# THE IMPACT OF RETAILER DISTRIBUTION CENTRES ON SUPPLY CHAIN COMPETITIVENESS

MBA 2013

Karl Thorington
13384164

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfillment of the requirements for the degree of Master of Business Administration

29 January 2014

© University of Pretoria

# Abstract

The increase in global competition has led to many companies examining how they do business in an increasingly competitive environment, and in many cases adopting models that impact their supply chain competitiveness. Many companies are struggling to find the balance between cost containment and the increasing demands of customers requiring them to demonstrate greater flexibility and achieve higher service levels. This research evaluates the effectiveness of supply chain strategy, specifically related to the decisions made when retailers elect to insert their own distribution centres and the choices they make in the design thereof.

Critically, these design decisions were evaluated from both a supplier and retailers perspective against academic articles which relate to effective supply chain collaboration methods. The research examined the consequences of an ineffective supply chain design decision and how this decision resulted in a constraint in the supply chain which reduced competitiveness through higher inventory levels and reduced sale throughput as a result of lost sales and low service levels.

This research is exploratory by design and purposive sampling was used to select interviewees that would bring depth to the research by providing understanding as to the rationale behind the supply chain strategy selected. In addition, the research was conducted by reviewing quantitative data collected both pre and post the insertion of a retailer distribution centre to statistically compare the impact of this business strategy on supply chain competitiveness.

**Keywords**
Supply chain strategy
Supply chain collaboration
Constraints
Global competitiveness

# Declaration

I declare that this research project is my own work. It is submitted in partial fulfillment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Karl Thorington
28 January 2014

# Acknowledgements

To my wife Melonie, thank you for understanding the reasons why embarking on the MBA was so important to me and for supporting and understanding when things got tough.

To my son Ethan, it was great to have you as a study partner as we embarked on our separate educational journeys together. I wish that someday you will be in a position to immerse yourself in a similar experience of your choice, as I have this year.

To my parents, thank you for all your support to the family when I could not be there and the continued interest and pride shown in my studies throughout the year.

And finally to my supervisor Dr. Pieter Pretorius, I thank you for encouraging me to pursue this research topic, providing guidance and structure throughout the research process and the many interesting discussions we had in between.

# Table of contents

# List of figures

# List of tables

# List of abbreviations

**CEO –** Chief Executive Officer

**CVMI** – Consignment Vendor Managed Inventory

**DBR** – Drum – buffer – rope

**DC** – Distribution centre

**DSD –** Direct store delivery

**FMCG –** Fast moving consumer goods

**OOS –** Out of stock

**OSA –** On-shelf-availability

**RDC –** Retailer distribution centres

**SCM** – Supply chain management

**SCOR –** Supply chain operations reference

**SKU –** Stock keeping unit

**TOC –** Theory of Constraints

# Chapter 1

# 1   Introduction to the research problem

## 1.1   Research title

The impact of retailer distribution centres on supply chain competitiveness.

## 1.2   Research problem

The application of an effective supply chain strategy can have significant implications for an organisation's success and the ability to compete in an increasingly globalized business environment. "*As companies move towards increased global competitiveness, supply chains now face new issues and challenges. These include increasing demands to reduce costs, increase quality, improve customer service and ensure continuity of demand.*" (Soosay, Hyland, & Ferrer, 2008, p. 1). "*The cost of doing business is the most significant strategic constraint businesses have to deal with in South Africa*" (Lazenby, 2012, p. 1)

Increasingly, CEOs are adjusting their strategic business models in order to gain a competitive advantage or disrupt their competitors in tough economic times (Johnson, Christensen, & Kagermann, 2008). In the Barloworld Logistics 2013 Supply Chain Foresight survey, innovation in the way that companies collaborate within the supply chain was cited as a much needed business strategy required to compete in an arena where international organisations already have an advantage. The survey conducted research within the South African business environment, and over 350 executives provided responses. The need to better align supply chain strategy with business strategy, in addition to making use of the supply chain as a competitive advantage, were among some of the key results that emerged from the survey (Barloworld Logistics, 2013).

Figure 1 illustrates the steps required when deciding upon an appropriate strategy for a company. "*The task of crafting a strategy should always begin with an appraisal of the company's external and internal situation, should then move toward an evaluation of the most promising alternative strategies and business models, and culminating in*

*choosing a specific strategy*" (Hough, Thompson Jr, Strickland III, & Gamble, 2011, p. 56).

Figure 1: Thinking strategically about the company's situation to choosing a strategy (Hough, Thompson Jr, Strickland III, & Gamble, 2011, p. 56)
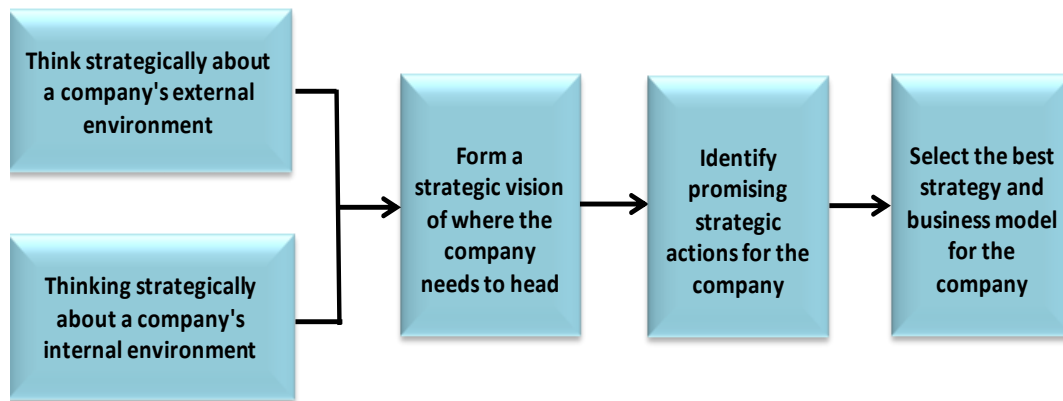


In line with the approach advocated by Hough et al (2011), companies in South Africa are changing their business models to align with their corporate strategy in order to better position themselves to compete in an increasingly competitive and changing business environment. "*In this emerging competitive environment, the ultimate success of the single business will depend on management's ability to integrate the company's intricate network of business relationships.*" (Lambert & Cooper, 2000, p. 65). Spector (2011) suggests that business models are constantly evolving and changing the way organisations are conducting business, where business models define how the business fits together.

The Barloworld research indicates that only 40 percent of South African companies believe they innovate sufficiently within their supply chain. Lack of innovation is often blamed on the company culture, lack of skills and opportunity, and fear of change (Barloworld Logistics, 2013). The Barloworld report goes on to say that organisations that succeed in creating a supply chain advantage are those that have been able to align supply chain management and logistics with their business strategy (Barloworld Logistics, 2013).

Supply chain collaboration strategies are deemed to form part of a company's business model and when this business model does not align with a firms competitive positioning, these can become a constraint on the business. "*The business model is more about how a business works as a system. Thus a strong business model may be managed poorly and fail, just as much as a weak business model may succeed due to strong management and implementation skills*" (Ostenwalder, Pigneur and Tucci (2005) as quoted in Spector (2011, p. 3389).

## 1.3 Research aim

The aim of this research is to investigate whether retailer distribution centres (RDCs) as part of a supply chain strategy deliver increased competitiveness to the supply chain and thus the organisation as a whole. Specifically, whether RDCs can be seen as a collaborative strategy and what their roles are in adding value to the supply chain, where effective collaboration enables both parties to combine knowledge and capability better than acting in isolation (Sridharan & Simatupang, 2009).

Is there a relationship between RDCs and competitive performances in the supply chain and is this relationship positive or negative? "*Supply chain collaboration can be defined as two or more independent firms jointly working to align their supply chain processes so as to create value to end customers and stakeholders with greater success than acting alone*" (Simatupang, Wright, & Sridharan, 2004, p. 57)Fisher, (1997, as cited in Soosay *et al.* 2008) argues that the benefits of collaboration include revenue enhancements, cost reductions and increased operational flexibility to cope with high demand uncertainties.

This research aims to explore whether RDCs fall under the classification of a typical supply chain collaboration strategy, as defined by Soosay *et al.* (2008) as a strategic alliance, joint venture, cooperative agreement, virtual collaboration or vertical, horizontal and lateral integration. Is there evidence of a sharing of benefits taking place across the entire supply chain or are any benefits derived being held by one of the parties only? Furthermore it will be explored whether the collaboration efforts result in joint decision making in terms of the strategic decisions made to optimize the supply

chain relationship, or are decisions made to the benefit of the stronger party in the relationship, leading to local optimisation.

The principal theory to be applied to supply chain strategy effectiveness is Eliyahu Goldratt's Theory of Constraints (TOC), where we will explore the impact of RDCs on the throughput of the supply chain as a whole and its' ability to achieve the goals of the supply chain and maximize profits. Whilst the TOC has been applied successfully as a management philosophy over the past two decades, very little TOC research has been published in refereed academic journals (Ronen, 2005). We will be looking at RDCs and their impact on the ability of the organisation to achieve its' goal, where the goal of most business entities is to make money now and in the future (Simatupang, Wright, & Sridharan, 2004, p. 4).

The research proposes to explore the underlying theory that would support supply chain collaboration as a competitive strategy, whether RDCs as applied are effective supply chain collaborations and how RDCs can be viewed as a constraint to the business when not managed effectively or implemented holistically as a means to supporting all the organisations' goals which participate in the supply chain.

# Chapter 2

# 2 LITERATURE REVIEW AND THEORY

## 1.2 Introduction

The field of supply chain integration and collaboration practices has been examined previously in research papers (Lambert & Cooper, 2000; Mason, Lalwani, & Boughton, 2007; Mathumaramaytha, 2011; Simatupaung, Wright, & Sridharan, 2004 Soosay, Hyland, & Ferrer, 2008; Sridharan & Simatupang, 2009). The objective of this chapter is to review a selection of theories in application to research done in the fast moving consumer goods industry, with the purpose of being used to assess the application and competitive advantage gained by the insertion of RDCs.

This research aims to look at three core theories in assessing the impact of RDCs on supply chain competitiveness. Firstly Porters' five competitive forces model with specific attention to the bargaining power of suppliers and buyers in the market and how this shapes strategy. Secondly, supply chain collaboration strategy, how it can be applied effectively and the sustainable stategic advantage that can be created. Lastly we will apply the Theory of Constraints to supply chain design, with specific analysis of strategies that favour individuals in the chain as opposed to the entire chain itself, and the resulting impact on throughput.

Barratt (2004) argues that supply chain collaboration has proven difficult to implement, that there has been an over reliance on technology to implement it, a failure to understand when and with whom to collaborate and a fundamental lack of trust between trading partners. He goes on to suggests that some authors are already suggesting that the writing is on the wall for supply chian collaboration. In this research, supply-chain collaboration models will be introduced with the aim of providing examples of effective supply chain collaboration as a theory base for comparison with actual strategies implemented.

This research will further review the theory of the bullwhip effect and drum-buffer-rope scenario to demonstrate the potential impact that supply chain collaboration and

practices can have on effective inventory and service level performances. These two models are important to include in this research as they are considered to be good measures of effective supply chain collaboration, particulary as they have an impact on costs, inventory, reliability and other business processes (Wangphanich, Kara, & Kayis, 2010).

## 2.2 Theory review

### 2.2.1 Porter's five forces model

"*Awareness of the five forces can help a company understand the structure of its industry and stake out a position that is more profitable and less vulnerable to attack. In essence, the job of a strategist is to understand and cope with competitio*n." (Porter, 2008, p. 78) Porter's five forces model was developed in 1979 by Michael E Porter as a tool to scan the external environment opportunities and threats to an organisation. In 2008, Porter reaffirmed, updated and extended his initial work, to be viewed in the context of a more current economic environment. The five forces remain as relevant today as they were in 1979 enabling company strategists who understand that competitive threats extend beyond immediate competitors, to detect wider threats and be better equipped to address them, as well as uncover opportunities (Porter, 2008).

Porter (1979) graphically introduced his five forces as the *five forces model of competition* (Figure 2).

Figure 2: The five-force's model of competition (Porter, 1979)
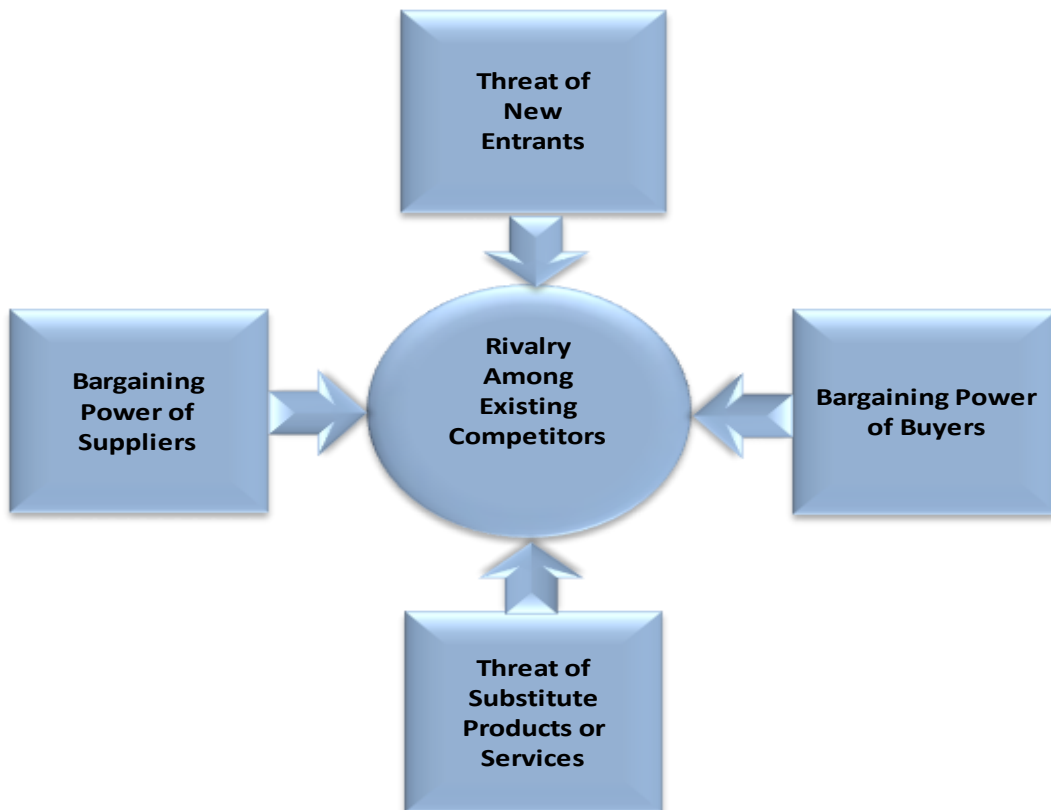


Porter (1979) describes and elaborates on the five forces as being the following elements:

1. **The threat of new entrants**, where new entrants bring new capacity, a desire to gain market share and often substantial resources. Porter elaborates by reflecting that the seriousness of the threat of new entrants depends on the barriers present to these companies entering the market. Access to distribution channels, and the extent to which existing competitors have effectively tied up these channels, will influence the ease of entry into the market

2. **The bargaining power of suppliers**, relates to the bargaining power of suppliers in an industry which allows them to raise the prices or reduce the quality of goods and services. Porter states that powerful suppliers can squeeze the profitability out of an industry by making them pay higher prices for the goods they provide. However, in many sectors today, the era of mass

production that drove choice and availability has been replaced by customer driven supply chains, and is driving a new competitive framework for supply chain operators (Mason, Lalwani, & Boughton, 2007, p. 187).

3. **The bargaining power of buyers,** can capture more value for themselves by forcing down prices, demanding better quality or more service, which in turn can drive up costs and reduce overall supply chain profitability. "*Large retail chains like Pick n' Pay, Checkers and Spar convenience stores typically have considerable negotiating leverage in purchasing products from manufacturers because of manufacturers need for broad retail exposure and the most appealing shelf locations*" (Hough, Thompson Jr, Strickland III, & Gamble, 2011, p. 78). Hough *et al.* (2011) go on to say that it is the competition amongst manufacturers for this limited retail space that gives buyers and retailers such significant bargaining strength.

   Frequently, it is the strength of the retailer's bargaining power in the relationship that determines the shape and form of the supply chain. This allows them to use this power to shift inventory costs, reduced cycle time and information technology costs upstream, to manufacturers (Simatupang, Wright, & Sridharan, 2004).

4. **The threat of substitutes** relates to products or services that perform a similar function in the industry and the degree to which the product or service you offer can be replaced by an alternative. In his recent adaptation of his work, Porter relates to the use of new technology plastics to substitute for traditional materials such as aluminium, or the use of videoconferencing as a substitute for business travel (Porter, 2008).

5. **Rivalry amongst existing competitors** refers to the situation where rival competitors in the industry are competing for market share and position. Porter (2008) refers to tactics being used which include price discounting, new product introductions, advertising and improvements in the service provided. The effective development of a supply chain strategy that is aligned to the business strategy provides a similar competitive advantage. Five areas in which it is

important to develop effective supply chain strategies include differentiation of the supply chain, financial, technology, relationship and globalization strategy (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009). According to Coyle *et al.* success in each of these areas will see supply chain capabilities contribute to corporate growth.

A key element to understanding the five forces model is that when strategically assessing these five forces at play in a particular industry, should the collective impact of these forces be strong, then the lower the combined profitability of the industry participants. The ability to extract attractive profits decline and this hampers the organisation from being able to achieve its goal effectively (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009).

The relevance of applying the five forces model relates to the increasing threat of new global entrants into the South African market place, who will re-define the way in which we compete. "*A company with a core competence (or better a distinctive competence) in cost-efficient, supply-chain management can sometimes achieve a cost advantage over less adept rivals*" (Hough, Thompson Jr, Strickland III, & Gamble, 2011, p. 152). Global giants such as Wal-Mart are bringing new competitive forces to bear as a low price leader, using scale and aggregation of buying power to press home the price advantage (Barloworld Logistics, 2011).

### 2.2.2 Supply chain collaboration

Simatupeng *et al.* (2004) define supply chain collaboration as having two or more independent firms jointly working to align their supply chains, thereby creating value to end customers with greater success than operating alone. Soosay *et al.* (2008, p 161) describe collaboration as " *an inter-organisational relationship type in which the participating parties agree to invest resources, mutually achieve goals, share information, resources, rewards and responsibilities as well as jointly make decisions and solve problems*".

The contemporary supply chain models view supply chain management as an extended set of enterprises from the supplier's supplier to the customer's customer. (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009). Figure 3 illustrates a typical supply chain demonstrating the flow of products in a non-integrated supply, where the independent links in the chain play a role in the overall success of the chain itself (Coyle *et al,* 2009). Typically, in the pursuit of more effective and competitive supply chains; the trend has been away from these types of models to more collaborative arrangements. The research will further explore the use of assorted supply chain model frameworks.

Figure 3: Contemporary supply chain profile (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009, p. 33)
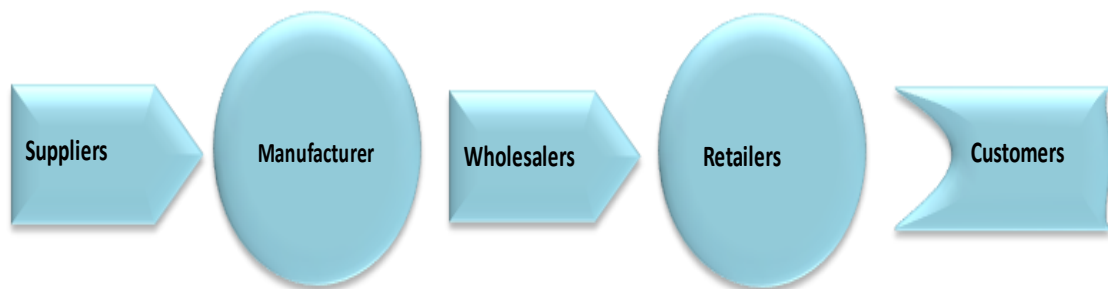


In the literature reviewed, the arguments *for* effective supply chain collaboration as a competitive strategy significantly outnumber the arguments against collaboration as a supply chain strategy (Lambert & Cooper, 2000; Mason, Lalwani, & Boughton, 2007; Mathumaramaytha, 2011; Simatupaung, Wright, & Sridharan, 2004; Soosay, Hyland, & Ferrer, 2008; Sridharan & Simatupang, 2009). The consensus is that competition due to market globalisation and increasing competition, provokes independent firms to have to collaborate in a supply chain to allow them to gain mutual benefits (Simatupang, Wright, & Ramaswami, 2002).

