with our third party logistics provider and systems for invoicing our customers*". These systems and structures the interviewee believe have improved their lead times and as such they agree that there is a link between ICT infrastructure/ IT usage and suppliers' lead time and delivery reliability.

7.5.3. On-Time Delivery Factors

The results from the field study indicated that On-time delivery was influenced by delivery lead time, the senior managers agreed with this finding as they have seen the impact of having strict lead times from their suppliers assisting in meeting their customers lead time. *One manager stated " I do agree that lead time influences us meeting on- time delivery, when our suppliers deliver within the agreed time-frame it makes it easier for us to meet the delivery time agreed with ur customers*". Another manager stated that while he agrees that lead time influenced on-time delivery he believed that there were other factors that contributed to them meeting their delivery time one of which is the fact that they use third party logistics providers, he believed that this arrangement has led to " *tremendous improvements in our on-time delivery*". The manager further stated that " *prior to the third party logistics providers we were paying huge fines for late delivery or stock outs at our customers, since we started using a third party logistics provider the fines have been reduced and their has been improvement in relationships with our customers as we are delivering on-time*".

7.5.4. The Effects of Visibility on Delivery Time and Supply Chain performance as Seen in Case Study Company.

Visibility is the ability to "see" upstream and downstream of a supply chain , (Lee, 2000; Holcomb et al., 2004, Holweg & Pil, 2008). The issue within supply chains has always been the effective use of such information and "sight" to enhance supply chain performance, in the case of this research to improve and enhance on time delivery. The research case study company indicated that information sharing, information usage and visibility were all low (with α <0.5) . This data from the case study company was based on their operation prior to the implementation of the use of visibility tools and adjustment of supply relationships. The results were also gathered prior to the case study entering into a contract agreement with a third party company (to focus on delivery to their customers). The case study company also indicated that there customers experienced low improvement in regards to delivery based on the tools they used at the time (email, telephone, fax and verbal methods)

The results gathered from the customers one year after the implementation of visibility tools indicated that there was an approximately 86% reliability of receiving delivery on time form the suppliers. Also the suppliers had implemented systems such as the use of ERP systems (such as SAP) and EDI systems such as (SAGE). With the incorporation of these systems there was also improvement in the sharing of information across the supply chain (with 40% of customers indicating that they almost always receive information regarding the availability of products and 49% indicating that they always receive information).

The data confirms research by other researchers such as Kim, Cavusgil and Calantone (2006), Bartlett, Julien and Baines (2007), who all pointed to the fact that use of visibility tools that led to the exchange of high-quality information between partners improves the channel coordination and improves the overall responsiveness of the partnership and ultimately market performance. The researches differs in that these researchers did not specifically focus their research in the area of on time delivery, they assessed overall improvement in performance of the supply chain. The research data also indicated that improved availability of products was one of the impact seen by the case study company prior to the full implementation of visibility tools. They also indicated that with visibility there was improvement in their decision making capabilities and delivery to customers. This was even more profound as after the implementation of full visibility tools between the case study company and their customers, the customers indicated that there were improvement in delivery dates and times, delivery speed, correctness of orders and response to variability in requests for orders. These findings are in line with that of other researchers who assessed the performance of supply chain through the resource based theory, strategic choice theory, systems theory and game theory.

The perspective of researchers focusing on the resource based view has indicated that firms with resources (eg. ICT) that can be used to enhance visibility, may experience improved performance (Chae, Olson & Sheu, 2014). This results also indicated an improvement in delivery performance through the enhancement of visibility tools, that is with the implementation of systems to allow for electronic purchasing and billing, warehouse management systems etc. These were implemented by the case study company at varying levels, and improvements were seen by the customers to delivery and response to order requests, product delivery requests and product variability requests.

7.5.5. Supply Chain relationships

This factor was not assessed using regression analysis, but the senior managers were asked to provide their regarding supply chain relationship influencing supply chain visibility and hence supply chain on-time delivery. The correlation of data gathered at the case study company indicated a correlation between information shared with supply chain partners and the information medium used to share information.

RQ1 : Will having a good relationship between supplier and customers influence on-time delivery?

RQ2: Do supply chain relationship influences the level of visibility achieved within the supply chain?

Also the AHP questionnaire administered at the case study company and to their customers had indicated that shared values and on-time delivery were the only two constructs agreed by all supply chain partners to be of importance to achieving the overall supply chain goals. One manager indicated that " *relationships with our suppliers are very important, we ship/source most of our products sold in the UK from Jamaica, Mexico and other Caribbean countries. These suppliers have to assist us in meeting our delivery time in the UK, we have achieved improvements in delivery because we have improved relationships with our suppliers.*" The manager went further to discuss some of the areas he believes proves improved supply chain relationships and thus improved delivery and visibility performance, he stated that " *some of our customers and suppliers are now able to "see" our in-house inventory, we were only able to do this as we have developed close relationships with these customers and we trust them. Yes trust is very important to a supply chain* *relationship, if i do not trust the customer or supplier I will be a bit hesitant to say what is happening internally in the business.*"

Another manager discussed the fact that he believed the use of the third party logistics providers also improved relationships with customers as they were receiving their delivery more efficiently, he went further to state that " *I believe supply chain relationships improves visibility and on-time delivery, but I believe relationships are so complex, as we have to understand each customer and supplier and build different types of relationships with each*". The manager also discussed the fact that the case study company had different types of contractual arrangements with each supplier and customer and this was also based on the type of supply chain relationships that existed. The manager stated that " t*he larger companies are very strict and they dictate the terms of the contract, if we want to do business with them, it becomes on their terms that it is done, I find the smaller stores, family owned businesses, pubs etc. a bit easier to deal with, they are more flexible and we can tweak the contract accordingly. So we have different relationships with those companies than what we have with the large supermarkets for example Tesco*".

7.5.6. Supply Chain Visibility

The results from the field study indicated that supply chain visibility was influenced by responsiveness along the supply chain. The responsiveness discussed in the data gathering had to do with response to product changes, volume changes, order changes and delivery changes. The interviewees were all in agreement that these factors affected supply chain visibility, as their responsiveness to customers order query and delivery query, was dependent on the level of visibility they had in their warehouses and with their suppliers. Responsiveness influences visibility as responsiveness is linked to all supply chain partners being able to use information to the benefit of meeting deadlines, order quantities etc. One manager stated that " w*e are still not where we need to be in regards to the level of information shared, or how well we respond to our customers requests. But these factors have to be managed across the supply chain, our suppliers have to be willing to share information and respond to our requests, the more they respond and allow us to "see", the better able we will be to respond and serve our customers.*"

Another manager mentioned that " *we are looking at technology such as R.F.I.D and other systems to allow us to be more efficient and more responsive. These systems and technology are costly and as such we have to do a little at a time.*" He went further to state " *when we first started business in the UK we had a lot of warehousing issues, we have since invested in warehouse management systems, bar code scanners and other computer systems. We have seen improvements in our warehouse, so as we invest in systems as we get better at what we do we will improve visibility, delivery and responsiveness.*"

7.5.7. Company Size

The results indicated that based on company size the factor that had the greatest variance was supply chain visibility. The managers agreed with this, they explained that despite operating under one parent company, each section of the business (that is the company that deals with frozen foods, company that deals with ethnic products etc.) operated as independent company. The manager stated that " *each section of the business utilizes the same warehouse and as such that is one common technology, but as it relates to customers placing an order, or ordering from suppliers and delivery to customers, each company operates independently. As such each company would have technology or system that best suits that side of the business.*" Another manager stated " *maybe in the future this is something we should look at, how do we ensure that all section of the business uses the same technology or system to ensure that visibility is gained through-out the business whether we are serving large or small customers*".

7.6. Validation Interview/Discussion Summary

The purpose of the interviews and discussions was to verify the results from the main field study by interviewing the senior managers at the case study company in London. The results gathered from the interviews supported the revised model where it was confirmed that factors such as supply chain responsiveness, product variability, lead time and reliability all influenced supply chain visibility. While order lead time influenced the level of on-time delivery that can be achieved along the supply chain. Also, the interviewees confirmed that supply chain relationships did have an impact on the level of supply chain visibility and hence on-time delivery achieved within the supply chain. The managers agreed with findings and did not highlight any concerns regarding the revised model.

7.7. Chapter Conclusion

This chapter focused on the testing of the conceptual framework of the research. 21 hypotheses were formulated and tested using single and multiple regression analysis, the research questions were also analyzed through correlation analysis. The effects of company size on the research parameters were also looked at. Based on the results 15 hypotheses were rejected with 6 supported. The results highlighted the importance of delivery lead time to on-time delivery . It also indicated that 60.4% of the variance across companies based on size was due to supply chain visibility (ß =.949). The predictors explained 60.4% of the variance detected in company sizes, the data also indicated that supply chain processes had a significant influence on supply chain responsiveness and was responsible for 39.3% of the variance detected in supply chain responsiveness. The data also indicated that IT usage/ICT infrastructure greatly influenced supply chain lead time and reliability.

In the next chapter, treports of the key findings of this research and aligns the findings with those from extant literature.

8. Conclusion

8.1. Research Aims and How They Were Met

The main aim of the study is to determine the effectiveness and impact on on-time delivery of supply chain visibility tools used by small to medium FMCG supply chain companies in the United Kingdom, specifically the geographic area of London. From this aim, the following objectives were derived to guide the study:

1. To determine to what extent are information technology tools for visibility deployed by FMCG SME supplier companies.

2. To determine what aspects of supplier operations have the greatest influence on meeting the agreed lead time.

3. To determine if the use of technology and visibility tools were of high priority in meeting on time delivery and determine whether or not visibility can predict on-time delivery

4. To determine the extent to which certain factors (order accuracy, delivery lead time, goods delivered on agreed date and time, and response time to product mix changes) can be used to predict on-time delivery.

5. To determine the extent to which certain factors (Information format, IT systems/tools, information for coordination, and suppliers' responsiveness) can be used to predict supply chain visibility and to use ICT infrastructure to predict supply chain visibility, delivery performance, responsiveness, supply chain reliability, information for coordination, and on-time delivery.

6. To ascertain if supply chain order processes can predict supply chain responsiveness, delivery reliability, product viability, and supply chain flexibility and use supply chain responsiveness and information coordination to predict supply chain visibility.

7. To determine the extent to which supply chain visibility can predict supply chain order processes and order processes cannot be used to predict on-time delivery.

In order to achieve the research objectives objectives, three approaches were used. Firstly, extant literature related to supply chain visibility, on time delivery, supply chain performance indicators, supply chai organization collaboration and relationship models, FMCG supply chains, ProModel simulation in supply chains was extensively reviewed. Secondly, an exploratory study of the case study company was conducted to ascertain the factors that affected visibility at the organization using repertory grid and questionnaires. Thirdly, field study was carried out where questionnaires were self-administered to various supply chain customers located in London. The field data was analyzed quantitatively using SPSS.

The ANOVA analysis of the customer survey results showed that the majority of the variation in supply chain collaboration occurred between small and large companies, and medium and large companies but small and medium companies felt that collaboration was of high importance to achieving visibility and as such no significant variance was found between these companies. The larger companies were less willing to share information, which impacted the level of visibility achieved across the supply chain. It was also found that for the use of IT, there was a 47.6% variance based on the size of the companies. On the other hand, it was observed that as it pertained to the use of visibility tools such as video conferencing, large companies were much more capable than small and medium businesses, and small and medium businesses had high variances when assessed for visibility measures such as electronic invoicing,. Small businesses still relied heavily on relationships and in person conversation to relay their orders and queries.

8.2. Research contribution to knowledge

This research made the following contributions to knowledge:

1. To the best of the researcher's knowledge, this study is the first study to examine supply chain visibility tools and their impact in meeting on time delivery for small, medium type companies. Specifically those focusing on distributing FMCG products that are ethnic based products.
2. With its focus on ethnic type FMCG product distribution, this study has developed a relationship model/framework for contract development and deployment for SME's. This can aid SME's in developing policies regarding how they go about developing contracts and forming relationships across their supply chains.
3. This study has contributed to knowledge through publications which have been exposed to double-blind peer review. The publications are available online to future researchers.
4. This study has contributed to methodology where repertory grid (RepGrid) was used to examine key factors regarding relationship development across SME supply chain. This was further used to to assist in developing a partnership model which was specific to the operations of SME's. To the best of researcher's knowledge, this method has not been previously used in the context of developing relationship models for SME's.

8.3. Research limitations and Future Research

In this research, effort has been made to develop a comprehensive research framework, employ reliable and valid measures of study variables and analyze the data using robust statistical techniques. However, as with any study of this nature, it is important to recognize and understand the study limitations.

Firstly, this study employed multiple research methods, these methods includes cross-sectional surveys. Cross-sectional surveys are typically designed within a single point of time and typically does not provide cause and effect relationships (Bryman, 2012). Cross-sectional survey design is commonly preferred when the researcher has time and resource restriction (Collis and Hussey, 2013). Time and resource was a limitation for this researcher, hence the approach taken but while the approach was appropriate for the time available, the approach limited the depth of statistical analysis conducted.

Secondly, the researcher resides in Jamaica, but the research was being conducted in the UK, this limited the level of interaction the researcher was able to have with the research population as a n independent party was hired for data gathering. This limited the opportunities for data sample and the model validation.

Further, some of the case study company's customers are locate outside of central London, but the limited time and funding did not allow the researcher to gather data within the wider London geographic region and other parts of the UK.

Finally, this study focussed on a case study company located in the UK but its operation is unique as it is owned by a Jamaican company and as such is operating with procedures and systems that are built to serve both markets. Products are sourced in the Caribbean but sold within the UK, the company itself is made up of four independently operating companies, that are also operating dependably, hence providing difficulties in generalizing the results of the study.

Several future research recommendations and suggestions are presented which might be of interest to future researchers.

1. The researcher suggests the need to carry out further through the administering of questionnaires to a wider cross-section of customers within the UK. This will allow for a more in- depth analysis of the data and allow for a wider assessment of visibility development across the supply chain.
2. Since this study focussed on the FMCG SME sector, focusing on a case study company in the UK, it would be interesting to use the research model developed to further examine whether the model can be adopted in Jamaica and other Caribbean countries where the products are sourced.
3. Other researchers have assessed the use of 3 PL's for the improvement of on-time delivery, it would be necessary to also examine the impact the use of 3PL's on on-time delivery to this case study company.

List of Publications

Journals:

- Silvera, Y. ,DeCoster, R. (2012). Supply Chain Visibility and how this affects On Time Delivery - A Case Study of a UK SME Food Distributor. *Journal of Arts, Science and Technology, Vol 5 p.126-147.*

Conferences and Doctoral Seminars:

- Silvera, Y., DeCoster, R., Onyefulu, C., (2015) – Supply Chain Visibility Critical or not to the On Time Delivery Performance of SME's in Supply Chains? Presented at CAPE 2015 – Scotland (University of Edinburgh)
- Silvera, Y., DeCoster, R., (2012). The Impact of On Time Delivery on Supply Chain Management: Are third party logistics providers worth the investment? Presented at The Student Conference on Operational Research, 2012, Nottingham UK.
- Silvera, Y. (2012). Does Supply Chain Visibility Improve On Time Delivery? - Fact or Fiction. – Presented at the Supply Chain Management Educators' Conference, 2012.
- Silvera, Y., DeCoster, R. (2011). Performance Indicators within Food Supply Chains – Focusing on On Time Delivery – How Does this affect the Supplier Relationships? A research paper presented at Brunel University, School of Engineering and Design Research Conference (RESCON 11).
- Silvera, Y., DeCoster R. (2010) -Building Effective Supplier Relationships - A Conceptual Framework for Researching UK'S Fast Moving Consumer Goods-Presented at CAPE 2010 Conference-Scotland (University of Edinburgh).

Appendix

A. Survey Questionnaires & Interviews

A.1. Company Questionnaire Sample

Questionnaire Agenda

Dear Respondent;

This questionnaire forms part of a case study research focusing on the Fast Moving Consumer Goods sector. I just needed a sample audience (in this FMCG suppliers) to use an example for my research thesis.

Profile

Please give a brief History of the company in the space provided below:

ENCO IS A MANUFACTURER AND DISTRIBUTOR OF CARIBBEAN PRODUCTS AND FUNCTIONAL DRINKS.

1. Company Name/ Product Area: ENCO PRODUCTS LTD
2. # Of Employees : 55
3. Job Role: GENERAL MGR
4. Annual Sales $: 47m
5. Types Products Sold: CARIBBEAN FOOD, FUNCTIONAL DRINKS

Please tick (√), rank or comment as appropriate.

Information Sharing

6. Please state the medium through which Supply Chain information is shared: E-MAIL, SAGE ERP, FORMAL MEETINGS, EXCEL, BESPOKE REPORTS IN LYNX (MS ACCESS APPLICATION)
7. How effective is this medium?

   Very Effective ☑ Somewhat Effective ☐ Not Effective ☐
8. What other factors enables the exchange/transfer of information within your Supply Chain? PROXIMITY OF SUPPLY CHAIN TEAM. REGULAR FACTORY MEETINGS
9. How Unique are these factors to your Supply Chain?

   Very Unique ☐ Somewhat Unique ☑ Not Unique ☐
10. List the types of Information shared across the Supply Chain
    - STOCK INFO – QUANTITY + RISK.

- AVAILABILITY OF SKUS
- ....

11. When and how frequently is information shared?
Daily ☐ Weekly ☑ Bi- Weekly ☐ Monthly ☑
REVIEW BUCKET.

12. What is the quality of the information shared? Good ☑ Neutral ☐ Poor ☐

Please comment on this.

Information Usage

13. How is this information used by the Distribution Centre?
ORDERS SENT TO DISTRIBUTION VIA SAGE + BUILT TO ROUTES BY 3RD PARTY HAULIER.

14. If the information is not used please state why. ....

15. Is the information shared time sensitive? Yes ☑ No ☐ DAY 1 FOR 4

16. In what format is this information transferred? SYSTEM

17. What are the barriers to using the shared information within your Supply Chain?
USING OTIF TO MEASURE SUPPLY PERFORMANCE.
MAKE OTIF ACCURATE REFLECTING CUSTOMER REQUIREMENTS

18. What needs to change to make the information usable?
....

Supply Chain Relationships

19. What are the current benefits to your company to information sharing across the Supply Chain?
CUSTOMER SERVICE / SUPPLY TO HAVE SHARED OBJECTIVES RE OTIF + IF. INCREASING CO-OPERATION BETWEEN CS + SC.

20. Are they any disadvantages to sharing of information within your supply chain, please state?
NO. PEOPLE LOOKING AT CHANGES TOO FREQUENTLY

21. How important is information with supply chain partners to you?

Very important ☑ Moderately Important ☐ Low Importance ☑

TO RETAILERS. SHOULD BE USED MORE WITH SUPPLIER

22. What has been the impact to sharing information across the supply chain?

BUILDS TRUST + UNDERSTANDING. REDUCES BICKERING.

Supply Chain Visibility

23. How important is enhanced visibility across the supply chain to you?

Very important ☑ Moderately Important ☐ Low Importance ☐

24. How has the exchange of information enhanced visibility across the supply chain?

Significantly improved ☑ No improvement ☐ Low Improvement ☐

25. What operational benefits have been achieved from information sharing/improved visibility?
HIGHER STOCK TURNS, IMPROVED INFO ON OOS

26. How would you rank these benefits to your business?

High ☑ Medium ☐ Low ☐

27. How much visibility has been gained?. High ☐ Medium ☑ Low ☐

28. How useful is this visibility? Very Useful ☑ Moderately Useful ☐ Low ☐

Future Development

29. What plans do you have to improve your Supply Chain Visibility/Information Sharing? IMPLEMENT ACTIVE SUPPLIER MGMT

OTIF MEASUREMENT, BUILD SC ORGANISATION + COMPETENCE

30. Please rank the priority for SC V/information Sharing improvement in the future;
High ☑ Medium ☐ Low ☐

31. What plans do you have for technology Investment? SALESFORCE HANDHELD

32. Please Rank the priority for technology investment in the future:

High ☑ Medium ☐ Low ☐

33. Do you use a third party logistics provider? Yes ☑ No ☐

34. How has this improved your Information Sharing across the Supply Chain?

ROUTE PLANNING DONE BY 3RD PARTY.

Improved ☑ No improvement ☐ Low Improvement ☐

35. How has the use of a third party logistics provider improved your supply chain visibility?

TRANSPARENCY ON DELIVERY FAILURE, + RECTIFICATIO

Improved ☑ No improvement ☐ Low Improvement ☐

36. How has the use of a third party logistics provider improved your on time delivery?

Improved ☑ No improvement ☐ Low Improvement ☐

37. How has Information Sharing improved your on time delivery?

OTIF NEEDS FIXING

Improved ☐ No improvement ☑ Low Improvement ☐

38. How has Supply Chain Visibility Improved your on time delivery?

AS ABOVE

Improved ☐ No improvement ☑ Low Improvement ☐

39. What are your investment plans for New Product Development? ...MARLEY, COCONUT WATER SMOOTH, CARIBBEAN CHOICE, LASCO

40. How would you rank information sharing to your plans for NPD?

High ☐ Medium ☑ Low ☐

41. How would rank SCV to your plans for NPD?

High ☐ Medium ☐ Low ☑

42. How would rank the importance of on time delivery to your NPD plans?

High ☑ Medium ☐ Low ☐

Thank you for your cooperation in completing this questionnaire. Upon completion of analysis you will be informed of the results.

FINANCIAL SUPPORT FOR NPD

A.2. Pilot Questionnaire Sample

Brunel
UNIVERSITY
LONDON

This survey is designed to collect information on supply chain visibility in food retail industry, and the impact of delivery time. This is for partial fulfilment of the requirements for the Ph.d degree in the above named university. If you agree to participate in this study, please read each item carefully then answer as accurately as possible. If you have any questions, concerns for additional information regarding this questionnaire please feel free to conatct me at 1-876-393-1923 or email yolanda.silvera@brunel.ac.uk. Or im04yyp@brunel.ac.uk.

All information provided will be kept strictly confidential and be used for academic purposes only. Do NOT write your name on this paper. Thank you in advance for your cooperation and contribution to this research study.

Section A: Company Background

Instructions: The items listed in this section are designed to collect information on your company. Please read the items carefully then tick (√) or write the appropriate response for the items.

1. Company Name: Hi-lo Food Stores Ltd	
2. Company Address: 13 Old Hope Road.	
3. Number of years company has been in operation: Over 25 years	4. Total number of full-time employees:
5. Country Location of Business: JAMAICA	
6. Type of Company (E.g., Wholesale, Supermarket, Restaurant, Major Brand Retailer, Local Shop Store) Please state: Retailer	

7. What is your current position in the company? Please state: Purchasing Manager

8. How many years have you been involved this company?
   - Less than 1 year ☑
   - 1-5 years ☐
   - 6-10 years ☐
   - Above 10 years ☐

9. What is your Department? Please state: Purchasing

10. What role/activities do you perform in the supply chain? (Please state): ________________

Section B: Performance Dimensions

nstructions: The items listed in this section are designed to collect information on your company's Required erformance dimensions and delivery performance. from its suppliers Please read the items carefully then tick (√) the ppropriate response for the items by using the key: **Very Low (1) to Very High (5)** to indicate the mportance of the factors identified below to your business.

Factors	Priority				
	VERY LOW	LOW	AVERAGE	HIGH	VERY HIGH
1. Product Quality	1	2	3	4	5
2. Delivery Speed	1	2	3	4	5
3. Meeting target delivery date & time	1	2	3	4	5
4. Price	1	2	3	4	5
5. Volume flexibility	1	2	3	4	5
6. Product Range	1	2	3	4	5
7. Ability to customize Product	1	2	3	4	5

8. Please state what other priority factors you consider important. (e.g. Cost vs. Quality, Product Range etc.). (Please State): Cost

Section C: Delivery Performance & Reliability

Instructions: The items listed in this section are designed to collect information on your company's delivry reliability and delivery performance. Please read the items carefully then tick (√) the appropriate response for the items by using the key: **Never (1) to Always (5)** to indicate the frequency with which suppliers fulfil the delivery and reliability factors. **(Never- 0 times per week; Often – 1-2 times per week; Sometimes – 3 times per week ; Almost Always – 4 times per week ; Always – every day)**

Delivery Performance	Response				
	NEVER	OFTEN	SOMETIMES	ALMOST ALWAYS	ALWAYS
9. On time delivery of order from supplier	1	2	3	4	5
10. The number faultless notes invoiced by your supplier	1	2	3	4	5
11. Supplier's flexibility in delivery schedule to meet your needs	1	2	3	4	5
12. Responds rapidly to product mix variations to meet your needs	1	2	3	4	5
13. Being able to return incorrect items to supplier	1	2	3	4	5
14. Ability to receive your order correct the first time you place the order	1	2	3	4	5
15. Responds rapidly to demand quantity variations to meet your needs	1	2	3	4	5
16. Provide dependable delivery	1	2	3	4	5
17. Supplier has short delivery lead time on orders	1	2	3	4	5
18. Flexibility of service systems to meet your needs	1	2	3	4	5
Reliability Measures					
19. Goods are delivered on the agreed date	1	2	3	4	5
20. Supplier has short delivery time	1	2	3	4	5
21. Supplier provides advance notification of late deliveries or stock outs	1	2	3	4	5
22. Supplier provides quantities ordered	1	2	3	4	5
23. Supplier provides product mix when requested	1	2	3	4	5
24. Supplier responds to special requirements when requested	1	2	3	4	5

25. Are there any other factors you consider important to meeting on time delivery? (Please state): No.

26. What length of time do your suppliers take to answer your queries (responsiveness)? (Please state in number of days): Responsiveness depend on circumstance they may respond but not address.

27. What is the length of time your supplier takes to process a received order? (Please state in number of days): Approximately 2 days.

28. What is the length of time your supplier takes to package and deliver a received order? (Please state in number of days): 3days however delivery date is usually shifted.

