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Inbound supply chain management in the automotive industry of South Africa during a recession.

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Inbound supply chain management in the automotive industry of South Africa during a recession.

Herman Müller

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2011

ABSTRACT

Automotive manufacturers inbound supply chains span across borders and across continents. Due to this, economic events such as recessions have a direct impact on these inbound supply chains.

Automotive manufacturers within South Africa source components on a global scale. Multiple suppliers supply Tier 1 suppliers of components and parts that, in turn, are supplied to the automotive manufacturers' plants.

This study reviews the impact that recessions have on the inbound supply chain of automotive manufacturers within South Africa, and specifically evaluates the impact on the Tier 1 suppliers within the automotive manufacturing process. The impact of the December 2007 recession was investigated by semi structured interviewing of ten Tier 1 suppliers within South Africa. This process identified areas within their companies where the recession had a direct impact.

The study found that Tier 1 suppliers experienced the recession on key areas such as downsizing of staff, high inventory levels (Bullwhip effect), cash flow, exchange rate exposure, capital investment, demand / forecasting accuracy and supplier bankruptcy. The severity of the impact of the recession was however, the occurrence of all the above at the same time. This created a "perfect storm" scenario for the Tier 1 suppliers to overcome.

The study's objective is to highlight the impact of recessions on automotive manufacturers inbound supply chains as well as to assist these organisations in understanding the impact that all of these risks occurring simultaneously will have on them. The study also serves to emphasise the importance of designing scenarios and strategies that will continue to manage organisations through recessions. By creating impact awareness, supply chain executives and engineers will be able to create the necessary strategies to minimise the impact that recessions could have on their organisations.

DECLARATION

I, Herman Muller, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

HERMAN MULLER

Signed at ……

On the …….. day of …… 2011

DEDICATION

Commencing with a MBA is a decision. Completing it is a journey. The beginning of this journey is founded in knowledge, literature and experience. One soon realises that the knowledge of one's self, and the importance of support from friends, colleagues and students are prudent in ensuring that this journey will be completed. At the end of the journey one looks back at the times when one thought that completing the journey would never be realised and that giving up was an option that was greatly considered. But during these times of turmoil and uncertainty, pockets of light appear on the path that assist one to focus on the road ahead, and to remain committed to the completion of this incredible journey.

I would like to dedicate this study to those who supported me during the completion of my MBA. Those who were always there and experienced the irritation and frustration head on were part of a select few individuals who stood by me during the journey with no questions or guilt. These people ensured that I received exactly what was needed in order to complete this task. I have come to the realisation that even though I was the one who undertook to complete the MBA, each person around me culminated in achieving their own personal "MBA" by supporting and assisting me. To my Heavenly Father who has been there from the very beginning: He blessed me with mental ability, focus, strength and dedication to complete the MBA. I pass all the glory and praise to Him as He is the only Sovereign God who could have made all this possible.

To my loving, caring, supportive wife: She was the angel waiting for me late at night with a warm embrace and loving smile. Thank you for being my pillar of strength and for showing me limitless understanding. You are special beyond words and without you I would definitely not have made it. My deepest appreciation goes to you for preparing all the hot meals, late night coffees and for being kind and considerate when my thoughts were with the business school. I truly love you my angel! You are a special individual that I will cherish

forever.

To my family: My parents and brother, who were present and supported me through this journey. I could not have wished for a better support system and love. At the end of the day, it is family that stands by you when others do not. I love you all.

At the completion of this journey, I look back only to realise that it is just the beginning. I am thankful for the opportunity that was awarded me to complete my MBA at the Wits Business School. I hope that one day I can return the favour to someone else and provide them with the opportunity to have a life-changing experience at the WBS that they will cherish for ever.

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It is always difficult to acknowledge all those who have contributed with a specific piece of work, let alone for an entire MBA.

There are numerous role players that assist you in the journey. Each and every lecturer and especially Mr Mundy my supervisor, who supported me and had the opportunity to free my mind and aid me to develop as a business leader, thank you for all your efforts, time and sharing your knowledge. It is greatly appreciated.

To the WITS BUSINESS SCHOOL and the Faculty, thank you for the support and the opportunity to complete my MBA with one of the best MBA schools. Thank you for the assistance during the past 4 years.