Tangible benefits from supply chain collaboration include improved revenue, cost reductions and increased operational flexibility to cope with high demand uncertainties (Mathumaramaytha, 2011). Flexibilty and adaptability are seen to be increasingly important in a competitive environment where demand is increasingly uncertain and requires greater responsiveness (Lua, 2012). An increasingly intangible benefit is the ability to interlink systems and processes for enhanced information sharing. Soosay *et*

10

*al.* (2008, p161) refer to it as the rich sharing of information that allows for the processing of this information to create new knowledge.

An example of this would be the information transfer of consumer buying patterns, or retailer buying models, that would be shared and utilised by the manufacturer to develop demand plans and manufacturing schedules. This would allow the manufacturer to optimise the inventory levels, and availability of inventory, to satisfy customer requirements timeously and in doing so see the value chain "*delivering a better deal for consumers through greater collaboration between retailers and suppliers*" (according to Potter, Lalwani, Disney & Velho, 2003 as cited in Mason, Lalwani, & Boughton, 2007, p19)

Supply chain management and collaboration form part of a company's value chain, where the value chain is identified by the primary activities that create customer supported value, in addition to other related supported values (Hough *et al.*, 2011). Within these value chain activities we find marketing, product design, production and delivery, and these activities provide the enabling business environment for the development of sustainable competitive advantage (Hopkins, 2009 as cited in Fearne & Martinez, 2012).

Organisations seeking to collaborate within their supply chains need to select the appropriate type of collaboration that ties in with their business model and aligns with their organisational strategy. Soosay *et al.* (2008) reflect that collaboration options selected should be innovative in nature, which allows the relationship to jointly acquire additional knowledge and increased capabilities. Soosay *et al.* (2008) also refer to five types of supply chain collaborations that can be entered into, namely:

1. **Strategic alliances,** which are broadly intended to be long term inter-firm relationships in which two or more partners share resources, knowledge and capabilities with the objective of enhancing the competitive position of each partner (Spekman and Sawney, 1998 as cited in Soosay *et al.,* 2008).

2. **Joint ventures** which provide collaborative efforts that allow for sharing of knowledge and expertise, typically in developing new markets or opportunities. An example of this is, when one company brings the product or the innovations, whilst another brings the skills and expertise to get these products effectively to market.

3. **Cooperative arrangements,** where the objective is primarily to shift from contractual agreements to more trusting relationships that can result in more complex arrangements, with greater potential for collaborative benefits from innovation sharing.

4. **Virtual Collaboration** which relates to the sharing of information networks and requires high levels of trust and respect for the partners intellectual property rights. Typically, this type of collaboration facilitates cost sharing, skills sharing and access to greater technology for one partner or both.

5. **Vertical, horizontal and lateral integration,** relates to the direction in which the collaboration takes place, where vertical integration looks at the strategy related to integration between relationships upstream and dowstream  in the supply chain, horizontal integration looks at the relationship between two or more unrelated competing organisations at the same level of the supply chain, and lateral combines the benefits of both. "*Where vertical and horizontal collaboration can be combined, new often superior business models are being created*" (Mason, Lalwani, & Boughton, 2007, p. 197)

Figure 4 illustrates a more vertically integrated supply chain model where a retailer has vertically integrated upstream into the supply chain to effect its' business model. This would typify an FMCG retailer model such as Woolworths or Pick n Pay who offer both traditional brick-and-mortar type retail shopping experience and online home delivery shopping networks. This type of model is commonly known as an integrated fulfillment model (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009). Typical collaboration opportunities which exist in an external, vertical model, include customer relationship management, collaborative demand planning and forecasting, demand replenishment systems and shared distribution (Barratt, 2004).

12

Figure 4: Integrated Fulfillment as adapted from (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009, p. 257)
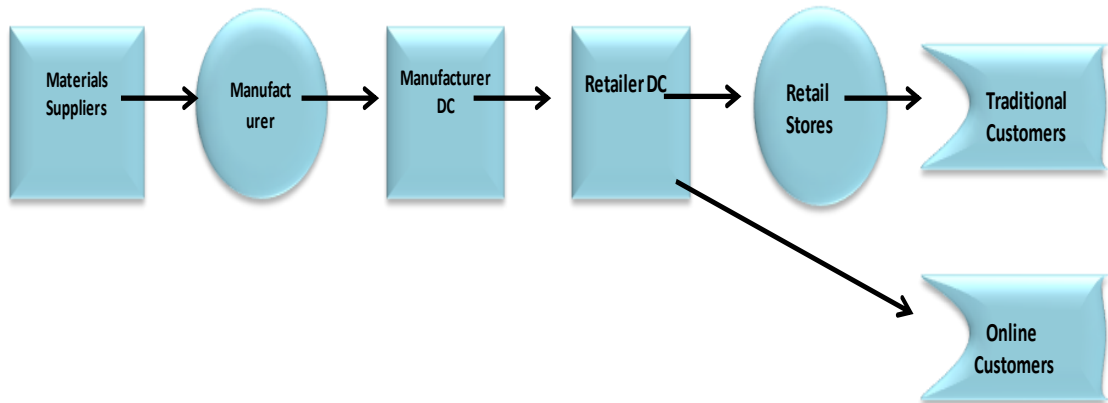


The final model to be applied on supply chain collaboration is the Supply Chain Operations Reference (SCOR) model which is a widely accepted model used in the supply chain industry and provides a unique framework linking performance metrics, processes, best practices and people into a unified process (The Supply Chain Council Inc., 2010). "*The Supply Chain Operations Reference model was developed by the Supply Chain Council to assist firms in increasing the effectiveness of their supply chains, and to provide a process-based appproach to supply-chain management (SCM)*" (Lockamy III & McCormack, 2004, p. 1192).

Benefits of this model include rapid assessment of supply chain performance, efficient supply chain network design and the ability to align supply chain team skills with defined strategic objectives  (The Supply Chain Council Inc., 2010). Figure 5 illustrates the dimensions of the model, which covers a hollistic view of the supply chain from an organisations' suppliers' supplier to its customers' customer. The SCOR model provides a common process-oriented language among supply-chain partners and this is particularly important at a time when firms are adopting SCM solutions as a  means to reduce costs, increase market share and sales and build solid customer relations (Lockamy III & McCormack, 2004). Furthermore, when SCM is viewed as a philosophy based on the belief that each firm in the supply chain directly impacts upon the performance of all other supply chain members, the efffective use of this philosophy requires the alignment of supply-chain partners with each other, harmonized to their

13

organisational structures, processes, culture, incentives and people (Lockamy III & McCormack, 2004).

Figure 5: The SCOR structure (The Supply Chain Council Inc., 2010)



The SCOR process model reviews all customer transactions ranging from order entry to delivery and culminating in payment. The ability to effectively map the processes involved in the supply chain based on demonstrated best practices allows companies to design an integrated operating model  which promotes the chains ability to respond effectively to market changes and opportunities (The Supply Chain Council Inc., 2010). Figure 5 illustrates the processes used to describe the scope and configuration of a supply chain (referred to in the SCOR process as level one processes) as plan, source, make , deliver and return. The Supply Chain Council (2010) briefly describes these as follows:

1. The plan process which describes the planning activities associated with operating the supply chain and seeks to effectively identify customer needs and balance the resources required to meet these needs.
2. The source process which describes the ordering and receipts of goods and services.
3. The make process looks at the activities required to convert materials into products or the creation of content for services.
4. The deliver process reviews the process and activities associated with the creation, maintenance and fulfillment of customer orders.

14

5. Finally, the return process looks at activities associated with the reverse flow or return of goods from customers, either for return credit, replacement or repair.

Perfect order fulfillment is defined by the Suppply Chain Council as being an effective indicator of how well every facet of a supply chain – planning, sourcing, manufacturing and delivery – are co-ordinated to efffectively meet customer demand (The Supply Chain Council Inc., 2010). Metrics to determine the effectiveness include percentage of orders fulfilled in full, delivery performance to delivery dates, accuracy of documentation and condition of product supplied. In addition, the Supply Chain Council use metrics that measure local optimisation and enhanced profitability of each of the supply chain nodes including the impact of inventory oversupply and stock outs.

The key to the success of supply chain collaboration is selecting the correct form and level of collaboration to suit the goal of enhancing value to the value chain and the end customer. "*Reports from real world practice show that supply chain collaboration brings benefits for all participating members*" (Ireland and Bruce, 2000 as cited in Simatupang *et al.,* 2004, p. 57). However, supply chain collaboration has its limitations, and can manifest as a power play amongst members when the power is not equally distributed. Large retail chains, due to their market power, often shift inventory costs, cycle time, and burdens of information technology to their upstream members (Simatupang, Wright, & Sridharan, 2004). Figure 6 illustrates the decision review process that should be followed when deciding on the supply chain model that aligns strategically with the business model.

15

Figure 6: Process model for forming supply chain relationships as adapted from (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009, p. 112)
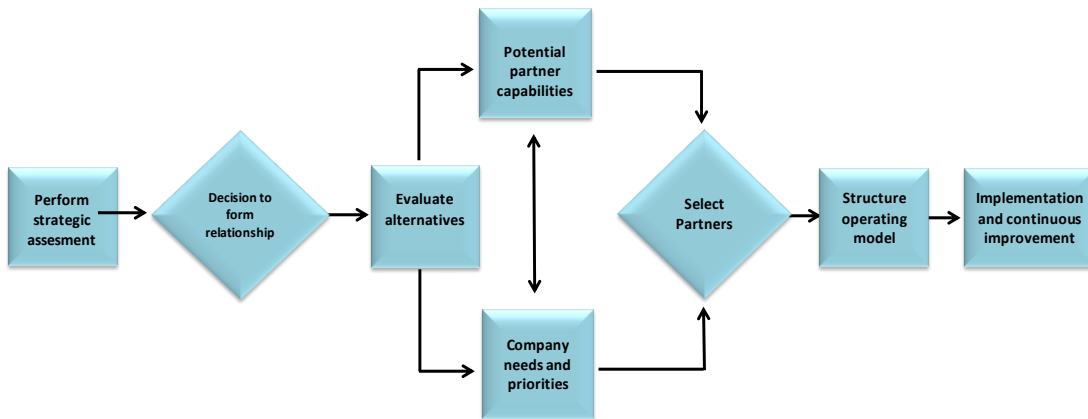


Whilst reviewing the literature and prior research on supply chain collaboration, it is important to argue that not all literature was fully supportive of collaboration as the most effective strategy. "*Recent work has provided convincing empirical evidence for the relationship between integration and performance. However, a few years ago, Ho et al. (2002) raised some doubts with respect to the relationship between integration and performance in survey studies*" (van der Vaart & van Donk, 2008, p. 42). Van der Vaart and van Donk reasoned that whilst much of the past research done tends to confirm the anticipated relationship between the level of supply chain integration as a form of collaboration and performance, the choice of respondants and populations used in the research may limit the validity of the results.

This viewpoint is supported by an article that further prescribes that the quality of supply chain partner selected is as important as the decision on the supply chain method itself. "*Ultimately, what you have to determine from a supplier is how suitable the company will be as a supply chain partner*" (Blanchard, 2013, p. 45). There is also the view that the costs associated with a collaboration strategy as a requirement to improve operational performance, will rise. "*To attain higher efficiency, one has to sacrifice responsiveness. The opposite is also true*" (Lua, 2012, p. 638).

Lua (2012) illustrates the phenomena of higher efficiency leading to less responsiveness, using the consolidation of inventory into a centralised location which promotes greater efficiencies, but which may come at the cost of a slower delivery service. Whether the level of responsiveness is a constraint, or not, on the system depends on the speed of service and whether it meets the customer needs.

### 2.2.3    The Theory of Constraints

"*The Theory of Constraints (TOC) has been widely known as a management philosophy coined by Goldratt (1990) that aims to initiate and implement breakthrough improvement through focusing on a constraint that prevents a system from achieving a higher level of performance*" (Simatupang, Wright, & Sridharan, Applying the Theory of Constraints to Supply Chain Collaboration, 2004, p. 4). "*TOC has been successfully implemented in production, logistics, distribution, project management, research and development and sales and marketing in small and large organisations. However, contrary to the vast application of TOC in practice, very little TOC research has been published in refereed academic journals.*" (Ronen, 2005, p. 1).

According to Boyd and Gupta (2004), there is an absence of well-established, tested and accepted operations management theories. They go on to say that one which is notable for the disparity between its application by practitioners and the attention received in academic literature is constraints management, and that perhaps this is due to it never having been established as a theory to the satisfaction of operations management researchers (Boyd & Gupta, 2004).

Ronen (2005) suggests five possible reasons as to why TOC may have such a low profile in research academic journals:

1.  The goal of TOC is simplicity, whilst academic journals prefer process-optimising quantitative approaches
2.  TOC processes are cause and effect driven and academic journals give preference to field studies with empirical data.
3.  TOC was originated by practitioners and not academics and as a result not enough academics have been exposed to its full contribution.

4. TOC is misperceived as a simplistic toolkit that does not need thorough research.
5. TOC is perceived as being a cult and thus inaccessible to the academic community.

Ronen (2005) goes on to suggest that it may be of worth to apply academic methodologies to TOC concepts and confirm or improve its methods, and that TOC researchers should conduct their research using well established academic research rules. This may go some way to rectifying the disparity that surrounds the academic relevance of TOC as compared to its' wide practical application.

Gupta & Boyd ( 2008, p. 1003) argue that TOC is indeed a good theory and meets the criteria required to qualify. They define these to be:

1. Definitions of terms and variables. In the case of TOC, these would be terms and metrics such as throughput, inventory, operational expense and constraint.
2. A domain where theory applies. TOC claims to be applicable to a well-defined, although large, domain.
3. A set of relationships of variables. TOC specifies relationships between its variables and terms
4. Specific predictions. TOC makes specific predictions concerning organisational performance if effectively applied.

By applying the TOC in research and using well established research methodology and hypothesis testing, on-going research can contribute to closing the gap between TOC and the world of academia in the constraint management field, or at least promote debate that would enhance TOCs academic claim.

The TOC is by nature a process of continuous improvement by focusing on the area in the business that provides the greatest leverage for improvement. As businesses grow, or the external business environment changes, so business models and strategies change and adapt to meet new challenges or opportunities. TOC practitioners believe the goal of a business is to make money now and in the future, and a constraint is any

element or factor that prevents the organisation from achieving this goal (Simatupang, Wright, & Sridharan, 2004).

At the highest level of the organisation, TOC views all operations systems as a set of interdependent processes, where the output of one process flows into another (Boyd & Gupta, 2004). As a result of this flow process, a constraint in one process will have a significant impact on the entire system. As a methodology to resolve these process constraints, Goldratt introduced the five focussing steps to identify and define corrective action.

These five steps are (Goldratt & Cox, 2004, p. 307):

1. Identify the systems constraint. In the process chain no improvement can be made unless the system constraint has been correctly identified. The process chain is only as strong as its weakest link and this link needs to be strengthened in order to strengthen the entire chain.

2. Decide how to exploit the system constraint(s). Review how to make the system constraint as productive or effective as possible. Get greater throughput from the existing constraint in order to increase overall throughput of the process chain.

3. Subordinate everything else to the above decision. Align the flow of every other part of the process to match that of the constraint. Having parts of the process upstream of the constraint flowing faster than the constraint, will lead to a build-up of inventory or processes before the constraint. Processes downstream of the constraint flowing faster than the constraint will be starved of work. The output of the system will only be as great as the constraint itself.

4. Elevate the system constraint. Once you have exploited the constraint as much as you can, if the total output is still sub-optimal, acquire more of the constraint resource.

5. **If in the previous steps a constraint has been broken, go back to step one, but do not allow inertia to cause a systems constraint**. As stated previously TOC is a continuous improvement process. Once the constraint has been broken another constraint will appear which will limit the volume of the system. This constraint may be internal (within the operation) or external (in the market), but irrespective of where it is located, it constrains the business from achieving unlimited profits. It is not always necessary to elevate the system constraint however, and the choice of whether or not to elevate the constraint is a strategic one based on the willingness and ability to commit resources to do so (Ronen and Pass, 2007 as cited in Gupta and Boyd, 2008).

Much of the literature written on TOC has primarily dealt with systems constraints within a manufacturing context, or when dealing with supply chain solutions, deals mainly with managing the supply chain from a single enterprise perspective (Cox and Spencer, 1998; Jackson and Low, 1993 as cited in Simatupang *et al.,* 2004). "*The traditional relationship between retailers and suppliers is described as a transactional basis, as each party is most concerned with its own interests*" (Sridharan & Simatupang, 2009, p. 263). Today, we see more organisations adapting their supply chain activities beyond the scope of those that take place within an organization. Collaboration beyond the scope of an organisation is one of the most focused areas in business today to improve supply chain performance and competitiveness (Mathumaramaytha, 2011).

The dilemma of supply chain collaboration occurs when decisions need to be made that take into account the supply chain as a whole as opposed to the interests of the individual firms. Literature has given little attention to the application of TOC concepts in managing supply chains where collaboration between independent firms is required (Simatupang, Wright, & Sridharan, 2004). Where the decisions are made to the benefit of the individual links in the chain and not the entire chain itself (applying Goldratt's five steps), unless these links are the constraints on the system, the performance of the entire supply chain will not be improved. Simply, by increasing the effectiveness of one organisation in the supply chain will not necessarily increase the effectiveness of the chain itself, unless focus is placed on all the links as a whole. Figure 7 illustrates this

20

supply chain dilemma between supply chain effectiveness and individual member profitability.

Figure 7: Dilemma of supply chain collaboration. Source (Simatupang, Wright, & Sridharan, 2004).

| Objective | Requirements | Prerequisite |
|---|---|---|

**Maximise the benefits of supply chain collaboration**

**Maximise revenue of the supply chain from sales to end customers**

**Protect the profitability of the individual member**

**Base decisions on supply chain -wide performance measures**

**Base decisions on link-dentric performance measure**
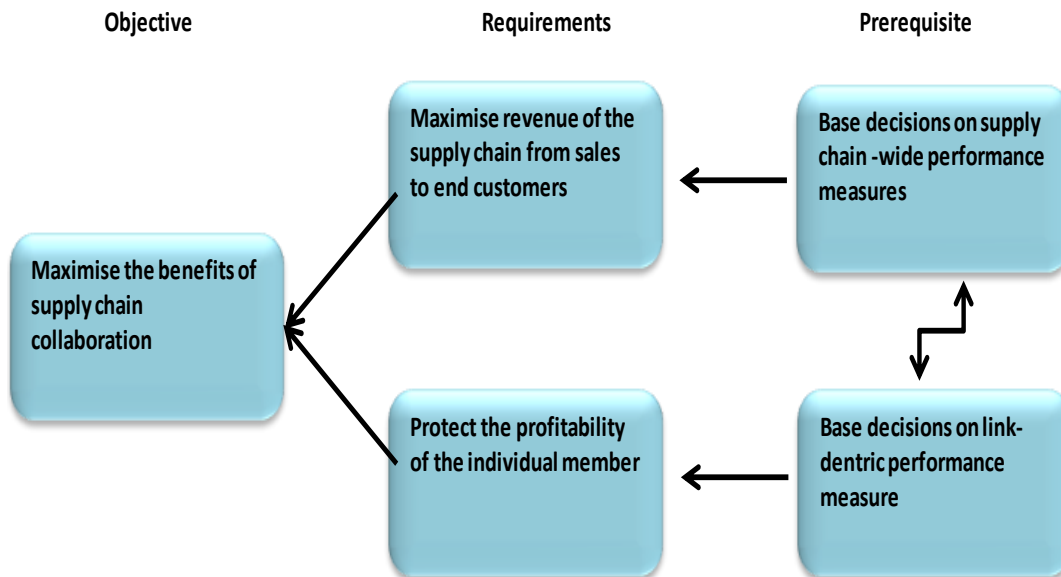
It is the dilemma of Figure 7 that this research intends to expand upon, asserting that if RDCs are implemented as part of an individual company's business model aligned to its organisation's strategy in order to improve its own profitability, the possibility exists that the overall supply chain performance might deteriorate if it is not effectively executed in a collaborative manner. Furthermore is the insertion of a RDC the appropriate competitive strategy, capable of improving the overall competitiveness of the company and as such delivering a competitive advantage?