Section D: Supply Visibility Measures and Supply Characteristic: Lead Time

Instructions: The items listed in this section are designed to collect information on ~~your company~~'s the level of visibility within your company and the integartion of visibility tools within the supply chain. Please also comment on the ~~delvivery~~ delivery lead time measure within your supply chain. Please read the items carefully then tick (√) the appropriate response for the items.

Visibility for Coordinating and Integration	Response				
	VERY LOW	LOW	AVERAGE	HIGH	VERY HIGH
1. Ordering Information	1	2	3	4	5
2. Payment Processing Information	1	2	3	4	5
3. Order Forecasting	1	2	3	4	5
4. We inform suppliers in advance of changing needs	1	2	3	4	5
5. Our suppliers share proprietary information with us	1	2	3	4	5
6. Our suppliers keep us fully informed about issues that affect our business	1	2	3	4	5
7. We and our suppliers exchange information that helps establishment of business planning	1	2	3	4	5
8. We and our suppliers keep each other informed about events or changes that may affect each other	1	2	3	4	5
Supply Chain Visibility					
9. Supplier uses information technology well to exchange information with your company as a customer.	1	2	3	4	5
10. Your company has access to order information electronically	1	2	3	4	5
11. Your company can place orders electronically	1	2	3	4	5

12. You receive invoices electronically	1	2	3	4	5
13. Supplier's order placing system is fast and reliable	1	2	3	4	5
14. Supplier shares product availability information with you electronically Not sure what this is	1	2	3	4	5
15. You receive invoices electronically	1	2	3	4	5
Visibility Tools * Give a definition for Visibility tools.	NEVER	OFTEN	SOMETIMES	ALMOST ALWAYS	ALWAYS
16. Communicate face to face with suppliers	1	2	3	4	5
17. Communicate with suppliers via phone	1	2	3	4	5
18. Communicate with suppliers via video-conferencing or chat	1	2	3	4	5
19. Conduct purchasing Via Electronic Data Interchange (EDI)	1	2	3	4	5
20. Make payments to suppliers electronically International	1	2	3	4	5
21. Co-ordinate activities with supplier via informal means (word of mouth, note)	1	2	3	4	5
22. Co-ordinate activities with supplier via formal means (contract, purchase order etc.)	1	2	3	4	5

23. Please state the type of EDI system you use (e.g. SAGE MAS90). Please state:
RETAIL.NET

24. Please state the type of ERP system you use (e.g. SAP). Please state:
SAP

25. Do you use Radio Frequency Identification as part of your visibility tools? Please state:
NO

26. If yes to question 25 please state brand system being used. Please state:
____

27. If yes to question 25 please state how long you have been using R.F.I.D in your business. Please state: ____________________

Supply Characteristic: Lead Time

Instruction: Please read the items carefully then tick (√) the appropriate response for the items listed below in regards to your suppliers' delivery to your company.

1. What is the average lead time on orders (in days)?
   - Less than 1 day ☐
   - 1-5 days ☑
   - 6-10 days ☐
   - Above days ☐

2. What is the minimum lead time on orders (in days)? – None set
   - Less than 1 day ☐
   - 1-5 days ☐
   - 6-10 days ☐
   - Above days ☐

3. What is the maximum lead time on orders (in days)? – None set
   - Less than 1 day ☐
   - 1-5 days ☐
   - 6-10 days ☐
   - Above days ☐

4. What percentage of the time are your orders acknowledged on time?
   - Less than 20% of the time ☐
   - 20% - 40% of the time ☐
   - 41% - 60% of the time ☐
   - 61% - 80% of the time ☐
   - 81%- 100% of the time ☑

5. What percentage of your order related queries are answered correctly?
   - Less than 20% of the time ☐
   - 20% - 40% of the time ☐
   - 41% - 60% of the time ☐
   - 61% - 80% of the time ☐
   - 81%- 100% of the time ☑

6. What is your order fill rate percentage? (Please state): Approximately 91%.

7. What is your total order cycle time (in days)?
   - Less than 1 day ☐
   - 1-5 days ☑
   - 6-10 days ☐
   - Above days ☐

8. Please state the penalties you pay for late deliveries (dollar value per annum). Retailers don't deliver.

11 9. We value a long term relationship with our suppliers. (Please state): I suggest you ask the person filling out the questionnaire

12 10. We see the relationship with our suppliers as a long term. (Please state): to comment on the statement of feedback so what you need

11. We view our suppliers as an extension of our organization. (Please state): Yes

12. We are willing to work with our key suppliers to improve our process during the long run. (Please state): Yes. Key suppliers are the foundation of the company. Their success enables our own

Section E: Supply Visibility & Realtionship Improvement

Instructions: The items listed in this section are designed to collect information on your company's ~~the~~ level of improvement in the last three years due to the use of visibility tools and relationship management between your company and your suppliers. Where the usgae or relationship is less than three years indicate the level of improvement since implementation. Please read the items carefully then tick (√) the appropriate response for the items

The usage of relationship is over 3 years

Factors	Priority				
	SIGNIFICANT DECREASE	DECREASE	AVERAGE	INCREASE	SIGNIFICANT INCREASE
1. Information regarding transactions (order conformation, etc.)	1	2	3	4	5
2. Information regarding resource or process status (order status, etc.)	1	2	3	4	5
3. The number of faultless invoices invoiced by supplier	1	2	3	4	5
4. On time delivery	1	2	3	4	5
5. Supplier flexibility in schedules of delivery to meet your needs	1	2	3	4	5
6. Goods are delivered on the agreed date	1	2	3	4	5
7. Supplier has short delivery time	1	2	3	4	5
8. Supplier provides advance notification of late deliveries or stock outs	1	2	3	4	5
9. Supplier provides quantities ordered	1	2	3	4	5
10. Supplier provides product mix when requested	1	2	3	4	5
11. Supplier responds to special requirements when requested	1	2	3	4	5
12. Improved level of trust between yourself and supply partner	1	2	3	4	5
13. Improved responsiveness from suppliers	1	2	3	4	5
14. Ability to rapidly communicate problems between yourself and suppliers	1	2	3	4	5

THANK YOU!

A.3. Customer Questionnaire Sample

R1

Brunel UNIVERSITY LONDON

Survey on supply chain visibility in food retail industry, and the impact of delivery time

This is for partial fulfilment of the requirements for the PhD degree at the above named university. If you agree to participate in this study, please read each item carefully then answer as accurately as possible. If you have any questions, concerns for additional information regarding this questionnaire please feel free to conatct me at 1-876-393-1923 or email yolanda.silvera@brunel.ac.uk.

All information provided will be kept strictly confidential and be used for academic purposes only. Thank you in advance for your contribution to this research study.

Section A: Company Background.

1. Company Name: Asda Park royal Superstore	
2. Company Address: 2-20 weston road NW10 7LW	
3. Number of years company has been in operation: 29 yrs	4. Total number of full-time employees: 82
5. Country Location of Business: UK	
6. Type of Company (E.g., Wholesale, Supermarket, Restaurant, Major Brand Retailer, Local Shop Store) Please state: Supermarket.	

7. What is your current position in the company? Please state: Food hall manager.

8. How many years have you been involved this company?
   - Less than 1 year ☐
   - 1-5 years ☐
   - 6-10 years ☐
   - Above 10 years ☑

9. What is your Department? Please state: Food hall

10. What role/activities do you perform in the supply chain? (Please state): - Holding meetings with food suppliers to discuss issues relating the supplier.
- Receiving floor inventories lab.

[illegible]

Section B: Information Technology Usage

Please rank the significance of the following priorities:

IT Usage	Priority				
	VERY LOW	LOW	AVERAGE	HIGH	VERY HIGH
1. Product Quality	1	2	3	4	5
2. Delivery Speed	1	2	3	4	5
3. Meeting target delivery date & time	1	2	3	4	5
4. Price	1	2	3	4	5
5. Volume flexibility	1	2	3	4	5
6. Product Range	1	2	3	4	5
7. Ability to customize Order	1	2	3	4	5
8. Your company can place orders electronically	1	2	3	4	5
9. Your company has access to order information electronically	1	2	3	4	5

10. Please state the type of EDI system you use (e.g. SAGE MAS90): [illegible]

11. Please state the type of ERP system you use (e.g. SAP): Oracle

12. Do you use Radio Frequency Identification as part of your visibility tools? Yes/No ([illegible])

    a. If yes, please state brand system being used: ______

    b. If yes, please state how long you have been using R.F.I.D in your business: ______

13. Please state what other priority factors you consider important. (e.g. Cost vs. Quality, Product Range etc.): Costs & Quality

K 1

Section C: Suppliers Lead Time

Please indicate your suppliers' delivery time to your company:

Suppliers Lead Time	LESS THAN 1 DAY	1-5 DAYS	6-10 DAYS	ABAOVE DAYS	
14. Average lead time on orders	1	2	3	4	
15. Minimum lead time on orders	1	2	3	4	
16. Maximum lead time on orders	1	2	3	4	
Factors	Less than 20 %	20-40%	41-60%	61-80%	81-100%
17. Percentage that your orders are acknowledged on time	1	2	3	4	5

18. Please state how long your order related queries are responded to (in days): 2 days

19. Please state the penalties you pay for late deliveries (pounds value per annum): —

20. We view our suppliers as an extension of our organization: Yes/No

21. We are willing to work with our key suppliers to improve our process for the long term: Yes/No

Please indicate your suppliers' delivery performance to your company:

Delivery Performance (Never- 0 times per week; Often – 1-2 times per week; Sometimes – 3 times per week ; Almost Always – 4 times per week Always – every day)	Response				
	NEVER	OFTEN	SOMETIMES	ALMOST ALWAYS	ALWAYS
22. On time delivery of order from supplier	1	2	3	4	5
23. Supplier's flexibility in delivery schedule to meet your needs	1	2	3	4	5
24. Responds rapidly to product mix variations to meet your needs	1	2	3	4	5
25. Ability to receive your order correct the first time	1	2	3	4	5
26. Responds rapidly to demand quantity variations	1	2	3	4	5
Reliability Measures					
27. Goods are delivered on the agreed date	1	2	3	4	5
28. Supplier has short delivery time	1	2	3	4	5
29. Supplier provides product mix when requested	1	2	3	4	5

30. Are there any other factors you consider important to meeting on time delivery? (Please state):

—

K1

Section D: Supply Visibility Measures

Please indicate on your company's supply chain visibility:

Visibility for Coordinating and Integration	Response				
	NEVER	OFTEN	SOMETIMES	ALMOST ALWAYS	ALWAYS
1. Supplier uses information technology well to exchange information with your company as a customer.	1	2	3	4	5
2. You receive invoices electronically	1	2	3	4	5
3. Supplier shares product availability information with you electronically	1	2	3	4	5
4. Communicate face to face with suppliers	1	2	3	4	5
5. Communicate with suppliers via phone	1	2	3	4	5
6. Communicate with suppliers via video-conferencing or chat	1	2	3	4	5
7. Conduct purchasing Via Electronic Data Interchange (EDI)	1	2	3	4	5
8. Make payments to suppliers electronically	1	2	3	4	5
9. Co-ordinate activities with supplier via informal means (word of mouth, note)	1	2	3	4	5
10. Co-ordinate activities with supplier via formal means (contract, purchase order etc.)	1	2	3	4	5

Section E: Supply Priorities

Please rank the significance of the following priorities:

Supply Priorities	Priority				
	SIGNIFICANT DECREASE	DECREASE	AVERAGE	INCREASE	SIGNIFICANT INCREASE
1. Information regarding transactions (order conformation…)	1	2	3	4	5
2. The number of faultless invoices invoiced by supplier	1	2	3	4	5
3. On time delivery	1	2	3	4	5
4. Supplier has short delivery time	1	2	3	4	5
5. Supplier provides advance notification of late deliveries or stock outs	1	2	3	4	5
6. Improved responsiveness from suppliers	1	2	3	4	5

THANK YOU!

A.4. AHP Questionnaire Sample

Brunel
UNIVERSITY
LONDON

This is for partial fulfillment of the requirements for the PhD Degree at the above mentioned university. This is a simple grid to assess those elements that you consider vital to your organizations operations, and to achieve supply chain relationshsips and visbility. The overall aim of this questionnaire (Grid Analysis) is determine whetehr or not shared priorties is necessary to achieve supply chain vsibility and on-time delivery.

If you have any questions regarding this questionnaire please feel free to contact me at 1-876-393-1923 or yolanda.silvera@brnel.ac.uk

The informatio shared in this questionnaire is confidential and will be used for academic purposes only. Thank you for particpating.

Instructions: Please tick according to the perfromance of each of your supplier. Please rank your suppliers' performance (high, medium, low) based on their ability to meet values

(constructs) that you consider of high priority to your business.

	High Performing Supplier	Average Performing Supplier	Low Performing Supplier	
On Time Deliveries	✓	✓	✓	Does Not Deliver On Time
Appropriate Communication	×	✓	×	Non-Communicative
Share Similar Values - e.g. Environmental Issues	✓	✓	✓	Does Not share Similar Values
High Quality Products	✓	×	×	Low Quality Products

A.4.1. AHP Repertory Grid Results

Table A.1.: Principal Components Analysis Values - Retrieved from IdioGrid

Constructs – Emergent	Elements			Constructs-Implicit
	High Performing Supplier	Average Performing Supplier	Low Performing Supplier	
On- Time Delivery	2.10	2.48	2.10	Does not Deliver On-Time
Appropriate Information	1.67	1.81	1.86	Non-Communicative
Shared Values	2.14	1.86	1.71	Does Not Share Similar Values
High Quality Products	2.10	2.00	1.90	Low Quality Products

Table A.2.: Correlation Values for Constructs- Retrieved from IdioGrid

Constructs	On-Time Delivery	Appropriate Communication	Shared values	High Quality Products
On-Time Delivery				
Appropriate Communication	0.28			
Shared Values	-0.19	-1.00		
High Quality Products		-0.96	0.98	

P<0.01

A.5. Interview and Discussion

Sample Exploratory Interview Conducted at Case Study Company:

Dear Sir / Madam,
This interview is part of my research at Brunel University, London. It is designed to understand the factors that are affecting your business in particular those affecting you meeting on-time delivery. The interview is also geared towards understanding your overall operation, supplier/ customer relationships, transportation operations and IT infrastructure currently in place. The interview is designed to take approximately 30 minutes. Your participation is voluntary and all the information provided will only be used for this research.

Thank you.

Table A.3.: Weighting for Constructs Showing the level of Importance of Factors-Retrieved from IdioGrid

Constructs	Component Weighting 1	Component Weighting 2
On-Time Delivery	**0.88**	**0.97**
Appropriate Communication	**-0.98**	0.18
Shared Values	**1.00**	-0.09
High Quality Product	**1.00**	-0. 00

Cut off point of 0.7

Element	Component 1	Component 2
High Performing Supplier	2.05	-0.86
Average Performing Supplier	0.05	1.50
Low Performing Supplier	-2.10	-0.64

Values used for plotting elements in components space

Job role:……………………………………………………………………………………………..

1. Provide me with an overview of the company's operations

2. How many employees do you have?

3. What is your monthly throughput and what are some the KPI's used to measure your delivery/ supplier performance?

4. How do you source your products? What type of products do you supply?

5. Tell me about your logistics operations, both warehousing and transportation.

6. What type of IT Infrastructure do you currently have?

7. Are there future plans to put new system to enhance customer satisfaction in relation to delivery?

8. Are there penalties involved when you deliver late to your customers?

9. What are your plans regarding new product development?

10. How are you developing your IT systems to enhance delivery of these new products?

11. What types of contracts or supplier/customers arrangements do you use within your organization

12. Do you believe these foster good partnerships between yourselves and your suppliers/ customers?

13? How can these partnerships be improved? What are you doing to improve the partnerships?

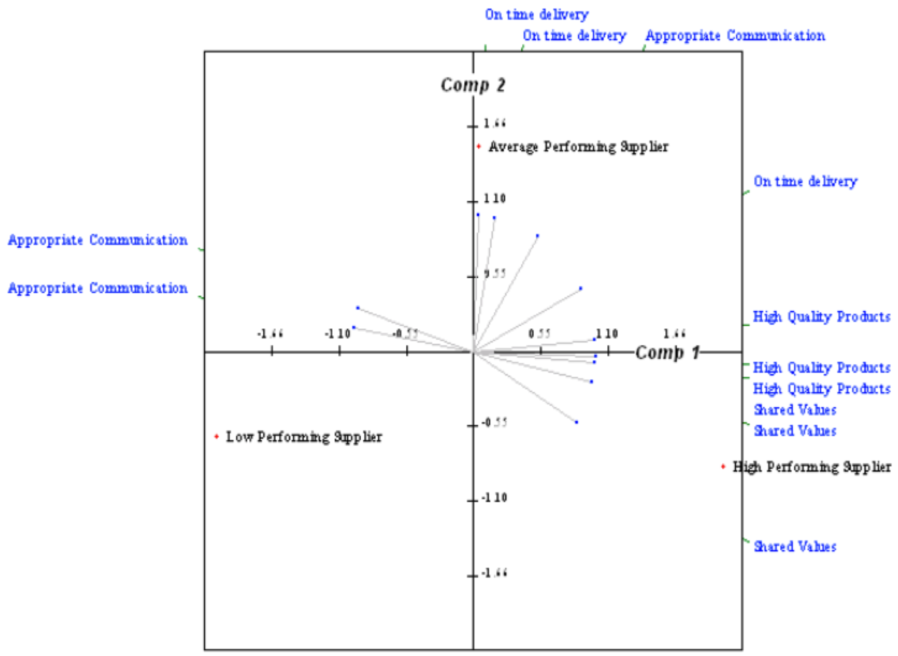


Figure A.1.: Graphics Matrix Showing Correlations Between Constructs and Elements

A.6. Validation Interview/Discussion Questions

Sample Interview Questions used to Validate Research Model:

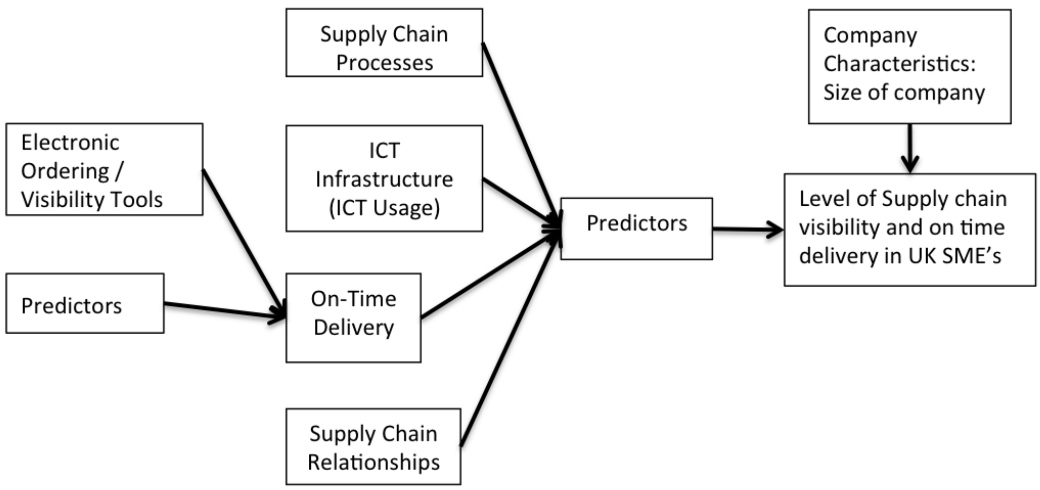
Dear Sir / Madam,

This interview is part of my research at Brunel University, London. It is designed to understand the factors that influences on-time delivery and supply chain visibility in FMCG SME's in the UK. The interview is designed to take approximately 30 minutes. Your participation is voluntary and all the information provided will only be used for this research.

Thank you.

Yolanda Silvera
Brunel University, London
College of Engineering, Design and Physical Sciences
Yolanda.Silvera@brunel.ac.uk

Proposed Research Model Showing Parameters and Predictors



Job role:……………………………………………………………………………………………

1.What is your opinion on the proposed framework shown?

………………………………………………………………………………………..

2. What is your opinion on the following: There is a positive relationship between Delivery lead time and On-Time:

…………………………………………………………………………………………..

3. What is your opinion on the following: There is a positive relationship between Supply Chain Processes and:
a) Supply chain Responsiveness
………………………………………………………………

b) Product Variability Offered to Customers ……………………………………………

4. What is your opinion on the following: There is a positive relationship between Supply Chain Visibility and:
a) Supply Chain Responsiveness ……………………………………………………..

b) Product Variability Offered to Customers …………………………………………..

c) On-Time Delivery to Customers ……………………………………………………

d) Supply Chain Relationships along the Chain ……………………………………..

5. What is your opinion on the following: There is a positive relationship between company size and the level of supply chain visibility achieved.

………………………………………………………………………………………..

6. What is your opinion on the following: There is a positive relationship between the visibility achieved and:

a) Overall On-time Delivery achieved by a company …………………………………

b) Overall Visibility achieved by a company …………………………………………..

B. SCOR Model Parameters & Visibility Literature Sources

B.1. SCOR Model Parameters

Table B.1.: SCOR Model Parameters for Operations

Performance Attribute	Level 1 Metric	Metric Definition
Reliability	Perfect Order Fulfilment	The percentage of orders meeting delivery performance with complete and accurate documentation and no delivery damage
Responsiveness	Order Fulfilment Cycle	The average actual cycle time consistently achieved to fulfil customer orders
Agility	Upside Flexibility	The number of days required to achieve an unplanned sustainable 20% increase in quantities delivered
	Upside Adaptability	The maximum sustainable percentage increase in quantity delivered that can be achieved in 30 days
	Downside Adaptability	The reduction in quantities ordered sustainable at 30 days prior to delivery with no inventory or cost penalties
	Overall Value-at -Risk	Risk exposure of a trading portfolio based on historic volatility. The sum of the probability of risk events times the monetary impact of the events which can impact any core supply chain functions (e.g. Plan, Source, Make, Deliver and Return) or key dependencies
Cost	Total Cost to Serve	The sum of SC cost to deliver goods and services to the customer. It comprises both direct and indirect costs of the supply chain
Asset Management Efficiency	Cash-to-Cash Cycle Time	The time it takes for an investment made to flow back into a company after it has been spent for raw materials. For services, this represents the time from the point where a company pays for the resources consumed in the performance of a service to the time that the company received payment from the customer for those services
	Return on Fixed Assets	Return on Supply Chain Fixed Assets measures the return an organization receives on its invested capital in supply chain fixed assets. This includes the fixed assets used in Plan,

B.2. Information Visibility

Table B.2.: Articles Focusing on Information Visibility

Fosso Wamba, S., et al.	2007	To investigate the potential of RFID and the EPC network in the supply chain. Furthermore, it also elaborates on the implementation and usage of RFID and EPC network.	Case studies based on several inter-related firms in a supply chain. The study is based on interviews and focus groups.	Confirm great opportunities with the technology. Most improvements lie in the reduction of information handling for employees and in improved efficiency in certain business processes. Main thresholds are that firms need to move from focal firm focus toward network collaboration in order to reap the benefits of the technology. In the conclusion, it is also acknowledged that the potential savings of implementation of RFID is substantial.
From Information to Visibility				
Author	**Year**	**Focus**	**Research**	**Conclusion**
J. Grffiths, D. Margetts	2000	This article concerns, the inbound logistics and production of a manufacturer and how internal decisions affect the supply chain.	Hypothesis which are explored and supported by case study research.	Visibility is understood being achieved by exchange of information. The conclusion is that demand information is of utterly importance to support the supply chain. By sharing demand changes the supply chain is operating more efficiently.
Mark Barratt and Adegoke Oke	2007	The research focus, on finding the pillars of supply chain visibility. How visibility can be achieved and give a sustainable competitive advantage. This study regards the link between information and visibility rather than the link between information and performance.	The empirical material is gathered from interviews and studies of five different external supply chain linkages. The visibility is measured from a resource based perspective in order to identify how visibility provides a sustainable competitive advantage.	Information sharing does not provide visibility. Visibility can be provided by both technological and non-technological resources employed in the supply chain. The need of visibility is dependent on the strategic importance of the inter-linkage. Informal procedures and behavior are crucial to achieve distinctive visibility. Trust and commitment are needed to support the deployment of the resources needed to provide visibility.
Jakki J. Mohr, Ravipreet S. Sohi	1995	The development and testing of a model to measure communication value and distinguish relevant communication from the buzz.	The research is based on a literature study. Based on the literature study a model, which measure the value of information, is developed. A survey study is used in order to validate the model.	Information sharing within a relationship is significantly related to the communication flow within that relationship. The bilateral expectations of information exchange created by the norms, concerning information sharing, help foster an atmosphere conducive to an open communication.

Source: Johansson & Melin (2008)

Table B.3.: Articles focusing on Visibility Performance.

Edward G. Anderson Jr, Douglas J. Morrice and Gary Lundeen	2005	The article examines the bullwhip effect in service supply chains and examines if sharing customer demand will be helpful to reduce backlog variations.	Modeling of the supply chain with variable backlogs instead of make-to-stock and lead time reduction.	Visibility is different levels of information (sharing demand information). By sharing end user demand, the variance in demand can be reduced, thus mitigating the bullwhip effect. However, the information shared needs to be adapted to each node. The bulk of the backlog information (end user demand information) needs to be at the stage closest to the user. The information shared to other nodes needs to be the proper information needed for them in order for the other nodes to act on the information.
Visibility and Performance				
Author	**Year**	**Focus**	**Research**	**Conclusion**
F.T.S. Chan	2003	How the supply chain can improve the efficiency and effectiveness of not only product transfer, but also information sharing between all tiers of a complex hierarchy. This article mainly aims at giving different performance measures for supply chains.	A literature study in combination with a case study which verifies the presented model.	Visibility is a measure of performance. Visibility is measured by time and accuracy, visibility is to transfer information or access to information.
Christopher S. Tang	2005	A classification of supply chain risk management articles.	Literature study reviews different quantity models.	Visibility is understood as the information shown across the linkages of the supply chain. It is argued that visibility can reduce risk in the supply chain. The main areas for creating better visibility is understood to be greater collaboration by coordination of forecasts and planning, CPFR, and with support of technology such as RFID.
D. Berry, M.M. Naim	1996	To develop a framework for analysis and design of supply chains, concerning the material flow and the information flow.	Modeling and simulation of various redesign approaches.	The focus of this article is that most supply chains have simply evolved and not been designed to perform excellence. Each entity regards the next entity as their customers rather than acknowledging the end customer. By redesigning them, the supply chains will become more efficient.