To all my student friends that I have encountered over the past 3 years, it has been a privilege and an honour in sharing these years with all of you. Your comments, interactions and friendliness have truly made a lasting impact on me. I really look forward in meeting you in the future as both business leaders and friends.

To all my friends who have supported me during this time and who are still around after the completion of the qualification, to you thank you for being real friends through the good and the bad times. You are all special to me.

I would also like to acknowledge all the companies that assisted with the data gathering during my Study. Given the nature of the study and the time it took to conduct the interviews, I am very thankful to everyone that participated. Thank you for the opportunity and the friendliness that those involved afforded to me. I am deeply grateful for the openness and friendliness from the companies that partook in the research project. I truly appreciate your input and time.

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CHAPTER 1: INTRODUCTION

1.1. Purpose of the study

The purpose of this study is to assess the impact of global recessions on inbound supply chain management within the automotive manufacturing companies' supply chain during recessionary periods.

1.2. Content of the study

Logistics management was considered a main focus point of organisations to gain competitive advantage (Stock and Lambert, 1987). This view focussed on company as an entity and the processes and activities it should execute in delivering the product promise as per the marketing mix. The authors go on to state that the objective of logistics management is to manage the place component of the marketing mix, ensuring that the right product is available at the right time, at the right place, at the right cost, and the right quantity. The overall objective of logistics management is to ensure that the promise to the customer, in terms of the marketing mix, is met in the most cost effective way in terms of cost-benefit trade-offs, and that the total cost of providing the product to market is minimised. Over the last decade however, the focus has shifted away from only focussing on the internal logistics management activities of organisations and has instead widened attention to include the interaction of companies with each other as well as assessing what Supply Chain Management (SCM) really means (Mentzer, DeWitt, Keebler, Min, Nix, Smith, Zacharia 2001).

The management of corporate supply chains, especially on an international basis, is a key focus area for organisations trading on a global basis. SCM involves all functional areas across the supply chain and includes activities such as: procurement from suppliers, inbound logistics, warehousing and manufacturing, distribution (outbound logistics) and customer sales as well as reverse logistics. Traditionally, these functional areas were managed in

isolation however, the focus has shifted “to change supply chain management from managing individual functions to managing a set of integrated processes” (Lambert, 2004: 20). SCM is thus cross-functional, cross-company and includes all processes across these entities. Business process alignment is used to structure the activities between members of an end-to-end supply chain (Mentzer, DeWitt, Keebler, Min, Nix, Smith et al., 2001).

According to Mentzer et al Figure 1 illustrates the relationships between role-players within a supply chain model. The global environment includes role players such as supplier’s suppliers, supplier, focal firm, customer and the customer’s customer (or true customer) (Mentzer et al 2001). The Firm’s internal divisions ensure that there is inter-functional coordination between the departments such as Marketing, Sales, Research and Development, Forecasting, Production, Purchasing, Logistics, Information Systems, Finance and Customer Service.

On an Inter –Corporate level organisations ensure that there are formal supply chain structures in place to facilitate cross-organisation integration. Mentzer also states the area of integration includes, but is not limited to, Products, Services, Information, Financial Recourses, Demand and Forecasts (Mentzer et al., 2001). Once these are all aligned and cross functional integration is achieved, the value proposition and customer service levels as required are realised. This will contribute to true competitive advantage and profitability.