In order to measure the effectiveness of TOC as a collaborative supply chain theory, we require a set of appropriate metrics to guide us in this research. "*Financial measurements work well at the higher level, but they cannot be used at the operational level*" (Chase, Aquilano, & Jacobs, 2002). Chase *et al.* (2002), refer to Goldratt's measurements to guide effectiveness of operational performance. These are:

1. **Throughput,** which is defined as the rate at which money is generated by the system through sales. Actual sales must occur.
2. **Inventory,** which is defined as all the money that the system has invested in purchasing things that it intends to sell.
3. **Operating expenses,** which are defined as all the money the system spends to turn inventory into throughput.

Chase *et al.* (2002) go on to state that the goal of the firm is to "*Increase throughput while simultaneously reducing inventory and reducing operating expense*". As supply chain is an extension of the firm's business model, and an extension of the processes of a business, we can derive that the goal of the supply chain is to similarly increase throughput, reduce inventory and reduce operating expenses. Metrics which measure this impact can be effectively used to analyse whether the impact of a supply chain initiative such as RDCs, is in fact supporting the goal of the business and enhancing profits.

### 2.2.4   The bullwhip effect

The bullwhip effect refers to a scenario where orders to the supplier tend to have larger fluctuations than sales to the buyer (or retailer) and this distortion continues to amplify as it progresses upstream. A practical example of how this occurs is in the case of short or missed deliveries that occur in traditional supply chains resulting in customers over-loading their schedules or orders. (Disney & Towill, 2003) *"This in turn places more demands on the production system that inevitably leads to more unreliable deliveries. Customer's then increase their safety stock target that further distorts the demand signal, giving rise to the bullwhip problem"* (Disney & Towill, 2003, p. 158)*.*

A common approach to deal with the bullwhip effect is to insert additional inventory into the supply chain to manage these fluctuations. This is also an expensive approach and whilst it can have a stabilising effect on demand fluctuation, more often than not this does not happen as the replenishment decisions are not designed carefully via common control theory techniques (Disney & Towill, 2003). The best solution for reducing the impact of the bullwhip effect on the supply chain is to improve the structure of the supply-chain network, level of information sharing, operational

efficiencies of supply-chain units and contributions of supply-chain units (Wangphanich, Kara, & Kayis, 2010).

In traditional supply-chains without the effective use of information sharing, the bullwhip effect increases along the supply chain from retailer, distributor, manufacturer and supplier. (Wangphanich, Kara, & Kayis, 2010). Inserting another layer of decision making into this chain, namely a RDC, can have the effect of increasing the overall lead times and effectively increasing the amount of inventory held in the entire chain. For this reason, one of the metrics to be reviewed in this research will be the inventory impact of the RDC and whether there has been an overall increase or decrease in the chain lead times as a result.

Figure 8 illustrates the effect that a spike in customer orders can have on the levels of orders in the supply-chain when an effective, collaborative structure is not in place to effectively react to this spike. It is evident that the impact on the plant/supplier is out of proportion to the initial customer order spike, and this will result in surplus inventory build-up at the relevant supply-chain points. *" Collaborative planning and forecasting for replenishment in the supply chain are other tools for reducing stock outs and overreaction to swings in demand levels"* (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009, p. 10)

In a retail environment, to fully experience the impact of the bullwhip effect, it is necessary that the throughput constraint in the supply chain be in the market place. Upstream capacity needs to exceed the market demand in order for it to be able to respond to the demand triggers that are placed upon it. If the constraint is elsewhere in the supply chain then the constraint itself will limit the size and impact of the whip-lash itself.

Figure 8: Bullwhip effect adapted from Disney & Towill (2003)
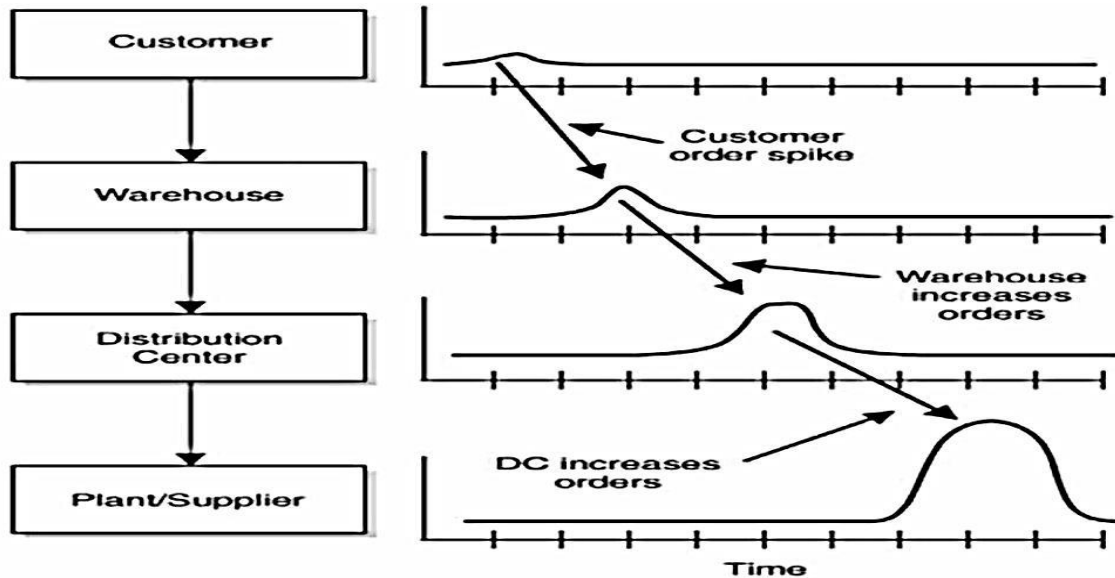


## 2.2.5 Drum – buffer – rope

*"Drum-buffer-rope logistical systems are the heart of synchronous manufacturing/theory of constraints systems that emphasize the identification and effective utilization of constraint resources."* (Umble & Umble, 1999, p. 29). These systems are used to assist organisations and supply-chains operate with the minimum levels of inventory and operating expenses, through the optimal use and combination of inventory and time buffers in the chain. (Umble & Umble, 1999).

In drum-buffer-rope, the drum refers to the physical constraint of the process or system that limits the throughput potential of the system. The drum reconciles the requirements of the customer with the system's constraints and sets the pace for the supply-chain. The buffer protects the drum from inactivity, ensures it always has work to do, and involves the use of either time or inventory to improve the responsiveness of the system and protect the system throughput. The rope ensures the timely release of work into the system to prevent gridlock or starvation of work and deliver optimum overall system performance. Materials are pulled into the system only as required to support the drum, but once in are pushed through in small transfer batches to targeted buffer locations (Umble & Umble, 1999).

24

Figure 9: The Drum-Buffer-Rope system adapted from (Chase, Aquilano, & Jacobs, 2002)
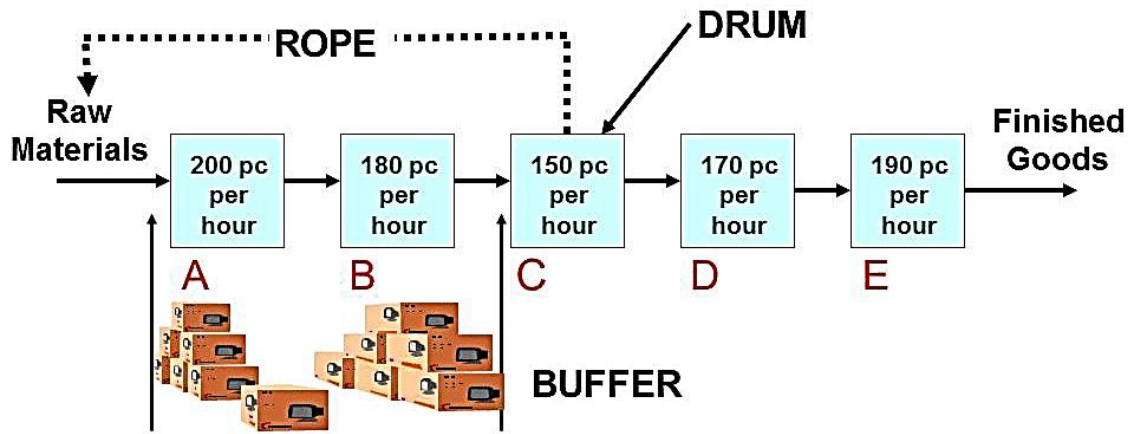


Figure 9 above clearly illustrates the drum-buffer-rope system where the constraint in this system is process C at 150 pieces per hour, and we assume that we can sell all that we can produce from this supply chain system i.e. the market demand is not the constraint. In this illustration, if processes A and B produce at maximum capacity, we will have a build-up of inventory before process C as it is unable to produce at the same rate as the prior two processes. Process C is our bottleneck, as it constrains our throughput rate and we make point C our control point or *drum* because it strikes the beat at which the rest of the system functions (Chase, Aquilano, & Jacobs, 2002).

The *rope* represents the communication that occurs between point C and Point A to ensure that only enough material is fed into the system to satisfy the requirements to keep constraint C working and thus prevent inventory build-up. The *buffer* is the inventory held in front of the constraint C and is a time buffer sufficiently large enough to keep constraint C working and no more.

The presence of a constraint in the supply chain is not necessarily a bad thing as once correctly identified, it allows you to focus your attention on your most loaded resource and improve upon this to get throughput improvement in a relatively short space of time. "*The drum-buffer-rope logistics system can help facilities operate with a minimum of inventory and expenses. By applying a DBR system and using stock and time*

*buffers appropriately, you may be able to boost you manufacturing plants' efficiency."* (Umble & Umble, 1999, p. 24).

Using the drum-buffer-rope methodology, we can see that it is desirable that the constraint in the system is found at the end of the process i.e. in the market demand. With the constraint being in the market and taking on the role of the drum, there is available capacity upstream which has the capacity to meet the market demand, and in this case supply the needs of the customers. If the constraint is elsewhere, it would indicate that market demand is not being fulfilled, orders are not being supplied and customer service standards are not being met. Efforts must be made to elevate the constraint and in doing so elevate the throughput of the system itself.

Greater levels of vertical supply-chain collaboration in a system can increase the complexity required to manage the system itself. However, where inventory and time buffers are identified and aligned correctly, the needs of each process as well as the system itself can be correctly factored into the design model. This can not only protect the performance of the overall system (service lead time to customers) but also minimise safety stock cost impact. (Umble & Umble, 1999).

### 2.2.6   Justification for this research

This research aims to expand on previously mentioned research, which looks at the subject of effective supply chain collaboration as a competitive strategy. Unlike previous studies this research seeks to look at the trend of retailer distribution centre integration as a supply chain strategy and attempts to determine whether it is a competitive strategy that adds value the length of the supply chain, in addition to value to the end consumer.

This analysis of supply chain strategy and design should be relevant across industries, even though this research will focus primarily on fast moving consumer goods in the make-to-stock as opposed to the make-to-order supply chain model. Knowledge gained from this research is not specific to South Africa and as illustrated by the literature, should be beneficial across geographies and industry types and sizes. "*As*

26

*different from one another as industries might appear on the surface, the underlying drivers of profitability are the same*" (Porter, 2008).

## 2.3   Chapter summary

Chapter two seeks to establish the position of the theory of this research by forming a strategic platform using Porter's five forces model. Knowing and understanding the competitive forces in the industry's business, assist with determining the opportunities and threats. "*Knowledge of these underlying sources of competitive pressure provides the groundwork for a strategic agenda of action.*" (Porter, 1979, p. 138)

Understanding these forces enables a company to determine the levels of diversification or collaboration it requires to execute the strategy effectively. "*Organisations in supply chains are compelled to restructure and re-engineer relentlessly to increase their effectiveness and satisfy customers.*" (Soosay, Hyland, & Ferrer, 2008). Supply chain collaboration, design and measurement are seen by most as an effective strategy to improve their competitive position in the marketplace, relative to its competitors, if applied equitably and effectively. Do RDCs fall under this category of collaboration, or are they possibly a form of supply chain duplication, adding a process in the supply chain, without adding much overall value?

The TOC will be applied to analyse the RDC strategy through the lenses of constraint theory to assess whether RDCs provide a collaborative competitive advantage to an organisation or not. This will provide additional insight which can enable organisations to analyse and control their business constraints in new ways (Spector, 2011).

Theories such as the bullwhip effect and drum-buffer-rope will assist with providing sound theory based arguments as to how supply-chain design can impact upon inventory levels, lead times and costs, all of which are clear metrics of supply-chain effectiveness.

# Chapter 3

## 3 Research questions

### 3.1 Research aim

The aim of this research is to determine the relationship between the vertical integration of retailer distribution centres as strategic business models and overall supply chain competitiveness. Specifically, does the insertion of a RDC in to the supply chain model increase or decrease the competitive advantage of the supply chain as defined by the TOC's metrics of throughput, inventory and operating expenses?

There will be a one hypothesis test ($H_0$) with multiple metrics which will determine the competitiveness derived from a RDC supply chain strategy. Organisations today are using multiple metrics to measure how well they are serving their customers and the concept of perfect order fulfilment is being used as a metric of reliability and to capture the entire customer experience (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009).

For the purpose of this research the hypothesis test will look at no change or an improvement as being more competitive as the assumption is there are other benefits not being measured, both tangible and intangible, which could provide a net positive gain as a result of conducting business through the RDC. These may include amongst others increased product listings with the retailer, improved reverse logistics co-ordination and handling, improved interaction between suppliers and retailer supply chain management which could evolve into joint decision making and reductions in shortage claims from store deliveries.

### 3.2 Research questions

#### 3.2.1 Qualitative

The qualitative element of this research will be looking to explore three areas of supply chain competitiveness as it relates to the manner in which supply chains have been established in South Africa. These three areas are:

1. Business strategy – specifically reviewing whether a company's supply chain strategy is aligned to its business strategy, the overall importance of the supply chain to the business and whether the model used is delivering expected and effective results.

2. Supply chain collaboration – looking at the degree to which the supply chain practices employed are collaborative in design and execution with specific emphasis on information sharing, technology sharing and joint investments. In addition, looking at the balance of power in the relationships and their impacts on effective supply chain collaboration practices.

3. System constraints – reviewing the supply chain models used by the interviewees and determining the effectiveness of these models to deliver improved throughput and service to consumers. Specific focus is placed on RDCs and how they are being operated, as being possible constraints.

The insights that will be provide by this exploratory research will help us become familiar with the problem situation, identify important variables and use these variables to form hypotheses that can be tested in greater detail in subsequent research (Weiers, 2011)

### 3.2.2  Quantitative

**Hypothesis:** The insertion of an RDC, and the subsequent lengthening of a supply chain, has a positive impact on customer service levels as measured by order fulfilment, lost sales value and inventory levels.

$H_0$: Percentage change in unit order fulfilment levels after inserting RDC $\geq 0$
$H_1$: Percentage change in unit order fulfilment levels after inserting RDC $< 0$

$H_0$: Percentage change in Rand lost sales after inserting RDC $\leq 0$
$H_1$: Percentage change in Rand lost sales after inserting RDC $> 0$

$H_0$: Percentage change in inventory levels after inserting RDC $\leq 0$
$H_1$: Percentage change in inventory levels after inserting RDC $> 0$

This hypothesis will be measured by analysing the above metrics prior to and after the insertion of an RDC. The objective here is to ascertain how supply chain responsiveness and effectiveness is impacted by the strategic insertion of another process, namely RDCs, in the supply chain with all other variables being held constant. The metrics used are consistent with those identified by the Supply Chain Council as measures of supply chain effectiveness and ability to meet customer requirements.

The limitation of this hypothesis test is in the range of the data sets available for testing. In this case 36 data samples were available for each of the three metrics being measured, with 12 samples prior to and 24 samples post the implementation of the RDC. However it is believed that the quantitative analysis will add depth to the qualitative interview research by allowing some statistical inferences to be made based on available data that may either support or discredit the qualitative findings of this research.

# Chapter 4

## 4 Research methodology

### 4.1 Research method

This research was exploratory in nature and  followed a mixed method research approach where mixed methods research is defined as *"the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or languages into a single study"* (Johnson & Onwuegbuzie, 2004, p. 17). Mixed methods research views both quantitative and qualitative research methods as being useful and attempts to draw from the strengths of each method in single research studies (Johnson & Onwuegbuzie, 2004).

The research method chosen explored two phases of research for this study. The first phase required the collection of data pertaining to the logic and business model design which led the implementation of RDC strategy. This was exploratory research in nature, where exploratory research is about discovering general information about a topic that is not understood clearly by the researcher (Saunders & Lewis, 2012). In addition, this exploratory research was qualitative in nature, being non-numerical data, and required the use of a semi-structured questionnaire being applied to a non-random population sample.

 An example of the structured questionnaire used is attached in appendix A and this questionnaire was applied to a sample of ten selected professionals in fast moving consumer goods (FMCG) business and supply chain fields, all of whom participated in supply chain design and application in one form or another. The population was selected from a diverse range of businesses within the FMCG industry in order to provide a range of responses and included participants who elected not to participate in RDCs in their model, direct sellers to outlets and consumers, participants in RDCs as well as an RDC supply chain professional for a leading South African FMCG retailer.

The questionnaire was applied via a structured interview process, where a structured interview is defined as being "*a method of data collection using a questionnaire in which each person is asked the same set of questions in the same order by an interviewer who records the responses*" (Saunders & Lewis, 2012). Content and construct validity for the questionnaire was carefully reviewed to ensure that the questionnaire collects the correct and sufficient quantity of intended data. (Saunders & Lewis, 2012).

A semi-structured questionnaire was used to group responses and provides structure to the interview process, and interviewees were encouraged to explore the subject matter in ways which may have reached broader than the questions themselves in an effort to acquire as much insight as possible. To that end the questions were open-ended where the respondents were free to formulate their own answers and expand on the subject of the question (Weiers, 2011).

The purpose of this format was to acquire depth of knowledge from the respondents as to the rationale behind the application of RDC business models and strategies, the perceived benefits and pitfalls of this strategy and whether all parties in the supply chain deemed this to be a collaborative strategy. In addition, it was expected that this element of exploratory research would provide the researcher with insight as to whether the benefits were mutual or exclusive in nature.

The second phase in this research required the collection of secondary data from the manufacturing organisations analysed. Available secondary data accumulated by a selected organisation in the fast moving consumer goods sector prior to and subsequent to the insertion of a RDC into the supply chain was used. This provided the data required to perform an historical causal study (testing the relationship between two or more variables), by examining the impact of the RDC on key performance metrics that related to the competitiveness of the systems' throughput and costs. To this end, data reflecting the unit percentage order fulfilment as a customer service measure, Rand lost sales as a throughput measure and inventory levels in the supply chain as a cost measure was used. This data will be analysed in chapter six of this research and compared both pre and post RDC integration, with all other variables being held constant.