Source: Johansson & Melin (2008)

C. Supplier/Delivery Data at Case Study Company

C.1. Data Used to Develop ProModel Simulation

Table C.1.: Data for Frozen Foods Section of Case Study Company- Order and Delivery Dates for a Sample Product

Supplier Code	Order Placed	Order Received at Case Study Company	Date Required	Customer Code	Customer Order Placed	Product Code	Date required by Customer	Customer Order Dispatched
I008	15/05/07	11/7/07	11/7/07	B2052	19/7/07	4505	20/07/07	20/07/07
	11/06/07	6/8/07	6/8/07		24/07/07		25/07/07	25/07/07
	29/6/07	12/09/07	12/09/07		26/07/07		27/07/07	27/07/07
	11/07/07	17/09/07	17/09/07		31/07/07		1/08/07	1/08/07
	1/08/07	25/10/07	24/10/07		2/08/07		3/08/07	3/08/07

Table C.2.: Data for Oriental Side of Case Study Company - Order Delivery Dates for a Sample Product

Supplier Code	Order Placed	Order Received at Case Study Company	Date Required	Customer Code	Customer Order Placed	Product Code	Date required by Customer	Customer Order Dispatched
YEO006	31/01/07	3/04/07	19/03/07	SUP001	1/05/07	SCO105	4/05/07	2/05/07
	5/02/07	26/04/07	19/03/07		09/07/07		12/07/07	11/07/07
	13/03/07	20/06/07	4/06/07		7/08/07		10/08/07	09/08/07
	18/04/07	23/07/07	20/07/07		17/09/07		20/09/07	18/09/07
	21/05/07	6/08/07	14/07/07		8/10/07		11/10/07	9/10/07
	8/06/07	3/10/07	29/10/07		26/11/07		29/11/07	29/11/07

Table C.3.: Data for Ethnic Side of Business- Order Delivery Dates for a Sample Product

Supplier Code	Order Placed	Order Received at Case Study Company	Date Required	Customer Code	Customer Order Placed	Product Code	Date required by Customer	Customer Order Dispatched
C0011	5/01/07	23/03/07	16/03/07	ASD093	27/04/07	AC1608	3/05/07	2/05/07
	1/02/07	30/04/07	2/04/07		1/05/07		8/05/07	4/05/07
	15/02/07	5/07/07	6/07/07		11/06/07		11/06/07	14/06/07
	15/02/07	23/08/07	10/08/07		2/07/07		2/07/07	5/07/07
	15/02/07	10/09/07	10/08/07		1/08/07		2/08/07	2/08/07
	15/02/07	29/10/07	12/10/07		3/09/07		4/09/07	4/09/07

C.2. Data Retrieved From ProModel

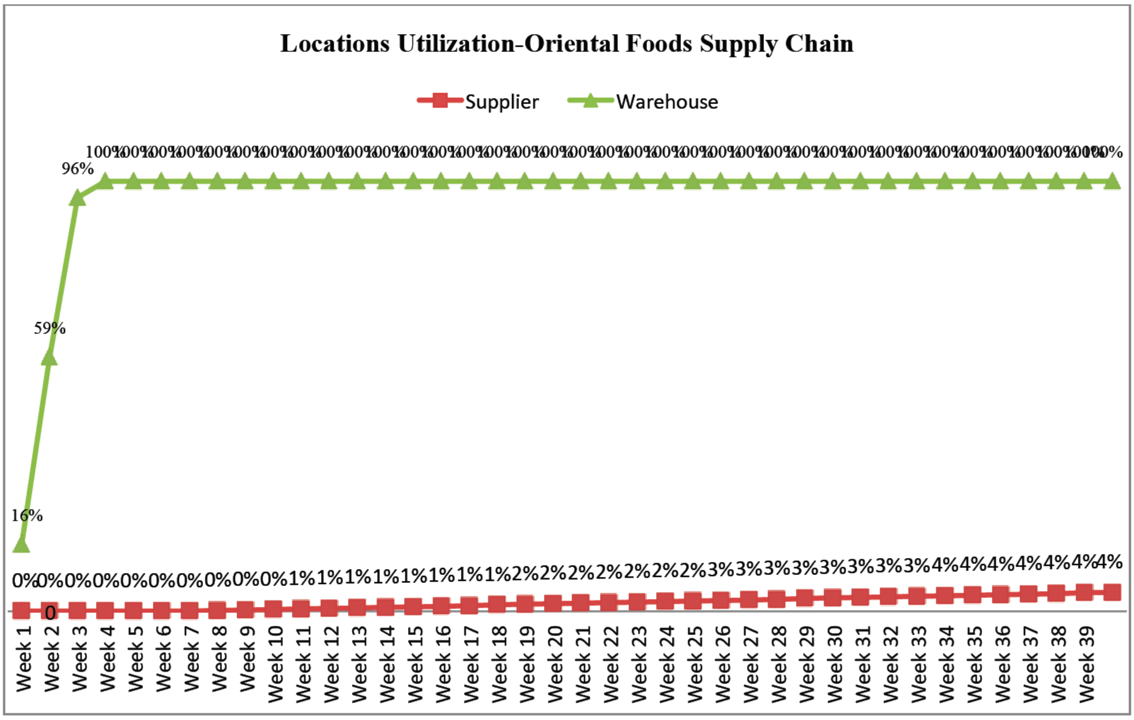


Figure C.1.: Delivery from Supplier to Warehouse Utilization

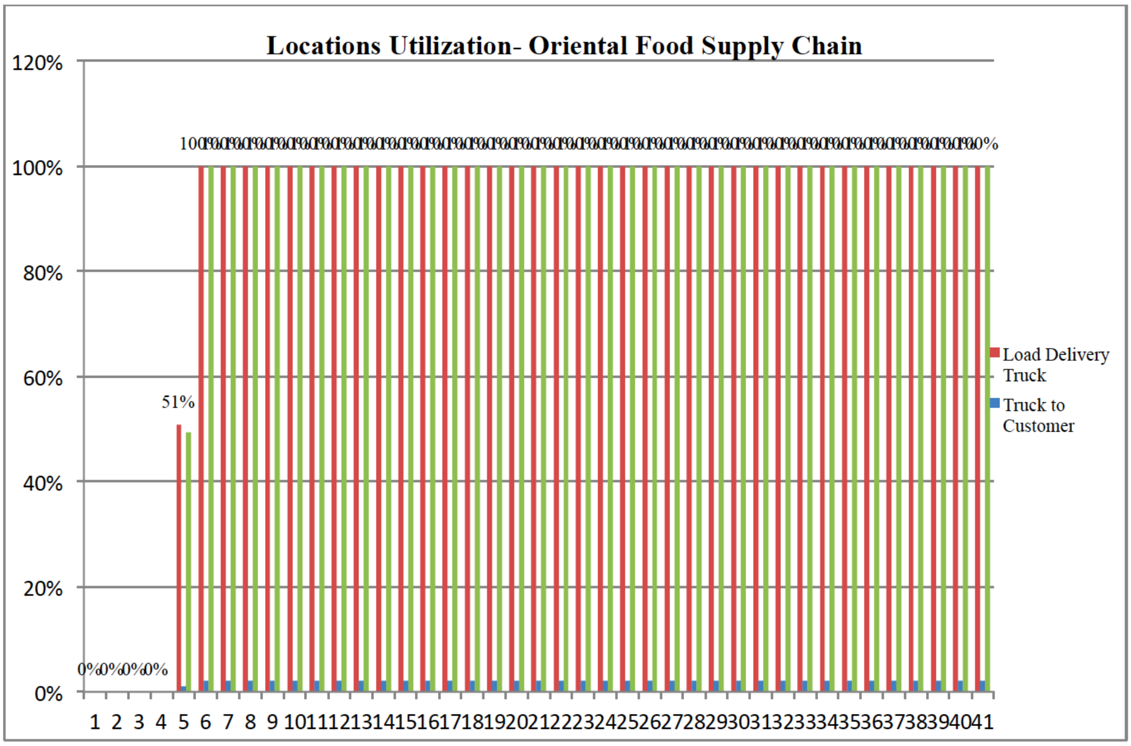


Figure C.2.: Utilization of Transport - Case Study Company

Locations Utilization- Frozen Foods Supply Chain

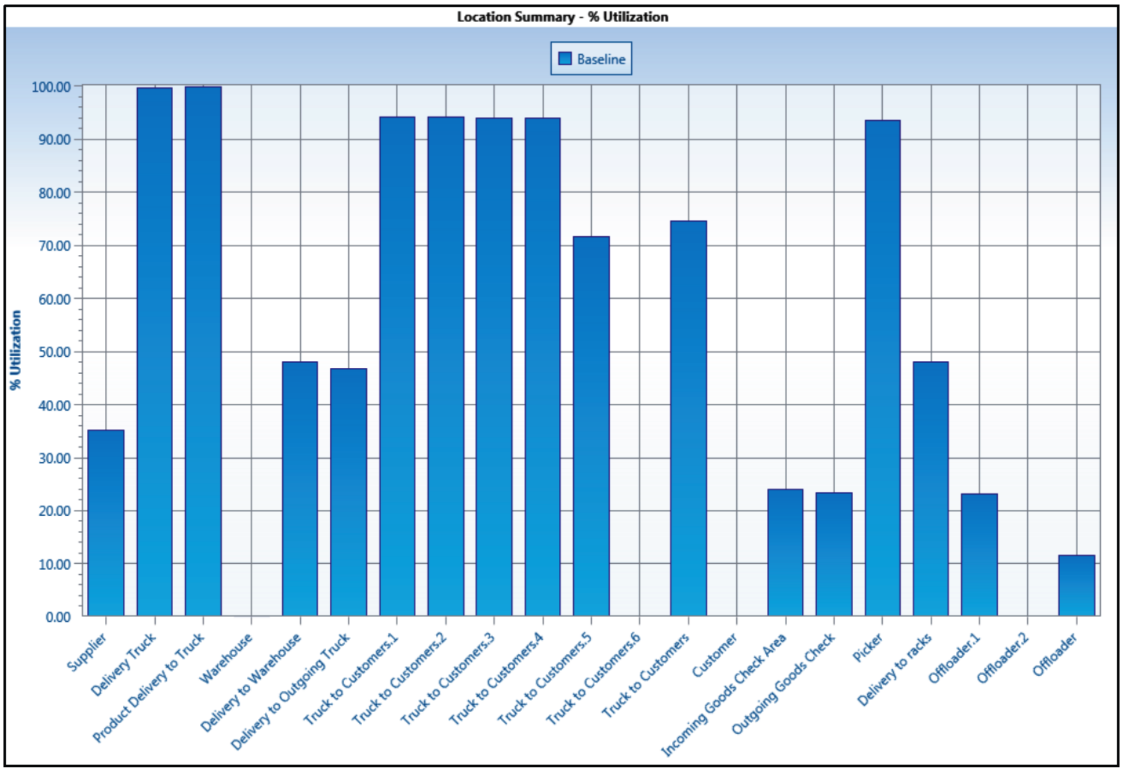


Figure C.3.: Locations % Utilization

Table C.4.: Frequency Response for Delivery Time -Tested at Case Study Company Site

Items	Measures	Frequency	Percent
Goods delivered on agreed date	Sometimes Almost Always Always	5 34 23	7.9 54 36.5
Total		62	98.4
Supplier has short delivery time	Sometimes Almost Always Always	6 32 24	9.5 50.8 38.1
Total		62	98.4
Supplier provides product mix when requested	Sometimes Almost Always Always	4 29 29	6.3 46 46
Total		62	98.4

enco.MOD (Normal Run - Rep. 1)					
Name	Scheduled Time (HR)	% Empty	% Part Occupied	% Full	% Down
Supplier	6232.85	0.00	100.00	0.00	0.00
Loader to 40 ft container.1	6232.85	0.00	0.00	100.00	0.00
Loader to 40 ft container.2	6232.85	0.00	0.00	100.00	0.00
Loader to 40 ft container	12465.70	0.00	0.00	100.00	0.00
Shipping	6232.85	0.02	1.67	98.31	0.00
Truck to shipping	6232.85	0.00	3.34	96.66	0.00
Truck to DC	6232.85	73.21	26.79	0.00	0.00
offloader to warehouse	6232.85	73.26	0.00	26.74	0.00
check point at warehouse	6232.85	73.26	26.74	0.00	0.00
loader to racks	6232.85	73.26	26.74	0.00	0.00
Warehouse	6232.85	37.76	62.24	0.00	0.00
offloader to truck.1	6232.85	89.97	0.00	10.03	0.00
offloader to truck.2	6232.85	89.97	0.00	10.03	0.00
offloader to truck	12465.70	89.97	0.00	10.03	0.00
Truck to customers.1	6232.85	79.94	20.06	0.00	0.00
Truck to customers.2	6232.85	100.00	0.00	0.00	0.00
Truck to customers	12465.70	89.97	10.03	0.00	0.00
off loader at customers	6232.85	79.94	0.00	20.06	0.00
customer	6232.85	100.00	0.00	0.00	0.00
Forklift to load truck to DC	6232.85	93.31	0.00	6.68	0.00

Figure C.4.: Data Retrieved from ProModel Showing % Occupied and Empty at each Location in Warehouse -Enco

chadha delivery.MOD (Normal Run - Rep. 1)					
Name	Scheduled Time (HR)	% Empty	% Part Occupied	% Full	% Down
Supplier	7896.00	14.08	85.92	0.00	0.00
Shipping	7896.00	0.01	9.34	90.65	0.00
Truck to shipping	7896.00	0.00	14.08	85.92	0.00
Load truck at supplier	7896.00	0.00	0.00	100.00	0.00
Delivery to warehouse	7896.00	0.32	4.74	94.94	0.00
Offloader to warehouse	7896.00	0.34	0.00	99.66	0.00
Warehouse	7896.00	0.36	99.64	0.00	0.00
Picker	7896.00	54.74	0.00	45.26	0.00
Product check at warehouse	7896.00	0.35	0.00	99.65	0.00
Product stack outgoing	7896.00	54.74	0.00	45.26	0.00
Load delivery truck	7896.00	9.48	0.00	90.52	0.00
Truck to customer.1	7896.00	9.49	90.51	0.00	0.00
Truck to customer.2	7896.00	100.00	0.00	0.00	0.00
Truck to customer	15792.00	54.74	45.26	0.00	0.00
Customer	7896.00	100.00	0.00	0.00	0.00
Product to racks	7896.00	0.35	0.00	99.65	0.00

Figure C.5.: Data Retrieved from ProModel Showing % Occupied and Empty at each Location in Warehouse -Chadha

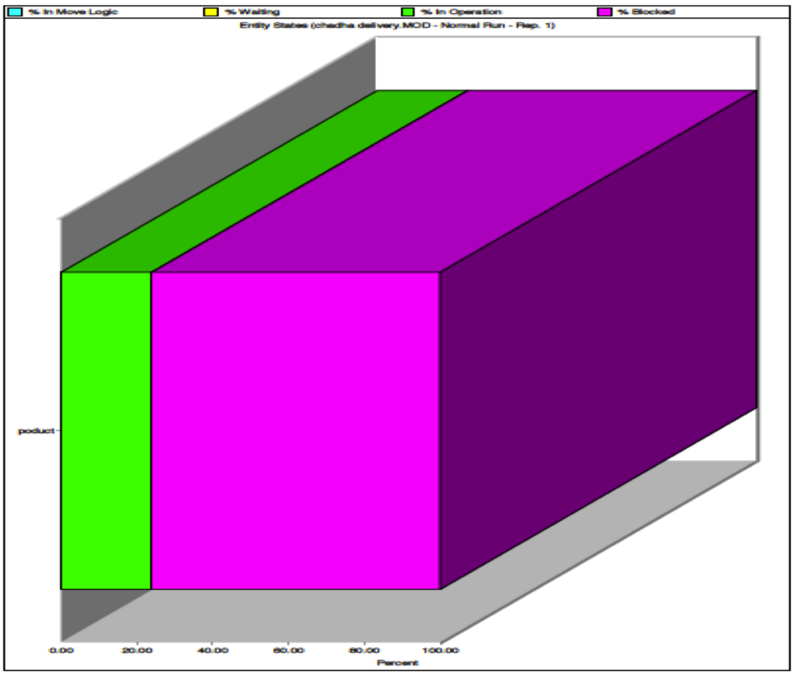


Figure C.6.: Sample Data from ProModel Showing % of Time Product was Blocked in Process - Chadha

D. Case Study Company's Customers

Table D.1.: Use of Visibility for Coordination and Integration

Items	Measures	Frequency	Percent
Supplier uses IT to exchange info with customers	Never	0	0
	Often	0	0
	Sometimes	0	0
	Almost always	55	87.3
	Always	8	12.7
Customer receives electronic invoices	Never	0	0
	Often	0	0
	Sometimes	1	1.6
	Almost always	45	71.4
	Always	17	27
Supplier shares product availability info electronically	Never	0	0
	Often	3	4.8
	Sometimes	4	6.3
	Almost always	25	39.7
	Always	31	49.2
Face to face comm. with suppliers	Never	0	0
	Often	0	0
	Sometimes	23	36.5
	Almost always	29	46
	Always	11	17.5
Comm. via phone	Never	0	0
	Often	3	4.8
	Sometimes	6	9.5
	Almost always	47	74.6
	Always	7	11.1
Comm. via video conf/chat	Never	0	0
	Often	7	11.1
	Sometimes	16	25.4
	Almost always	27	42.9
	Always	13	20.6
Conduct purchasing via EDI	Never	0	0
	Often	0	0
	Sometimes	2	3.2
	Almost always	40	63.5
	Always	21	33.3
Electronic payments to suppliers	Never	0	0
	Often	2	3.2
	Sometimes	8	12.7
	Almost always	28	44.4
	Always	24	38.1
Informal means of coordination	Never	0	0
	Often	8	12.7
	Sometimes	14	22.2
	Almost always	32	50.8
	Always	9	14.3
Formal means of coordination	Never	0	0
	Often	0	0
	Sometimes	3	4.8
	Almost always	24	38.1
	Always	36	57.1
N = 63			

Percentage Usage of R.F.I.D Technology by Customers

]

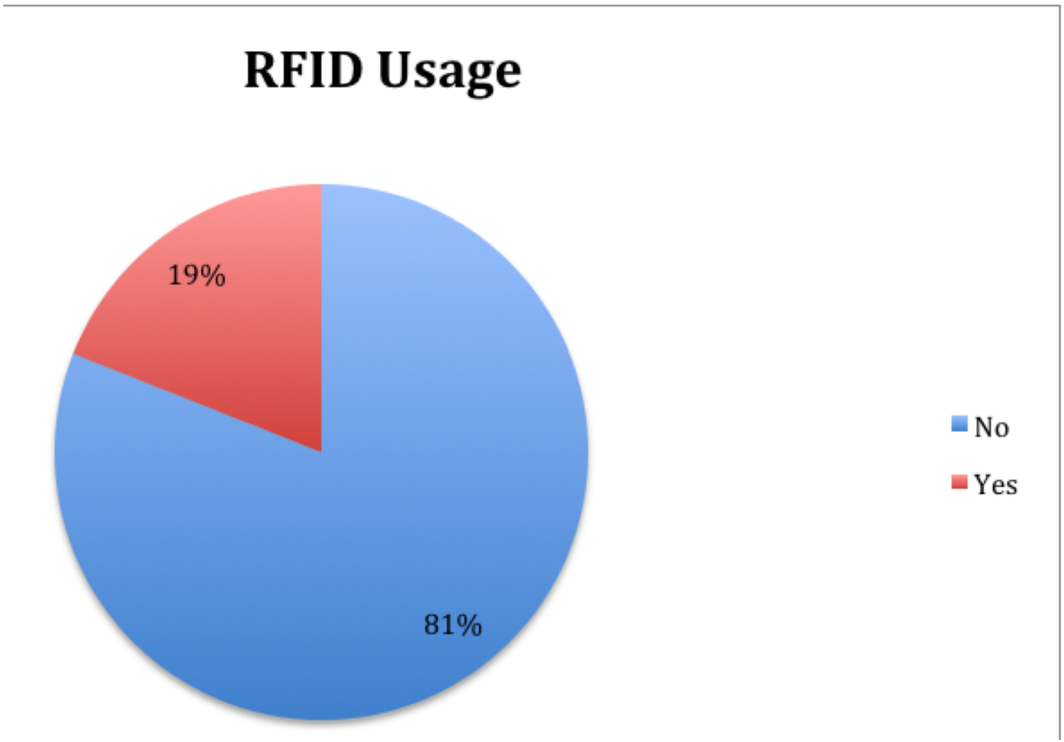


Figure D.1.: Percentage Usage of R.F.I.D Technology by Customers

Percentage of Customers that Received their Orders Correct the First Time

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Suppliers' Response to Product Mix Variations- Customers' Perspective

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Ability of Suppliers to Respond to Demand Variations Requested by Customers

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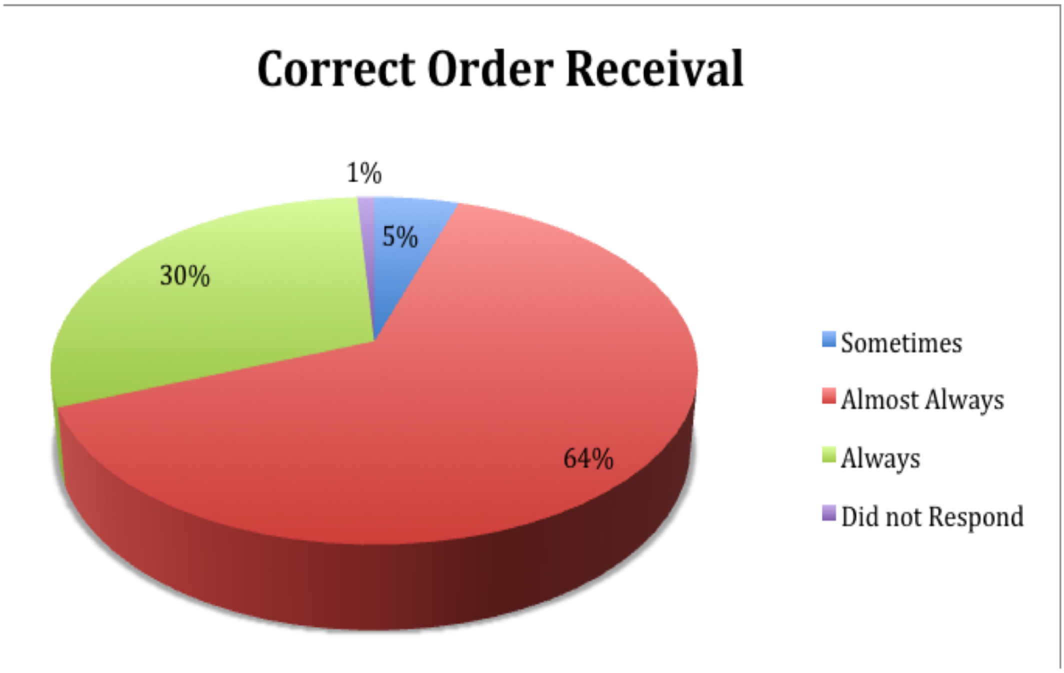

Figure D.2.: Percentage of Customers that Received their Orders Correct the First Time

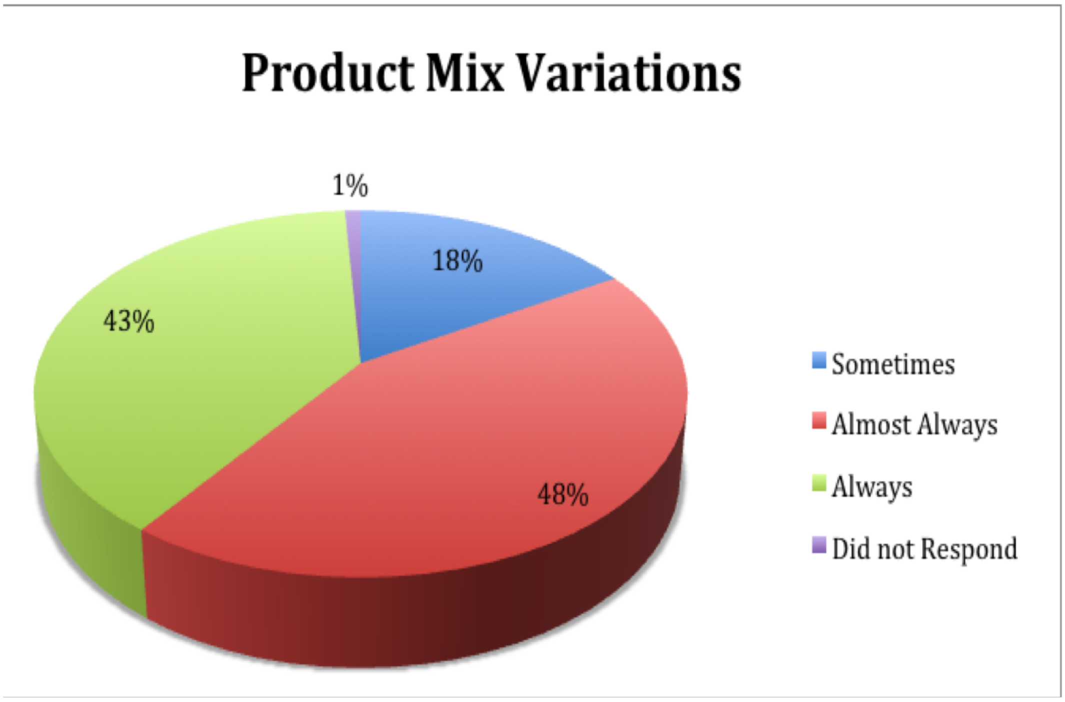

Figure D.3.: Suppliers' Response to Product Mix Variations- Customers' Perspective