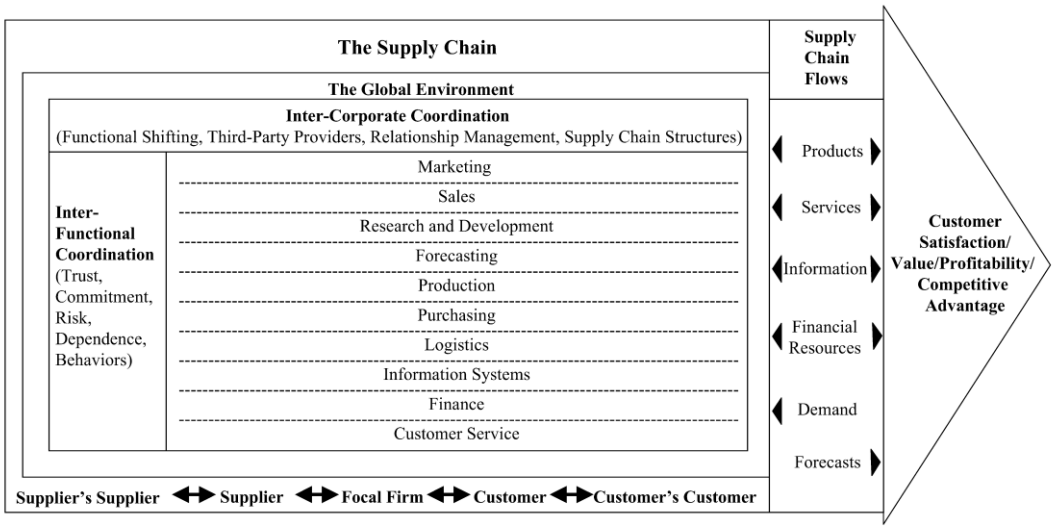

Figure 1: A Model of Supply Chain Management (Mentzer et al 2001)

Compared with the rest of the world, executing logistics within South Africa is more costly than compared with the rest of the world. According to the fifth annual logistics survey of South Africa (CSIR, 2009), logistics costs within South Africa for 2007 amounted to 15.9% of Gross Domestic Product (GDP) (global average 9% of GDP), which is equivalent to R317 billion Rand per annum. Figure 2 (CSIR, 2009) illustrates the make-up of the different cost segments contained within the 15.9% of GDP. The study also found that inventory carrying costs doubled over the past 5 years, while transportation costs increased by 50% (World Average 39%) over the same period. There is an increasing trend in these figures illustrating the general opportunity to manage these costs in a downwards fashion. This will impact the organisation's ability to compete internationally due to the higher cost of operation as well as their ability to reduce costs during recessionary periods.

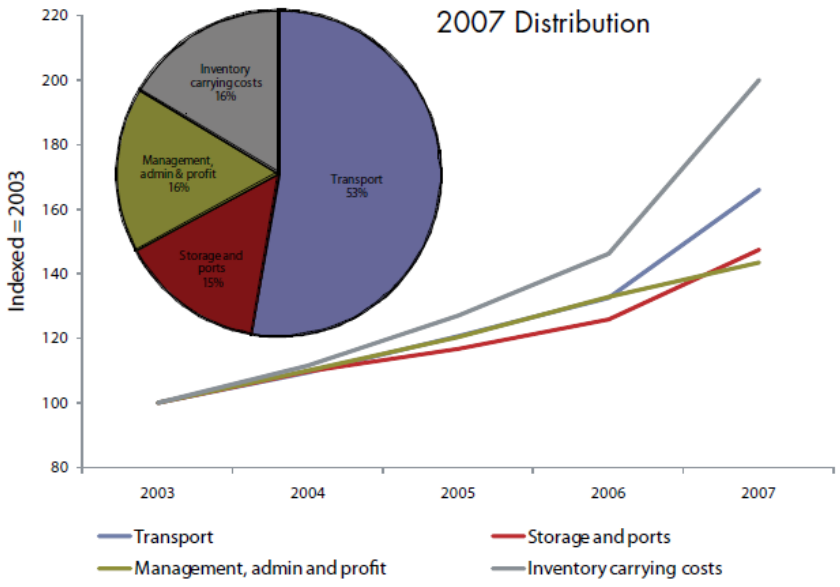

Figure 2: Logistics cost growth at current prices (nominal) and 2007 cost contribution (CSIR 2009)

A Global recession occurred from the end of December 2007 (Arntzen, 2009). Arntzen goes on to state that during this time supply chains globally incurred costs due to the impact of the recession on their target market.

He (Arntzen, 2009: 2) states :

> "Downturns have drastic effects up and down the supply chain, slowing of cash as well as flows of material and products. Most customers react quickly: They stop buying, cancel orders, delay accepting deliveries, and stretch our purchase orders and payments. For their part, suppliers worry about customers' ability to pay – or pay on time – so they push for early payment, sometimes requiring cash on deliver"

During his budget speech, South African Minister of Finance, Mr Trevor Manuel (Manuel, 2009: 4) commented on the impact of the global recession by stating:

"The United States has been in recession since the last quarter of 2007 and its economy is expected to contract by 1.6 per cent in 2009. The official interest rate has been cut to almost zero. Growth in Europe has slowed to 1 per cent in 2008 and is forecast to contract by 2 per cent in 2009. The UK economy is expected to shrink by 2.8 per cent in 2009".