In addition to the historical causal research, comparisons will be drawn in chapter six between the impact of RDCs as a supply chain strategy and a company that has shortened its supply chain by removing a number of its own distribution centres in a strategy to have greater flexibility and responsiveness to customer demand patterns. Here the objective is to explore an opposing strategy to lengthening the supply chains through RDC insertion, in order to provide additional comparative and potentially conflicting data on the strategy, and the subsequent impact on inventory and service levels.

## 4.2  Research scope

The scope of the research was limited to South African manufacturing and retail organisations in the fast moving consumer goods industry, with particular relevance to the toiletries, cosmetics, soft drinks and cereal industries. Whilst these industries appeared diverse in nature, they have commonality in the supply chain design and retailer outlets used to get their products to market. It was the author's contention that the added diversity of the manufacturers would not detract from the findings of the research results, but rather enhanced the value and transferability (generalisability) of the findings of this research across the varied industries. "*Transferability refers to whether or not particular findings can be transferred to another similar context or situation, while still preserving the meanings and inferences from the completed study*" (Houghton, Casey, Shaw, & Murphy, 2013).

The reason for limiting the research to the South African fast moving consumer goods industry was due to the author having some understanding of the local market conditions and operations, as well as access to key individuals in this market who would provide valuable insight. It is the author's contention that this would allow the research content to not only have greater depth through access to subject matter experts, but also greater content validity due to the access to relevant and accurate service and cost data.

## 4.3  Population

Phase one data collection for the qualitative study and analysis required a non-probability sampling technique referred to as purposive sampling. This is a type of sampling technique used when the researcher uses his or her own judgement to select the sample members based on a range of possible reasons and premises (Saunders & Lewis, 2012).

In this research, the author interviewed nine senior executives at general manager or director level positions employed at fast moving consumer goods suppliers. The purpose of this was to ascertain from a supplier perspective the perceived tangible and intangible benefits, or constraints, of doing business with retailers using RDCs. In addition, information was sought as to the level of collaboration which exists in the process and to what degree information and decision making is shared.

Similarly, the author interviewed one fast moving consumer goods retail supply chain executive from a leading South African retail chain deemed to be a leading proponent of the RDC model in the country. The purpose of this interview was to get insight into the decisions taken by the retailers to open RDCs and how they believed this aligned effectively with their business strategy.  "*It is probably easier to understand why executives would want to manage their supply chains to the point of consumption, because whoever has the relationship with the end user has the power in the supply chain*" (Lambert & Cooper, 2000).

With this statement in mind, a question asked was specifically why a retailer would vertically integrate upwards into the supply chain, when there appeared to be no unique competitive advantage to be gained from this strategy. Unlike manufacturers who may integrate backwards to secure supply of scarce raw materials, this is not the case for retailers who do not manufacture, and specifically when it is limited to a logistical supply chain solution. The key opportunity here was to understand supply chain collaboration from a retailer's perspective and as such provide a balance to the expert opinion provided in the research itself, particularly when analysing the data and results.

## 4.4  Sampling method

The initial use of purposive and subsequently snowball sampling, a type of sampling in which after the first sample member, subsequent sample members will be identified by earlier sample members (Saunders & Lewis, 2012), was used to access the sample of interviewees from the population of fast moving consumer goods supplier executives in South Africa.

The questionnaires provided to the retailer population was consistent with those asked to suppliers in order to get responses on the same issue for direct comparison and contrast in responses. The choice of the retailer supply chain executive was again purposive sampling as his company are exponents of the RDC business model and does business with the manufacturing organisations I identified for this research. The access to the retailer executives was similarly through snowball sampling as I was referred to the retailer supply chain executives by the supplier organisation's management.

In all cases care was taken with the issue of interviewer bias to ensure that whilst questions were asked in a probing exploratory manner, they were not posed in a leading manner, neither was any collected data ignored which did not correspond with the views held by the interviewer. On the contrary, diversity of responses added depth to the research and discussion, allowing for a more meaningful analysis. Similarly, the interviewer needed to ensure that people at the correct levels of the organisation were identified to answer strategic questions, and that these selected individuals were interviewed in order to get valid data.

The second phase related to information collected from the selected organisation for use in the research. Secondary data sourced from their database was raw quantitative data that needed to be processed into the desired format, so as to allow for comparative and statistical analysis. This data required authorisation from the relevant organisations to be used for the purpose of this research, but provided the necessary relevant information needed to do the stated hypothesis testing.

Secondary data provides the opportunity to access high quality large datasets than could be achieved in the time available for the author to collect (Saunders & Lewis, 2012). This allowed for a broader quantitative analysis to take place, which was important for the causal analysis. For the purpose of this research, the author was able to obtain data for 12 periods prior to the insertion of the RDC and 24 corresponding periods post implementation in order to give a representative sample set size. These data sets needed to reflect the seasonality of the business over these periods for valid comparison purposes.

## 4.5  Process of data analysis

As indicated in the research design section of the study, there were two phases to the research, namely a qualitative questionnaire section and a quantitative secondary data analysis. In both cases the data was prepared and will be presented in chapter five in a manner that ensures consistency and allows for accurate analysis of the data collected.

For the qualitative questionnaire, the data was prepared for suitable analysis and in the process this will allow the author to immerse himself in the data for better understanding (Saunders & Lewis, 2012). Accuracy, layout and consistency of the qualitative research transcripts will be applied prior to qualitative analysis being performed. Being cognisant of any bias present in the information provided and the way it is being read, analysed and interpreted, the researcher looked for patterns in the interview data collected and reported these to provide added depth to the research study.

For the quantitative secondary data analysis, the data was collated into Excel$^{TM}$ spread sheets and arranged in a data matrix format with one column per reading cross referenced against the variable being measured. This was done for each of the three metrics being tested in the hypothesis and the results presented in tabular format. This will allow for statistical data analysis and comparison of the secondary research data before and after the insertion of RDCs.

To test the validity of the results we will perform a single slope directional test as it was asserted for the hypothesis that the insertion of the RDC (the independent variable) had an impact on the order fulfilment or inventory levels. The alternate hypothesis will be some other value contrary to this and that there will be no deviation in the results either way. This would indicate that a single tailed test is required to be performed because the null hypothesis is directional and accordingly, there will be reject areas at one end of the distribution only (Weiers, 2011).

As we are unaware of the standard deviation of our data, and assuming our data is normally distributed, in chapter five we will apply the *t-test* for comparing the means of paired observations. We use the *t-test* for paired observations when we wish to compare the before and after impacts of implementing an independent variable (Weiers, 2011).

## 4.6   Research limitations

The key limitations of this research were the time and finances available to conduct the research which limited the number of respondents and industries contained in the study. This research was limited to within the framework of the scope identified, namely the South African fast moving consumer goods industry, primarily focussed at the make-to-stock business models.

This research also looked only at the impact of local suppliers on local retailers and did not consider the impact of importer supply chains or retailer specific house branded goods. In addition, bias on behalf of the interviewer and respondents needs to be considered when reviewing the study, although all attempts have been made when sampling, analysing and interpreting the results to eliminate such bias. All efforts will be made to eliminate bias from both parties, and the ethical responsibility that a researcher has to protect individual respondent's rights to anonymity (Saunders & Lewis, 2012), may assist respondents to present honest feedback to questions posed to them.

Finally, the availability of the secondary data sample for quantitative analysis would not be sufficient for this to support a quantitative research finding. "*The level of certainty*

*with which you can say it represents your population is dependent on the size of your sample and of your population"* (Saunders & Lewis, 2012). In this research the post implementation data is limited by the date of implementation of the RDC and a sample set of 24 was attainable. This being the case, it is the researcher's belief that the statistical analysis generated did, however, provide valuable supporting insights when analysed with the qualitative research into the effectiveness of the RDCs to deliver against the measured metrics.

# Chapter 5

## 5 Results

### 5.1 Purpose and Outline

The purpose of this chapter is to present the results of the mixed method research undertaken. The first part of the chapter will present the qualitative data obtained from the ten expert interviews conducted and identify the themes and sub-themes which emerged from the sessions. The second part of this chapter will focus on the quantitative analysis which took place in conjunction with the qualitative interviews and present the results of the hypothesis tests which took place.

### 5.2 Qualitative Results

The data will be presented in the same sequence of the interview questionnaires and responses and will focus on the three categories of business strategy, supply chain collaboration and system constraints. Responses will be reflective of the common and extraordinary responses which emerged from the interviews, both of which will add to the breadth of the research itself and limit the impact of researcher bias.

As indicated in chapter 4, ten semi-structured interviews were conducted with industry experts. Their roles in their organisations and interview numbers are tabulated as follows:

Table 1: Interview number and interviewee designations

| Interview Number | Industry Sector | Designations | Company |
|---|---|---|---|
| 1 | Supplier/Manufacturer | General Manager Cosmetic Retail Sales | X |
| 2 | Supplier/Manufacturer | Supply Chain Director - FMCG Cereals | Y |
| 3 | Retailer | DC Business Unit Manager – Retailer | Z |
| 4 | Supplier/Manufacturer | Managing Director - South Africa | X |
| 5 | Supplier/Manufacturer | Logistics Manager - FMCG Beverages | B |
| 6 | Supplier/Manufacturer | Supply Chain Director - Cosmetics Direct Selling | A |
| 7 | Supplier/Manufacturer | General Manager Toiletries Retail Sales | X |
| 8 | Supplier/Manufacturer | Sales Director Toiletries Retail Sales | X |
| 9 | Supplier/Manufacturer | National Sales Manager Toiletries Retail Sales | X |
| 10 | Supplier/Manufacturer | Manufacturing Manager - FMCG Beverages | B |

### 5.2.1   Business Strategy – Supply chain strategy alignment to business strategy and competitiveness

An important element in supply chain strategy is how its' design aligns and supports the business strategy in order to support the success of the business now and in the future. Three of the four supplier/manufacturer companies interviewed all operated as country subsidiaries of global multinational corporations. All three indicated that their supply chain model was guided by a global strategy and adapted to meet the requirements of the local business unit. The fourth indicated that whilst its supply chain had elements of global best practice, as a South African company, they were not required to adapt a first world model to an emerging market and their design was uniquely local.

The key theme that came from the interviews was that supply chain strategy between suppliers and retailers varied by customer requirements based on the design elements incorporated by the retailers and not the suppliers themselves. Retailer's requirements varied from retail distribution centres to direct store deliveries and consultant deliveries for direct selling. The design of the supply chain is not based on internal synergies, but rather external customer requirements and high levels of design flexibility.

A supplier interviewee commented that "*meeting the customer needs requires flexible models",* whilst another remarked that *"retailer supply is reviewed when retailers review their strategies as the strategy is front end and dictated by the retailers and their needs. They hold the power."* The general consensus was that when retailers decided to review their supply chain model effectiveness, if you wanted to do business with that retailer, you had to adapt your methods to suit their design. In many cases this had not only negated the uniqueness of their supply chain and their ability to use it as a competitive advantage, it had also led to warehouse facilities that required resources and design to support multiple supply chain methods and channels.

 Aside from the above review system, there appeared to be very little strategic discussions that took place in the companies aside from the beverage company that had undergone an end to end supply chain strategy shift some three years prior and which had seen the business re-align how they operated throughout the business. This review had yielded them significant service; product throughput and overhead saving in their business model and was now the focus of their continuous improvement initiative and as such subject to regular review and re-alignment.

By not having the RDC supply chain model imposed upon them, the beverage company interviewed indicated how they had been able to adapt their model to one which not only allowed them to create synergies in their operations, but also create value for the customers they delivered to. They had been able to bypass the RDCs not only due to the strength of their brand and market share (they currently supply 76% of the markets soft drink requirements), but also through delivering improved service, reduced inventory holding costs to customers and greater ordering and delivery flexibility.

As commented by the beverage company executive when asked about their supply chain strategy and non-participation in RDCs, he stated *"we have been able to convince customers to drop their inventory, in some cases from 30 days to 2-3 days or their next delivery cycle. This has benefitted the customers greatly, but also allowed our company to get closer to consumption. The strength of the brand is an advantage but even more so is the accessibility of the product to the consumers"*.

The model they effectively adopted does not incorporate the use of the RDCs, but utilises a quick turnaround method at store level which, in some instances, required them to invest in infrastructure at the customer to facilitate their model. The beverage logistics manager interviewed remarked *"Effectively getting products to the consumer can be an advantage that will deter competition. This is very important in preventing smaller brands and new companies getting a foothold and traction in the market place"*.

Two of the four companies interviewed use RDCs in their supply chain models and have been able to incorporate this extension of their supply chain into their supply chain models. However, deficiencies in the RDC model, especially in terms of their ability to speedily launch new products and promotions effectively, has resulted in one of these companies adopting both an RDC and DSD model for the same retailer. One supplier indicated that *"time is an issue with promotions as you need to get to store quickly to align with advertising and support spending"*. He went on to say that with a particular retailer *"the bigger problem is the retailers pulling the stock through to the stores. It is a constant battle to get them to correctly replenish their stores"*.

The retailer interviewee when asked the question as to the role of RDCs explained that the retailer's strategy was to *"move away from direct store deliveries and remove the interaction between multiple stores and suppliers. The new way of thinking is to have key teams liaising with suppliers to deal with issues which may arise from issues, including erratic ordering patterns from the customers"*. He was quick to add, that contrary to supplier's opinion, the retailer was *"not making money at the RDCs, but rather improved gross profits at store levels"* whilst adding that their RDC was a *"flexible model, but relies on the suppliers coming to the party and sharing the costs to get their products to market"*.

All the companies interviewed commented that customer service was critical to their business and product availability was fundamental to this. One supplier interviewee commented *"it is critical to the business to be competitive and effective in the supply chain delivery as it not only gets product on shelves effectively, it also builds relationships with customers that allows us to build brands and sales"* whilst another commented that *"the products are similar, so only the supply chain model and how well it is executed differentiates the companies".* Similarly a third supplier interviewee remarked that *"a problem with being too cost focused and not enough customer focused is declining sales and our on-going supply chain strategy may require we look at how we effectively service the customers".*

In summary, the responses indicated that supply chain strategy was localised and focused on the varied models employed by the retailers. In areas where the retailer's models were deemed ineffective for their business, more diversified methods were developed which added complexity to their own supply chain models. All responded that competitiveness and customer service is critical to the business and the ability to compete on this strategy is sometimes the greatest differentiator between competing companies.

### 5.2.2  Business Strategy – Supply chain design and performance versus expectations

Supply chain design and performance relates the performance of the model versus the expectations. It is important that we gauge the effectiveness of the supply chain design to deliver what it is intended to do. When reviewing this question with the interviewees, all suppliers responded that the motivation behind the design of their supply chain was customer focused and meeting the customer's expectations or requirements to do business. Responses included *"Customer service and having product on shelf as and when the consumers want it"* to *"design relates to the customer models and must be flexible enough to handle multiple models such as direct store deliveries, retailer distribution centres, urban and rural deliveries and exports".*

43

Customer service is viewed as an external focus by the companies and is measured against internal benchmarks and customer targets. In addition to customer service being a drive behind the supply chain design, another element used in the design was cost containment either through providing service to the customers at the lowest cost possible, or cost reductions through limiting the amount of inventory that needed to be carried to service the customers effectively and limiting the impact of lost sales. The interviewee from the beverage company commented that *"supply chain costs were exceeding the consumer price index, and these costs could not be effectively passed onto the consumers. New efficient business models needed to be designed".* Another supplier interviewee said that design "*should be related to cost containment if you have an effective supply chain function, including pick and pack and inventory flows".*

The retailer interviewee, when asked what the motivation was to move to RDCs, listed various benefits to both suppliers and retailers including removal of back door issues which occurred as a result of delivering to over 300 outlets, the reduction of costs to suppliers by doing one bulk drop versus multiple small store DSDs, as well as the ability of the RDCs to do multiple mixed deliveries to each store per week versus the supplier model limited to once per week. This enabled them to improve their response time to out of stock situations and maximise product availability and throughput. He commented that *"this also allows the retailers to have smaller retail outlets or dedicate more store space to actually selling and less to storage as retail floor space is expensive in comparison to warehouse space".*

Whilst most were generally positive about the capability of their supply chains to deliver against their expectations, there were some reservations expressed by those using the RDCs about their ability to supply their stores effectively, specifically in the supply of high value cosmetics products. Comments from suppliers ranged from *"Consumers are becoming more vocal about not having their expectations met by the supply chains and this is coming through in our customer complaints records. How does a customer know what their true consumption is if they don't have stock on shelves? The rate of sales which is limited by the stock availability becomes the new norm. It is a constant battle to get them to correctly replenish their stores".*

In addition, the cereal supplier remarked that to deliver effectively against expectations the relationship requires *"greater collaboration up the supply chain to attain greater results. There is far more collaboration evident between the supplier and their vendors which is supplier led, than there is between suppliers and retailers."*

Conversely, those using the RDC for FMCG toiletries orders, have been very positive about the impact of RDCs in this sector claiming that *"Shoprite DC has worked for the company as there is greater sharing of information than there was prior to the RDC and this has led to better execution and decision making on inventory and sales".* They also remarked that supply chain is a *"key and important area of the business, as the businesses evolve and the customers expect more, so we need to do more to stay ahead and remain a preferred supplier".* The National Sales Manager remarked *"Is it worth being in the Shoprite DC in terms of benefits delivered? Definitely yes as the business to business data supplied gives you stock holding by SKU at the DC and in store. This will tell you the value and the volume of stock and what items are out of stock where so that it can be corrected."*

Those that have employed a direct selling or a DSD model have all remarked on the ability of their supply chain design to flexibly deliver versus expectations. The interviewee from the direct selling company remarked *"The supply chain collaboration with the third party logistics company has particularly delivered well on the model in that it has helped deliveries to remote areas and difficult to reach customers. This has allowed us to reach markets that other companies find hard to reach."* Similarly the beverage company that delivers direct to store remarked *"yes indeed, service levels have improved and as such availability and throughput too. Costs have been contained and the supply chain has been streamlined. Production efficiencies have improved through alignment of staff and effective application of constraint theory and management throughout the supply chain."*

The retailer was emphatic in his response as to whether he believed the RDCs had delivered the benefits their model was designed to. *"Definitely yes, we expedite receiving or deliveries more effectively and there are no double bookings which increases the prospects of effective deliveries. We measure the turnaround times of the suppliers to the DCs and then supply a better outbound service to the stores than*

45

*the suppliers could achieve through DSDs. Stores do not check receipts so this speeds receiving up and stock goes direct to the sales area. The core competency of receiving and handling is at the DCs and not duplicated at each and every store level and this reduces the admin at store level".*

In summary, responses from interviewees around supply chain design were unanimous in their customer centric focus, whilst cognisant of the need to be mindful of the cost impact of the design. Whilst most were satisfied that the supply chain design was delivering what it was intended to do, there were sectors that felt that the responsiveness of the RDCs to ensure that stock availability at store level was always maintained, was not always well managed and not only led to consumer dissatisfaction, but also impacted on consumption numbers. In contrast the retailer listed numerous benefits of the RDC model, whilst those using other models expressed their satisfaction in delivering good service to the customers effectively.