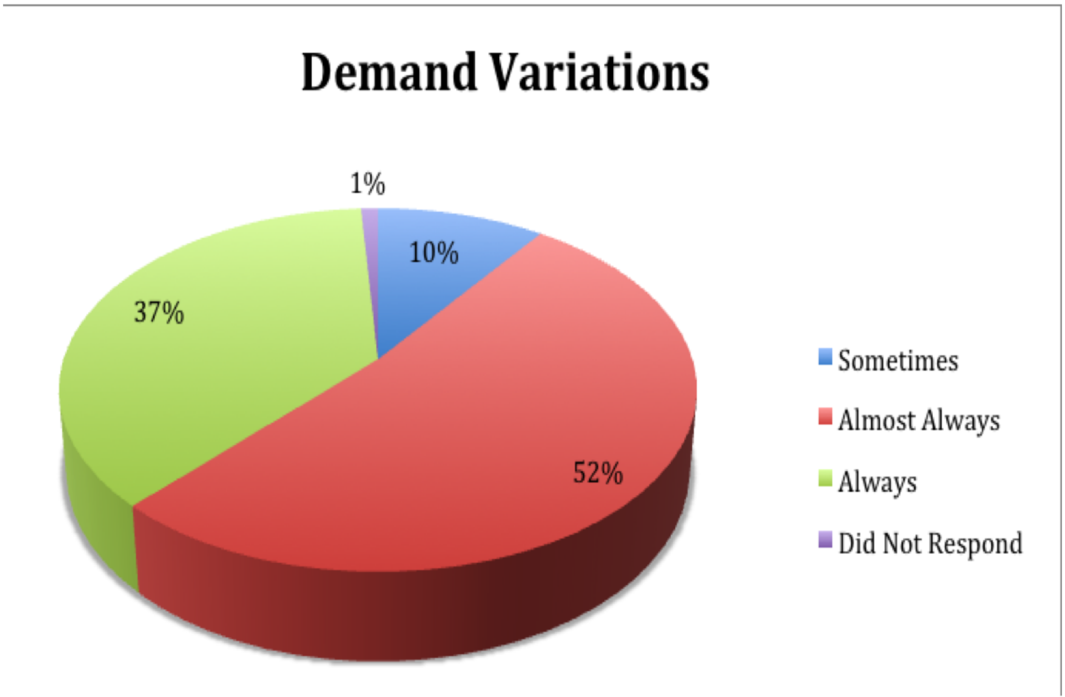

Figure D.4.: Ability of Suppliers to Respond to Demand Variations Requested by Customers

E. ANOVA Results

E.1. Information Usage

Table E.1.: Results of Analysis of Data for Information Usage

Product Quality	df	Mean Square	F	Sig.
Between Groups	2	.087	.336	.716
Within Groups	60	.259		
Total	62			
Delivery Speed				
Between Groups	2	.251	.987	.379
Within Groups	60	.254		
Total	62			
Meeting Delivery Date & Time				
Between Groups	**2**	**1.395**	**5.390**	**.007**
Within Groups	**60**	**.259**		
Total	**62**			
Price				
Between Groups	2	.013	.051	.951
Within Groups	60	.261		
Total	62			
Volume Flexibility				
Between Groups	2	.022	.049	.952
Within Groups	60	.443		
Total	62			
Product Range				
Between Groups	2	.193	.685	.508
Within Groups	60	.281		
Total	62			
Product Customization				
Between Groups	2	.469	1.708	.190
Within Groups	60	.275		
Total	62			
Electronic Order Placement				
Between Groups	2	.815	2.490	.091
Within Groups	60	.327		
Total	62			
Electronic Order Verification				
Between Groups	2	.016	.045	.956
Within Groups	60	.354		
Total	62			
RFID Usage				
Between Groups	**2**	**.968**	**7.469**	**.001**
Within Groups	**60**	**.130**		
Total	**62**			

E.1.1. Tukey Post Hoc Results

Table E.2.: Tukey Results for Information Usage

Dependent Variable	(I) Size of Companies	(J) Size of Companies	Mean Difference (I-J)	Sig.
Meeting Delivery Date & Time	Small	Medium	.13889	.704
		Large	-.35000	.080
	Medium	Small	.13889	.704
		Large	-.48889*	.011
	Large	Small	.35000	.080
		Medium	-.48889*	.011
RFID Usage	Small	Medium	.11111	.639
		Large	.40000*	.002
	Medium	Small	-.11111	.639
		Large	.28889*	.041
	Large	Small	-.40000*	.002
		Medium	-.28889*	.041

*The mean difference is significant to the 0.05 level

E.2. Suppliers' Lead Time Measures

Table E.3.: Anova Results for Suppliers' Lead Time Factors

Average Lead Time on Orders	df	Mean Square	F	Sig.
Between Groups	2	.984	6.175	.004
Within Groups	59	.159		
Total	61			
Minimum Lead Time on Orders				
Between Groups	2	.177	4.187	.020
Within Groups	59	.042		
Total	61			
Maximum Lead Time on Orders				
Between Groups	2	.036	.441	.646
Within Groups	59	.081		
Total	61			
% Order On Time Acknowledgement				
Between Groups	2	.246	1.046	.358
Within Groups	59	.235		
Total	61			

E.2.1. Tukey Post Hoc Results

Table E.4.: Tukey Results for Suppliers' Lead time Factors

Dependent Variable	(I) Size of Companies	(J) Size of Companies	Mean Difference (I-J)	Sig.
Avg. Lead Time on Deliveries	Small	Medium	-.38889*	.015
		Large	-.37500*	.012
	Medium	Small	.38889*	.015
		Large	.01389	.994
	Large	Small	.37500*	.012
		Medium	-.01389	.994
Minimum Lead Time on Deliveries	Small	Medium	-.16667	.052
		Large	.00000	1.000
	Medium	Small	.16667	.052
		Large	.16667*	.041
	Large	Small	.00000	1.000
		Medium	-.16667*	.041
Length of Response Time for order Related Queries	Small	Medium	-.20556	.422
		Large	-.40000*	.028
	Medium	Small	.20556	.422
		Large	-.19444	.433
	Large	Small	.40000*	.028
		Medium	.19444	.433

*The mean difference is significant to the 0.05 level

E.2.2. Delivery Performance

Table E.5.: ANOVA Results for Analysis of Delivery Performance Factors - Customer Responses

On Time Delivery of Orders From Suppliers	df	Mean Square	F	Sig.
Between Groups	2	.305	2.541	.087
Within Groups	59	.120		
Total	61			
Suppliers' Flexibility in Delivery				
Between Groups	2	.007	021	.979
Within Groups	59	.334		
Total	61			
Responds to Product Variation Mix				
Between Groups	2	1.292	2.946	.060
Within Groups	59	.439		
Total	61			
Receive Order Correct First Time				
Between Groups	2	.459	1.598	.211
Within Groups	59	..287		
Total	61			
Response to demand Variation				
Between Groups	2	.377	.872	.423
Within Groups	59	.433		
Total	61			

E.2.3. Reliability Measures

Table E.6.: ANOVA Results for Factors Relating to Reliability of Suppliers

Goods Delivered on Agreed Date	df	Mean Square	F	Sig.
Between Groups	2	.398	1.069	.350
Within Groups	59	.373		
Total	61			
Supplier has Short Delivery Time				
Between Groups	2	.002	.006	.994
Within Groups	59	.420		
Total	61			
Supplier Provides **Product Mix**				
Between Groups	2	.096	.249	
Within Groups	59	.385		.781
Total	61			

Table E.7.: Anova Results for Main Items Tested on Customers' Questionnaire

Information Technology Usage	df	Mean Square	F	Sig.
Between Groups	2	.259	.065	.937
Within Groups	60	3.987		
Total	62			
Suppliers' Lead Time				
Between Groups	2	2.083	.504	.607
Within Groups	59	4.132		
Total	61			
Supply Visibility Measures				
Between Groups	2	48.655	5.524	.006
Within Groups	59	8.808		
Total	61			
Supply Priorities				
Between Groups	2	7.701	3.812	0.028
Within Groups	60	2.020		
Total	62			

E.3. Supply Visibility Measures

Table E.8.: ANOVA Results for Factors Measuring Supply Visibility Factors

Supplier use of IT	df	Mean Squares	F	Sig. (p)
Between Groups	2	.022	.191	.827
Within Groups	60	.116		
Total	62			
Electronic invoices				
Between Groups	2	.409	1.872	.163
Within Groups	60	.219		
Total	62			
Shares product info electronically				
Between Groups	2	1.400	2.258	.113
Within Groups	60	.620		
Total	62			
Face to Face Communication				
Between Groups	2	1.627	3.430	.039
Within Groups	60	.474		
Total	62			
Communicate via telephone				
Between Groups	2	0.18	.043	.958
Within Groups	60	.409		
Total	62			
Communicate via videoconferencing				
Between Groups	**2**	**8.054**	**13.311**	**.000**
Within Groups	**60**	**.605**		
Total	**62**			
Purchase via EDI				
Between Groups	2	.360	1.305	.279
Within Groups	60	.276		
Total	62			
Electronic Payments to Suppliers				
Between Groups	2	.454	.728	.487
Within Groups	59	.623		
Total	61			
Informal Communication				
Between Groups	2	1.405	1.865	.164
Within Groups	60	.753		
Total	62			

E.3.1. Tukey Post Hoc Results

Table E.9.: Tukey Results for Factors Relating to Supply Visibility

Dependent Variable	(I) Size of Companies	(J) Size of Companies	Mean Difference (I-J)	Sig.
Communicate with Suppliers via Video-Conferencing	Small	Medium	-.94444*	.002
		Large	-1.16000*	.000
	Medium	Small	.94444*	.002
		Large	-.21556	.671
	Large	Small	1.16000*	.000
		Medium	.21556	.671

*The mean difference is significant to the 0.05 level

E.4. Supply Priorities

Table E.10.: Post Hoc Results for Factors Customers Consider Priority

Dependent Variable	(I) Size of Companies	(J) Size of Companies	Mean Difference (I-J)	Sig.
No. of Faultless Invoice	Small	Medium	-.45556*	.022
		Large	-.42000*	.022
	Medium	Small	.45556*	.022
		Large	.03556	.973
	Large	Small	.42000*	.022
		Medium	-.03556	.973
On Time Delivery	Small	Medium	.36667	.090
		Large	.42000*	.027
	Medium	Small	-.36667	.090
		Large	.05333	.943
	Large	Small	-.42000*	.027
		Medium	-.05333	.943