On the back of this global recession South African consumer spending was also impacted severely. According to an annual report issued by the Standard Bank Group of South Africa in 2010, the debt to income ratio in South Africa increased over the recession period. Figure 3 (Ballin, 2010) illustrates the increase of debt to income ratio over the past few years in South Africa to 26.3%. Consumer's debt levels where on the rise and affected their purchasing ability due to servicing of debt.

	During the recession		Recovery after recession		
Downswing	Ave. annual growth in household debt	Increase in debt-to-income ratio[1]	Per cent of spending financed by credit		
			First year	Second year	Third year
1974 – 1977	13	6,1	60	38	42
1981 – 1982	24	15,1	83	92	64
1984 – 1985	19	7,3	**13**	**43**	**62**
1989 – 1993	18	11,3	76	64	91
1996 – 1999	10	7,2	**19**	**39**	**49**
2008 to date	16	26,3	?	?	?

1. Percentage point increase from the low point in the previous cycle (typically early stages of the preceding upswing) to the peak of the ratio (typically reached in the middle of the recession).

Figure 3: Debt to income ratio (Ballin, 2010)

South African consumers came from a booming economy with high property values and high levels of debt to income. In a local newspaper, (The Mail and Guardian, 2009) an economic unit from a local South African bank called Nedbank stated that consumers were under pressure and that there was a decrease in spending on durable, semi-durable and non-durable goods. Households' debt to disposable income ratio increased slightly to 76,7% in the first quarter of 2009 from 76,3% in the final quarter of 2008. As Figure 4 depicts, the consumer demand decreased in 2009 (Smit, 2010) and organisations found

it more difficult to sell products and realise profit targets and year-on-year growth objectives due to this decrease in sales.

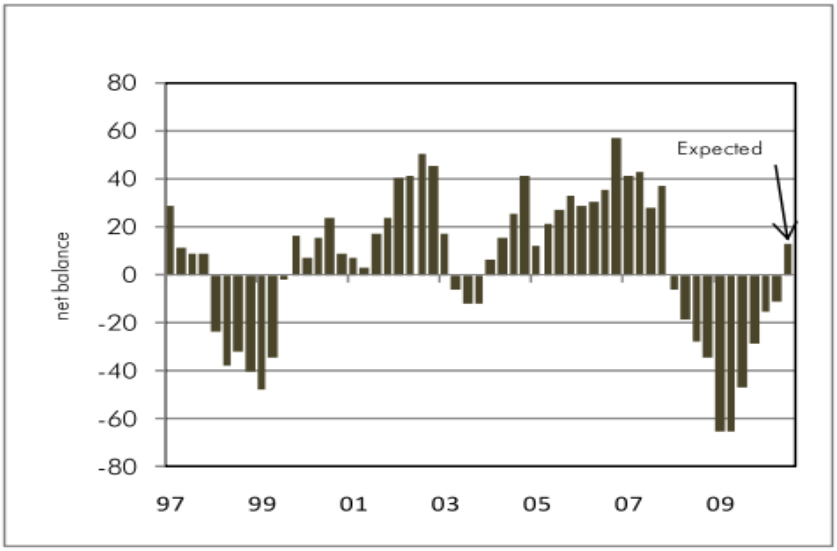

Figure 4: Domestic sales volumes remain under pressure (Smit, 2010)

Organisations found themselves with increasing inventories of raw material, in process inventories and finished goods throughout the supply chain. Figure 5 (Smit, 2010) illustrates the build-up of inventories over this period.