### 5.2.3   Supply Chain Collaboration – Collaboration in the supply chain strategy and design, and sharing of benefits.

The interview feedback on supply chain collaboration delivered mixed feedback from the sample group. The toiletries interviewees were united in believing that the RDC model had delivered added benefits in terms of information flows and building customer relationships vital to securing deals and store promotions as a result of greater collaboration and discussion on these issues. The Sales director commented that *"the business model needs to be collaborative with your customers otherwise you will not have an effective business model at all"* and further that *"you need the right resources and skills to be fully collaborative. The company (supplier) currently lacks a qualified logistics expert who can talk strategy and supply chain design with the customers".*

Not all however shared this sentiment with the interviewee from the cereal supplier saying "*In the United States  there is free sharing of data to allow the suppliers to provide a better service and remove "friction points" or constraints. In South Africa you pay for the data – weekly and it is not freely shared".* Similarly, the managing director remarked *"It's all about transparency of information and until this country has this as*

46

*part of the culture between retailers and suppliers, we are never going to get it right. Clicks will be opening a Gauteng DC for cosmetics and we were advised of this in passing without them explaining to the supplier what this means for them".* He went on to add that this was not only a lack of transparency due to the lack of engagement, but also an indictment as to how business is done. *"The first thing a supplier looks at is how much this will cost us instead of asking what this will do to service levels, which is sad and a missed opportunity".*

All the suppliers working through RDCs were united in commenting that there was little if any collaboration and discussion between retailers and suppliers when it came to supply chain strategy and design. One interviewee remarked *"there is no collaboration in the design of the supply chain. When retailers choose to change their model it's for internal reasons and generally cost motivated."* Another remarked *"there are no discussions over supply chain or warehouse design between retailers and suppliers. By the time you are across the table the warehouse and models are in place already".*

Even the toiletries interviewees remarked that there was *"room for improvement to take place especially at design level and partnerships"* and that collaborative decision making was *"limited in terms of how they interact with the customers and in terms of how the supply chain strategy is designed".*

When asked the same question on supply chain collaboration, the retailer interviewee responded *"yes, there is some with suppliers who are responsible."* When asked to expand on this in terms of visibility of the stock holding at the DC and store levels to facilitate better inventory management by the supplier, he responded by saying *"We have erratic store orders due to erratic consumer ordering patterns which does not facilitate aggressive inventory cutting levels to allow for these flows. We can cut in the chain, but we can calculate service impact to on shelf availability and the trade-off between inventory levels and service levels."*

In terms of shared benefits in the RDC supply chain, suppliers were again united in saying that benefits from the supply chain design were not shared equally amongst participants. Financial savings from streamlining supplier operations and moving from DSDs to RDCs were passed onto the retailers by the suppliers in the form of a DC

allowance percentage based on the savings gained and reflected as a percentage of sales delivered. In contrast the savings at the stores as a result of the streamlined operation were not brought to the table and were kept by the retailers.

One interviewee remarked *"No, I don't believe that savings are shared. The company that gets the savings tries to keep them or uses them to leverage additional terms i.e. if I pay a higher RDC allowance it must be linked to higher sales targets so that we can get some benefit as a supplier".* Yet another commented that upon entering the RDC, *"we negotiated strongly, else it could have been a lot worse and heavily weighted in their favour which is the route they initially wanted to follow",* and further remarked that the RDCs were viewed as *"another profit centre for the retailer as opposed to a strategy to deliver product effectively to the store".*

The managing director was clear in his belief that RDCs become more efficient as DSDs become less attractive, but when looking at moving into an RDC, *"you need to be in a position to know where you can win or lose."* Suppliers indicated that reverse logistics costs, shortages and delivery costs to stores were certainly removed when going RDC, and not all these savings were passed onto the retailer.

In summary, there was a mixed response to the issue of supply chain collaboration with several indicating that it had improved in certain areas of execution, but not in the areas of strategy and supply chain design. Those companies that did not participate in RDCs appeared to have supply chain collaboration both upstream and downstream in the supply chain in the form of vendor partnerships, third party logistics agreements, sub-contractor manufacturing and the use of owner drivers to handle deliveries. All of these were aimed at getting product to the consumers in the most effective and efficient way. The concerns raised by those using RDCs was not only the collaboration opportunities in terms of how and where the RDCs will be implemented, but also how effective the link was between the RDCs and the stores themselves in supplying stock for consumption on shelf.

### 5.2.4 Supply Chain Collaboration – Types of supply chain collaboration used between suppliers and RDCs

Areas of supply chain collaboration reviewed for effectiveness primarily centered on the areas of demand planning and inventory management, information sharing and shared metrics and shared investments in infrastructure and technology. Of particular interest was the openness and access to shared information for the purpose of enhanced service delivery and decision making in the supply chain.

As one supplier interviewed remarked "*communication is key not only within but also between companies*" whilst another indicated that the sharing of information "*varies considerably by retailer*". She went on to say that "*some retailers view information as a loss of competitive advantage and use it as a means to keep suppliers on the back foot or as a revenue generation tool*". In fact all suppliers indicated that whilst there had been a vast improvement in information sharing over the years, and useful information was emerging from RDCs in terms of inventory and sell through data, it was still far short of what was seen in the United States and in many cases, current data came at a high price. Business to business data was usually available for free, but historical in nature. Consumption data came at a price. As the supplier national sales manager commented "*relationships have to develop and information sharing needs to take place for the chain to be more competitive*".

Certainly those multinationals that compared their experiences with Walmart in the United States to that with local retailers commented that with Walmart "*It is completely transparent, with a seamless and collaborative relationship and parties freely sharing information. This allows our company to better forecast what the stock levels need to be going forward too, particularly on replenishment of core items.*" The cereals manufacturer reflected that unlike the United States where there was free sharing of data, in South Africa you pay for data. "*Increasing Walmart presence in Africa may see this competitive practice come into the market*".

An example of the different levels of collaboration by retailer and product category was in the toiletry suppliers indicating "*the Spar data is nice because it is drilled down by store, so if you do a launch you can see exactly who has and who has not listed the*

49

*products launched. This becomes an opportunity to drill into each door and focus on that door and is a tool that is useful to be used to focus and grow the business at consumption level"*. Whilst the cosmetic suppliers indicated that *"others that shared data willingly and beyond the call of duty ended up having better growth and better results than those who don't share".*

In the area of demand planning and inventory collaboration, there appeared to be little relevant collaboration between suppliers and retailers here. Even the toiletries suppliers who had seen the greater levels of information collaboration indicated *"no, retailers do not provide a forecast of their demand requirements. They do discuss it but I do not believe they are geared up to give by SKU, by month forecasts of what they project they will sell."* The cosmetics suppliers interviewed remarked to this question *"no, and this is a real lost opportunity. The data is historical and not real time or current. If there was collaboration we would pick up anomalies quicker which would allow us to manage and react quicker".*

The beverage supplier when asked if there is inventory and demand planning collaboration with retailers commented *"not with customers, but yes there is within the divisions in the company including operations and sales".* The model that the beverage suppliers have adopted is lower inventory with high levels of manufacturing and supply flexibility to react to the market needs and changing forecast levels. In fact the production plan can change daily to react to changes in market demands and they believe the long term view of a forecast is inaccurate in supplying customer demand requirements. *"Flexibility is required to meet market needs and the high impacts not only of seasonality but even of a hot weekend or a very hot day on affecting availability in the trade and by association, the scheduled production".* This approach has had a major impact on their supply chain design and response to forecast variations. They had experienced that even forecasting only one week out had delivered only 65% forecast accuracies, so the shorter the forecast period, the closer they were to the actual rate of consumption and the better their ability to supply to demand. At these levels they are practically making to order, and as such their ability to supply to meet demand is a lot higher and is clearly reflected in their service levels

.

All suppliers indicated both internal metrics and shared metrics when measuring service levels. These typically focused on order fulfilment, lost sales and on-time deliveries, but excluded any metrics on costs. Suppliers viewed these metrics as an indicator of meeting customer requirements, but also as an opportunity to benchmark their supply chain. "*Metrics allow for benchmarking versus retailer standards and expectations as well as competitors performance. Is your supply chain delivering a competitive advantage?*" A concern for the cosmetics general manager was the lack of metrics being provided by retailers as to service levels between RDCs and stores with a major perception being "*RDCs have slowed service in the cosmetics market despite the belief that there are benefits to be had. We are struggling to see the service benefits as RDCs ended up adding on time to market and inefficiencies, through lack of experienced personnel required to manage a complex business model. Cosmetics are a lot more difficult to manage than FMCG models*".

There were no examples of collaboration between suppliers and retailers in terms of joint investments in either infrastructure or technology at RDC levels or otherwise. In contrast, the beverage company had indicated that they had invested in building delivery dock-levelers at store back doors to facilitate their deliveries and reduce delivery turnaround times.

In summary, information sharing is taking place at differing levels between suppliers and retailers but it is limited, mainly historical in nature and frequently comes at a price. The information sharing has improved, but there is still much room for improvement with indications that high levels of sharing are delivering better growth results. There is limited collaboration beyond this in areas such as demand planning, inventory, technology or infrastructure investment and local practices clearly lag behind collaboration practices taking place globally.

### 5.2.5 Supply chain constraints – The impact of RDCs on supply chain effectiveness

The purpose of this section of the interview was to acquire and explore the perceptions of the experts interviewed as to the contribution of RDCs to supply chain effectiveness. To expand on this, do suppliers and retailers believe that RDCs add value to the supply

51

chain through improving service, or are they believed to be of little value add and a duplication of what is in place and an extra cost.

The retailer interviewee was adamant that RDCs do add value to suppliers and consumers alike. He commented that *"supplier sales do increase after the insertion of an RDC due to stock availability. RDCs order more regularly from suppliers in larger quantities, share joint forecasts and collaborate with suppliers to improve on shelf availability versus their competitors."*

The cosmetics supplier commented that *"theoretically the RDCs allow the retailers to do more frequent, smaller drops to the store which should allow for improved throughput of inventory. However, if the supplier is already performing this function effectively, then this could be duplication and there would be no benefits. The RDCs were intended to manage inventory availability more effectively; however this was not always visible on shelf."*

A common thread that emerged from all interviews with those participating in RDCs, however, is that a well-run RDC can enhance the business if it is managed effectively. Interviewees remarked that *"If well run a RDC can help a business, if not it's a problem. In one retailer, you want to be in the RDC as the alternative of DSD is a worse option".* The cereal supplier commented that *"In emerging markets, being largely untapped, we don't see the same benefits from RDC as you would in the United States. The challenge in South Africa is that there is a lack of understanding of the business impact, or a lack of understanding of the data emerging that is being analysed. There is no desire to help the business overall and in South Africa it's just seen as an added cost that needs to be managed correctly".*

One of the multinational supplier's concerns about the RDCs was not so much the models used, as much as how they were being implemented and managed. *"The talent pool in South Africa is low and this can result in not only poor decision making but also poor implementation and a lack of understanding as to what they are doing. This can knock a retailer back 18 months or so which significantly affects the entire chain."* Even the retailer admitted that *"this RDC has good people to run the operation, however a poorly managed RDC can cripple a supplier"*

*"Benefits accrue to the retailer not the end consumer in terms of how they manage their supply chain loop and consolidated store deliveries. There are perceived zero benefits from a consumer perspective, it may even be negative when you look at longer lead times",* the cosmetics supplier remarked. *"If it works well it can add value to the consumer in that stock is available at the right place, right price and at the right time. Retailers can service each outlet daily from the RDC which the suppliers would find difficult to do"* remarked another supplier.

When asked the question as to how often the suppliers and retailers evaluate the RDC models used for effectiveness against other potential models, the suppliers responded that limited dialogue takes place on this, and that which does is not collaborative and is supplier initiated. *"As a supplier we do share information from the global organisation and what best practices happen elsewhere. The retailer did apply a lot of the recommendations we brought to the table, but they are still not specialists in this business model and could have outsourced effectively".*

The main theme emerging from this area was that RDCs are only perceived to add value to the consumer if they are effectively managed and place stock on-shelf for consumers to buy where and when they want it. By doing this they can effectively assist in driving consumption and throughput. That said, the cosmetics suppliers believe that RDCs are merely a duplication of what worked effectively before, whilst the toiletries and cereals supplier believe there was value to be had if they were well managed as they believed it was difficult for consumers to feel any value added benefits from the service. A concern arose surrounding the skills levels and talent pool in South Africa available to deliver on the purpose of RDCs. It raised valid concerns about the RDCs capability to add value to the supply chain or just become a constraint and adversely affect the profitability potential of the supply chain.

## 5.3 Quantitative Results

This section will present and explain the quantitative results from the secondary data collected with the aim of providing additional insights into the effectiveness of the RDC model implemented to deliver enhanced supply chain competitiveness. The statistical analysis hopes to answer the questions related to:

- The impact of RDCs on supplier order fulfilment levels
- The impact of RDCs on supplier lost sales
- The impact of RDCs on inventory levels

The data collected and analysed reflects the transactions initially between retailer and supplier stores (Year 0) and subsequent years operating through the RDC (Years 1 and 2). The data also reflects the impact of RDCs in a Cosmetics industry supply chain.

### 5.3.1 Data Cleaning

The data collected was of very good quality as the data sets were collected directly from a supplier database. There were no missing data fields for the 108 samples collected and upon review there appeared to be no abnormalities in the data that may distort the results.

### 5.3.2 Descriptive Statistics for the data

The descriptive statistics presented were calculated using Stats Tools 6 and focused on each of the three metrics selected independently. The following table summarises the results for each of the data sets:

Table 2: Data Sets Summary Statistics

| Metric | Period | N | Mean | Standard Deviation | Mean Abs. Deviation | Min | Max |
|---|---|---|---|---|---|---|---|
| Order Fulfilment Units % | Year 0 | 12 | 0.89394 | 0.03966 | 0.02935 | 0.81385 | 0.93027 |
| | Year 1 | 12 | 0.91369 | 0.03855 | 0.03168 | 0.84173 | 0.95803 |
| | Year 2 | 12 | 0.90289 | 0.04069 | 0.03151 | 0.82783 | 0.95036 |
| Lost Sales R's % | Year 0 | 12 | 0.11025 | 0.0484 | 0.03414 | 0.06233 | 0.2064 |
| | Year 1 | 12 | 0.0978 | 0.04789 | 0.03804 | 0.04389 | 0.18413 |
| | Year 2 | 12 | 0.0861 | 0.02417 | 0.01847 | 0.04693 | 0.12663 |
| Inventory Levels | Period 1 | 34 | 2366775 | 922714 | 711220 | 839686 | 4749463 |
| | Period 2 | 34 | 2743307 | 1069510 | 824369 | 973273 | 5505060 |

The above data table reflects the characteristics of the sample sets for base year $Y_0$ which represents the 12 month period prior to the insertion of the RDC, and the periods $Y_1$ and $Y_2$ for the subsequent two 12 month periods after the move into the RDC. For the inventory levels data set, this represents the data analysed when applying the inventory models pre and post the insertion of the RDC to the cost of goods value of the inventory sold to this retailer over a 34 month period. These two models are then analysed to determine the impact on theoretical inventory levels required to sustain this model and sales levels.

### 5.3.2.1    The impact of RDCs on supplier order fulfilment levels

The hypothesis tested was:

$H_0$: Percentage change in unit order fulfilment levels year on year after inserting RDC ≥ 0 when comparing the change in means for the two paired sample sets.

$H_1$: Percentage change in unit order fulfilment levels year on year after inserting RDC < 0 when comparing the change in means for the two paired sample sets.

The results of the Hypothesis testing comparing base year $Y_0$ to $Y_1$ and $Y_2$ were as follows:

Table 3: Statistical test results for Hypothesis tests for order fulfilment levels

| Period | Degrees of freedom | Sample Mean | Sample Standard Deviation | t-Test Statistic | p-Value (Single tail) | 95% Confidence interval values | | Reject Null Hypothesis at 95% confidence? |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper | |
| Year 0 versus Year 1 | 11 | -0.0197 | 0.0624 | -1.0957 | 0.8517 | -0.0594 | 0.0199 | Don't Reject |
| Year 0 versus Year 2 | 11 | -0.0089 | 0.0387 | -0.8 | 0.7797 | -0.0336 | 0.1567 | Don't Reject |

The above table reflects the test results conducted on paired sample means. From these results we can see that at the 95% confidence levels, the t-Test value is greater than the t-Crit value calculated for 11 degrees of freedom, which amounted to -1.796. In addition, the p-Value obtained is greater than the 0.05 test value used and as a result of both of these tests; there is not sufficient evidence to reject the null hypothesis $H_0$.

We can thus accept $H_0$ and make the statement that after the insertion of RDCs, order fulfilment levels between the supplier and the RDC was better than the order fulfilment levels between supplier and stores directly for that same retailer.

### 5.3.2.2   The impact of RDCs on lost sales values

$H_0$: Percentage change in Rand lost sales after inserting RDC ≤ 0 when comparing the change in means for the two paired sample sets.
$H_1$: Percentage change in Rand lost sales after inserting RDC > 0 when comparing the change in means for the two paired sample sets.

The results of the Hypothesis testing comparing base year $Y_0$ to $Y_1$ and $Y_2$ were as follows:

Table 4: Statistical test results for Hypothesis tests for lost sales

| Period | Degrees of freedom | Sample Mean | Sample Standard Deviation | t-Test Statistic | p-Value (Single tail) | 95% Confidence interval values | | Reject Null Hypothesis at 95% confidence? |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper | |
| Year 0 versus Year 1 | 11 | -0.0132 | 0.0774 | -0.589 | 0.7161 | -0.0624 | 0.0360 | Don't Reject |
| Year 0 versus Year 2 | 11 | 0.0241 | 0.0439 | -1.906 | 0.9584 | -0.0520 | 0.0037 | Don't Reject |

The above table reflects the test results conducted on paired sample means. Similar to the prior test results, from the p-Value and t-Test statistics achieved, we can determine that there is not sufficient evidence to reject the null hypothesis $H_0$.

We can thus accept $H_0$ and make the statement that after the insertion of RDCs, the percentage change in lost sales value was favourable and the RDC had a favourable impact on lost sales percentage between the supplier and retailer measured as opposed to when the supplier delivered directly to store.

### 5.3.2.3    The impact of RDCs on inventory levels in the supply chain

$H_0$: Percentage change in inventory levels after inserting RDC ≤ 0 when comparing two data sets applying the old inventory holding model and the new to the same time period.

$H_1$: Percentage change in inventory levels after inserting RDC > 0 0 when comparing two data sets applying the old inventory holding model and the new to the same time period. The results of the Hypothesis testing applying the old versus the new inventory models on the same base data group were as follows:

Table 5: Statistical test results for Hypothesis tests for Inventory levels

| Data Set | Degrees of freedom | Sample Mean | Sample Standard Deviation | t-Test Statistic | p-Value (Single tail) | 95% Confidence interval values | | Reject Null Hypothesis at 95% confidence? |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | | | Lower | Upper | |
| Old v New | 33 | 376532 | 146795.5 | -14.96 | <0.0001 | -427752 | -325313 | Reject |

The above table reflects the test results conducted on the paired sample means for inventory levels, using the inventory models used prior to and post the implementation of the RDC. From these results we can see that the t-Test value achieved is less than the t-Crit value calculated for 33 degrees of freedom, which amounted to -1.692. In addition, the p-Value obtained of <0.0001 is less than the 0.05 test value used and thus at the 95% confidence levels, there is sufficient evidence to reject the null hypothesis $H_0$.

We can thus reject $H_0$ and make the statement that after the insertion of RDCs, the average growth in inventory levels was positive and the insertion of RDC had an unfavourable impact on inventory levels held within the supplier and retailer supply chain, as opposed to the previous model used when delivering direct to store.

## 5.4 Chapter Summary

Chapter five has presented the results of the mixed-methods research conducted from both the qualitative interview and the quantitative secondary data collected. Statistical tests were conducted on the secondary data in order to provide a more detailed analysis opportunity based on actual results attained. Chapter 6 will provide discussion and analysis of these results.