*The mean difference is significant to the 0.05 level

F. Normality Test Results - PP and QQ Plots

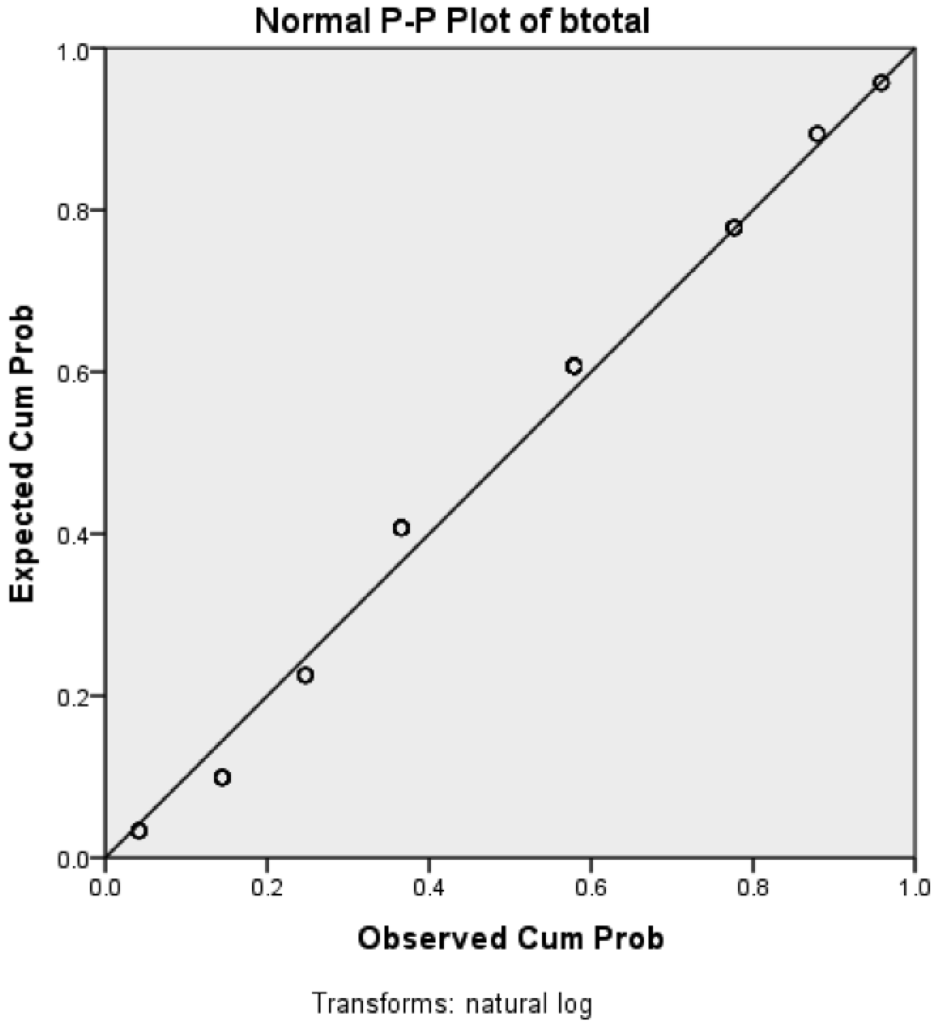

Figure F.1.: PP plot - Information Technology Usage

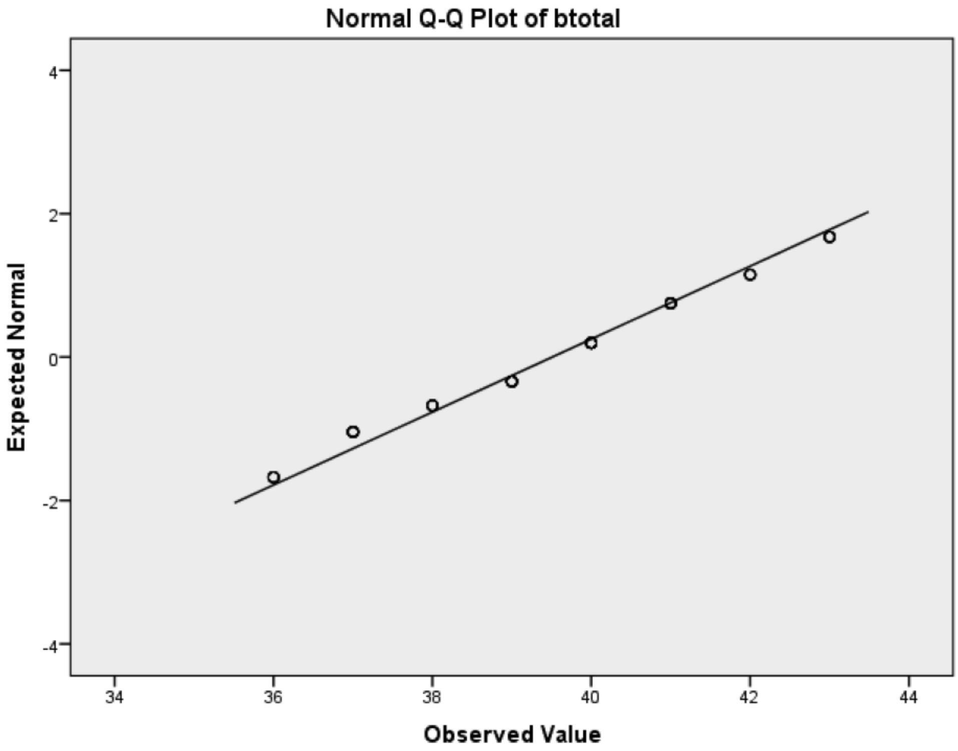

Figure F.2.: QQ Plot - Information Technology Usage

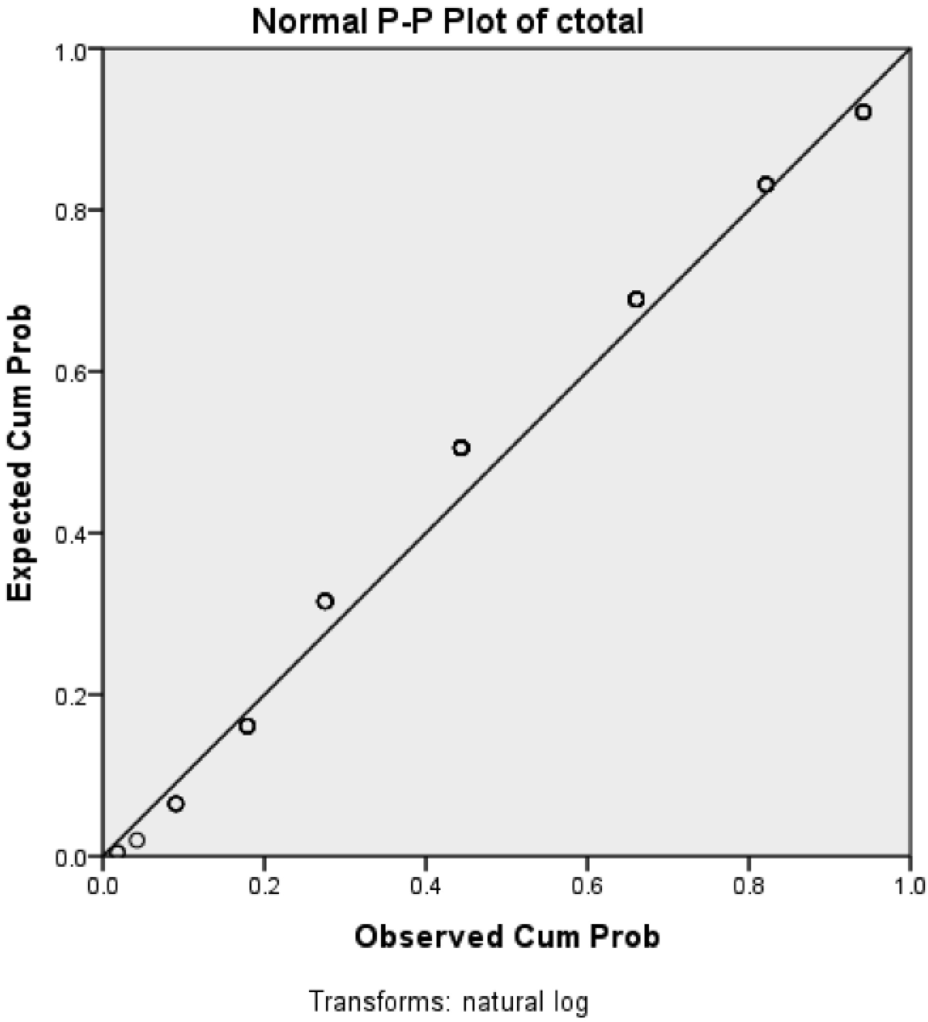

Figure F.3.: PP plots Suppliers' Lead Time

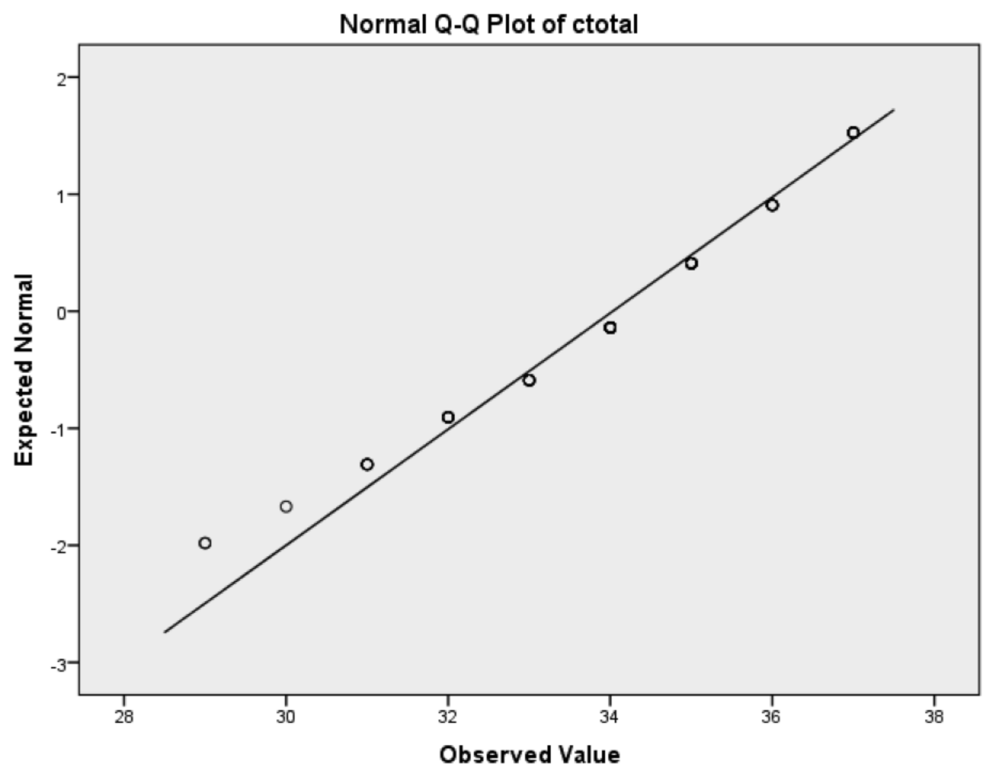

Figure F.4.: QQ Plots Suppliers 'Lead Time

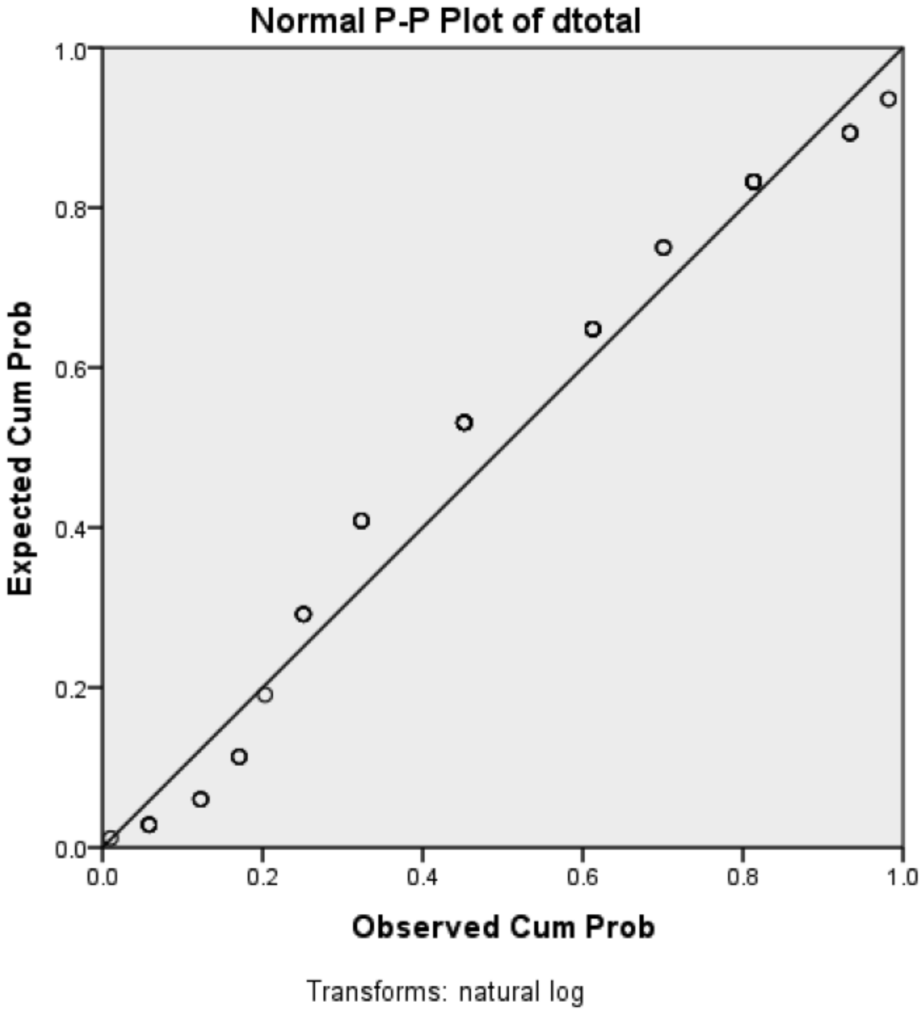

Figure F.5.: PP plots Supply Visibility Measures

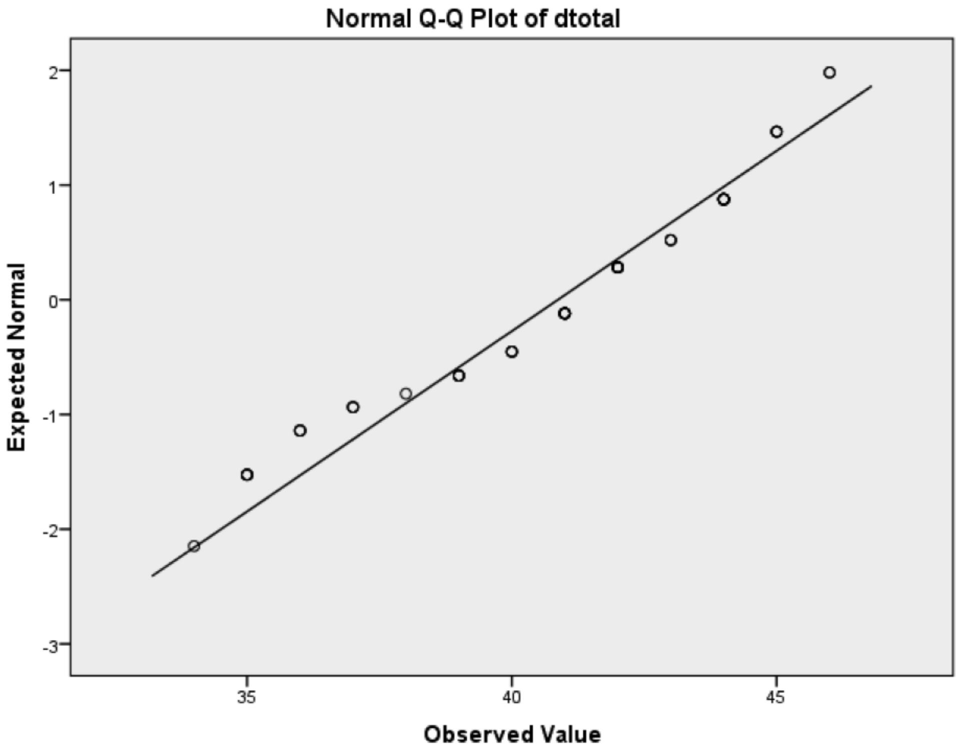

Figure F.6.: QQ Plots Supply Visibility Measures

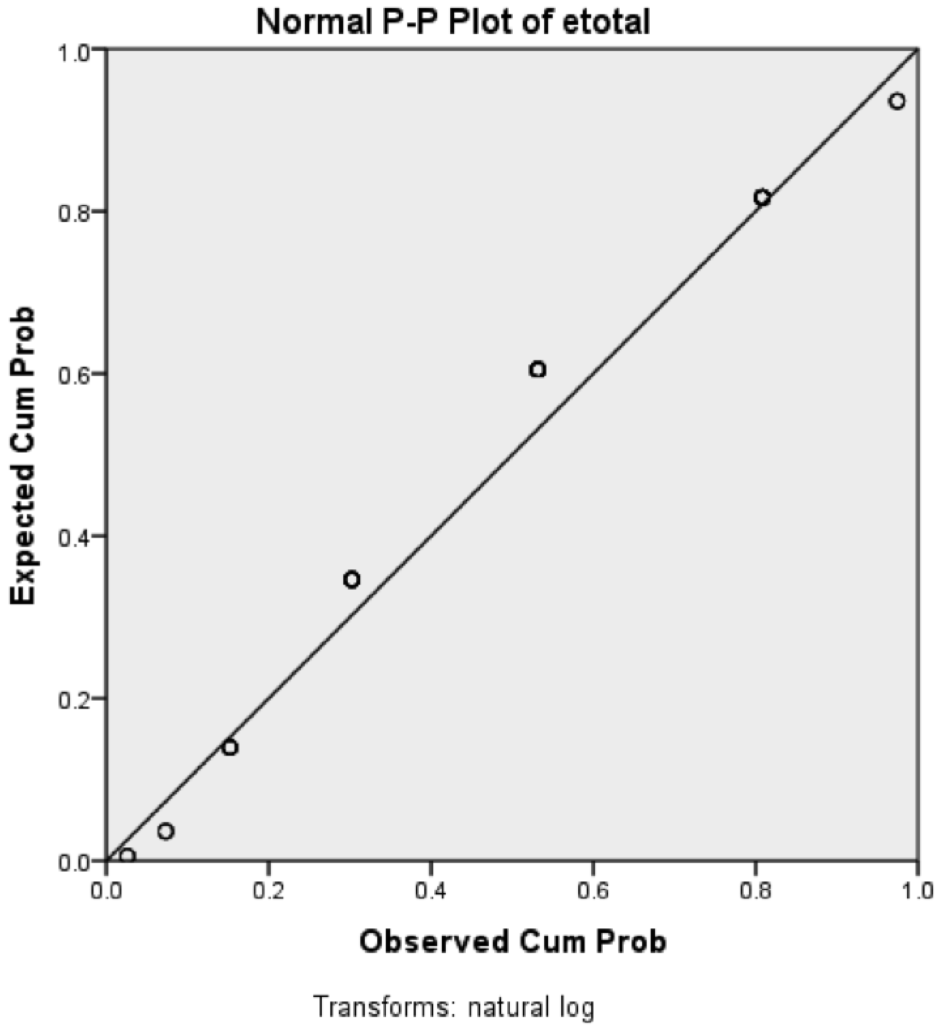

Figure F.7.: PP Plots Supply Chain Priorities

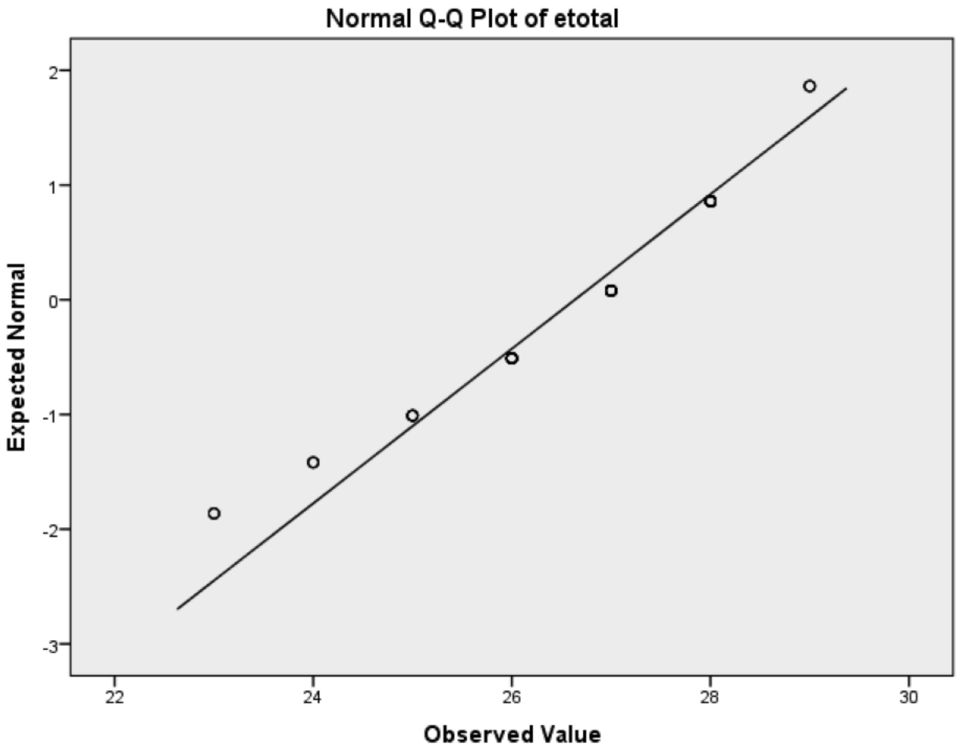

Figure F.8.: QQ Plots Supply Chain Priorities

G. Outlier Box Plots

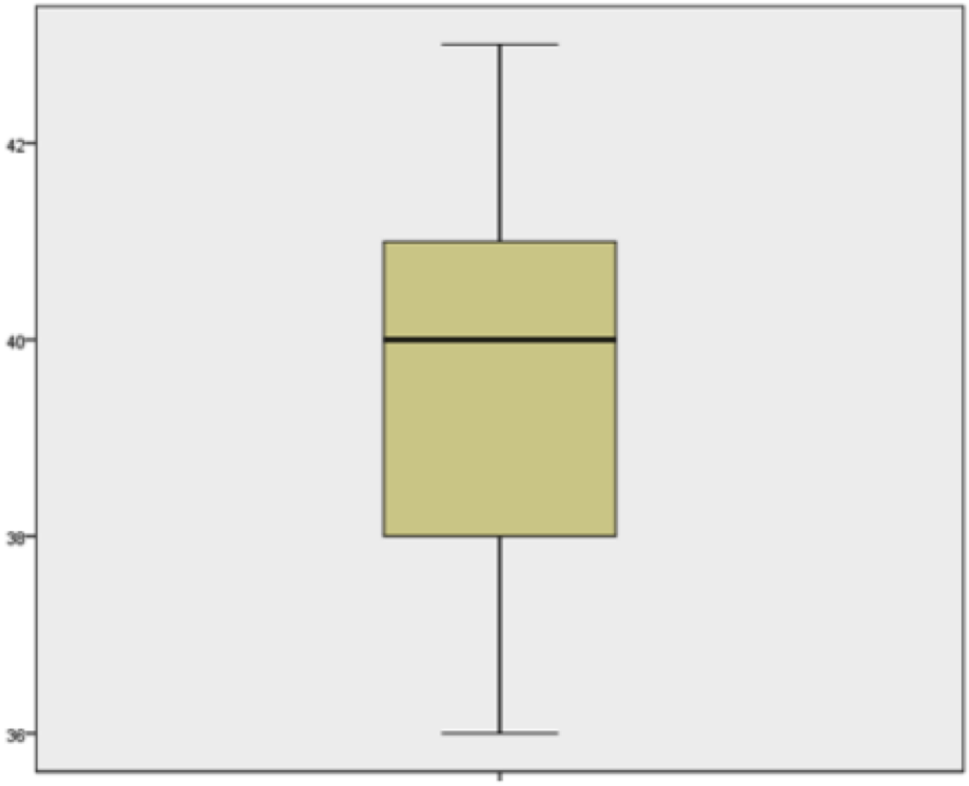

Figure G.1.: Information Technology Usage - No Outliers Found For This Parameter

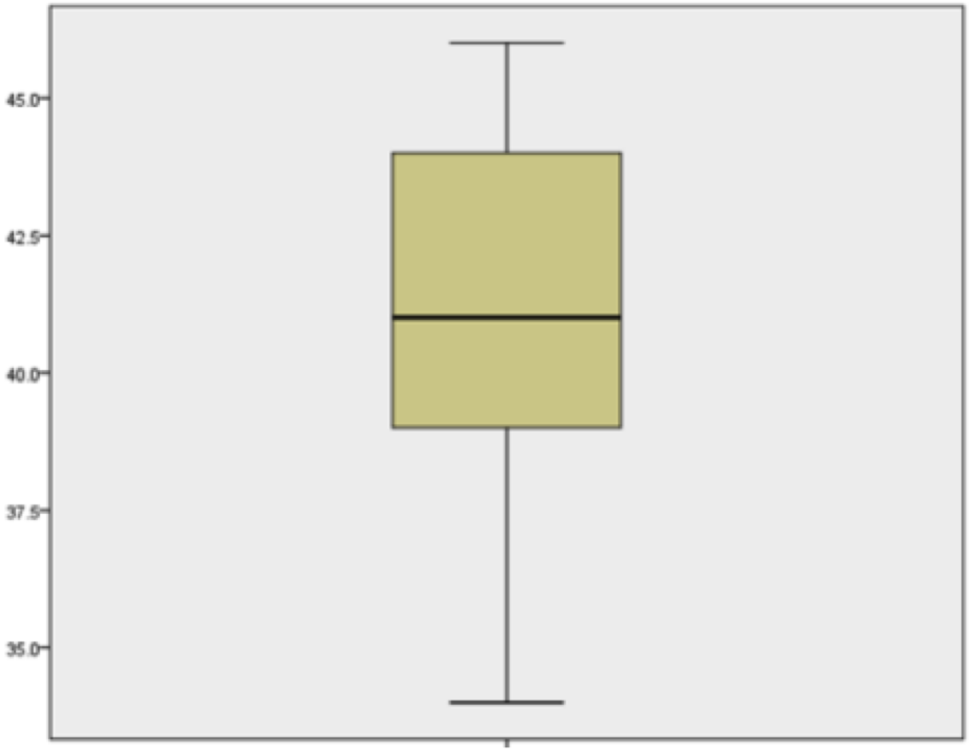

Figure G.2.: Supply Visibility Measures - No Outliers Found For This Parameter

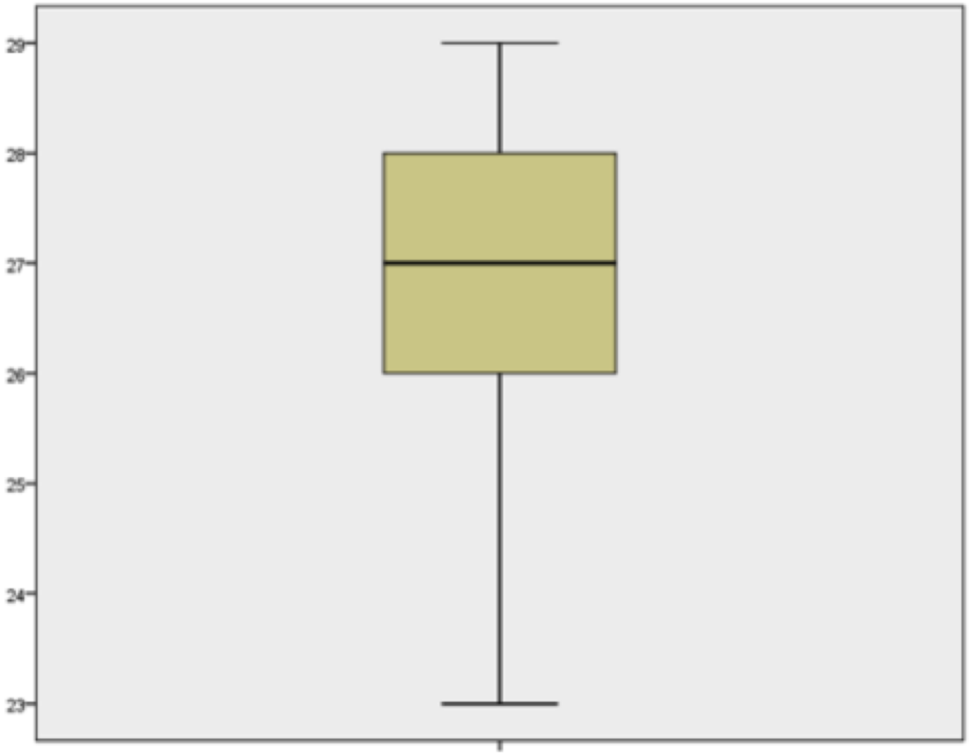

Figure G.3.: Supply Priorities- NoOutliers found For This Parameter

Bibliography

Ackoff, R. L. (1958). Towards a behavioral theory of communication. *Management Science*, 4(3):218–234.

Ackoff, R. L. (1993). Corporateperestroika: The internal market economy. *Systems practice*, 6(3):239–249.

Adielsson, F. and Gustavsson, E. (2011). Applying supply chain visibility-a study at a company in the paper and pulp industry.

Ahmad, S. and Schroeder, R. G. (2002). Refining the product-process matrix. *International Journal of Operations & Production Management*, 22(1):103–124.

Akkermans, H., Bogerd, P., and Vos, B. (1999). Virtuous and vicious cycles on the road towards international supply chain management. *International Journal of Operations & Production Management*, 19(5/6):565–582.

Akyuz, G. A. and Rehan, M. (2009). Requirements for forming an Ôe-supply chainÕ. *International Journal of Production Research*, 47(12):3265–3287.

Alexander, K., Gilliam, T., Gramling, K., Kindy, M., Moogimane, D., Schultz, M., and Woods, M. (2002). Focus on the supply chain: Applying auto-id within the distribution center. *Auto-ID Center, White Paper*.

Algethmi, M. A. (2014). *Mobile commerce innovation in the airline sector: an investigation of mobile services acceptance in Saudi Arabia*. PhD thesis, Brunel University School of Engineering and Design PhD Theses.

Ambrose, E., Marshall, D., and Lynch, D. (2010). Buyer supplier perspectives on supply chain relationships. *International Journal of Operations & Production Management*, 30(12):1269–1290.

Anandarajan, A. and Wen, H. J. (1999). Evaluation of information technology investment. *Management decision*, 37(4):329–339.

Andersen, B., Fagerhaug, T., Randmæl, S., Schuldmaier, J., and Prenninger, J. (1999). Benchmarking supply chain management: finding best practices. *Journal of Business & Industrial Marketing*, 14(5/6):378–389.

Anderson, E. J., Coltman, T., Devinney, T. M., and Keating, B. (2011). What drives the choice of a third-party logistics provider? *Journal of Supply Chain Management*, 47(2):97–115.

Anderson, J. C., Håkansson, H., and Johanson, J. (1994). Dyadic business relationships within a business network context. *The Journal of Marketing*, pages 1–15.

Anderson, M. G. and Katz, P. B. (1998). Strategic sourcing. *The International Journal of Logistics Management*, 9(1):1–13.

Angeles, R. (2005). RFID technologies: Supply-chain applications and implementation issues. *Information systems management*, 22(1):51–65.

Apte, U. M., Dew, N., and Ferrer, G. (2006). What is the right RFID for your process? Technical report, DTIC Document.

Aramyan, L. H., Oude Lansink, A. G., Van Der Vorst, J. G., and Van Kooten, O. (2007). Performance measurement in agri-food supply chains: a case study. *Supply Chain Management: An International Journal*, 12(4):304–315.

Arbnor, I. and Bjerke, B. (1994). *Methodology for Creating Business Knowledge*. SAGE Publications.

Archer, N. P., Maheshwari, B., Kumar, V., and Kumar, U. (2006). Optimizing success in supply chain partnerships. *Journal of Enterprise Information Management*, 19(3):277–291.

Arend, R. J. and Wisner, J. D. (2005). Small business and supply chain management: is there a fit? *Journal of Business Venturing*, 20(3):403–436.

Arksey, H. and Knight, P. (1999). *Interviewing for Social Scientists: An Introductory Resource with Examples*. SAGE Publications.

Arntzen, B. C., Brown, G. G., Harrison, T. P., and Trafton, L. L. (1995). Global supply chain management at digital equipment corporation. *Interfaces*, 25(1):69–93.

Arshinder, K., Kanda, A., and Deshmukh, S. (2011). A review on supply chain coordination: coordination mechanisms, managing uncertainty and research directions. In *Supply chain coordination under uncertainty*, pages 39–82. Springer.

Asif, Z. and Mandviwalla, M. (2005). Integrating the supply chain with RFID: A technical and business analysis. *Communications of the Association for Information Systems*, Vol. 15:Article 24.

Atali, A., Lee, H., and Ozer, O. (2005). If the inventory manager knew-RFID in retail and distribution [j]. In *MSOM Conference 2005 Proceedings. Chicago, IL.*

Auramo, J., Kauremaa, J., and Tanskanen, K. (2005). Benefits of IT in supply chain management: an explorative study of progressive companies. *International Journal of Physical Distribution & Logistics Management*, 35(2):82–100.

Badillo-Piña, I., Tejeida-Padilla, R., and Morales-Matamoros, O. (2012). A systems science perspective for supply chain management. In *Proceedings of the 56th Annual Meeting of the ISSS-2012, San Jose, CA, USA.*

Baker, P. (2008). The design and operation of distribution centres within agile supply chains. *International Journal of Production Economics*, 111(1):27–41.

Ballou, R. H. (1992). *Business Logistics Management*. Pearson, third edition.

Ballou, R. H., Gilbert, S. M., and Mukherjee, A. (2000). New managerial challenges from supply chain opportunities. *Industrial Marketing Management*, 29(1):7–18.

Balocco, R., Miragliotta, G., Perego, A., and Tumino, A. (2011). RFID adoption in the fmcg supply chain: an interpretative framework. *Supply Chain Management: An International Journal*, 16(5):299–315.

Balocco, R., Perego, A., and Perotti, S. (2010). B2b emarketplaces: a classification framework to analyse business models and critical success factors. *Industrial Management & Data Systems*, 110(8):1117–1137.

Banerjee, A. (1986). NoteÑon Òa quantity discount pricing model to increase vendor profitsÓ. *Management Science*, 32(11):1513–1517.

Bantham, J. H., Celuch, K. G., and Kasouf, C. J. (2003). A perspective of partnerships based on interdependence and dialectical theory. *Journal of Business Research*, 56(4):265–274.

Barbour, R. S. (2001). Checklists for improving rigour in qualitative research: a case of the tail wagging the dog? *BMJ: British Medical Journal*, 322(7294):1115.

Barnes-Schuster, D., Bassok, Y., and Anupindi, R. (2006). Optimizing delivery lead time/inventory placement in a two-stage production/distribution system. *European Journal of Operational Research*, 174(3):1664–1684.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1):99–120.

Barratt, M. and Oke, A. (2007). Antecedents of supply chain visibility in retail supply chains: a resource-based theory perspective. *Journal of operations management*, 25(6):1217–1233.

Bartlett, P. A., Julien, D. M., and Baines, T. S. (2007). Improving supply chain performance through improved visibility. *The International Journal of Logistics Management*, 18(2):294–313.

Bassioni, H. A., Price, A. D. F., and Hassan, T. M. (2005). Building a conceptual framework for measuring business performance in construction: an empirical evaluation. *Construction Management and Economics*, 23(5):495–507.

Beamon, B. M. (1999). Measuring supply chain performance. *International journal of operations & production management*, 19(3):275–292.

Bendoly, E. and Kaefer, F. (2004). Business technology complementarities: impacts of the presence and strategic timing of ERP on b2b e-commerce technology efficiencies. *Omega*, 32(5):395–405.

Benjamin, R. and Wigand, R. (1995). Electronic markets and virtual value chains on the information superhighway. *Sloan Management Review*, 36(2):62.

Berg, B. (2004). *Qualitative Research Methods for the Social Sciences.* Pearson.

Berrah, L. and Clivillé, V. (2007). Towards an aggregation performance measurement system model in a supply chain context. *Computers in Industry*, 58(7):709–719.

Best Practices, L. (2002). Supply chain management best practices. *Benchmarking Reports*, ID: OP-87.

Bichanga, W. O. and Mwangi, A. (2014). Evaluating the effectiveness of supply chain visibility in the retail supply chain: A case study of uchumi super markets limited-kenya. *International Journal of Management Sciences*, Vol. 2, No. 4:179–190.

Biehl, M., Prater, E., and Realff, M. J. (2007). Assessing performance and uncertainty in developing carpet reverse logistics systems. *Computers & Operations Research*, 34(2):443–463.

Blackstone Jr, J. and Cox, J. (2005). Apics: The association for operations management. *APICS Dictionary,*.

Blaikie, N. (2000). *Designing Social Research: The Logic of Anticipation.* Wiley.

Blumberg, B., Cooper, D., and Schindler, P. (2008). *Business Research Methods.* McGraw-Hill Higher Education.

Bohnenkamp, T. (2013). The effect of the resource based view on decisions in supply management. B.S. thesis, University of Twente.

Bourland, K. and Powell, D. (1996). Exploring timely demand information to reduce inventories. *European Journal of Operations Research*, 92((2)):239Ð253.

Bower, J. L. and Hout, T. M. (1988). Fast-cycle capability for competitive power. *Harvard Business Review*, 66(6):110–118.

Bowersox, D., Closs, D., and Cooper, M. (2007). *Supply Chain Logistics Management.* McGraw-Hill/Irwin series operations and decision sciences. McGraw-Hill/Irwin.

Bowersox, D. J., Closs, D. J., and Stank, T. P. (1999). *21st century logistics: making supply chain integration a reality.*

Bradley, P. (2002). How far can you see? *Logistics Management and Distribution*, pages 27–34.

Brecher, C. (2011). *Integrative Production Technology for High-Wage Countries.* Springer Berlin Heidelberg.

Brown, D. (2007). *RFID Implementation.* McGraw-Hill communications. McGraw-Hill Education.

Brown, K. and Vastag, G. (1993). Determinants of manufacturing delivery reliability: a global assessment. *Manufacturing Research and Technology*, 17:285–285.

Browne, J. D., Rolstadas, A., and Anderson, B. (1998). Performance measurement - the enaps approach. *The International Journal of Business Transformation*, No.1(2):73–84.

Brun, A., Caridi, M., Salama, K. F., and Ravelli, I. (2006). Value and risk assessment of supply chain management improvement projects. *International Journal of Production Economics*, 99(1):186 – 201. Control and Management of Productive SystemsControl and Management of Productive Systems.

Bryman, A. and Bell, E. (2007). *Business Research Methods*. Oxford University Press.

Bryman, A. and Bell, E. (2011). *Business Research Methods 3e*. OUP Oxford.

Bryman, A. and Cramer, D. (2011). *Quantitative Data Analysis with IBM SPSS 17, 18 and 19*. Routledge.

Bullington, K. E. and Bullington, S. F. (2005). Stronger supply chain relationships: learning from research on strong families. *Supply Chain Management: An International Journal*, 10(3):192–197.

Burgess, K., Singh, P. J., and Koroglu, R. (2006). Supply chain management: a structured literature review and implications for future research. *International Journal of Operations & Production Management*, 26(7):703–729.

Bushuev, M. A. and Guiffrida, A. L. (2012). Optimal position of supply chain delivery window: Concepts and general conditions. *International Journal of Production Economics*, 137(2):226–234.

Cachon, G. and Netessine, S. (2004). *Game theory in supply chain analysis. Handbook of Quantitative Supply Chain Analysis: Modeling in the eBusiness Era. edited by D. Simchi-Levi, S.*

Cachon, G. P. and Fisher, M. (2000). Supply chain inventory management and the value of shared information. *Management Science*, 46(8):1032–1048.

Cachon, G. P. and Lariviere, M. A. (2001). Contracting to assure supply: How to share demand forecasts in a supply chain. *Management science*, 47(5):629–646.

Cannon, A. R., Reyes, P. M., Frazier, G. V., and Prater, E. L. (2008). RFID in the contemporary supply chain: multiple perspectives on its benefits and risks. *International Journal of Operations & Production Management*, 28(5):433–454.

Caridi, M., Crippa, L., Perego, A., Sianesi, A., and Tumino, A. (2010). Do virtuality and complexity affect supply chain visibility? *International Journal of Production Economics*, 127(2):372–383.

Caridi, M., Moretto, A., Perego, A., and Tumino, A. (2014). The benefits of supply chain visibility: A value assessment model. *International Journal of Production Economics*, 151:1–19.

Caridi, M., Perego, A., and Tumino, A. (2013). Measuring supply chain visibility in the apparel industry. *Benchmarking: An International Journal*, 20(1):25–44.