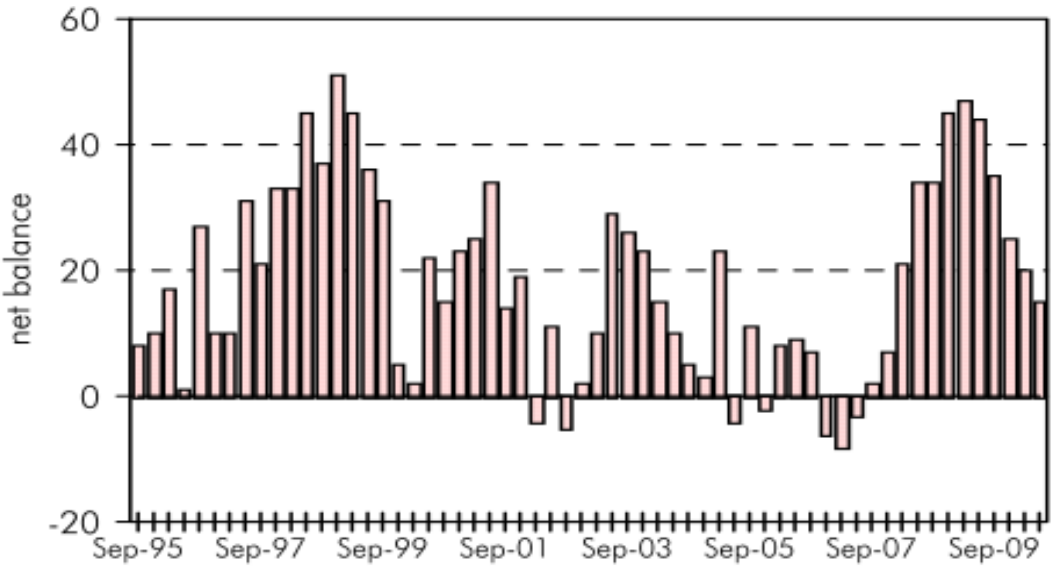

Figure 5: Finished goods stocks in relation to expected sales (Smit, 2010)

Sellers were protecting themselves on the basis of agreed off-take agreements with organisations, and retailers and consumers simply did not place the forecasted orders as planned. Capital was tied up in inventories, and peripheral costs such as warehousing and handling increased due to increased inventories as a result of decrease in sales. Organisations experienced cash flow problems, as cash was tied up in dead inventory due to the access supply of products, together with a minimal demand for these products.

1.3. Problem statement

1.3.1. Main problem

The purpose of this study is to assess the impact of a global recession on inbound supply chain management.

1.4. Significance of the study

The study fills a knowledge gap in that it will look at the Tier 1 suppliers to the automotive manufacturer and the impact that the recession had on these organisations' supply chains. It will look at the areas of impact within these organisations and their ability to react to the effects of the recession. Supply chains are required to meet the changing demand of the customers. However, in order to overcome recessionary periods, organisations need to be agile. Supply chains need to be pro-active in terms of their planning and execution of these events, and able to react on economic downturns as swiftly as possible to ensure that inventory carrying costs are minimised, impact on cash flow is understood and customer service levels are maximised. In their journal article Wadhwa, Saxena and Chan are of the view that even in complex supply chains, flexibility is an important mechanism for survival and growth in the face of continuous change (Wadhwa, Saxena and Chan 2008). For Tier 1 suppliers to continuously render a service to the automotive manufacturer supply chain flexibility would allow them the ability to react to the decrease in demand that would occur during recessionary periods.

The study will provide guidance to supply chain executives and engineers on the impact of recessions on their organisations and create awareness of the characteristics required by supply chains in order to design their supply chains with the necessary agility to meet these times of change on a planned and proactive manner. It will contribute to the existing body of knowledge in the sense that the study will illustrate the reality and the areas of impact during recessions on Tier 1 suppliers within the South African automotive industry.

1.5. Delimitations of the study

- For the purpose of this study the research will focus on the automotive manufacturing environment and especially on the Tier 1 suppliers within the automotive industry of South Africa.
- Tier 1 suppliers to automotive manufacturers will be reviewed, and focus will be on their supply of automotive components as part of the supply chain.
- The impact of the recession on them and their service to the automotive manufacturer as well as the downstream impact to their target market and their end customer will be reviewed.
- The individuals that will be interviewed within the Tier 1 suppliers will be the respective companies' decision makers regarding supply chain activities and design.

1.6. Definition of terms

- Supply Chain Management (SCM) – is the integration of key business processes from the end user through to the original suppliers that provides products, services, and information that add value for customers and other stakeholders (Lambert, 2004).
- Logistics Management – the process of planning, implementing and controlling the efficient, cost effective flow and storage of raw materials,

in-process inventory, finished goods, and related information from point-of-origin to point-of-consumption for the purpose of conforming to customers' requirements (Stock and Lambert, 1987).

- Marketing mix –an economic term referring to the interaction of the *4 P's of marketing* namely price, product, promotion and place (Kotler and Keller, 2005).