# Chapter 6

# 6 Discussion of results

## 6.1 Purpose and outline

The purpose of this chapter is to discuss and analyse the results obtained and recorded in Chapter 5 using the literature reviewed in Chapter 2 as a filter through which to interpret these results. Here we will examine both the qualitative research questions and the quantitative hypotheses, exploring each in turn in the context of developing a greater understanding of supply chain competitiveness and how it is applied within the scope of this research.

## 6.2 Qualitative results analysis

### 6.2.1 Business strategy – Supply chain strategy alignment to business strategy and competitiveness

In Chapter 1, the introduction to our research problem, we introduced research from the Barloworld Logistics survey which indicated that one of the key results emerging from the survey indicated that executives believed there was a greater need to align supply chain strategy to business strategy and potentially use supply chain strategy as a competitive advantage. The findings from this research would suggest that supply chain strategy employed was primarily aligned with the company's business strategy, but where the company was a global entity with a global strategy, the supply chain design was not always aligned with local market customer needs. Focus was in some cases placed on global sourcing, efficiencies and productivity measures and not directly focused on servicing local customer and consumer needs effectively.

This required local companies to attempt to align with a global supply chain model, whilst responding to the flexible supply chain requirements of local customers which did not always prove effective. In addition, much of the power in the South African market as defined in Porter's five forces model, lies with the buyers or retailers and as such the research revealed supply chains were not fully optimised to provide the most

59

competitive service at the most competitive cost. The tangible benefits referred to by Mathumaramaytha (2011) are not being fully realised by suppliers in this market due to the mixed supply chain models they are required to develop, in addition to the retailers' business models being imposed upon them as a result of the imbalance of power retailers wield in the decision making process.

An element of concern which arose from the research findings was the limited strategic supply chain discussion which took place in the supplier companies reviewed. This was not only limited within the companies themselves, but almost non-existent between suppliers and retailers when it came to supply chain design. This resulted in some of the suppliers remarking, that product availability at store levels had worsened and that the product replenishment practices and strategies employed by the retailers had been detrimental to their business.

A further element had been the reduction in the ability to use logistics as an effective competitive advantage as a consequence of the RDCs standardising how the supply chains operated and in effect applying very similar models to all suppliers. Whilst the retailer interviewee was quick to point out that RDCs were not money making initiatives, many of the suppliers interviewed still viewed them as such and it was clear that the beverage company and the direct selling cosmetics company who had been able to design and implement their own end to end supply chain, had delivered the most innovative and effective supply chains in the research.

The manufacturing manager of the beverage company was clear when he commented that their "*business strategy was to make money, and if that meant doubling profit by halving the price and quadrupling the volume, then we will do it"*. He further went on to say that the company objective *"is to become the premier customer service and marketing company in South Africa"* and he was adamant that this could only be achieved if they had full design and control on the depth and breadth to which they supplied their product. To this end they believed they had been able to achieve just this and the results achieved supported this assertion.

He also shared a decision that was made in a previous FMCG multinational he worked at, where the advent of RDCs and increased presence of wholesaler distributors had

60

greatly limited their ability to use their logistics to differentiate themselves from the competition. He remarked that "*At my time at a previous company, the decision was made to outsource their distribution to a third party logistics company as the advent of RDCs and the use of wholesalers meant that there was not enough competitive advantage afforded by doing the distribution in-house. Collaboration with the third party logistics company was the preferred model used.*"

### 6.2.2 Business strategy – Supply chain design and performance versus expectations

It was evident from the interviews conducted, that those suppliers who had greater control of the design and execution of their end to end supply chain, were happier that it delivered upon the expected results. Those that went through the RDCs had major concerns surrounding how the link between the RDC and the stores operated and the ability to ensure that product was within reach of the consumers at all times. In addition the lack of transparency that existed meant that there was clearly frustration in understanding how to improve the situation and deliver improved sustainable results. The availability on shelf meant that the "*threat of substitutes*" referred to by Porter was a real issue in this industry as many suppliers commented that if their product wasn't on hand, consumers would have an alternative which they would purchase. Rivalry in the FMCG and cosmetics markets is high and the absence of product could potentially lead to long term lost consumers that had been expensive to acquire through sales and marketing efforts in the first place. "*For retailers, the most important loss is when the shopper decides to buy the product out-of-stock from another retailer. For the manufacturer, the most significant loss is when the consumer decides to substitute the out-of-stock product with one from a competitors' brand. In both cases the loss is due to the fact that the supply chain has been unable to satisfy the needs of the customer*" (Ettouzani, Yates, & Mena, 2012, p. 214)*.*

Research conducted by Ettouzani, Yates, and Mena (2012) looking at OSA in the United Kingdom established that between two-thirds and three-quarters of out-of-stocks have their causes in stores with only the remaining balance being attributed to the upstream supply chain. Their research indicated that the top two themes that

resulted in out-of –stocks were demand fluctuation and forecasting, communication and collaboration, which were seen to being key barriers to improved OSA.

What emerged from the interviews of those who were in the RDCs, was a belief that their supply chain was less competitive than it had been prior to the insertion of RDCs, primarily because the supply chain models used currently are duplicated by their competitors who are required by retailers to follow the same models. One supplier remarked that previously, the logistics function of the company had certainly been a competitive advantage in terms of short order cycle times, faster throughput and cost management. The RDCs negated this advantage not only through the standardisation of the retailer's model imposed on the suppliers, or the commingling of competitors products being delivered between the RDC and stores, but also the RDC fee that was charged to each supplier to use the facility. Most suppliers indicated that they were looking upstream to their vendors to look at ways to effectively collaborate and create value in the supply chain, and that the vendors were enthusiastic in participating.

In contrast the suppliers using DSD models reflected upon how their supply chain had allowed them to deliver upon the design expectations of the chain itself. Through design and execution from vendor to consumer, and being able to effectively control the route to customer and the market itself, growth was achieved a lot faster. A supplier commented "*if you can control the market, then you grow a lot faster. This is because we have the ability to control how a product is priced, presented and understand what the end customer is buying and are thus able to service them more effectively. The moment you deal with a wholesaler or a RDC, you lose visibility of this*".

He went on to add when probed on why they opted not to work through a RDC that, "*if your supply chain is supposed to be a barrier to competition, what barrier does going through an RDC present? Going through the RDC means that the barriers are low, whereas when you control the route to market in terms of the service you provide, you make it difficult for somebody to replicate or fight on this level*".

Soosay et al. (2008) indicated that collaboration should be innovative and allow for the joint acquisition of knowledge and capabilities and yet, from the discussions which took place, there was not a large amount of evidence of this aside from what emerged from

62

the toiletries company. They admittedly came from low a collaboration base when contrasted to the practices employed in the United States and as such, the gains had made it easier for them to do business, but relative to other practices they were still unable to react timeously to changes in consumer demands without holding a significant inventory buffer at both supplier level and in the RDCs.

In the literature reviewed Lua (2012) wrote that flexibility and adaptability are seen to be increasingly important in an environment of high demand uncertainty and yet, the insertion of an RDC reduces the flexibility as it not only increases the cycle time of inventory to market requiring that demand is forecast further out, it also increases the uncertainty overall as a result of the action taken at the RDC. Most of the suppliers interviewed claimed that their design needed to be flexible to meet consumer needs and yet, they did not believe that this was being delivered by the RDCs. Consequently, those who were operating through the RDCs did not believe they were fully delivering on their expectations.

The beverage manufacturing manager summed it up effectively when he stated that "*the best space you can be in is where your core competency is your competitive advantage, and if it is not, you need to make it that way"*. Supply chain for them not only became a core competency, it has become a barrier to entry for other competitors entering and competing in the industry.

### 6.2.3  Supply chain collaboration – Collaboration in the supply chain strategy and design and the sharing of benefits

From the literature reviewed typical collaboration types include customer relationship management, demand planning and forecasting, demand replenishment systems and shared distribution (Barratt, 2004). Whilst some of the suppliers interviewed reflected upon increased levels of supply chain collaboration in terms of inventory and sales information flows, there still remained large gaps in information flows and transparency of actions between suppliers and retailers to affect this optimally. Several of the suppliers reflected upon lack of skills both within their organisations and the retailer's organisations, that were required to effectively collaborate, and the retailer referred to a

63

lack of trust in the process that prevented them from providing free access to information and real time data.

A supplier remarked on this matter that it appears there is a lack of trust only when information was required to be freely shared, but when it was paid for, this was no longer an issue. This type of behaviour fuelled the speculation by the suppliers that the RDCs were there to make profit first and add value to the supply chain second. It was clear from the interviews that there was little, if any, consultation between retailers and suppliers when supply chain design choices were made, but this was more evident when it came to working out how suppliers would operate within the models and what fees they would pay.

In our literature we read that there are practical real word examples of how supply chain collaboration brings benefits for all participating members. In the interviews themselves, one particular supplier responded that where there was information sharing, those retailers have displayed better growth patterns than those who did not. Yet despite the obvious benefits of collaboration, suppliers were adamant that collaboration was at best limited with room for improvement and were united in saying that there was not an equal sharing of benefits. Savings made by suppliers as result of the new operations were passed on to the retailers in the form of RDC allowances, and those savings made by retailers due to efficiencies and synergies were not brought to the table.

Effective forms of collaboration which include strategic alliances, virtual collaboration and vertical integration appeared to have gaps in their design which limited their effectiveness and indeed, the collaboration appeared to be more facility based in the structure of the RDC, than the actual performance of the supply chain design as a whole. Certainly, the capacity to do multiple weekly drops from the RDC to the stores, which should have provided a rapid response to erratic consumer buying, was believed not to have delivered effectively and was evident by the frequent empty shelves reported by the interviewees, particularly in the cosmetics industry. The frustration was greater when it was unknown whether this was as a result of a system parameter, a manual transaction or buyer behaviour which limited the flow of inventory through the supply chain effectively.

Effective supply chain collaboration allows companies to "*leverage each other on an operational basis so that together they perform better than separately*" (Coyle, Langley Jr, Gibson, Novack, & Bardi, 2009, p. 116). The benefits achieved by the chain as a whole should be greater than the sum of the benefits of the individual firms. Whilst some benefits had been evident in some company models, the overall belief from the suppliers was that this was not fully recognised and could be greatly improved upon with greater levels of transparency and information sharing.

Coyle et al. (2009) wrote that "*companies can share plans and provide mutual visibility that causes them to change behaviour".* All the suppliers were consistent in saying that there wasn't mutual visibility in the relationships with their retailers and that this limited their ability to modify and adapt their business models accordingly. As a result, most felt that with more real time information flows on inventory levels and consumption patterns at the retailers, they would not only be more flexible in their service levels, but also have the ability to adjust their inventory holdings accordingly.

In contrast to this the beverage company that had greater visibility of their supply chain, ensured that the flexibility this model allowed enabled them to exploit weaknesses at certain times of  the year and maximise strengths. The supply chain initiatives which allowed them this greater visibility and access to consumers had been initiated to improve costs, but more importantly improve customer service.

It was evident from the interviews that the collaboration efforts were not fully realising the benefits which they could have throughout the supply chain. At the heart of this are companies negotiating to secure as much benefit for the individual companies themselves, rather than the chain as a whole. Those companies with greater power levels were designing the supply chains and by all accounts keeping most of the rewards for themselves. It was also evident from the interviews that the greater share of the power is with the retailers and this was typified by the statement from a supplier who commented that supplying the RDC "*has become a condition of doing business with the retailer".*

### 6.2.4 Supply chain collaboration – Types of supply chain collaboration used between suppliers and RDCs

It was evident from the research interviews that took place that there was little evidence of effective supply chain collaboration taking place when viewed from a context of information sharing, inventory, demand management and shared investments. "*In traditional supply chain inventory management, orders are the only information firms exchange, but information technology now allows firms to share demand and inventory data quickly and inexpensively*" (Cachon & Fisher, 2000, p. 1032). Where information was shared, it was either sold to suppliers by retailers, or historical data that had little foresight as to what was projected to happen in the retailers business.

The comment that the sharing of information "*varies considerably by retailer",* was carried through in the responses from the different suppliers. The toiletries suppliers saw the information supplied by one retailer as an opportunity for them to evaluate performances of individual stores as regards promotional programs, or regular business performance by stock keep unit, which allowed them an opportunity to analyse and remedy the issue with the store manager. Even though the data was historical, it was deemed that receiving this information from the RDC provided a platform for analysis that was not available when doing business at store level.

This view was echoed by the cereal supplier who commented that whilst the consumption data came at a price, there was some measure of benefit in analysing this information and correcting behaviours, but that more was needed to be done and greater levels of transparency and information sharing was needed to improve supply chain effectiveness.

In terms of sharing a demand forecast, there was little evidence of this taking place aside from retailers making historical consumption numbers available. It posed the question as to whether the retailers themselves had the technology in place to project their demand forecast down to stock keep unit levels, or whether they were unwilling to share their projections as they were unwilling to be locked into sales targets. The absence of a forecast provided retailers with the ability to order as much or as little as they wished and as commented by one supplier, had in the past pushed them into an

66

out of stock situation when they had greatly exceeded their projected sales for the retailer.

The cosmetic retailer interviewed acknowledged that in the few instances where data was shared freely with a retailer, better growth and results were evident. This phenomenon is supported by a study conducted by Cachon & Fisher (2000), when comparing the results of companies who did not share information to those that had a full information sharing policy, the supply chain costs were on average 2.2% lower on the full information policy firms than the traditional non sharing firms, with as much as a 12.1% difference recorded. Full information policy was characterised as providing the suppliers with data to improve their order quantity decisions and to improve their alllocation decisions. In addition to reducing supply chain costs, the study also showed that lead times were cut and costs reduced by nearly 21% on average and cutting batches in half reduced costs by a further 22% on average.

The beverage company indicated that the DSD method used allowed them to gather their own data which was used to support supply chain design and collaboration. They had effectively altered the supply chain design by negotiating dock levellers and improving turnaround time at certain key clientele and this had aided them in reducing their fleet size and doing multiple trips per vehicle. In addition they had closed down many of their own dry depots and "*leaned out"* their supply chain so that they were responsive to current consumption patterns. The results had been impressive to say the least with the manufaturing manager commenting "*with inventory at 21 days we had 13% out of stocks, now we are running at 3.5 days cover and our out of stocks are 0.3%. DC models are the wrong models to apply as they increase cycle times and as such increase inventory"*.

The examples of collaboration were limited to some information sharing in the form of historical consumption data and sell-in data from the RDC to the stores on the toiletries business. There was however little, if any,  forward looking data and very little evidence of sharing of  technology aside from some internet portal sites that allowed for data downloads and no evidence of shared investments between the RDCs and suppliers. Only the beverage company through investment in building dock levellers at customers, showed evidence of any infrastructure investment.

A trend emerging from this research is that information and technology sharing between retailers to supplier is far more prevalent globally from the literature reviewed than is evident in the population reviewed in South Africa. Comments from supplier interviewees that are part of multinational organisations with operations in the United States reveal that the information flow is seamless and the inventory holdings and sales performances are transparant with traceability right to the till. Walmart who have entered the South African markets are deemed to be experts in this exchange of information flow and of Consignment Vendor Managed Inventory (CVMI). CVMI is defined as a modifcation of the Vendor Managed Inventory model and was implemented by Walmart in the United States. "*This is a modification of VMI in which the supplier makes stock levels decisions and owns the goods until they are sold. By doing so Walmart only "owns" the goods for a brief moment in time as the goods are passing through the check-out barcode gun*" (Lee & Chu, 2005, p. 159) .

This model applied by Walmart, by design, requires greater integration, information sharing and collaboration for it to work effectively. It is far more integrated than what is evident from this research in South Africa, and allows the supplier to connect more closely with the consumers than they are currently able to do, and in doing so design their supply chain strategies to align with the consumer requirements. The benefit for the retailer is the limited ownership of the inventory and the positive impact on cash flow, and added to the positive gains for the supplier, the net sum of the gain throughout the supply chain would appear to be favourable.

Finally the interview responses, in particular those of the cosmetics suppliers, indicated that suppliers had been exposed to inventory impact of the bullwhip effect. They believed that with the addition of the RDC and the amplified signal emerging from this link, the overreaction to changes in demand signals had been amplified to the efffect that by the time demand had reverted to a normal pattern, there had been a significant build up of inventory in the supplier warehouse which incurred a significant carrying cost and a subsequent slowdown of future orders to suppliers. This was particularly evident with new product launches.

### 6.2.5   Supply chain constraints -  The impact of RDCs on supply chain effectiveness

The beverage company general manager interviewed was adamant that the reason they would not participate in an RDC is that they add no value and simply add unnecessary buffer inventory to the supply chain whilst increasing lead times. Buffer inventory is simply cost and muffles the consumption signals that come through to them. As this company has significant bargaining power, they have been able to propose their supply chain model and negotiate its implementation effectively. Clearly he felt that the RDCs are a constraint to their business and supply chain model operating effectively, which is not only evident through their non-participation, but also from their reducing their own DC infrastructures.

The beverage company has actively pursued the Theory of Constraints methodology not only in their manufacturing processes, but also throughout their end to end supply chain. They have effectively used the drum-buffer-rope methodology to agree the correct demand signals to be used, calculate what their effective capacity is and whether the buffer is held on the production line or the warehouse inventory. This has enabled them to reduce their finished goods inventory from 21 to 3.5 days and in addition improve customer service from 87% to 99.7%. In addition, they have been able to ensure that any constraint in their total value chain is in the market and not in the operation itself.

In contrast to these results, those participating in RDCs have had mixed reactions to their effectiveness. It is evident that the lack of collaboration in information sharing has resulted in additional inventory being held at the RDCs, without a corresponding reduction of inventory at the supplier themselves. Consequently there is additional inventory in the supply chain, and hence, additional costs too.

In addition, the consensus was that the effectiveness of an RDC was heavily dependent on the quality of the decisions being made at the RDC. The lack of talent and skills in supply chain management, coupled with the ineffective information sharing and the evidence of poor stock availability on shelf in store, led many to believe that on balance, RDCs did not always add value to the supply chain and certainly did not add value to the end consumer through improved product availability. Some benefits had

emerged within the toiletries suppliers dealing with RDCs, but it appeared that the level of effectiveness in the dealings were related to the levels of effectiveness of the supplier-retailer relationships that had been built up.

The lack of transparency has also brought into question how decisions are made by retailer DCs. The decision that triggers a replenishment decision to the store, if not consumption, may well have an impact on availability of product to the consumer. This was evident from an interview response from the cosmetics general manager when commenting on the failure of RDCs to deliver expected benefits, and a lack of clarity as to why this was the case.

In addition, there was concern that in many cases the RDCs merely duplicated the suppliers own logistics capabilities and only added value to the retailer operations, whilst providing a service to the stores which was less effective than that which was in place before. In the literature reviewed Soosay, Hyland, & Ferrer  (2008) wrote that organisations are compelled to review their supply chain effectiveness in satisfying customer demands, but interviewees expressed their concern that the design may be flawed when retailers were looking to satisfy their own needs before those of their customers and this design may result in a constraint in the supply chain.

In chapter 2, figure 2.6 "*the dillemma of supply chain collaboration*" as presented by Simatupang, Wright, & Sridharan (2004), illlustrates that in order to maximise the benefits of supply chain collaboration there needs to be a balance between the benefits accruing to the individual members as well as the members in the chain itself. The results of the interviews held would suggest that there is an unequal distribution of benefits which is skewed towards the retailers and, as such, this is impacting upon the effectiveness of the supply chain as a whole and the competitiveness of the supplier companies involved.

Furthermore, if the goal of the firm is to "*increase throughput while simultaneously reducing inventory and reducing operating expense"* (Chase, Aquilano, & Jacobs, 2002), and by association we can acccept that it is the role of supply chain to support this goal, then we can assert from the interviews held that whilst the retailer interviewed would promote that the RDCs are delivering on this goal, suppliers would not be

supportive of this statement. Certainly they would argue that inventory levels have increased in the chain and the availability of product on shelf has not supported optimal throughput levels.