Cavinato, J. L. (1992). A total cost value model for supply chain competitiveness. *Journal of business logistics*, 13(2):285.

Chae, B. (2009). Developing key performance indicators for supply chain: an industry perspective. *Supply Chain Management: An International Journal*, 14(6):422–428.

Chae, B., Olson, D., and Sheu, C. (2014). The impact of supply chain analytics on operational performance: A resource-based view. *International Journal of Production Research*, 52(16):4695–4710.

Chakravorty, S. S. and Atwater, J. B. (1996). A comparative study of line design approaches for serial production systems. *International Journal of Operations & Production Management*, 16(6):91–108.

Chan, F. (2003). Performance measurement in a supply chain. *The International Journal of Advanced Manufacturing Technology*, 21 (7):534–548.

Chan, F. T. and Qi, H. (2003a). Feasibility of performance measurement system for supply chain: a process-based approach and measures. *Integrated manufacturing systems*, 14(3):179–190.

Chan, F. T. and Qi, H. J. (2003b). An innovative performance measurement method for supply chain management. *Supply chain management: An international Journal*, 8(3):209–223.

Chappell, G., Durdan, D., Gilbert, G., Ginsburg, L., Smith, J., and Tobolski, J. (2003). Auto-id in the box: the value of auto-id technology in retail stores. *Auto-ID Center*, 2(2).

Chen, F. (1998). Echelon reorder points, installation reorder points, and the value of decentralized demand information. *ManagementScience*, 44:221Ð234.

Chen, F., Drezner, Z., Ryan, J. K., and Simchi-Levi, D. (2000). Quantifying the bullwhip effect in a simple supply chain: The impact of forecasting, lead times, and information. *Management Science*, 46(3):436–443.

Chen, I. J. and Paulraj, A. (2004). Towards a theory of supply chain management: the constructs and measurements. *Journal of operations management*, 22(2):119–150.

Cheng, E. W. and Li, H. (2001). Analytic hierarchy process: an approach to determine measures for business performance. *Measuring Business Excellence*, 5(3):30–37.

Chia, A., Min, H., Goh, M., and Hum, S.-H. (2009). Performance measurement in supply chain entities: balanced scorecard perspective. *Benchmarking: An International Journal*, 16(5):605–620.

Chikan, A. and Gelei, A. (2010). New insight into the competitiveness of supplier firms: aligning competences and customer expectations. In *Supply Chain Forum: An International Journal*, volume 11, pages 30–44. Taylor & Francis.

Chinchuluun, A., Karakitsiou, A., and Mavrommati, A. (2008). Game theory models and their applications in inventory management and supply chain. In *Pareto Optimality, Game Theory And Equilibria*, pages 833–865. Springer.

Choe, J.-m. (2008). Inter-organizational relationships and the flow of information through value chains. *Information & Management*, 45(7):444–450.

Choi, T.-M. and Sethi, S. (2010). Innovative quick response programs: a review. *International Journal of Production Economics*, 127(1):1–12.

Choon Tan, K., Lyman, S. B., and Wisner, J. D. (2002). Supply chain management: a strategic perspective. *International Journal of Operations & Production Management*, 22(6):614–631.

Chou, C.-F. (2004). Development of a comprehensive supply chain performance measurement system: A case study in the grocery retail industry. Master's thesis, Massachusetts Institute of Technology.

Christopher, M. (1992). *Logistics and Supply Chain Management*. Financial Times series. Financial Times/Irwin Professional Pub.

Christopher, M. (1998). *Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service*. Financial Times Management. Financial Times/Pitman.

Christopher, M. (2005). *Logistics and Supply Chain Management: Creating Value-adding Networks*. Financial Times Series. FT Prentice Hall.

Christopher, M. (2011). *Logistics and Supply Chain Management*. Financial Times Series. Prentice Hall, fourth edition edition.

Christopher, M. and Peck, H. (2004). Building the resilient supply chain. *The international journal of logistics management*, 15(2):1–14.

Christopher, M. and Towill, D. R. (2002). Developing market specific supply chain strategies. *The international journal of logistics management*, 13(1):1–14.

Chung, S. and Snyder, C. (1999). ERP initiation - a historical perspective. In *in proceedings of the Americas Conference of Information Systems (AMCIS Õ99)*.

Cirtita, H. and Glaser-Segura, D. A. (2012). Measuring downstream supply chain performance. *Journal of Manufacturing Technology Management*, 23(3):299–314.

Clark, T. H. and Hammond, J. H. (1997). Reengineering channel reordering processes to improve total supply-chain performance. *Production and Operations Management*, 6(3):248–265.

Closs, D. J., Goldsby, T. J., and Clinton, S. R. (1997). Information technology influences on world class logistics capability. *International Journal of Physical Distribution & Logistics Management*, 27(1):4–17.

Cobb, B. R., Rumí, R., and SalmeróN, A. (2013). Inventory management with log-normal demand per unit time. *Computers & Operations Research*, 40(7):1842–1851.

Cohen, M. and Fine, C. (1998). Architectures in 3-d: concurrent product, process and supply chain development.

Collins, A., Henchion, M., and OÕReilly, P. (2001). Logistics customer service: performance of irish food exporters. *International Journal of Retail & Distribution Management*, 29(1):6–15.

Collis, J. and Hussey, R. (2003). *Business Research*. Palgrave Macmillan.

Collis, J. and Hussey, R. (2009). *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*. Palgrave Macmillan.

Collis, J. and Hussey, R. (2013). *Business research: A practical guide for undergraduate and postgraduate students*. Palgrave macmillan.

Cooper, M. C., Lambert, D. M., and Pagh, J. D. (1997). Supply chain management: more than a new name for logistics. *The international journal of logistics management*, 8(1):1–14.

Corbett, L. M. (1992). Delivery windows-a new view on improving manufacturing flexibility and on-time delivery performance. *Production and Inventory Management Journal*, 33(3):74.

Coughlan, P. and Coghlan, D. (2002). Action research for operations management. *International Journal of Operations & Production Management*, 22(2):220–240.

Council, S. C. (1996). SCOR framework.

Council, S. C. (2012). SCOR framework.

Craighead, C. W. and LaForge, R. L. (2002). Information technology to facilitate product flow: Survey of us manufacturing practices. *Production and Inventory Management Journal*, 43(3/4):24.

Creswell, J. (2008). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.

Creswell, J. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.

Creswell, J. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.

Creswell, J. W. (2009a). Editorial: Mapping the field of mixed methods research.

Creswell, J. W. (2009b). Qualitative procedures. *Research design: Qualitative, quantitative, and mixed methods approaches*, pages 173–202.

Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., and Hanson, W. E. (2003). Advanced mixed methods research designs. *Handbook of mixed methods in social and behavioral research*, pages 209–240.

Cronbach, L. J. and Shavelson, R. J. (2004). My current thoughts on coefficient alpha and successor procedures. *Educational and psychological measurement*, 64(3):391–418.

Croom, S., Romano, P., and Giannakis, M. (2000). Supply chain management: an analytical framework for critical literature review. *European journal of purchasing & supply management*, 6(1):67–83.

Croson, R. and Donohue, K. (2003). Impact of posdata sharing on supply chain management: an experimental study. *Production and Operations Management*, 12(1):1Ð11.

da Silveira, G. J. and Arkader, R. (2007). The direct and mediated relationships between supply chain coordination investments and delivery performance. *International Journal of Operations & Production Management*, 27(2):140–158.

Dada, M. and Srikanth, K. (1987). Pricing policies for quantity discounts. *Management Science*, 33(10):1247–1252.

Daff, L. (2011). The research proposal. *Accounting, Auditing & Accountability Journal*, 24(4):553–553.

Damiani, E., Frati, F., and Tchokpon, R. (2011). The role of information sharing in supply chain management: the securescm approach. *International Journal of Innovation and Technology Management*, 8(03):455–467.

Das, S. K. and Abdel-Malek, L. (2003). Modeling the flexibility of order quantities and lead-times in supply chains. *International Journal of Production Economics*, 85(2):171–181.

Dash, S., Bruning, E., and Guin, K. K. (2007). Antecedents of long-term buyer-seller relationships: a cross cultural integration. *Academy of Marketing Science Review*, 11(1):1–29.

David Hwang, Hokey Min Vol. 115 Issue: 3, p.-. (2015). Vol. 115:pp.541–569.

Day, G. S. (1994). The capabilities of market-driven organization. *Journal of Marketing*, 58(4):37–52.

De Beuckelaer, A. and Wagner, S. M. (2012). Small sample surveys: increasing rigor in supply chain management research. *International Journal of Physical Distribution & Logistics Management*, 42(7):615–639.

Dehlin, S. and Olofsson, T. (2008). An evaluation model for ict investments in construction projects. *Journal of Information Technology in Construction (ITcon)*, 13(23):343–361.

Denscombe, M. (2007). *The Good Research Guide*. EBSCO ebook academic collection. Open University Press.

Denzin, N. (1970). *The research act: a theoretical introduction to sociological methods*. Methodological perspectives. Aldine Pub. Co.

Denzin, N. K. and Lincoln, Y. S. (2000). *Handbook of Qualitative Research*. Sage Publications.

DeVellis, R. (2003). *Scale Development: Theory and Applications*. Applied social research methods series. Sage.

Ding, H., Guo, B., and Liu, Z. (2011). Information sharing and profit allotment based on supply chain cooperation. *International Journal of Production Economics*, 133(1):70 – 79. Leading Edge of Inventory Research.

Dinwoodie, J. and Xu, J. (2008). Case studies in logistics: a review and tentative taxonomy. *International Journal of Logistics Research and Applications*, 11(5):393–408.

Disney, S. and Towill, D. (2003). The effect of vendor managed inventory (vmi) dynamics on the bullwhip effect in supply chains. *International Journal of Production Economics*, 85(2):199 – 215. Supply Chain Management.

Dooley, K. (2002). Simulation research methods. *Companion to organizations*, pages 829–848.

Dubois, A., Hulthén, K., and Pedersen, A.-C. (2004). Supply chains and interdependence: a theoretical analysis. *Journal of Purchasing and Supply management*, 10(1):3–9.

Duffy, R. and Fearne, A. (2004). The impact of supply chain partnerships on supplier performance. *The International Journal of Logistics Management*, 15(1):57–72.

Dunn, W. N., Pavlak, T. J., and Roberts, G. E. (1987). Cognitive performance appraisalÑmapping managers' category structures using the grid technique. *Personnel Review*, 16(3):16–19.

Dyer, J. H. and Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of management review*, 23(4):660–679.

Edwards, H. M., McDonald, S., and Young, S. M. (2009). The repertory grid technique: Its place in empirical software engineering research. *Information and Software Technology*, 51(4):785–798.

Ehsan Sabet, Nahid Yazdani, S. D. L. (2017). Supply chain integration strategies in fast evolving industries. *The International Journal of Logistics Management*, Vol. 28(Issue: 1):pp.29–46.

Eisenhardt, K. M. (1989a). Agency theory: An assessment and review. *Academy of management review*, 14(1):57–74.

Eisenhardt, K. M. (1989b). Building theories from case study research. *Academy of management review*, 14(4):532–550.

Eisenhardt, K. M. and Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic management journal*, pages 1105–1121.

Ellram, L. M. (1991). Supply-chain management: the industrial organisation perspective. *International Journal of Physical Distribution & Logistics Management*, 21(1):13–22.

Ellram, L. M. (1996). The use of the case study method in logistics research. *Journal of business logistics*, 17(2):93.

Elmaghraby, W. and Keskinocak, P. (2003). Dynamic pricing in the presence of inventory considerations: Research overview, current practices, and future directions. *Management science*, 49(10):1287–1309.

Elrod, C., Murray, S., and Bande, S. (2013). A review of performance metrics for supply chain management. *Engineering Management Journal*, 25(3):39–50.

Emory, W. and Cooper, D. (1991). *Business research methods*. Irwin.

Endacott, R. and Botti, M. (2007). Clinical research 3: Sample selection. *Accident and emergency nursing*, 15(4):234–238.

Engelstätter, B. (2009). Enterprise systems and labor productivity: disentangling combination effects. Technical report, ZEW Discussion Papers.

Erhun, F. and Keskinocak, P. (2003). Game theory in business applications. *Management Science and Engineering, Stanford University, Stanford*.

Ernst, R., Kamrad, B., and Ord, K. (2007). Delivery performance in vendor selection decisions. *European Journal of Operational Research*, 176(1):534–541.

Erwin, B., Callahan, P., and Cho, D. (1996). Will the web kill edi? *The Forrester Report*.

Espino-Rodríguez, T. F. and Padrón-Robaina, V. (2006). A review of outsourcing from the resource-based view of the firm. *International Journal of Management Reviews*, 8(1):49–70.

Eylon, D. and Allison, S. (2002). The paradox of ambiguous information in collaborative and competitive settings. *Group & Organization Management*, 27 (2):172–208.

Fad, B. E. (2005). Analytical hierarchy process (ahp) approach to size estimation. *PRICE Systems LLC*.

Fan, H., Cheng, T. C. E., Li, G., and Lee, P. K. C. (2016). The effectiveness of supply chain risk information processing capability: An information processing perspective. *IEEE Transactions on Engineering Management*, 63(4):414–425.

Fawcett, S. E. and Birou, L. M. (1993). Just-in-time sourcing techniques: Current state of adoption. *Production and Inventory Management Journal*, 34(1):18.

Fawcett, S. E. and Magnan, G. M. (2002). The rhetoric and reality of supply chain integration. *International Journal of Physical Distribution & Logistics Management*, 32(5):339–361.

Fayezi, S., O'Loughlin, A., and Zutshi, A. (2012). Agency theory and supply chain management: a structured literature review. *Supply chain management: an international journal*, 17(5):556–570.

Fearne, A. and Hughes, D. (1999). Success factors in the fresh produce supply chain: insights from the uk. *Supply Chain Management: An International Journal*, 4(3):120–131.

Fernie, J. and Sparks, L. (2004). *Logistics and Retail Management: Insights Into Current Practice and Trends from Leading Experts.* Kogan Page Series. Kogan Page.

Fiala, P. (2005). Information sharing in supply chains. *Omega*, 33(5):419–423.

Field, A. (2005). *Discovering statistics using SPSS.* Introducing statistical methods. Sage Publications.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics.* Sage.

Fink, R. C., Edelman, L. F., Hatten, K. J., and James, W. L. (2006). Transaction cost economics, resource dependence theory, and customer–supplier relationships. *Industrial and Corporate Change*, 15(3):497–529.

Fisher, M., Hammond, J., Obermeyer, W., and Raman, A. (1997). Configuring a supply chain to reduce the cost of demand uncertainty. *Production and operations management*, 6(3):211–225.

Fleisch, E. and Tellkamp, C. (2005). Inventory inaccuracy and supply chain performance: a simulation study of a retail supply chain. *International journal of production economics*, 95(3):373–385.

Fletcher, M. (2008). Trading places Ð SMEs in the global economy. *International Journal of Entrepreneurial Behavior & Research*, 14(4):260–263.

Flint, D. J. (2004). Strategic marketing in global supply chains: Four challenges. *Industrial marketing management*, 33(1):45–50.

Folan, P. and Browne, J. (2005). Development of an extended enterprise performance measurement system. *Production Planning & Control*, 16(6):531–544.

Forslund, H. and Jonsson, P. (2007). Dyadic integration of the performance management process: a delivery service case study. *International Journal of Physical Distribution & Logistics Management*, 37(7):546–567.

Forslund, H. and Jonsson, P. (2009). Obstacles to supply chain integration of the performance management process in buyer-supplier dyads: The buyers' perspective. *International Journal of Operations & Production Management*, 29(1):77–95.

Forum, A. A. (1999). Future competition: Supply chain vs. supply chain. *Logistics Management & Distribution Report*, 38, No.3:20–21.

Forza, C. (2002). Survey research in operations management: a process-based perspective. *International journal of operations & production management*, 22(2):152–194.

Foster, J. (2001). *Data Analysis Using SPSS for Windows Versions 8 - 10: A Beginner's Guide.* SAGE publications. SAGE Publications.

Frame, P. (1992). Saturn to fine suppliers $500/minute for delays. Automotive News, 21(12) : 36$.

Frankfort-Nachmias, C. and Nachmias, D. (2008). *Research Methods in the Social Sciences*. Worth Publishers.

Frazier, G. L. and Antia, K. D. (1995). Exchange relationships and interfirm power in channels of distribution. *Journal of the Academy of Marketing Science*, 23(4):321–326.

Frohlich, M. and Westbrook, R. (2002). Demand chain management in manufacturing andservices: web-based integration, drivers and performance. *JournalofOperations-Management*, 20(6):729Ð745.

Fynes, B., De Burca, S., and Mangan, J. (2008). The effect of relationship characteristics on relationship quality and performance. *International Journal of Production Economics*, 111(1):56–69.

Gall, M., Gall, J., and Borg, W. (2007). *Educational Research: An Introduction*. Pearson/Allyn & Bacon.

Garengo, P., Nudurupati, S., and Bititci, U. (2007). Understanding the relationship between pms and mis in SMEs: an organizational life cycle perspective. *Computers in Industry*, 58(7):677–686.

Gattorna, J. and Walters, D. (1996). *Managing the Supply Chain: A Strategic Perspective*. Macmillan business. Palgrave Macmillan Limited.

Gavirneni, S. (2002). Information flows in capacitated supply chains with fixed ordering costs. *Management Science*, 48(5):644–651.

Gavirneni, S., Kapuscinski, R., and Tayur, S. (1999). Value of information in capacitated supply chains. *Management science*, 45(1):16–24.

Gerchak, Y. and Wang, Y. (2004). Revenue-sharing vs. wholesale-price contracts in assembly systems with random demand. *Production and operations Management*, 13(1):23–33.

Ghadge, A., Dani, S., Chester, M., and Kalawsky, R. (2013). A systems approach for modelling supply chain risks. *Supply Chain Management: An International Journal*, 18(5):523–538.

Ghobadian, A., Gallear, D., and Li, R. (2000). A review of supply chain purchasing strategies. In *Global logistics for the new millennium–proceedings of the 5th international symposium on logistics, Iwate, Japan, Waseda UP Ltd, Tokyo*, pages 454–60.

Gibbons, R. (1992). *Game Theory for Applied Economists*. Princeton University Press.

Gill, J. and Johnson, P. (2002). *Research Methods for Managers*. SAGE Publications.

Giri, S. and Rai, S. S. (2013). Dynamics of garment supply chain. *International Journal of Managing Value and Supply Chains*, 4(4):29.

Glover, B. and Bhatt, H. (2006). *RFID Essentials*. Theory in practice. O'Reilly Media.

Goh, M., De Souza, R., Zhang, A. N., He, W., and Tan, P. (2009). Supply chain visibility: A decision making perspective. In *Industrial Electronics and Applications, 2009. ICIEA 2009. 4th IEEE Conference on*, pages 2546–2551. IEEE.

Goldman, S., Nagel, R., and Preiss, K. (1994). *Agile Competitors and Virtual Organizations: Strategies for Enriching the Customer*. Wiley.

Golicic, S. L., Davis, D. F., McCarthy, T. M., and Mentzer, J. T. (2002). The impact of e-commerce on supply chain relationships. *International Journal of Physical Distribution & Logistics Management*, 32(10):851–871.

Gormley, J., Woodring, S., and Lieu, K. (1997). Supply chain beyond ERP, packaged application strategies. *The Forrester Report*, 2(2).

Goyal, S. (1976). An integrated inventory model for a single supplierÐsingle customer problem. *International Journal of Production Research*, pages 107–111.

Graham, T. S., Daugherty, P. J., and Dudley, W. N. (1994). The long-term strategic impact of purchasing partnerships. *Journal of Supply Chain Management*, 30(4):13.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American journal of sociology*, 91(3):481–510.

Grbich, C. (2012). *Qualitative Data Analysis: An Introduction*. SAGE Publications.

Green Jr, K. W., Whitten, D., and Inman, R. A. (2007). The impact of timely information on organisational performance in a supply chain. *Production Planning & Control*, 18(4):274–282.

Gronau, N. (2004). Enterprise resource planning und supply chain management. *Architektur und Funktionen Oldenbourg Wissenschaftsverlag, München*.

Guiffrida, A. L. and Nagi, R. (2005). Cost characterizations of supply chain delivery performance. *International Journal of Production Economics*, 102(1):22–36.

Gulati, R. (1998). Alliances and networks. *Strategic Management Journal*, 19(4):293–317.

Gunasekaran, A. (2004). Supply chain management: Theory and applications. *European Journal of Operational Research*, 159(2):265–268.

Gunasekaran, A. and Ngai, E. W. (2004). Information systems in supply chain integration and management. *European Journal of Operational Research*, 159(2):269–295.

Gunasekaran, A., Patel, C., and McGaughey, R. E. (2004). A framework for supply chain performance measurement. *International journal of production economics*, 87(3):333–347.

Gunasekaran, A., Patel, C., and Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. *International journal of operations & production Management*, 21(1/2):71–87.

Gunasekaran, A., Williams, H. J., and McGaughey, R. E. (2005). Performance measurement and costing system in new enterprise. *Technovation*, 25(5):523–533.

Gustin, C., Daugherty, P., and Stank, T. (1995). The effects of information availability on logistics integration. *Journal of Business Logistics*, 16 (1):1–21.

Hair, J., Black, W., Babin, B., Anderson, R., and Tatham, R. (2010). *Multivariate Data Analysis*. Always learning. Prentice Hall.

Håkansson, H. (1987). Industrial technological development: A network approach.

Håkansson, H. and Ford, D. (2002). How should companies interact in business networks? *Journal of business research*, 55(2):133–139.

Håkansson, H. and Snehota, I. (1995). Developing relationships in business markets. *London: International Thompson*.

Halldorsson, A., Kotzab, H., Mikkola, J. H., and Skjøtt-Larsen, T. (2007). Complementary theories to supply chain management. *Supply chain management: An international journal*, 12(4):284–296.

Hamel, J., Dufour, S., and Fortin, D. (1993). *Case study methods*. Qualitative research methods. Sage Publications.

Handfield, R. (2002). Managing relationships in the supply chain. webpage.

Handfield, R. B. and Bechtel, C. (2002). The role of trust and relationship structure in improving supply chain responsiveness. *Industrial Marketing Management*, 31(4):367 – 382. Cycle Time and Industrial Marketing.

Handfield, R. B. and Nichols, E. L. (2002). *Supply chain redesign: Transforming supply chains into integrated value systems*. FT Press.

Hausman, W. H. (2004). Supply chain performance metrics. In *The practice of supply chain management: Where theory and application converge*, pages 61–73. Springer.

Hawkins, T. G., Wittmann, C. M., and Beyerlein, M. M. (2008). Antecedents and consequences of opportunism in buyerâsupplier relations: Research synthesis and new frontiers. *Industrial Marketing Management*, 37(8):895 – 909.

Hayes, R. H. and Wheelwright, S. C. (1979). Link manufacturing process and product life cycles. *Harvard business review*, 57(1):133–140.

Hayes, R. H. and Wheelwright, S. C. (1984). Restoring our competitive edge: competing through manufacturing.

Hearnshaw, E. J. and Wilson, M. M. (2013). A complex network approach to supply chain network theory. *International Journal of Operations & Production Management*, 33(4):442–469.

Hertz, S. and Alfredsson, M. (2003). Strategic development of third party logistics providers. *Industrial marketing management*, 32(2):139–149.

Hiebl, M. R. (2014). Upper echelons theory in management accounting and control research. *Journal of Management Control*, 24(3):223–240.

Hingley, M. and Lindgreen, A. (2002). Marketing of agricultural products: case findings. *British food journal*, 104(10):806–827.

Ho, S. C., Wang, W. Y. C., Pauleen, D. J., and Ting, P. H. (2011). Perspectives on the performance of supply chain systems: the effects of attitude and assimilation. *International Journal of Information Technology & Decision Making*, 10(04):635–658.

Holcomb, M. C., Fugate, B. S., Ross, T. J., and Quinn, F. J. (2004). The right connections: A survey of connectivity and visibility. *Supply Chain Management Review*, 8(7):34–43.

Holcomb, M. C., Ponomarov, S. Y., and Manrodt, K. B. (2011). The relationship of supply chain visibility to firm performance. In *Supply Chain Forum: an International Journal*, volume 12, pages 32–45. Taylor & Francis.

Hollingsworth, A. (2004). Increasing retail concentration: Evidence from the uk food retail sector. *British Food Journal*, 106(8):629–638.

Holweg, M. and Pil, F. K. (2008). Theoretical perspectives on the coordination of supply chains. *Journal of operations management*, 26(3):389–406.

Hoyt, J. and Huq, F. (2000). From arms-length to collaborative relationships in the supply chain: An evolutionary process. *International Journal of Physical Distribution & Logistics Management*, 30(9):750–764.

Huang, G. Q., Zhang, X., and Liang, L. (2005). Towards integrated optimal configuration of platform products, manufacturing processes, and supply chains. *Journal of operations management*, 23(3):267–290.

Hugos, M. (2006). *Essentials of Supply Chain Management*. Essentials (John Wiley). Wiley.

Hwang, D. and Min, H. (2015). Identifying the drivers of enterprise resource planning and assessing its impacts on supply chain performances. *Industrial Management & Data Systems*, 115(3):541–569.

Ibrahim, S. B. and Hamid, A. A. (2014). Supply chain management practices and supply chain performance effectiveness. *International Journal of Science and Research (IJSR) ISSN (Online)*, pages 2319–7064.

Iyengar, D. (2005). *Effect of transaction cost and coordination mechanisms on the length of the supply chain*. PhD thesis.

Iyer, K. N., Germain, R., and Frankwick, G. L. (2004). Supply chain b2b e-commerce and time-based delivery performance. *International Journal of Physical Distribution & Logistics Management*, 34(8):645–661.

Jacobs, F., Chase, R., and Lummus, R. (2011). *Operations and Supply Chain Management*. McGraw-Hill/Irwin series operations and decision sciences. McGraw-Hill Irwin.