- Dead Inventory – Set of items for which no demand has been registered for some specified period of time(Stock and Lambert, 1987).

- Original Equipment Manufacturer (OEM) – OEM's are original equipment manufacturers and supply original parts to the production facilities of the automotive manufacturer.

- Just In Time (JIT) - "Just-In-Time" is an inventory control philosophy where the goal is to maintain just enough material in just the right place at just the right time to make just the right amount of product (Stock and Lambert, 1987).

- Total Quality Management (TQM) – Total Quality Management is both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organisation. Total Quality Management is the application of quantitative and human resources to improve the material services supplied to an organisation, all the processes within the organisation, and the degree to which the needs of the customer are met – now and in the future. Total Quality Management integrates fundamental management techniques, existing improvement efforts and technical tools under a disciplined approach focussed on continuous improvement (Stock and Lambert, 1987).

- Built to order (BTO) – On demand production of standardised products (Anderson, 2004).

- Supplier Parks – the concentration of dedicated production assembly, sequencing or warehousing facilities run by suppliers or a third party in close proximity to the OEM plant (Miemczyk, Howard and Graves, 2004).

- Agility – being able to reconfigure operations, processes and business relationships efficiently, while at the same time flourishing in an environment of continuous change (David and James, 2006).

- Bullwhip effect (BWE) – The Forrester effect, also known as the BWE, illustrates an amplification of demand variation through a supply, a phenomenon that makes matching supply with demand more difficult (Forrester, 1961; Dooley, Yan, Mohan and Gopalakrishnan, 2010)

- Firm's Supply Chain Agility (FSCA) – the capability of the firm, both internally and in conjunction with its key suppliers and customers, to adapt or respond in a speedy manner to the marketplace changes as well as to potential and actual disruptions, contributing to the agility of the extended supply chain (Braunscheidel and Suresh, 2009).

- Electronic Data interchange (EDI) – the movement of business data electronically between or within firms (including their agents or intermediaries) in a structured, computerized data format that merits data to be transferred without reeking from a computer-supported business application in one location to a computer-supported business application in another location (Hill and Ferguson, 1989).

- LEAN manufacturing principles – Process of eliminating waste within the manufacturing process. These wastes include areas such as Transportation, Inventory, Motion, Waiting time, Over Processing, Over Production and Defects within the product (Womack, Jones, Simon and Schuster, 1996).

1.7. Assumptions

The following assumptions have been made regarding this study:

a. The views of the individuals will be a fair reflection of the reality, and their views as expressed in the questionnaire and interview will be seen as a true reflection of the reality.

b. The total number of respondents will be sufficient to gain adequate data.

c. Information will be conveyed honestly and truthfully by the respondents. False data will have a severely detrimental effect on the study's results.

d. The respondent sample will reflect the general experiences of the organisation they work within. Non-representative views will skew the results of the study and reduce its validity.

e. The detail regarding brand and company will at all times be treated as confidential. This will ensure that brand loyalty and perceived efficiency of the organisation are not included in the reading and analysis of the data or feedback.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This section contains a literature review on the key characteristics of the study in terms of automotive supply chains and the trade-offs between the different value chain areas and the impact of these on the total logistics cost. This section will also review the importance of supply chains in general to be agile to allow for scalability, especially during recessionary periods.

2.2. Background discussion

Since Henry Ford developed the Model T in the 1900's and revolutionised the production process of vehicle manufacturing, the business model fundamentally changed from one where Mr Ford believed that the whole supply chain should be owned and controlled, to one where the whole supply chain consists of independent role players that is not controlled (Drucker, 1990). They merely function together within a supplier-customer relationship to provide the automotive manufacturer with the parts to assemble the final product.

Over the past years numerous manufacturing principles were introduced into the automotive industry, especially from Japan due to their early adoption of W. Edwards Demming's Statistical Quality Control concepts (Drucker, 1990). From this point Japan lead the manufacturing race within the automotive industry with the application of Just in Time (JIT) principles and Total Quality Management (TQM).

In modern day automotive manufacturing supply chains supporting the manufacturing process have evolved to well-designed and executed processes with numerous outsourced partners performing non-core activities and supplying these parts to the automotive manufacturer (Adrian, Andrew, Zenon and Dennis, 2006). Principles of TQM and JIT are well implemented and practiced through all automotive manufacturers and new sources of competitive advantages need to be developed to stay ahead of the game.