## 6.3   Quantitative results analysis

### 6.3.1   The impact of RDCs on supplier order fulfilment levels

The data collected for this test reflected service levels between cosmetics supplier Company X and a well know retailer chain in South Africa. Data is compared for the twelve months prior to moving into the RDC and the subsequent 24 months operating in the RDC, comparing month on month to allow for seasonality impact. The limitation of this data is that it only compares the order fulfilment between the supplier and the retailer (store and then RDC) pre and post implementation, and not the fulfilment levels between RDC and the stores themselves.

The assumption is that if the stock is available at the RDC, it is available to the stores and the two week buffer inventory held by the RDC is expected to provide at least the same if not greater out bound service levels as it does inbound. The retail DC manager made the comment that "*an inbound service level target from suppliers is 95% and because we hold buffer stock, we target an outbound of 98%"*. This is based upon unit order fulfilment.

The results of the hypothesis tests performed indicated that there was not sufficient evidence to reject $H_0$ and as such we can accept that, on average, the order fulfilment levels to the RDC were better than they were to the stores when doing direct delivery. Between $Y_0$ and $Y_1$ we saw an almost two percent improvement in service levels between the supplier and the retailer, and although there was a nearly one percent decline between $Y_1$ and $Y_2$ in service levels, the $Y_2$ results were still an improvement on $Y_0$.

 "*Increasing competition in the market generally leads to a high fluctuation in the demand of products. Such fluctuations pose a very severe problem at each stage of the supply chain i.e., customer, retailer, warehouse, supplier and manufacturing in*

71

*deciding about the suitable inventory levels to maintain a good service level with*
*minimum amount of holding cost.”* (Agrawal, Sengupta, & Shanker, 2007, p. 576). The
relationship between the supplier and the retailer through the RDC has led to improved
order fulfilment at the RDC as a result of a concentration of skills and collaborative
efforts between them, as opposed to between the stores and the supplier. Simply put, it
is less complex to manage your business and service levels when dealing with a one to
one supply relationship than it is when dealing with a one to many. This was evident in
the discussions with the toiletries suppliers and their remarks related to the value of
building up relations with the buyers and the RDC managers as a means to facilitate
improved information sharing and service levels.

With additional safety inventory being held at the RDC, this should translate into
improved order fulfilment between the RDC and the stores and facilitate improved unit
throughput at store level, especially when the increased frequency of delivery between
RDC and stores is taken into the equation. And yet this is not the perceived reality of
the suppliers who reported increased frustration from consumers due to lack of product
availability and the absence of stock on shelves, where stock was sitting at the RDC.

From the raw data collected, unit sales grew by 8.47 % between $Y_0$ and $Y_1$, and a
further 4.1% between $Y_1$ and $Y_2$ on regular business between supplier and retailer, yet
the supplier indicated that this was below the expectation levels of the company and
results seen with retailers who had no RDC.  This growth in sales can be explained by
the fewer stock-outs due to increased inventory levels we have seen in the supply
chain which have occurred as a result of the change to the supply chain's inventory
model after the RDC. This increase in sales is not necessarily attributed to improved
supply performance from the RDC as arguably, the same results may have been
attained had the stores themselves held more inventory.

If the "*pull through*"  of inventory is not taking place effectively between store and RDC,
then the opportunity exists for the constraint in this supply chain to not be in the market
place but at the RDC as a consequence of how effectively the RDC is being managed
and supplying the stores themselves. As a consequence of this, and enhanced by the
limited visibility and information sharing, we find inventory being buffered before (at
suppliers) and after the RDC (at store level) to compensate for execution levels.

72

Certainly, there is no evidence that the suppliers interviewed have been able to reduce their inventory holdings as a consequence of inventory being held in the chain at RDCs.

In applying the drum-buffer-rope system, the rope analogy refers to the impact of information sharing and communication that occurs between a constraint and an upstream inventory input into the system. In this case we are looking at the communication flow between suppliers and retailers when making decisions about when and how much inventory should be released by the suppliers to the RDCs in order to ensure that the requirements of the RDCs are met and inventory is always available to service the stores.

From the interviews conducted, it is evident that information flow is not real time or readily available and as a result, the decisions made upstream to supply the RDCs are neither flexible nor aligned to the drum. The drum, in this analysis, is the end consumer consumption which creates the demand signal that acts as the pull trigger to which the supply chain must respond in order to effectively supply the market. Whilst the RDC had demonstrated some improvement in the order fulfilment percentage, it should be noted that in the best year $Y_1$ there was still a unit fulfilment shortage of 8.7% of orders placed and this is not indicative of a supply chain constrained by the market demand, but rather by ineffective supply chain policies.

### 6.3.2 The impact of RDCs on lost sales values

The data analysed here represents lost sales between the retailer and the supplier and as a consequence is viewed as a lost opportunity to maximising sales throughput. This analysis aimed to review how the lost sales had changed after the insertion of the RDC and what the impact had been on the throughput of the supplier. As with the prior test, at the 95% confidence level, there was insufficient evidence to reject $H_0$ and thus we can accept that the lost sales values dropped after the insertion of the RDC.

The statistical tests conducted revealed that the average lost sales for $Y_1$ versus $Y_0$ had declined by 1.3% and $Y_2$ versus $Y_0$ had shown further reduction to 2.4% of the base year. From this we can deduct that the RDCs had a favorable impact on the lost sales

73

value and that the Rand lost sales declined subsequent to the RDC being inserted. Based on statements made by the retailer interviewee, this improvement could have been as a result of speed of receiving of stock at stores from the RDC and hence on shelf availability, improved turnaround times, improved order fulfilment due to inventory being held at the RDC, centralised buying and replenishment by experts as opposed to this being done at store level and focus on higher value items that deliver the greater sales impact, to provide higher availability levels. "*Supplier sales do increase after the insertion of a RDC because of good stock availability*" he commented. To verify this statement it would be important to net off the benefit of reduced lost sales (i.e. increase in sales due to less stock-outs against the expenses incurred by the supplier in the form of the RDC charges and higher stock levels, and as such ascertain the total supply chain gain or loss for the supplier from this supply chain model.

The raw data collected also indicated a 10.87% growth in sales turnover between $Y_0$ and $Y_1$ and a further 8.22% between $Y_2$ and $Y_1$ which exceeded the inflationary price increase passed onto the market. However, the supplier again remarked that this had not met benchmark expectations, nor met the growth achieved with the customer with whom they shared greater information flows and delivered direct to store. It was expected that the lost sales values would have been even lower due to the additional layer of inventory in the chain and the frequency of deliveries to the stores, allowing for smaller more frequent batch deliveries. It was not clearly evident as to why this had not improved to expected levels, but the lack of demand planning information shared between the retailer and supplier, coupled with irregular order patterns based on financial cycles and ordering constraints at the retailer was believed to have impacted this metric.

Further investigation is required here and this would require greater transparency into buying triggers and patterns from the retailer to achieve this. Once again, however, whilst improvement has been shown in this area, in $Y_2$ which demonstrated the lowest average lost sales figure for the year, there was still a 8.6% lost sales impact which contributed to the growing levels of customer dissatisfaction noted by the supplier.

### 6.3.3 The impact of RDCs on inventory levels in the supply chain

The data for this test was extrapolated from the sales between the supplier and retailer at a Cost of Goods level in order to determine the inventory impact of the change in the inventory models applied. The full data set of 34 samples was applied to this test, with the inventory levels required to sustain these sales levels calculated using the before implementation and post RDC implementation models. The results obtained indicated that as result of the inventory models applied throughout the supply chain, the average monthly inventory levels increased by an average of 15.9% after the adoption of the new model. This is a significant increase in cash flow tied up in inventory for safety or buffer purposes.

Prior to the insertion of the RDC, retailer stores models were set at two weeks' worth of sales volume in order to allow for the weekly ordering cycle and delivery from the supplier, and safety stock to allow for short term consumer demand fluctuations. To support this, the supplier modelled safety stocks at their warehouse at no less than one month's forward cover based on their own internally generated demand forecast.

After the insertion of the RDCs, store models were dropped to one week's cover which accounted for more regular replenishment from the RDC (as much as daily, if required for the larger stores) and safety stock to cover consumption fluctuations. Stock levels at the RDCs were held at two weeks cover of the projected sales of the stores serviced by the RDC in order to ensure stock was readily available to cover demand changes at store level, whilst receiving a weekly dedicated delivery from the supplier.

There was, however, no change to the inventory parameters of the supplier and the one month's parameter which was in place pre-insertion, did not change. When questioned as to why this had not changed, the response was there was "*less collaboration with the retailers on information and a greater reluctance to share even though this could be to their benefit through increased service levels".* As a result, the supplier felt that the visibility and availability of real time information was not in place in order for them to reduce their own inventory levels safely.

Cachon & Fisher (2000) demonstrated the value of information sharing on containing costs and lead time reduction. They further anticipated that "*information sharing can*

75

*have a significantly greater value in environments with unknown demand, for example, early sales of new products or established products on promotion. In those settings information sharing would improve the supplier's ability to detect shifts in the demand process".* This relationship has been visited earlier on in this research through the results obtained by suppliers doing business with Walmart in the United States in addition to the results obtained by the beverage manufacturer in shortening their supply chain and using real time information feedback from their order process to respond with great flexibility to consumer demand. The beverage maufacturer when interviewed commmented "*we cannot forecast accurately based on consumption, so we have to work faster and increase the frequency with which we put inventory into the supply chain. By doing so we depend less on people guessing. We want to get as close to make-to-order as possible as this is when you are making exactly what the market requires".*

In the RDC model employed in this research, the limited transparency and information sharing related to retailer decisions made and the lengthening of the supply chain, has increased the inventory being held, to support the model. When asked about the extent of information sharing on inventory levels, the response from the retailer viewed a reduction in inventory in the chain as a clear trade off with service levels. "*Where we have worked with suppliers and cut stock holding, there are clear examples of reducing service levels to the RDC from 90% to 60%".*

In addition, the lengthening of the supply chain has had an adverse effect on the variability of the order quantity. "*Because of the longer lead-time, the uncertainty in the forecasting of the future demand increases and consequently the variability of the order quantity increases.*" (Agrawal, Sengupta, & Shanker, 2007, p. 576). They go on to say that "*the importance of sharing of relevant information across various stages of the supply chain is being increasingly realised and has been found to reduce the overall bullwhip effect.*"

It is evident from the results obtained and the supply chain design that post the implementation of the RDC, inventory levels increased and the opportunity for greater variability in order quantities as a result of the bullwhip effect has increased too. Greater collaboration through sharing of information and supply chain design could

impact upon this inventory increase, but as commented by retailers and suppliers alike, there is limited collaboration of this type taking place and where suppliers have greater control of the end to end supply chain, significant inventory benefits are evident.

"*There are considerable gains for the supplier who has decision rights to manage inventory at its retailer sites. The supplier can focus on compressing the length and variations of total lead-times based on different customer segments that want to pay for faster delivery time. Secondly, the supplier may enjoy lowered inventory levels due to demand risk pooling*" (Simatupang, Wright, & Sridharan, 2004, p. 65)

## 6.4   Chapter summary

What was evident from the analysis conducted on the research results is that the impact of the RDC on the supply chain performance has been sub-optimal in the cases of improving order fulfilment and throughput in the supply chain and adverse in terms of its impact on inventory holdings. The interview findings clearly indicate a lack of effective collaboration taking place between retailers and suppliers, particularly in the areas of information and technology sharing, but also as regards a total supply chain strategy encompassing shared benefits, visible and shared metrics and an inventory strategy throughout the supply chain.

Secondly, supplier companies with greater control over the design and execution of the entire supply chain had in contrast been able to find unique and innovative solutions to drive service levels and growth effectively. The results from the beverage company in particular had demonstrated effective cost reductions, improved service levels, order fulfilment and substantial inventory reduction. Whilst not all companies share the same type of product and business model, there are lessons here which are transferable across industries and which point to effective design and execution strategies. This is not only allowing them to develop their supply chain as a competitive advantage, it is also proving an effective barrier to new competition entering the market place.

Finally, a common thread that emerged from the Barloworld Logistics survey, through the literature and the interviews conducted, is the potential for skills gaps in the market to negatively impact on the competitiveness of the supply chain model selected.

Spector ( 2011) had suggested that a strong business model may be managed poorly and fail, whereas a weak business model with strong management and implementation skills might succeed. This was echoed by the interviewees who reflected that a well run RDC could enhance the competitiveness of the total supply chain, whereas an RDC with poor skills could cripple one. Selecting a correctly skilled team who could develop, execute  and evolve an innovative supply chain is as critical to success as the design of the busiess model itself.

# Chapter 7

## 7 Conclusion

### 7.1 Introduction

The aim of this research is to investigate whether RDCs as part of a supply chain strategy, deliver increased competitiveness to the supply chain as a whole. Specifically, do RDCs increase product availability to the consumers effectively compared to other models available and as a result, do we see benefits accruing to all the members of the supply chain through increased throughput and reduced out of stocks and inventory levels. "*A new belief is that companies will no longer compete against companies, but rather supply chains will compete against supply chains*" (Vokurka, Zank, & Lund III, 2002, p. 18). Vokurka *et al.* further state that competitive pressures will not only place greater emphasis on cost effectiveness, but also on the supply chains ability to deliver greater quality, dependability, flexibility and overall supply chain agility in achieving cost effectiveness.

Chapter 7 seeks to highlight the main findings of the research, pulling together the key learnings and their implications for organisations and their supply chain strategy and design. It will also provide recommendations on how to best elevate supply chain constraints through the use of effective collaboration techniques between retailers and suppliers. Finally, we will review limitations of this research and opportunities for further research to take place building not only on this research, but also existing research and academic literature.

### 7.2 Key Findings

Effective supply chain strategy has a goal to deliver long-term sustainable superior performance, where such superior performance depends on the ability of a manufacturing organisation to become a fully integrated partner within a supply chain context. Suppliers can no longer simply focus on internal processes to satisfy and serve the customer and consumer requirements, but are required to integrate and

coordinate throughout the supply chain and this requires a new focus and new ways of managing (Green Jr, Whitten, & Inman, 2008).

 In the research conducted we found that the deeper and more integrated the collaboration was between the supply-chain participants, the more improved the results and the better the relationships. This was evident from the toiletries suppliers' feedback, as well as the feedback from the cereals and cosmetics suppliers regarding their effective supply chain collaboration results achieved in the United States with RDCs, versus the limited results achieved in South Africa.

It was evident from the interviews conducted that the supply chain strategy adopted when inserting the RDC was clearly a retailer strategy and business model imposed on suppliers. Suppliers had little input into the design, operation and locations of the RDCs and found themselves required to operate through the RDCs as a condition of doing business.  A consequence of this is the cosmetic supplier interviewed with a facility in Gauteng, who is required to bulk ship inventory to a Cape Town RDC, only for the inventory to be picked and sent back to Gauteng for delivery to stores in the area. Clearly this increases the delivery cycle time and has an impact not only on cost effectiveness but also flexibility, inventory levels and the agility of the supply chain to respond to changes in consumer patterns and stock-outs.

Where suppliers reviewed had significant market share and power, we found they were able to negotiate participation in RDCs and also to recommend and implement innovative delivery strategies which reduced order turnaround times at delivery, reduced inventory levels at the retailer stores and increased order frequency and responsiveness to changes in consumption. This had enabled them to design and own their supply chain models and continue to effectively use this as a competitive advantage. Suppliers delivering to RDCs, in contrast, commented that their competitive advantage in logistics over other suppliers had almost evaporated as the opportunities to operate innovatively in the supply chains had all but gone. They were now looking upstream to their vendors to find collaborative supply chain innovation opportunities.

The research highlighted low levels of real time information that could be used by suppliers to effectively manage their operations. "*In a traditional supply chain without*

*information sharing, the bullwhip effect normally increases along the supply chain from retailer, distributor, manufacturer and supplier."* (Wangphanich, Kara, & Kayis, 2010, p. 4512). As a result, the inventory models used by the suppliers were unable to reflect the added inventory being held at the RDCs and we saw the inventory levels increase in the supply chain as a whole. Many of the decisions made by the retailers lacked transparency and as one supplier interviewed commented "*A leading retailer will soon be opening a Gauteng DC for cosmetics. We were advised this in passing without any explanation as to what this means for us. How much will this cost us as a supplier?"*

Skills gaps and levels of execution also emerged as an issue, with certain suppliers relying on key relationships to ensure their businesses were managed effectively, whilst others commented on the lack of inventory on shelf to drive business growth. Inventory which was in stock both at the supplier and the RDC was not finding its way timeously to the stores and as such the suppliers perceptions were that they were losing customers to competitors as the ease of substitution was relatively high. The statistical data in the research indicated improved levels on *order fulfilment* and *less lost sales* between suppliers and RDCs, but does not appear to have translated to improve on shelf availability and throughput as might have been expected, whilst inventory levels seem to have increased.

Whereas effective supply chain collaboration brings benefits to all parties, the dilemma between accommodating decisions that take into account the interests of the supply chain as a whole as opposed to the interests of the individual firms has not been overcome. Individual companies are seeking to maximise their own gains and protect their own profitability, rather than everybody in the supply-chain benefitting. The limited supply chain design, information and technology collaboration, in addition to agreed shared metrics installed to drive aligned behaviours and actions along the supply chain, has negated much of the innovation and investments made by suppliers to the extent that some companies have outsourced their logistics as there is no competitive advantage to be had doing this in-house.

Whilst RDCs, by design, can improve competitiveness through more frequent smaller batch deliveries to stores, reducing costs associated with DSD deliveries, improving communication between the RDC as a single point of contact and suppliers and

81

improved responsiveness to fluctuations in consumption, there are not enough examples of this being done successfully in this research to suggest this has been the case thus far. Certainly, there are examples in global markets of supply chain collaboration taking place to greater effect, as well as examples of those who negotiated not to participate in RDCs being able to deliver superior results.

The impact of RDCs on supply chain competitiveness has to a large degree been unfavourable when compared to the results achieved by those delivering direct to stores. Where the toiletries suppliers saw benefits, these primarily lay in the relationships and collaboration between the supplier and the RDC management teams which facilitated ease of problem solving, particularly when compared against the issues experienced at store level. In contrast, however, poor skills and execution, unequal sharing of supply chain benefits, limited opportunity for suppliers to use supply chain as a differentiating competitive strategy and issues with on-shelf availability (particularly in the cosmetics supply chain) has seen the RDCs deliver inferior results to the companies that deliver to stores and have greater control and innovation in their supply chain.

This underlying business model needs to be corrected to extract all benefits possible or the arrival of new retailers into the market with better; more collaborative and innovative solutions could place additional competitive pressures on local retailers and suppliers.

## 7.3  Limitations

This research has several limitations. The samples sizes selected for the statistical data sets were small and could have been expanded by including greater historical data. However access to this data was limited and the post implementation data was limited to only 24 months due to the time frame in which the RDC was inserted.

Due to time constraints, the statistical sample size data was also limited to the transactions between one supplier and retailer and the expansion of this to another data set for a different supplier and retailer may have added additional insights and greater diversity.

82

In addition, the data reflects primarily upon the transactions between the supplier and retailer and not the retailer and stores themselves. Comments regarding absence of stock on shelf emerged from the expert interviews but could not be measured in this research to support their assertions.

Research is limited to within the framework of the scope identified, namely the South African fast moving consumer goods industry. This research also reviews only the impact of local suppliers on local retailers, and does not consider the impact of importer supply chains or retailer specific house brand goods.

Finally, bias on behalf of the interviewer and respondents needs to be considered when reviewing the study. All efforts were made to eliminate bias from both parties, and the ethical responsibility that a researcher has to protect individual respondents rights to anonymity (Saunders & Lewis, 2012), assisted respondents with presenting candid feedback to questions posed to them. In addition, a diverse cross-section of industry types was used to get a broad response which provided a greater variety of responses.