Jajja, M. S. S., Brah, S. A., and Hassan, S. Z. (2012). The impact of supply chain strategy on supplier functions and organizational performance. In *POMS 23rd Annual Conference Chicago, Illinois, U.S.A.*

Jammernegg, W. and Reiner, G. (2007). Performance improvement of supply chain processes by coordinated inventory and capacity management. *International Journal of Production Economics*, 108(1):183–190.

Jankowicz, D. (2004). *The Easy Guide to Repertory Grids*. Wiley.

Jarillo, J. C. (1988). On strategic networks. *Strategic management journal*, 9(1):31–41.

Jaruphongsa, W., Cetinkaya, S., and Lee, C.-Y. (2004). Warehouse space capacity and delivery time window considerations in dynamic lot-sizing for a simple supply chain. *International Journal of Production Economics*, 92(2):169–180.

Jayaram, J., Vickery, S. K., and Droge, C. (1999). An empirical study of time-based competition in the north american automotive supplier industry. *International Journal of Operations & Production Management*, 19(10):1010–1034.

Joglekar, P. N. (1988). NoteÑcomments on Òa quantity discount pricing model to increase vendor profitsÓ. *Management science*, 34(11):1391–1398.

Johansson, S. and Melin, J. (2008). *Supply Chain Visibility: The Value of Information : a Benchmark Study of the Swedish Industry*. Skolan för industriell teknik och management, Kungliga Tekniska högskolan.

Johnson, M. E. and Davis, T. (1998). Improuing supply chain performance by using order fulfillment metrics. *Global Business and Organizational Excellence*, 17(3):3–16.

Johnson, R. B., Onwuegbuzie, A. J., and Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of mixed methods research*, 1(2):112–133.

Joshi, Y. (2000). Information visibility and its effect on supply chain dynamics, masters thesis. Master's thesis, Massachusetts Institute of Technology, Department of Mechanical Engineering.

Jraisat, L. E. (2011). A perspective for supply chain management: building a conceptual framework. *International Journal of Business Science and Applied Management*, 6(3):1–14.

Kaipia, R. and Hartiala, H. (2006). Information-sharing in supply chains: five proposals on how to proceed. *The International Journal of Logistics Management*, 17(3):377–393.

Kalafatis, S. P., Tsogas, M. H., and Blankson, C. (2000). Positioning strategies in business markets. *Journal of Business & Industrial Marketing*, 15(6):416–437.

Kallio, J., Saarinen, T., Tinnilä, M., and Vepsäläinen, A. P. (2000). Measuring delivery process performance. *The International Journal of Logistics Management*, 11(1):75–88.

Kamath, K. R. and Pakkala, T. (2002). A bayesian approach to a dynamic inventory model under an unknown demand distribution. *Computers & Operations Research*, 29(4):403–422.

Kambil, A., Brooks, J. D., et al. (2002). Auto-id across the value chain: from dramatic potential to greater efficiency and profit. *Accenture White Paper*.

Kaplan, R. S. and Norton, D. (1992). The balanced scorecard: Measures that drive performance,. *Harvard Business Review*, January-February:71–79.

Kaplan, R. S. and Norton, D. P. (1996). Using the balanced scorecard as a strategic management system.

Kaplan, R. S. and Norton, D. P. (1997). Why does business need a balanced scorecard? *Journal of cost management*, 11:5–11.

Kaplan, R. S. and Norton, D. P. (2001). Transforming the balanced scorecard from performance measurement to strategic management: Part i. *Accounting horizons*, 15(1):87–104.

Katajamäki, E. M. (1999). Electronic data interchange in logistics processes. Master's thesis, Industrial Engineering and Management, Lapeenranta University of Technology, Helsinki.

Kelle, P. and Akbulut, A. (2005). The role of ERP tools in supply chain information sharing, cooperation, and cost optimization. *International Journal of Production Economics*, 93:41–52.

Kelly, G. A. (1955). *The psychology of personal constructs. Volume 1: A theory of personality.* WW Norton and Company.

Keszei, A. P., Novak, M., and Streiner, D. L. (2010). Introduction to health measurement scales. *Journal of psychosomatic research*, 68(4):319–323.

Ketchen, D. J. and Giunipero, L. C. (2004). The intersection of strategic management and supply chain management. *Industrial Marketing Management*, 33(1):51–56.

Ketchen, D. J., Thomas, J. B., and McDaniel, R. R. (1996). Process, content and context: synergistic effects on organizational performance. *Journal of Management*, 22(2):231–257.

Kim, D., Cavusgil, S. T., and Calantone, R. J. (2006). Information systems innovations and supply chain management: channel relationships and firm performance. *JournaloftheAcademyofMarketingScience*, 34(1):40Ð54.

Kimball E. Bullington, S. F. B. (2005). Stronger supply chain relationships: learning from research on strong families. *Supply Chain Management: An International Journal*, Vol. 10(Issue: 3):pp.192–197.

Kingshott, R. P. (2006). The impact of psychological contracts upon trust and commitment within supplierâbuyer relationships: A social exchange view. *Industrial Marketing Management*, 35(6):724 – 739.

Kivijärvi, H., Hallikainen, P., and Penttinen, E. (2012). Supporting it implementation decisions with anpÑsupplier scheduling for e-invoicing. *International Journal of Information Technology & Decision Making*, 11(03):525–550.

Klaus, P. and Krieger, W. (2004). *Gabler Lexikon Logistik: Management logistischer Netzwerke und Flüsse.*

Koh, S. L., Demirbag, M., Bayraktar, E., Tatoglu, E., and Zaim, S. (2007). The impact of supply chain management practices on performance of SMEs. *Industrial Management & Data Systems*, 107(1):103–124.

Kohli, A. S. and Jensen, J. B. (2010). Assessing effectiveness of supply chain collaboration: an empirical study. In *Supply chain forum: An international journal*, volume 11, pages 2–16. Taylor & Francis.

Kopczak, L. R. (1997). Logistics partnerships and supply chain restructuring: survey results from the us computer industry. *Production and Operations Management*, 6(3):226–247.

Kotabe, M., Martin, X., and Domoto, H. (2003). Gaining from vertical partnerships: knowledge transfer, relationship duration, and supplier performance improvement in the us and japanese automotive industries. *Strategic management journal*, 24(4):293–316.

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Kotzab, H., Seuring, S., Müller, M., and Reiner, G. (2005). *Research Methodologies in Supply Chain Management*. A Springer Company. Physica-Verlag HD.

Krajewski, L. and Ritzman, L. (1999). *Operations management*. Addison-Wesley.

Krmac, E. V. (2011). Intelligent value chain networks: business intelligence and other ict tools and technologies in supply/demand chains. *Supply Chain Management-New Perspectives*, pages 581–614.

Kulp, S. C. (2002). The effect of information precision and information reliability on manufacturer-retailer relationships. *The Accounting Review*, 77(3):653–677.

Kulp, S. C., Lee, H. L., and Ofek, E. (2004). Manufacturer benefits from information integration with retail customers. *Management science*, 50(4):431–444.

Kumar, K. and van Hillegersberg, J. (2000). Enterprise resource planning: introduction. *Communications of the ACM*, 43(4):22–26.

Kumar, N., Scheer, L. K., and Steenkamp, J.-B. E. (1995a). The effects of perceived interdependence on dealer attitudes. *Journal of marketing research*, pages 348–356.

Kumar, N., Scheer, L. K., and Steenkamp, J.-B. E. (1995b). The effects of supplier fairness on vulnerable resellers. *Journal of marketing research*, pages 54–65.

Kurien, G. P. and Qureshi, M. N. (2011). Study of performance measurement practices in supply chain management. *International Journal of Business, Management and Social Sciences*, 2(4):19–34.

Kwon, I.-W. G. and Suh, T. (2004). Factors affecting the level of trust and commitment in supply chain relationships. *Journal of Supply Chain Management*, 40(1):4–14.

Lakri, S. and Dallery, Y. (2014). Measurement and management of supply chain performance: a benchmarking study. In *IFIP International Conference on Advances in Production Management Systems*, pages 433–440. Springer.

Lal, R. and Staelin, R. (1984). An approach for developing an optimal discount pricing policy. *Management Science*, 30(12):1524–1539.

Lambert, D. (2008). *Supply Chain Management: Processes, Partnerships, Performance*. Supply Chain Management Institute.

Lambert, D. M. and Cooper, M. C. (2000). Issues in supply chain management. *Industrial marketing management*, 29(1):65–83.

Lambert, D. M., Cooper, M. C., and Pagh, J. D. (1998). Supply chain management: implementation issues and research opportunities. *The international journal of logistics management*, 9(2):1–20.

Lambert, D. M., Emmelhainz, M. A., and Gardner, J. T. (1996). Developing and implementing supply chain partnerships. *The international Journal of Logistics management*, 7(2):1–18.

Lambert, D. M. and Pohlen, T. L. (2001). Supply chain metrics. *The International Journal of Logistics Management*, 12(1):1–19.

Lamming, R. (1993). *Beyond Partnership: Strategies for Innovation and Lean Supply*. A Pearson Education print on demand edition. Prentice Hall.

Lamming, R. (1996). Squaring lean supply with supply chain management. *International Journal of Operations & Production Management*, 16(2):183–196.

Lamming, R. C., Caldwell, N. D., Harrison, D. A., and Phillips, W. (2001). Transparency in supply relationships: Concept and practice. *Journal of Supply Chain Management*, 37(3):4–10.

Lane, R. and Szwejczewski, M. (2000). The relative importance of planning and control systems in achieving good delivery performance. *Production Planning & Control*, 11(5):422–433.

Lapko, Y., Trucco, P., Trianni, A., and Nuur, C. (2014). Implications for collaborative development of reverse distribution network: A system perspective. In *IFIP International Conference on Advances in Production Management Systems*, pages 351–357. Springer.

Larson, P. D. and Halldorsson, A. (2004). Logistics versus supply chain management: an international survey. *International Journal of Logistics: Research and Applications*, 7(1):17–31.

Lee, H., Padmanabhan, V., and Whang, S. (1997a). The bullwhip effect in supply chains. *Sloan Management Review*, 38(3):93–102.

Lee, H., Padmanabhan, V., and Whang, S. (1997b). Information distortion in a supply chain. *Management Science*, 43 (4):546–558.

Lee, H. and Whang, S. (1999). Decentralized multi-echelon supply chains: Incentives and information. *Management Science*, 45(5):633–640.

Lee, H. L. (2000). Creating value through supply chain integration. *Supply chain management review*, 4(4):30–36.

Lee, H. L. and Billington, C. (1992). Managing supply chain inventory: pitfalls and opportunities. *Sloan management review*, 33(3):65.

Lee, H. L. and Rosenblatt, M. J. (1986). A generalized quantity discount pricing model to increase supplier's profits. *Management science*, 32(9):1177–1185.

Lee, H. L., So, K. C., and Tang, C. S. (2000). The value of information sharing in a two-level supply chain. *Management science*, 46(5):626–643.

Lee, H. L. and Whang, S. (2000). Information sharing in a supply chain. *International Journal of Manufacturing Technology and Management*, 1(1):79–93.

Lee, N. and Hooley, G. (2005). The evolution of Òclassical mythologyÓ within marketing measure development. *European Journal of Marketing*, 39(3/4):365–385.

Lee, Y. M., Cheng, F., and Leung, Y. T. (2004). Exploring the impact of RFID on supply chain dynamics. In *Proceedings of the 36th conference on Winter simulation*, pages 1145–1152. Winter Simulation Conference.

Leedy, P. and Ormrod, J. (2001). *Practical Research: Planning and Design*. Merrill Prentice Hall.

Leng, M. and Parlar, M. (2005). Game theoretic applications in supply chain management: a review. *INFOR: Information Systems and Operational Research*, 43(3):187–220.

Levy, D. L. (1997). Lean production in an international supply chain. *Sloan management review*, 38(2):94.

Li, A. and Maani, K. (2011). A supply chain paradox. In *29th International Conference of the System Dynamics Society, Washington, DC*.

Li, D. and O'Brien, C. (1999). Integrated decision modelling of supply chain efficiency. *International journal of production economics*, 59(1):147–157.

Li, J., Shaw, M. J., Sikora, R. T., Tan, G. W., and Yang, R. (2001). The effects of information sharing strategies on supply chain performance. *College of Commerce and Business Administration, University of Illinois at Urbana-Champaign, URL: http://citebm. cba. uiuc. edu/B2Bresearch/ieee_em. pdf (30.9. 2002)*, 34.

Li, J., Wang, S., and Cheng, T. E. (2008). Analysis of postponement strategy by epq-based models with planned backorders. *Omega*, 36(5):777–788.

Li, L., Su, Q., and Chen, X. (2011). Ensuring supply chain quality performance through applying the SCOR model. *International Journal of Production Research*, 49(1):33–57.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T., and Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega, The International Journal of Sciences*, 34(2):107–124.

Li, S., Rao, S. S., Ragu-Nathan, T., and Ragu-Nathan, B. (2005). Development and validation of a measurement instrument for studying supply chain management practices. *Journal of operations management*, 23(6):618–641.

Li, X. (2014). 2014:7.

Little, D., Porter, K., Jarvis, P. C., and Kenworthy, J. G. (1995). Mrpii and stand-alone finite schedulers: the relationships. *Integrated manufacturing systems*, 6(1):22–26.

Liu, C.-L. (2012). An investigation of relationship learning in cross-border buyer–supplier relationships: The role of trust. *International business review*, 21(3):311–327.

Liu, Y., Luo, Y., and Liu, T. (2009). Governing buyerâsupplier relationships through transactional and relational mechanisms: Evidence from china. *Journal of Operations Management*, 27(4):294 – 309.

Lockamy III, A. and McCormack, K. (2004). Linking SCOR planning practices to supply chain performance: An exploratory study. *International journal of operations & production management*, 24(12):1192–1218.

Lotfi, Z., Mukhtar, M., Sahran, S., and Zadeh, A. T. (2013). Information sharing in supply chain management. *Procedia Technology*, 11:298–304.

Loudin, A. (1999). RFID comes into its own. *Warehousing Management*, 6(3):30–32.

Mabert, V. A. and Venkataramanan, M. (1998). Special research focus on supply chain linkages: challenges for design and management in the 21st century. *Decision Sciences*, 29(3):537–552.

Macbeth, D. K. and Ferguson, N. (1994). *Partnership sourcing: An integrated supply chain approach*. Financial Times Management/Pitman.

Maghsoudi, A. and Pazirandeh, A. (2016). Visibility, resource sharing and performance in supply chain relationships: insights from humanitarian practitioners. *Supply Chain Management: An International Journal*, 21(1):125–139.

Mahadevan, K. (2010). Supply chain visibility and integration-the current directions in organisations: A comprehensive literature review and research questions. In *Computer and Automation Engineering (ICCAE), 2010 The 2nd International Conference on*, volume 5, pages 226–229. IEEE.

Mahdi Rezaei, Mohsen Akbarpour Shirazi, B. K. I. M. . D. S. V. . I. . p.-. (2017). Iot-based framework for performance measurement: A real-time supply chain decision alignment. *Industrial Management & Data Systems*, Vol. 117(Issue: 4):pp.688–712,.

Maheshwari, B., Kumar, V., and Kumar, U. (2006). Optimizing success in supply chain partnerships. *Journal of Enterprise Information Management*, 19(3):277–291.

Maloni, M. and DeWolf, F. (2006). Understanding radio frequency identification (RFID) and its impact on the supply chain. *Penn State Behrend–RFID Center of Excellence*.

Maloni, M. J. and Benton, W. (1997). Supply chain partnerships: opportunities for operations research. *European Journal of Operational Research*, 101(3):419–429.

Mapes, J., New, C., and Szwejczewski, M. (1997). Performance trade-offs in manufacturing plants. *International Journal of Operations & Production Management*, 17(10):1020–1033.

Maria Caridi, Alessandro Perego, A. T. V. . I. . p.-. (2013). Measuring supply chain visibility in the apparel industry. *Benchmarking: An International Journal*, Vol. 20 Issue: 1,(Issue:1):pp.25–44.

Marquès, G., Thierry, C., Lamothe, J., and Gourc, D. (2010). A review of vendor managed inventory (vmi): from concept to processes. *Production Planning & Control*, 21(6):547–561.

Martinez, M. G. and Poole, N. (2004). The development of private fresh produce safety standards: implications for developing mediterranean exporting countries. *Food Policy*, 29(3):229–255.

Mason, S. J., Ribera, P. M., Farris, J. A., and Kirk, R. G. (2003). Integrating the warehousing and transportation functions of the supply chain. *Transportation Research Part E: Logistics and Transportation Review*, 39(2):141–159.

Mason-Jones, R. and Towill, D. R. (1998). Shrinking the supply chain uncertainty circle. *IOM Control*, 24(7):17–22.

Mason-Jones, R. and Towill, D. R. (1999). Using the information decoupling point to improve supply chain performance. *The International Journal of Logistics Management*, 10(2):13–26.

Matsoso, M. L. and Benedict, O. H. (2014). Non-financial performance measures in small medium enterprisesÕ supply chain management. *Journal of Economics*, 5(3):247–257.

Maxwell, J. A. (2008). Designing a qualitative study. *The SAGE handbook of applied social research methods*, 2:214–253.

McCrea, B. (2011). Putting the spotlight on ERP. *Logistics Management*, 50(6):32–35.

McCullough, S. S. (1999). Time to replace your mrp? *The Forrester Report*.

McDermott, C., Greis, N., and Fischer, W. (1997). The diminishing utility of the product/process matrix Ð a study of the us power tool industry. *International Journal of Operations & Production Management*, 17(1):65–84.

McLoughlin, D. and Horan, C. (2002). Markets-as-networks: notes on a unique understanding. *Journal of Business Research*, 55(7):535–543.

Mehlich, S. (2005). *mySAP SCM — Vom MRP II-Konzept zum Supply Chain Management*, pages 150–183. Springer Berlin Heidelberg, Berlin, Heidelberg.

Meredith, J. (1998). Building operations management theory through case and field research. *Journal of operations management*, 16(4):441–454.

Michael, K. and McCathie, L. (2005). The pros and cons of RFID in supply chain management. In *Mobile Business, 2005. ICMB 2005. International Conference on*, pages 623–629. IEEE.

Mikkola, M. (2008). Coordinative structures and development of food supply chains. *British Food Journal*, 110(2):189–205.

Milgate, M. (2001). Supply chain complexity and delivery performance: an international exploratory study. *Supply Chain Management: An International Journal*, 6(3):106–118.

Moberg, C. R., Cutler, B. D., Gross, A., and Speh, T. W. (2002). Identifying antecedents of information exchange within supply chains. *International Journal of Physical Distribution & Logistics Management*, 32(9):755–770.

Mohr, J. and Sohi, R. S. (1995). Communication flows in distribution channels: Impact on assessments of communication quality and satisfaction. *Journal of Retailing*, 71(4):393Ð416.

Moinzadeh, K. (2002). A multi-echelon inventory system with information exchange. *Management science*, 48(3):414–426.

Mollel, A. A. (2015). Impact of supply chain management practices on organizational performance in food processing firms of dar es salaam, tanzania.

Möller, K. K. and Halinen, A. (1999). Business relationships and networks:: Managerial challenge of network era. *Industrial marketing management*, 28(5):413–427.

Monahan, J. P. (1984). A quantity discount pricing model to increase vendor profits. *Management science*, 30(6):720–726.

Morgan, C. and Dewhurst, A. (2008). Multiple retailer supplier performance: An exploratory investigation into using spc techniques. *International Journal of Production Economics*, 111(1):13–26.

Moshirvaziri, K. and Benli, O. (2008). Project management under risk control: A monte carlo simulation approach. In *ANNUAL MEETING; 37th, Western Decision Sciences Institute; WDSI 2008; 2008; San Diego, CA*.

Myers, M. and Avison, D. (2002). *Qualitative Research in Information Systems: A Reader*. Introducing Qualitative Methods series. SAGE Publications.

Myerson, R. B. (1997). Dual reduction and elementary games. *Games and Economic Behavior*, 21(1-2):183–202.

Mmmel, A. (2008). Iv research methods: Analytical approach. Presentation Slides.

Nabavi, M. (2006). *Integrating Information Resources in Supply Chains: A Simulation Analysis of Delivery Performance and Resource Utilization*. University of Nebraska - Lincoln.

Naim, M. (1997). The book that changed the world. *Manufacturing engineer*, 76(1):13–16.

Narasimhan, R., Kim, S. W., and Tan, K. C. (2008). An empirical investigation of supply chain strategy typologies and relationships to performance. *International Journal of Production Research*, 46(18):5231–5259.

Nassar, S. (2011). Supply chain visibility and sustainable competitive advantage: An integrated model.

Neely, A., Gregory, M., and Platts, K. (1995). Performance measurement system design: a literature review and research agenda. *International journal of operations & production management*, 15(4):80–116.

Neuman, W. (2006). *Social Research Methods: Qualitative and Quantitative Approaches*. Alternative eText Formats Series. Pearson.

Noordewier, T. G., John, G., and Nevin, J. R. (1990). Performance outcomes of purchasing arrangements in industrial buyer-vendor relationships. *The Journal of Marketing*, pages 80–93.

Nouara, A. (2015). *Development of performance measurement model for oil operations: A study of Libyan oil companies*. PhD thesis, Brunel University London, United Kingdom.

Novich, N. (1990). Distribution strategy: are you thinking small enough? *MIT Sloan Management Review*, 32(1):71.

Nunnally, J. (1978). *Psychometric theory*. McGraw-Hill series in psychology. McGraw-Hill.

Nunnally, J. and Bernstein, I. (1994). *Psychometric theory*. Number no. 972 in McGraw-Hill series in psychology. McGraw-Hill.

Nyamu, J. (2016). *Telemedicine systems deployment in the Kenyan healthcare system: a study of the role of organisation collaboration*. PhD thesis, Brunel University London.

Olhager, J. and West, B. M. (2002). The house of flexibility: using the qfd approach to deploy manufacturing flexibility. *International Journal of Operations & Production Management*, 22(1):50–79.

Oliver, C. (1990). Determinants of interorganizational relationships: Integration and future directions. *Academy of management review*, 15(2):241–265.

Omachi, B. (2012). Agency theory in supply chain management. website.

Omar, R., Ramayah, T., Lo, M.-C., Sang, T. Y., and Siron, R. (2010). Information sharing, information quality and usage of information technology (it) tools in malaysian organizations. *African Journal of Business Management*, 4(12):2486.

Orlicky, J. (1975). *Material requirements planning: the new way of life in production and inventory management*. McGraw-Hill.

Orlikowski, W. J. and Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information systems research*, 2(1):1–28.

Osborne, M. J. and Rubinstein, A. (1994). *A course in game theory*. MIT press.

Otto, A. and Kotza, H. (2003). Does supply chain management really pay? six perspectives to measure the performance of managing a supply chain. *European Journal of Operational Research,*, 144:306–320.

Padmos, J., Hubbard, B., Duczmal, T., and Saidi, S. (1999). How i2 integrates simulation in supply chain optimization. In *Simulation Conference Proceedings, 1999 Winter*, volume 2, pages 1350–1355. IEEE.

Paik, S.-K. (2011). Supply management in small and medium-sized enterprises: Role of SME size. In *Supply Chain Forum: An International Journal*, volume 12, pages 10–21. Taylor & Francis.

Pallant, J. (2007). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows (Version 15)*. McGraw-Hill Companies,Incorporated.

Pallant, J. (2010). *SPSS Survival Manual: A step by step guide to data analysis using SPSS*. Allen & Unwin Australia.

Pallant, J. (2013). *SPSS survival manual*. McGraw-Hill Education (UK).

Panayides, P. (2013). Coefficient alpha: interpret with caution. *EuropeÕs Journal of Psychology*, 9(4):687–696.

Pant, S., Sethi, R., and Bhandari, M. (2003). Making sense of the e-supply chain landscape: an implementation framework. *International Journal of Information Management*, 23(3):201–221.

Parlar, M. and Weng, Z. K. (1997). Designing a firm's coordinated manufacturing and supply decisions with short product life cycles. *Management Science*, 43(10):1329–1344.

Partovi, F. Y., Burton, J., and Banerjee, A. (1990). Application of analytical hierarchy process in operations management. *International Journal of Operations & Production Management*, 10(3):5–19.

Pedersen, E. R. and Andersen, M. (2006). Safeguarding corporate social responsibility (csr) in global supply chains: How codes of conduct are managed in buyer-supplier relationships. *Journal of Public Affairs*, 6(3-4):228–240.

Pelton, L. E., Strutton, D., and Lumpkin, J. R. (1997). Marketing channels: A relationship management approach, richard d. *Irwin Inc.*

Penrose, E. G. (1959). *The Theory of the Growth of the Firm*. Wiley.

Perego, A. and Salgaro, A. (2010). Assessing the benefits of b2b trade cycle integration: a model in the home appliances industry. *Benchmarking: An International Journal*, 17(4):616–631.

Petersen, K. J., Ragatz, G. L., and Monczka, R. M. (2005). An examination of collaborative planning effectiveness and supply chain performance. *Journal of Supply Chain Management*, 41(2):14–25.

Peterson, R. A. (1994). A meta-analysis of cronbach's coefficient alpha. *Journal of consumer research*, 21(2):381–391.

Pettigrew, A. and Whipp, R. (1993). Understanding the environment. *Managing change*, 2.

Pettit, T. J. (2008). *Supply chain resilience: development of a conceptual framework, an assessment tool and an implementation process*. PhD thesis, The Ohio State University.

Pidun, T. and Felden, C. (2012). On improving the visibility of hard-measurable process performance. *International Journal of Intelligent Information Technologies (IJIIT)*, 8(2):59–74.

Plambeck, L. and Gibson, P. R. (2010). Application of agency theory to collaborative supply chains.

Pohja, T.-L. (2004). Some theoretical foundations of supply chain management and supply networks: the role of social networks in selecting partners. In *20th IMP Group Conference–Copenhagen*.

Poirier, C. (2016). *Using Models to Improve the Supply Chain*. CRC Press.