Gould is of the view that within the automotive supply chain, Tier 1 suppliers perform close to 100% perfect orders and that the difference between a very good and weak supplier is a mere 6% (Gould, 2003). He is also of the view that the difference between a good and weak supplier is their investment in Information Technology (IT). He states that the cost difference between a good and a weak supplier could be as great as 20% of total revenue more than that of a weak supplier (Gould, 2003). One key characteristic of these good suppliers is thus their investment in IT software and e-business solutions.

According to Gould another differentiating factor within the automotive supply chain suppliers is their ability to commit to “best practices” in the way that they focus on process excellence initiatives (Gould, 2003). The ability to review business processes and re-design these, and ultimately automating these new processes are a key factor distinguishing suppliers.

Another differentiating factor (Gould, 2003) is the integration of data and how it is shared between supply chain members. This data includes information such as order quantities and inventory levels. Gould is also of the view that this is a key factor going forward as the automotive supply chains have to change their business model fundamentally from a “push” orientated one, where standard models are pushed into the market for customers to select, to one where customers drive the demand by “pulling” the cars from the manufacturer according to their specifications. This is known in the industry as a built to order (BTO) system.

Stout (2005) shares this view by stating that collaboration and supply chain visibility are key drivers and that competition is not just on product level however, also with the competitor’s supply chain (Stout, 2005). The implementation of highly effective IT solutions that facilitates collaboration and visibility truly enhances the competitive nature of the automotive supply chain. David and James (2006) support the view that vehicle manufacturers are pursuing collaboration between them and their suppliers to the extent that they also collaborate in areas such as product development, supplier development and information sharing (David and James, 2006).

Gould (2003) views the industry as changing fundamentally in that the traditional supply chains for mass manufacturing for high volume will have to change to in future for low volume, niche-product manufacturing plants. Adrian et al (2006) also supports the sentiment that IT innovation and the BTO model of manufacturers are areas of competitive advantage and that a fundamental change in business model is required to support BTO. These authors also state that the advantages of BTO may involve (Adrian et al., 2006 :553):

- Reduction of cycle times and inventory turnover
- Increase in the number of data links between suppliers, and
- Relocating production facilities near main customer production facilities."

For the BTO initiatives to be a success, the authors came to the conclusion that the success of these initiatives depends on efficient supply chain management policies supported by state of the art IT implementation that will facilitate cross company collaboration (Adrian et al., 2006). *The level of integrated IT systems was tested with Question 6 to determine if such systems between the Tier 1 supplier and the automotive manufacturer exist*.

David and James support the view that a more intense relationship between vehicle manufacturers and their suppliers exists and that collaboration in areas such as product development and information sharing occurs as a norm (David and James, 2006). This is achieved by introducing synchronous supply strategies between the vendors (OEM's) and the vehicle manufacturer. These supply strategies occur on a global basis and the effects of globalisation must not be under estimated. Post confirms that automotive supply chains are spreading apart due to globalisation and that logistics managers must have a global view to ensure supply chain efficiency (Post, 2010). In his article, Post (2010) is of the view that there are mainly 3 best practices that automotive supply chains managers can implement to manage their operational cost. These include areas such as reducing standing inventory, implementing formal returns processes and evaluating new transportation approaches that streamline the global supply chain. The objective is to minimise the costs

through the supply chain to ensure that the automotive supply chain is cost competitive.

Question 1 looked at the global nature of the company's supply chains. Question 2 identified the manner in which the Tier 1 suppliers were scanning their external environment before the recession occurred, from a strategic point of view, to determine the possible impacts on their organisations.

2.3. Recessionary impact on supply chain management

Supply chains are in essence a group of suppliers and customers linked to provide a product and/or service to the end consumer. The consumer's demand will determine the amount of product movement within these supply chains, and the infrastructure capacity to provide these products to the end consumer. During good economic times customer demand is high and increases over time. During recessions however, the demand declines and this has a negative effect on production and sales. This variability in demand impacts the total supply chain cost, as well as affects all the role players within the supply chain individually.

2.3.1. The "Bullwhip" effect

The 2007-2008 recession had a major impact across all industries throughout the world. Consumer demand for product and services declined, and due to this demand variance the Forrester effect, also knows as the Bullwhip effect (BWE), was caused within numerous supply chains.