## 7.4  Future research

Opportunity exists for future research to take place looking into the financial implications of lost sales at the stores as a result of a bottleneck experienced at the RDC and to quantify the lost opportunity.

In addition the opportunity exists to analyse growth from a single supplier into one retailer with and one without an RDC model to contrast the growth, order fulfilment and customer service results achieved between the two differing supply chain models.

Finally, from a human resources perspective there is an opportunity to analyse the impact of skills shortages in the country and in particular the impact it has on effective execution of supply chain strategy and competitiveness.

## 7.5 Recommendations

RDCs have been successfully designed and implemented in various markets around the world, in various formats. We have also seen that there are tangible benefits from not working through a RDC as a result of improved control, design innovation, closeness to consumers and ability to execute effectively. However, retailer power in the South African market is high and under these circumstances, we can assert that either refusing to supply retailers through RDCs or requesting retailers to discontinue the use of RDCs when they themselves are receiving tangible benefits from their insertion, is unlikely to achieve the desired results for suppliers. In the long run however the (economic) system will suffer due to the net win-lose relationships.

The RDC has become a crucial link to the supply chain success or failure as "*the retailer's position is crucial to improving supply chain performance in terms of customer service for end customers. The retailer also has intimate knowledge of demand condition because of direct contact with end customers. Sharing current and advanced information with the supplier may mitigate the propagation of demand variation faced by the supplier.*" (Sridharan & Simatupang, 2009, p. 262) The limited information sharing and collaboration has reduced the opportunity to maximise throughput through effectively meeting the consumer demand signals and therefore has contributed to creating a bottleneck in the system.

It is important to this process that there is focus and agreement by all key stakeholders in the supply chain on how best to collaborate and enhance the RDC. It is critical that the policies, actions and agendas of those participating in the supply chain, particularly the RDCs themselves, do not become constraints. "*Proponents of constraint management would argue that because constraints exist in all complex organisations, a management approach that focuses attention on the constraint, measures the impact of actions and decisions on the throughput of the system (which is determined by the constraint) and is tightly integrated into a consistent system, should outperform management approaches that ignore the existence of constraints and are not as tightly integrated*" (Gupta & Boyd, 2008, p. 365).

Effective collaboration which can improve the competitiveness of RDCs will be enhanced by applying Goldratt's Theory of Constraint's five focusing steps to identify and suggest alternative solutions for stakeholders. "*For individual firms to benefit the broader supply chain, interacting firms must agree on common capabilities and mutual objectives. In essence, the **supply chain** must pursue profits and strategic business goals in a similar fashion to that of a single company.*" (Vokurka, Zank, & Lund III, 2002, p. 16)*.*

From the interviews and literature reviewed, recommended areas of focus would include:

- Knowledge sharing on technological advances and best practices.
- Agreement and sharing of mutually agreed and beneficial metrics to drive the correct behaviours throughout the supply chain. An example of this is not to measure the order fulfilment between supplier and RDC, but rather inventory availability at store level.
- Sharing of costs, risks and the benefits of the supply chain design and performance in order to promote further collaboration and transparency.
- Motivation to seek continuous improvement and innovation in the supply chain to service the end consumer as efficiently and effectively as possible. This would assist the supply chain in developing a barrier to entry to other retailers and suppliers entering the market.
- Technology and information collaboration which would assist in reducing cycle times and providing real time data to allow suppliers to respond to actual consumption, rather than inaccurate retailer buying patterns and limited forecasts.
- Skills availability and development within the supply chain itself that would impact on the performance of the RDC in particular and the supply chain as a whole. Key skills need to be elevated to ensure that the execution levels meet the design standards.
- Decide on the type of model to be used and whether collaborative inventory models should be used i.e. consignment stock or innovative warehouse models such as cross docking could and should possibly be implemented.
- Review the use of third party supply chain companies in the model as an opportunity to bring skills and expertise into the model.

- Regular performance reviews and supply chain effectiveness assessments between retailers and suppliers, to ensure that the supply chain model is delivering the desired results. Make changes to the model as necessary to optimize performance to agreed standards.

"*In today's highly competitive globalised world where the pace of change continues to increase at alarming speeds, companies require insight and foresight to adapt continuously if they want to survive and thrive*" (Barloworld Logistics, 2013, p. 6).Supply chain innovation in the form of collaborative strategies has become an important element of a company's life cycle and the pressure is on companies to pursue the most original and competitive strategies possible. It is inconclusive as to whether RDCs as a whole can be considered a competitive strategy, but it would appear the policies and behaviours of the actors in the supply chain, specifically relating to RDCs, can become a constraint to businesses and industries creating sustainable competitive advantages when the interests of the entire supply chain are not taken into account.

# 8 References

Agrawal, S., Sengupta, R. N., & Shanker, K. (2007). Impact of information sharing and lead time on bullwhip effect and on-hand inventory. *European Journal of Operational Research* (192), 576-593.

Barloworld Logistics. (2011). *2011 supply chain foresight - The South African FMCG and Retail industry*. Retrieved from Barloworld Logistics: http://barloworld-logistics.com

Barloworld Logistics. (2013, March 19). *2013 supplychainforesight*. Retrieved June 13, 2013, from Barloworld Logistics: http://www.barloworld-logistics.com

Barratt, M. (2004). Understanding the meaning of collaboration in the supply chain. *Supply Chain Management: An International Journal, 9*(1), 30-42.

Blanchard, D. (2013, January). Failure to vet your supply chain partners is a risky business. *Industry Week*, pp. 46-46.

Boyd, L., & Gupta, M. (2004). Constraints Management - What is the theory? *International Journal of Operations and Production Management, 24*(4), 350-371.

Cachon, G. P., & Fisher, M. (2000, August ). Suppply Chain Inventory Management and the Value of Shared Information. *Management Science, 46*(8), 1032-1048.

Chase, R. B., Aquilano, N. J., & Jacobs, F. R. (2002). Synchronous Manufacturing and Theory of Constraints. In R. B. Chase, N. J. Aquilano, & F. R. Jacobs, *Operations management for competitive advantage* (pp. 670-701). Boston, Mass: Irwin/McGraw-Hill.

Coyle, J. J., Langley Jr, J. C., Gibson, B. J., Novack, R. A., & Bardi, E. J. (2009). *Supply Chain Management - A logistics perspective.* Mason, Ohio: South-Western Cengage Learning.

Disney, S. M., & Towill, D. R. (2003). On the bullwhip and inventory variance produced by an ordering policy. *The International Journal of Management Science*, 157-167.

Ettouzani, Y., Yates, N., & Mena, C. (2012). Examening retail on shelf availability: promotional impact and a call for research. *International Journal of physical Distribution and Logistics Management, 42*(3), 213-243. doi:10.1108/09600031211225945

Fearne, A., & Martinez, M. G. (2012). Dimensions of sustainable value chains: implications of value analysis. *Supply Chain Management: An International Journal*, 575-581.

Goldratt, E. M., & Cox, J. (2004). *The Goal: A process of ongoing improvement* (3rd ed.). Lynnwood Ridge, South Africa: Goldratt group.

Green Jr, K. W., Whitten, D., & Inman, A. R. (2008). The impact of logstics performance on organisational performance in a supply chain context. *Supply Chain Management: An International Journal, 13*(4), 317-327.

Gupta, M. C., & Boyd, L. H. (2008). Theory of constraints: a theory for operations management. *International Journal of Operations and Production Management, 28*(10), 991-1012.

Hough, J., Thompson Jr, A. A., Strickland III, A., & Gamble, J. E. (2011). *Crafting and Executing Strategy* (2nd ed.). Maidenhead, Berkshire, United Kingdom: McGraw-Hill.

Houghton, C., Casey, D., Shaw, D., & Murphy, K. (2013). Rigour in qualitative case-study research. *Nurse Researcher, 20*(4), 12-17.

Johnson, M. W., Christensen, C. M., & Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review*, 51-59.

Johnson, R. B., & Onwuegbuzie, A. J. (2004, October). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher, 33*(7), 14-26.

Lambert, D. M., & Cooper, M. C. (2000). Issues in Supply Chain Management. *Industrial Marketing Management, 29*, 65-83.

Lazenby, H. (2012, March 2). South Africa needs to relieve supply-chain constraints. *Engineering news*, 1-2. Retrieved from http://www.engineeringnews.co.za

Lee, C. C., & Chu, W. H. (2005). Who should control inventory in the supply chain? *European Journal of Operational Research*(164), 158-172.

Lockamy III, A., & McCormack, K. (2004). Linking SCOR planning practices to supply chain performance: An exploratory study. *International Journal of Operations and Production Management, 24*(12), 1192-1218.

Lua, K. H. (2012). Demand management in a downstream wholesale and retail distribution: a case study. *Supply Chain Management: An International Journal*, 638-654.

Mason, R., Lalwani, C., & Boughton, R. (2007). Combining vertical and horizontal collaboration for transport optimisation. *Supply Chain Management: An International Journal*, 187-199.

Mathumaramaytha, C. (2011). Supply Chain Collaboration - What's an outcome. *IPEDR. 11*, pp. 102-108. Singapore: IACSIT Press.

Porter, M. E. (1979, March-April). How competitive forces shape strategy. *Harvard Business Review*, 137-145.

Porter, M. E. (2008). The Five Competitive Forces That Shape Strategy. *Harvard Business Review, 86*(1), 78-93.

Ronen, B. (2005). Special issue on the Theory of Constraints - Practice and Research. *Human Systems Management*, 1-2.

Saunders, M., & Lewis, P. (2012). *Doing Research in Business and Management.* Harlow: Pearson Education Limited.

Simatupang, T. M., Wright, A. C., & Ramaswami, S. (2002). The knowledge of coordination for supply chain integration. *Business Process Management Journal, 8*(3), 289-308.

Simatupang, T. M., Wright, A. C., & Sridharan, R. (2004). Applying the Theory of Constraints to Supply Chain Collaboration. *Supply Chain Management: An International Journal, 9*(1), 1-29.

Soosay, C. A., Hyland, P. W., & Ferrer, M. (2008). Supply chain collaboration: capabilities for continuous improvement. *Supply Chain Management: An International Journal, 13*(2), 160-169.

Spector, Y. (2011, June 1). Theory of constraint methodology where the constraint is the business model. *International Journal of Production Research, 49*(11), 3387-3394.

Sridharan, R., & Simatupang, T. (2009). Managerial views of supply chain collaboration. *Gadjah Mada International Journal of Business, 11*(2), 253-273.

The Supply Chain Council Inc. (2010). *Supply Chain Operations Reference Model.* Retrieved July 18, 2013, from Supply Chain Council: http://www.supply-chain.org/scor

Umble, M. M., & Umble, E. J. (1999). Drum-Buffer-Rope for Lower Inventory. *Industrial Management*, 24-33.

van der Vaart, T., & van Donk, D. P. (2008). A critical review of survey-based research in supply chain integration. *International Hournal of Production Economics*, 42-55.

Vokurka, R. J., Zank, G. M., & Lund III, C. M. (2002). Improving competitiveness through supply chain management: A cumulative improvement approach. *Competitiveness Review, 12*(1), 14-25.

Wangphanich, P., Kara, S., & Kayis, B. (2010, August 1). Analysis of the bullwhip effect in multi-product, multi-stage supply chain systems - a simulation approach. *International Journal of Production Research, 48*(15), 4501-4517.

Weiers, R. M. (2011). *Introductory Business Statistics - International Edition* (7th ed.). South-Western, Cengage Learning.

# 9 Appendix A – Semi-structured interview questionnaire

| Question purpose | Specific questions asked |
|---|---|
| Business Strategy | 1 How does your supply chain strategy align with your business strategy? How often do you review it? |
| | 2 Is it important that your supply chain is competitive and differentiates your company from the competition? Why? |
| | 3 How important is customer service in your industry? Why? |
| | 4 Do you believe your supply chain model used provides you with a competitive advantage over the competition? Why? |
| | 5 What was the motivation behind the design of your supply chain? |
| | 6 Do you believe your supply chain has delivered the benefits it was designed to? Explain? |
| Question purpose | Specific questions asked |
| Supply Chain Collaboration | 7 Would you consider your supply chain model collaborative with your supply chain partners? Why? |
| | 8 Do you have joint decision making in the supply chain strategy? |

| Question purpose | Specific questions asked |
|---|---|
| | 9 Do you believe that any benefits accrued in this collaboration are equally shared amongst supply chain partners? Why? |
| | 10 Is there open sharing of information between supply chain partners to enable improved decision making along the chain? Elaborate? |
| | 11 Is there co-management of inventory and demand planning? |
| | 12 Is there collaborative information technology in place between supply chain partners? Elaborate? |
| | 13 Are there shared metrics in place to measure effectiveness in terms of service, costs and profitability initiatives? Identify and elaborate. |
| | 14 Have you embarked on any shared investments with any of your supply chain partners? Explain. |
| | 15 How are disputes settled with your supply chain partners? Do you generally believe they are settled to the mutual benefit of the supply chain as a whole? |
| **Question purpose** | **Specific questions asked** |
| System Constraints | 16 Does a retail distribution centre improve the throughput of inventory and orders to fulfill customer orders? How? |
| | 17 What is the customer value proposition presented by a RDC? |

| | |
|---|---|
| | 18 How does a RDC manage inventory levels in the chain effectively? |
| | 19 How does a RDC manage service levels to the end customer effectively? |
| | 20 What differentiates a RDC from a supplier distribution centre? Is it duplication or value add? |
| | 21 How often do you assess your RDC strategy for effectiveness against other market models? Do you have a formal process to do so? |

# Appendix B – Company X turnover raw data

| Company X Turnover data January 2009 to December 2012 | | |
| --- | --- | --- |
| | Act Val | COG Val |
| 2009/Jan | 8129674.12 | 2265976.97 |
| 2009/Feb | 7594009.52 | 2100174.66 |
| 2009/Mar | 8219069.11 | 2198917.24 |
| 2009/Apr | 6640393.11 | 1846274.06 |
| 2009/May | 6873238.47 | 1859061.31 |
| 2009/Jun | 6257208.16 | 1775406.61 |
| 2009/Jul | 5938623.34 | 1638596.05 |
| 2009/Aug | 8550230.20 | 2246893.48 |
| 2009/Sep | 5517652.70 | 1417581.48 |
| 2009/Oct | 10246437.65 | 2709735.14 |
| 2009/Nov | 8879442.79 | 2255564.93 |
| 2009/Dec | 5864697.31 | 1544011.91 |
| 2010/Jan | 3861120.58 | 829029.43 |
| 2010/Feb | 5880848.09 | 1234843.83 |
| 2010/Mar | 10421113.69 | 2185232.81 |
| 2010/Apr | 10462954.15 | 2197943.23 |
| 2010/May | 6293273.08 | 1188407.00 |
| 2010/Jun | 5688164.57 | 1206874.17 |
| 2010/Jul | 4341431.49 | 1047407.93 |
| 2010/Aug | 4539417.10 | 1093540.23 |
| 2010/Sep | 8913613.41 | 1850026.54 |
| 2010/Oct | 12252512.62 | 2434196.94 |
| 2010/Nov | 6989307.53 | 1650660.36 |
| 2010/Dec | 5670824.41 | 1148996.10 |
| 2011/Jan | 6600402.08 | 1310736.38 |
| 2011/Feb | 8003539.96 | 1453050.94 |
| 2011/Mar | 8388673.90 | 1584532.82 |
| 2011/Apr | 8792761.05 | 1763568.37 |
| 2011/May | 5288432.14 | 1025581.85 |
| 2011/Jun | 10049908.52 | 1870719.07 |

| | | |
|---|---|---|
| 2011/Jul | 4003442.52 | 805240.08 |
| 2011/Aug | 5663886.69 | 1094104.29 |
| 2011/Sep | 16660446.37 | 3238270.87 |
| 2011/Oct | 11905221.35 | 2363784.66 |
| 2011/Nov | 8168162.53 | 1643035.27 |
| 2011/Dec | 6335493.94 | 1267386.31 |
| 2012/Jan | 7349778.66 | 1458146.05 |
| 2012/Feb | 2717956.68 | 572513.70 |
| 2012/Mar | 5963490.27 | 1384996.00 |
| 2012/Apr | 6615904.25 | 1455212.04 |
| 2012/May | 7346694.96 | 1429425.37 |
| 2012/Jun | 10782058.93 | 2237754.85 |
| 2012/Jul | 5324917.78 | 1119992.61 |
| 2012/Aug | 8252471.73 | 1729657.46 |
| 2012/Sep | 12107657.67 | 2449554.86 |
| 2012/Oct | 15812567.08 | 3221235.60 |
| 2012/Nov | 7070538.15 | 1512918.65 |
| 2012/Dec | 4403159.39 | 871451.56 |

# Appendix C – Company X lost sales raw data

| Company X lost sales value and units January 2009 to December 2012 | | |
|---|---|---|
| | Units | Act Value |
| 2009/Jan | 17 770.00 | 971 271 |
| 2009/Feb | 12 976.00 | 671 656 |
| 2009/Mar | 13 241.00 | 746 426 |
| 2009/Apr | 11 090.00 | 684 301 |
| 2009/May | 14 470.00 | 902 573 |
| 2009/Jun | 10 122.00 | 536 684 |
| 2009/Jul | 12 891.00 | 786 143 |
| 2009/Aug | 12 857.00 | 758 452 |
| 2009/Sep | 13 641.00 | 1 012 818 |
| 2009/Oct | 27 613.00 | 1 962 688 |
| 2009/Nov | 24 673.00 | 1 582 325 |
| 2009/Dec | 21 603.00 | 1 526 534 |
| 2010/Jan | 21 644.00 | 1 440 826 |
| 2010/Feb | 15 684.00 | 1 125 433 |
| 2010/Mar | 39 081.00 | 2 934 633 |
| 2010/Apr | 31 714.00 | 2 605 651 |
| 2010/May | 19 683.00 | 1 609 238 |
| 2010/Jun | 12 421.00 | 870 766 |
| 2010/Jul | 5 454.00 | 353 280 |
| 2010/Aug | 5 989.00 | 364 161 |
| 2010/Sep | 12 016.00 | 892 228 |
| 2010/Oct | 19 837.00 | 1 449 591 |
| 2010/Nov | 14 799.00 | 777 500 |
| 2010/Dec | 10 199.00 | 697 752 |
| 2011/Jan | 11 137.00 | 792 634 |
| 2011/Feb | 8 478.00 | 725 495 |
| 2011/Mar | 10 717.00 | 640 564 |
| 2011/Apr | 15 509.00 | 1 041 094 |

| | | |
|---|---|---|
| 2011/May | 10 831.00 | 741 542 |
| 2011/Jun | 21 630.00 | 1 786 608 |
| 2011/Jul | 8 060.00 | 663 491 |
| 2011/Aug | 8 762.00 | 548 434 |
| 2011/Sep | 17 126.00 | 1 113 613 |
| 2011/Oct | 29 522.00 | 1 812 585 |
| 2011/Nov | 18 561.00 | 1 249 410 |
| 2011/Dec | 13 792.00 | 623 798 |
| 2012/Jan | 36 542.00 | 1 708 655 |
| 2012/Feb | 14 809.00 | 566 639 |
| 2012/Mar | 11 670.00 | 452 809 |
| 2012/Apr | 10 214.00 | 578 212 |
| 2012/May | 11 813.00 | 713 694 |
| 2012/Jun | 10 361.00 | 672 931 |
| 2012/Jul | 10 020.00 | 594 737 |
| 2012/Aug | 15 420.00 | 885 240 |
| 2012/Sep | 35 518.00 | 2 166 815 |
| 2012/Oct | 62 276.00 | 4 019 147 |
| 2012/Nov | 21 380.00 | 1 460 074 |
| 2012/Dec | 10 635.00 | 617 617 |