Porter, M. E. (1980). Industry structure and competitive strategy: Keys to profitability. *Financial Analysts Journal*, pages 30–41.

Porter, M. E. (2008). *Competitive strategy: Techniques for analyzing industries and competitors*. Simon and Schuster.

Potgantwar, A. D. and Wadhai, V. (2011). Location based system for mobile devices with integration of RFID and wireless technology-issues and proposed system. In *Process Automation, Control and Computing (PACC), 2011 International Conference on*, pages 1–5. IEEE.

Prajogo, D. and Olhager, J. (2012). Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration. *International Journal of Production Economics*, 135(1):514 – 522. Advances in Optimization and Design of Supply Chains.

Prater, E., Biehl, M., and Smith, M. A. (2001). International supply chain agility-tradeoffs between flexibility and uncertainty. *International journal of operations & production management*, 21(5/6):823–839.

Pule, S. and Kalinzi, C. (2014). Relationship management in downstream supply chain: A predictor of performance among selected pharmaceutical companies in kampala, uganda. *International Journal of Managing Value and Supply Chains*, 5(3):61.

Rajagopal, P. (2006). *Determinants Of Effective Supply Chain Partnering In The Context Of Electrical And Electronics Firms In Malaysia*. PhD thesis, USM.

Ramayah, T. and Omar, R. (2010). Information exchange and supply chain performance. *International journal of information technology & decision making*, 9(01):35–52.

Ramudhin, A., Paquet, M., Artiba, A., Dupré, P., Varvaro, D., and Thomson, V. (2008). A generic framework to support the selection of an RFID-based control system with application to the mro activities of an aircraft engine manufacturer. *Production Planning and Control*, 19(2):183–196.

Rezaei, M., Shirazi, M. A., and Karimi, B. (2017). Iot-based framework for performance measurement: A real-time supply chain decision alignment. *Industrial Management & Data Systems*, 117(4):688–712.

Riddalls, C., Bennett, S., and Tipi, N. S. (2000). Modelling the dynamics of supply chains. *International Journal of Systems Science*, 31(8):969–976.

Ritter, T., Wilkinson, I. F., and Johnston, W. J. (2004). Managing in complex business networks. *Industrial marketing management*, 33(3):175–183.

Robinson, S. (2004). *Simulation: The Practice of Model Development and Use.* John Wiley & Sons.

Robson, I. and Rawnsley, V. (2001). Co-operation or coercion? supplier networks and relationships in the uk food industry. *Supply Chain Management: An International Journal*, 6(1):39–48.

Rochel, R. C. (2005). RFID technology introduction and impacts on supply chain management systems. Master's thesis, School of Computing and Information Technology, MT Albert, Auckland, Unitec New Zealand.

Romano, P. (2003). Co-ordination and integration mechanisms to manage logistics processes across supply networks. *Journal of purchasing and supply Management*, 9(3):119–134.

Rouse, P. and Putterill, M. (2003). An integral framework for performance measurement. *Management Decision*, 41(8):791–805.

Routroy, S. (2009). Antecedents and drivers for green supply chain management implementation in manufacturing environment. *ICFAI Journal of Supply Chain Management*, 6(1):20–35.

Rubin, H. and Rubin, I. (1995). *Qualitative interviewing: the art of hearing data.* Qualitative Interviewing: The Art of Hearing Data. Sage Pubications.

Rubin, H. and Rubin, I. (2011). *Qualitative Interviewing: The Art of Hearing Data.* SAGE Publications.

Rudberg, M. and Thulin, J. (2009). Centralised supply chain master planning employing advanced planning systems. *Production Planning and Control*, 20(2):158–167.

Rungtusanatham, M., Salvador, F., Forza, C., and Choi, T. Y. (2003). Supply-chain linkages and operational performance: A resource-based-view perspective. *International Journal of Operations & Production Management*, 23(9):1084–1099.

Russel, R. S. and Taylor III, B. W. (1998). *Operations management: focusing on quality and competitiveness.* London: Prentice-Hall International.

Ryu, S.-J., Tsukishima, T., and Onari, H. (2009). A study on evaluation of demand information-sharing methods in supply chain. *International Journal of Production Economics*, 120(1):162 – 175. Special Issue on Operations Strategy and Supply Chains Management.

Sachan, A. and Datta, S. (2005). Review of supply chain management and logistics research. *International Journal of Physical Distribution & Logistics Management*, 35(9):664–705.

Saeed, K. A., Malhotra, M. K., and Grover, V. (2005). Examining the impact of interorganizational systems on process efficiency and sourcing leverage in buyer–supplier dyads. *Decision Sciences*, 36(3):365–396.

Safizadeh, M. H., Ritzman, L. P., Sharma, D., and Wood, C. (1996). An empirical analysis of the product-process matrix. *Management Science*, 42(11):1576–1591.

Sahin, F. and Robinson, E. P. (2002). Flow coordination and information sharing in supply chains: review, implications, and directions for future research. *Decision sciences*, 33(4):505–536.

Sahin, F. and Robinson, E. P. (2005a). Information sharing and coordination in make-to-order supply chains. *Journal of operations management*, 23(6):579–598.

Sahin, F. F. and Robinson, E. P. (2005b). Information sharing and coordination in make-to-order supply chains. *Journal of Operations Management*, 23(6):579Ð598.

Salazar, F., Caro, M., and Cavazos, J. (2012). Final review of the application of the SCOR model: Supply chain for biodiesel castor-colombia case. *Journal of Technology Innovations in Renewable Energy*, 1(1):39.

Salvador, F., Forza, C., Rungtusanatham, M., and Choi, T. Y. (2001). Supply chain interactions and time-related performances: an operations management perspective. *International Journal of Operations & Production Management*, 21(4):461–475.

Saunders, M., Lewis, P., and Thornhill, A. (2000). *Research Methods for Business Students*. Financial Times/Prentice Hall.

Saunders, M., Lewis, P., and Thornhill, A. (2007). *Research Methods for Business Students*. Financial Times/Prentice Hall.

Saunders, M., Lewis, P., and Thornhill, A. (2009). *Research Methods for Business Students*. Always learning. Financial Times Prentice Hall.

Saunders, M., Lewis, P., and Thornhill, A. (2012). *Research Methods for Business Students*. Pearson Education Limited.

Saunders, M., Lewis, P., and Thornhill, A. (2015). *Research Methods for Business Students*. Pearson Education Limited.

Schneiderman, A. M. (1996). Metrics for the order fulfillment process (part 2). *Journal of Cost Management*, 10:6–18.

Schwabe, T. (2013). Transaction cost economics in supply chain management. B.S. thesis, University of Twente.

Segerstedt, A. (1999). Lot sizes in a capacity constrained facility with available initial inventories. *International Journal of Production Economics*, 59(1):469–475.

Sekaran, U. (2003). *Research Methods for Business: A Skill-building Approach*. Number v. 1 in Research Methods for Business: A Skill-building Approach. Wiley.

Selldin, E. and Olhager, J. (2007). Linking products with supply chains: testing fisher's model. *Supply Chain Management: An International Journal*, 12(1):42–51.

Sellitto, C., Burgess, S., and Hawking, P. (2007). Information quality attributes associated with RFID-derived benefits in the retail supply chain. *International Journal of Retail & Distribution Management*, 35(1):69–87.

Shao, X.-F. and Pan, Y. (2009). Supply chain collaboration and disruption mitigation capability. In *Management and Service Science, 2009. MASS'09. International Conference on*, pages 1–5. IEEE.

Shapiro, J. (2001). *Modeling for the Supply Chain: Solutions Manual*. Brooks/Cole.

Sharma, M. J., Moon, I., and Bae, H. (2008). Analytic hierarchy process to assess and optimize distribution network. *Applied Mathematics and Computation*, 202(1):256–265.

Sharma, V., Giri, S., and Rai, S. S. (2013). Supply chain management of rice in India: A rice processing company's perspective. *International Journal of Managing Value and Supply Chains*, 4(1):25.

Shaw, S. A. and Gibbs, J. (1995). Retailer-supplier relationships and the evolution of marketing: two food industry case studies. *International Journal of Retail & Distribution Management*, 23(7):7–16.

Shi, V. G., Koh, L., Cucciella, F., Lenny Koh, S., Baldwin, J., and Cucchiella, F. (2012). Natural resource based green supply chain management. *Supply Chain Management: An International Journal*, 17(1):54–67.

Shi, X., Tao, D., and Voß, S. (2011). RFID technology and its application to port-based container logistics. *Journal of Organizational Computing and Electronic Commerce*, 21(4):332–347.

Shields, P. M. and Rangarajan, N. (2013). *A playbook for research methods: Integrating conceptual frameworks and project management*. New Forums Press.

Shin, H., Benton, W., and Jun, M. (2009). Quantifying suppliersÕ product quality and delivery performance: A sourcing policy decision model. *Computers & Operations Research*, 36(8):2462–2471.

Shin, H., Collier, D. A., and Wilson, D. D. (2000). Supply management orientation and supplier/buyer performance. *Journal of operations management*, 18(3):317–333.

Shore, B. and Venkatachalam, A. (2003). Evaluating the information sharing capabilities of supply chain partners: A fuzzy logic model. *International Journal of Physical Distribution & Logistics Management*, 33(9):804–824.

Siau, K., Tan, X., and Sheng, H. (2010). Important characteristics of software development team members: an empirical investigation using repertory grid. *Information Systems Journal*, 20(6):563–580.

Siems, T. F. (2005). Who supplied my cheese? supply chain management in the global economy. *Business Economics*, 40(4):6–21.

Silvera, Y. and DeCoster, R. (2010). Building effective supplier relationships - A Conceptual Framework for Researching UKs Fast Moving Consumer Goods. In *CAPE 2010 Conference-Scotland (University of Edinburgh)*.

Silvera, Y. and DeCoster, R. (2012). Supply chain visibility and how this affects on time delivery. *Journal of Arts Science & Technology*, 5:126.

Simatupang, T. M. and Sridharan, R. (2002). The collaborative supply chain. *The international journal of logistics management*, 13(1):15–30.

Simatupang, T. M. and Sridharan, R. (2005). The collaboration index: a measure for supply chain collaboration. *International Journal of Physical Distribution and Logistics Management*, 35(1):44Ð62.

Simchi-Levi, D., Kaminsky, P., and Simchi-Levi, E. (2000). *Designing and Managing the Supply Chain Concepts, Strategies, and Case Studies*. Irwin/McGraw?Hill.

Simchi-Levi, D., Kaminsky, P., and Simchi-Levi, E. (2003). *Managing the Supply Chain: The Definitive Guide for the Business Professional*. E-Books von NetLibrary. McGraw-Hill Education.

Simone, J. (2011). Visibility part 1: What is supply chain visibility and why should we care? webpage.

Sink, D. and Tuttle, T. (1989). Planning and measurement in your organisation of the future. *Industrial Engineering and Management Press*.

Slack, N., Chambers, S., Harland, C., Harrison, A., and Johnston, R. (1995). *Operations Management*. Pitman Publishing, London.

Småros, J., Lehtonen, J.-M., Appelqvist, P., and Holmström, J. (2003). The impact of increasing demand visibility on production and inventory control efficiency. *International Journal of Physical Distribution & Logistics Management*, 33(4):336–354.

Smith, E. M. (2005). Telephone interviewing in healthcare research: a summary of the evidence. *Nurse Researcher*, 12(3):32–41.

Söderberg, L. and Bengtsson, L. (2010). Supply chain management maturity and performance in SMEs. *Operations Management Research*, 3(1-2):90–97.

Spencer, M. and Cox, J. (1995). An analysis of the product-process matrix and repetitive manufacturing. *The International Journal Of Production Research*, 33(5):1275–1294.

Srinivasan, V. and Basu, A. K. (1989). The metric quality of ordered categorical data. *Marketing Science*, 8(3):205–230.

Srivastava, B. (2004). Radio frequency id technology: The next revolution in scm. *Business Horizons*, 47(6):60 – 68.

Srivastava, S. K. (2006). Logistics and supply chain practices in India. *Vision: The Journal of Business Perspective*, 10(3):69–79.

Stadtler, H. and Kilger, C. (2005). *Supply Chain Management and Advanced Planning: Concepts, Models, Software and Case Studies*. Springer Berlin Heidelberg.

Stalk, G. (1988). Time–the next source of competitive advantage.

Stentoft Arlbjørn, J. and Halldorsson, A. (2002). Logistics knowledge creation: reflections on content, context and processes. *International journal of physical distribution & logistics management*, 32(1):22–40.

Stephens, S. (2001). Supply chain operations reference model version 5.0: a new tool to improve supply chain efficiency and achieve best practice. *Information Systems Frontiers*, 3(4):471–476.

Stewart, G. (1995). Supply chain performance benchmarking study reveals keys to supply chain excellence. *Logistics Information Management*, 8(2):38–44.

Straub, D. W., Hoffman, D. L., Weber, B. W., and Steinfield, C. (2002a). Measuring e-commerce in net-enabled organizations: An introduction to the special issue. *Information Systems Research*, 13(2):115–124.

Straub, D. W., Hoffman, D. L., Weber, B. W., and Steinfield, C. (2002b). Toward new metrics for net-enhanced organizations. *Information Systems Research*, 13(3):227–238.

Stuart, F. I. (1997). Supply-chain strategy: organizational influence through supplier alliances. *British Journal of management*, 8(3):223–236.

Subramani, M. (2004). How do suppliers benefit from information technology use in supply chain relationships? *MIS Quarterly*, 28 (1):45–73.

Sukati, I., Hamid, A. B. A., Baharun, R., Alifiah, M. N., Anuar, M. A., et al. (2012). Competitive advantage through supply chain responsiveness and supply chain integration. *International Journal of Business and Commerce (IJBC)*, 1(7).

Svensson, G. (2003). Holistic and cross-disciplinary deficiencies in the theory generation of supply chain management. *Supply Chain Management: An International Journal*, 8(4):303–316.

Swafford, P. M., Ghosh, S., and Murthy, N. (2008). Achieving supply chain agility through it integration and flexibility. *International Journal of Production Economics*, 116(2):288–297.

Swamidass, P. M. and Kotha, S. (1998). Explaining manufacturing technology use, firm size and performance using a multidimensional view of technology. *Journal of Operations Management*, 17(1):23–37.

Swamidass, P. M. and Newell, W. T. (1987). Manufacturing strategy, environmental uncertainty and performance: a path analytic model. *Management science*, 33(4):509–524.

Swaminathan, J. M., Smith, S. F., and Sadeh, N. M. (1998). Modeling supply chain dynamics: A multiagent approach. *Decision sciences*, 29(3):607–632.

Swaminathan, J. M. and Tayur, S. R. (2003). Models for supply chains in e-business. *Management Science*, 49(10):1387–1406.

Sweeney, E. (2006). Managing information flows: the key to effective supply chain integration. *Journal of the National Institute for Transport and Logistics*, Vol. 9, No. 3.

Szegedi, Z. (2008). Logistics in small and medium companies in central and eastern europe. *International Journal of Procurement Management*, 1(3):359–370.

Szegedi, Z., Vinogradov, S., Domjan, E., Störkel, M., and Valentinyi, Z. (2014). Problems of the co-operational attitude of supply chain members in the hungarian fmcg sector.

Tabachnick, B. and Fidell, L. (2013). *Using Multivariate Statistics*. Always learning. Pearson.

Tadikamalla, P. R. (1979). The lognormal approximation to the lead time demand in inventory control. *Omega*, 7(6):553–556.

Tan, F. B. and Hunter, M. G. (2002). The repertory grid technique: A method for the study of cognition in information systems. *MIS Quarterly*, pages 39–57.

Tan, K.-C., Kannan, V. R., Handfield, R. B., and Ghosh, S. (1999). Supply chain management: an empirical study of its impact on performance. *International journal of operations & production Management*, 19(10):1034–1052.

Tavakol, M. and Dennick, R. (2011). Making sense of cronbach's alpha. *International journal of medical education*, 2:53.

Teddlie, C. and Yu, F. (2007). Mixed methods sampling: A typology with examples. *Journal of mixed methods research*, 1(1):77–100.

Teece, D. J., Pisano, G., and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, pages 509–533.

Tellis, W. M. (1997). Application of a case study methodology. *The Qualitative Report*, 3(3):1–19.

Tellkamp, C. (2006). The impact of auto-id technology on process performance: RFID in the fmcg supply chain. *Dissertation of the University of St. Gallen, Graduate School of Business Aministration.*

Thakkar, J., Kanda, A., and Deshmukh, S. (2007). Evaluation of buyer-supplier relationships using an integrated mathematical approach of interpretive structural modeling (ISM) and graph theoretic matrix: the case study of Indian automotive SMEs. *Journal of Manufacturing Technology Management*, 19(1):92–124.

Thakkar, J., Kanda, A., and Deshmukh, S. (2008). A conceptual role interaction model for supply chain management in SMEs. *Journal of Small Business and Enterprise Development*, 15(1):74–95.

Thakkar, J., Kanda, A., and Deshmukh, S. (2009). Supply chain management for SMEs: a research introduction. *Management Research News*, 32(10):970–993.

Theeranuphattana, A. and Tang., J. C. (2008). A conceptual model of performance measurement for supply chains alternative considerations. *Journal of Manufacturing Technology Management*, 19(1):125–148.

Thietart, R.-A. (2001). *Doing management research: a comprehensive guide*. Sage.

Thomas, D. J. and Griffin, P. M. (1996). Coordinated supply chain management. *European journal of operational research*, 94(1):1–15.

To, G., Wright, R., and Chan, S. (2007). The impact of user constructs on e-learning effectiveness using the repertory grid. In *Proceedings of the 10th IASTED International Conference on Computers and Advanced Technology in Education*, pages 225–230. ACTA Press.

Todeva, E. and Knoke, D. (2005). Strategic alliances and models of collaboration. *Management Decision*, 43(1):123–148.

Toften, K. and Ottar Olsen, S. (2003). Export market information use, organizational knowledge, and firm performance: a conceptual framework. *International Marketing Review*, 20(1):95–110.

Tomkins, C. (2001). Interdependencies, trust and information in relationships, alliances and networks. *Accounting, organizations and society*, 26(2):161–191.

Trochim, W. and Donnelly, J. (2008). *Research Methods Knowledge Base*. Atomic Dog/Cengage Learning.

Tse, Y. K. and Tan, K. H. (2012). Managing product quality risk and visibility in multi-layer supply chain. *International Journal of Production Economics*, 139(1):49 – 57. Supply Chain Risk Management.

Tumaini, M. K. and Zheng, Q. (2011). Supply chain management (scm) and small and medium-sized enterprises (SMEs): Is it a myth? In *Applied Mechanics and Materials*, volume 58, pages 2613–2620. Trans Tech Publ.

Vaagen, H., Wallace, S. W., and Kaut, M. (2011). The value of numerical models in quick response assortment planning. *Production Planning & Control*, 22(3):221–236.

Vachon, S. and Klassen, R. D. (2002). An exploratory investigation of the effects of supply chain complexity on delivery performance. *IEEE Transactions on engineering management*, 49(3):218–230.

Van der Vaart, T. and van Donk, D. P. (2008). A critical review of survey-based research in supply chain integration. *International journal of production economics*, 111(1):42–55.

Van Hoek, R. I. (1998). Òmeasuring the unmeasurableÓ-measuring and improving performance in the supply chain. *Supply Chain Management: An International Journal*, 3(4):187–192.

van Hoek, R. I., Harrison, A., and Christopher, M. (2001). Measuring agile capabilities in the supply chain. *International Journal of Operations & Production Management*, 21(1/2):126–148.

Vastag, G., Kasarda, J. D., and Boone, T. (1994). Logistical support for manufacturing agility in global markets. *International Journal of Operations & Production Management*, 14(11):73–85.

Veludo, M. d. L., Macbeth, D. K., and Purchase, S. (2004). Partnering and relationships within an international network context. *International Marketing Review*, 21(2):142–157.

Villena, V. H., Revilla, E., and Choi, T. Y. (2011). The dark side of buyer–supplier relationships: A social capital perspective. *Journal of Operations Management*, 29(6):561–576.

Wade, M. and Hulland, J. (2004). Review: The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS quarterly*, 28(1):107–142.

Wagner, S. M. and Bode, C. (2008). An empirical examination of supply chain performance along several dimensions of risk. *Journal of business logistics*, 29(1):307–325.

Wang, E. T. and Wei, H.-L. (2007). Interorganizational governance value creation: coordinating for information visibility and flexibility in supply chains. *Decision Sciences*, 38(4):647–674.

Want, R. (2006). An introduction to RFID technology. *IEEE pervasive computing*, 5(1):25–33.

Warrington, T. B., Abgrab, N. J., and Caldwell, H. M. (2000). Building trust to develop competitive advantage in e-business relationships. *Competitiveness Review: An International Business Journal*, 10(2):160–168.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal*, 5(2):171–180.

Whipple, J. M. and Frankel, R. (2000). Strategic alliance success factors. *Journal of Supply Chain Management*, 36(2):21–28.

Whitaker, J., Mithas, S., and Krishnan, M. S. (2007). A field study of RFID deployment and return expectations. *Production and Operations Management*, 16(5):599–612.

Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American journal of sociology*, 87(3):548–577.

Williamson, P. J. (1991). Supplier strategy and customer responsiveness: Managing the links. *Business Strategy Review*, 2(2):75–90.

Wilson, D. T. (1995). An integrated model of buyer-seller relationships. *Journal of the academy of marketing science*, 23(4):335.

Wilson, N. (1996). Supply chain management: a case study of a dedicated supply chain for bananas in the uk grocery market. *Supply Chain Management: An International Journal*, 1(2):28–35.

Wöhe, G. and Döring, U. (2002). *Einführung in die allgemeine Betriebswirtschaftslehre*. Vahlens Handbücher der Wirtschafts- und Sozialwissenschaften. Vahlen.

Wood, A. (1993). Efficient consumer response. *Logistics Information Management*, 6(4):38–40.

Wright, R. P. and Cheung, F. K. (2007). Articulating appraisal system effectiveness based on managerial cognitions. *Personnel Review*, 36(2):206–230.

Wu, J., Ulieru, M., Cobzaru, M., and Norrie, D. (2000). Supply chain management systems: state of the art and vision. In *Management of Innovation and Technology, 2000. ICMIT 2000. Proceedings of the 2000 IEEE International Conference on*, volume 2, pages 759–764. IEEE.

Wu, Y. and Cheng, T. E. (2008). The impact of information sharing in a multiple-echelon supply chain. *International Journal of Production Economics*, 115(1):1–11.

Wyld, D. C. (2006). RFID 101: The next big thing for management. *Management Research News*, 29(4):154–173.

Yao, Y. and Dresner, M. (2008). The inventory value of information sharing, continuous replenishment, and vendor-managed inventory. *Transportation Research Part E: Logistics and Transportation Review*, 44(3):361–378.

Yearworth, M. and Edwards, G. (2014). On the desirability of integrating research methods into overall systems approaches in the training of engineers: Analysis using ssm. *Systems Research and Behavioral Science*, 31(1):47–66.

Yeh, D.-Y., Cheng, C.-H., and Chi, M.-L. (2007). A modified two-tuple flc model for evaluating the performance of scm: By the six sigma dmaic process. *Applied Soft Computing*, 7(3):1027–1034.

Yin, R. (1984). *Case Study Research: Design and Methods*. Applied social research methods series. Sage Publications.

Yin, R. (1994a). *Case Study Research: Design and Methods*. Applied social research methods series. Sage Publications.

Yin, R. (2003). *Case Study Research: Design and Methods*. Applied Social Research Methods. SAGE Publications.

Yin, R. (2009). *Case Study Research: Design and Methods*. Applied Social Research Methods. SAGE Publications.

Yin, R. (2013). *Case Study Research: Design and Methods*. SAGE Publications.

Yin, R. K. (1993). *Application of Case Study Research*. Sage Publications.

Yin, R. K. (1994b). Discovering the future of the case study method in evaluation research. *Evaluation practice*, 15(3):283–290.

Yount, W. R. (2006). *Research design and statistical analysis for Christian ministry.* WR Yount.

Yu, C. H. (2005). *Test-retest reliability. Encyclopedia of Social Measurement*, volume 3. Academic Press, San Diego, CA.

Yu, Z., Yan, H., and Edwin Cheng, T. (2001). Benefits of information sharing with supply chain partnerships. *Industrial management & Data systems*, 101(3):114–121.

Yusof, H. M., Mustapha, R., Mohamad, S. A. M. S., and Bunian, M. S. (2012). Measurement model of employability skills using confirmatory factor analysis. *Procedia-Social and Behavioral Sciences*, 56:348–356.

Yusoff, M. S. B. (2012). The dundee ready educational environment measure: a confirmatory factor analysis in a sample of malaysian medical students. *Int J Humanities Social Sci*, 2(16):313–21.

Zhang, A. N., Goh, M., and Meng, F. (2011). Conceptual modelling for supply chain inventory visibility. *International Journal of Production Economics*, 133(2):578 – 585. Towards High Performance Manufacturing.

Zhao, X., Huo, B., Flynn, B. B., and Yeung, J. H. Y. (2008). The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain. *Journal of Operations Management*, 26(3):368 – 388.

Zhao, X., Xie, J., and Zhang, W. (2002). The impact of information sharing and ordering co?ordination on supply chain performance. *Supply Chain Management: An International Journal*, 7(1):24–40.

Zhou, H. and Benton, W. (2007). Supply chain practice and information sharing. *Journal of Operations Management*, 25(6):1348 – 1365. Supply Chain Management in a Sustainable EnvironmentSpecial Issue on Frontiers of Empirical Supply Chain Research.

Zhou, H., Benton, W., Schilling, D. A., and Milligan, G. W. (2011). Supply chain integration and the SCOR model. *Journal of Business Logistics*, 32(4):332–344.

Zhu, Q., Sarkis, J., and Lai, K.-h. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International journal of production economics*, 111(2):261–273.

Zikmund, W., Babin, B., Carr, J., and Griffin, M. (2012). *Business Research Methods*. Cengage Learning.