In their book Pycraft, Singh, Philela, Slack, Chambers, Harland et al the authors describe the Forrester Effect which was demonstrated in the 1960's by Jay Forester. The Forester effect is not only caused by errors and distortions within supply chains. However, it also refers to an understandable desire within the different supply chain links to manage their production and their inventory levels sensibly (Pycraft, Singh, Philela, Slack, Chambers, Harland et al., 2001). These desires, if not supported with cross functional Information Technology,

will increase the way in which individual organisations compensate for the unknown.

The BWE illustrates the impact of a variance in consumer demand for a product and the increase of upstream demand variation caused by such a demand variance (Dooley et al., 2010). This has a multiplier effect on the closed supply chain players, and will have an increased effect on the Tier 1, tier 2 and tier 3 suppliers within the automotive industry. Dooley et al found that the BWE for retailers was minimal, as they could smooth their inventory to the levels required by the end customers (Dooley et al., 2010). However, that the upstream vendors such as wholesalers and manufacturers reacted much later and more aggressively as a reactive measure. This aggressive reaction caused by a BWE on upstream role players caused them to lose control over their inventory levels.

Sheffi is also of the view that a BWE occurred in supply chains during the recession (Sheffi, 2010). The author states:

> "as firms were slashing inventory, furloughing employees, idling factories and cutting orders to their suppliers, the intensity of the recession reverberated upstream in the supply chain with full force in almost perfect accordance with what the bullwhip effect would have predicted" (Sheffi, 2010: 8).

Sheffi is of the view that the reaction was too severe and companies cut inventories too low due to cash being tied up in inventories and their drive to release this cash. He also identified that due to inventories being cut too far, customers may have placed fake orders to ensure that they get products to sell. This was the case in some automotive companies as demand for vehicles where pushed up, and that desperate dealers inflated their orders. This caused forecasts to be inaccurate (Sheffi, 2010).

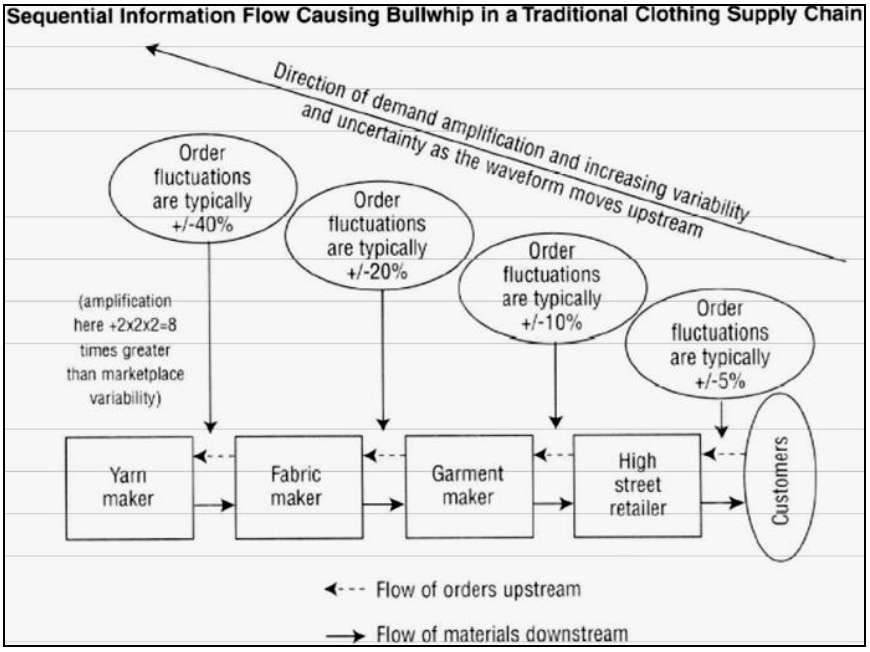

Figure 6: The "Bullwhip" effect on supply chain (Freelancer, 2011)

Figure 6 is an illustration of the Bullwhip effect within clothing manufacturing supply chain and how the uncertainty within a supply chain causes the various role players to react on the variability in orders that they receive from their customers. This cumulating effect caused an increase in stock holding due to the increase in variability.

The extent to which the BWE was experienced by the Tier 1 suppliers were tested with question 3, 4 and 9 within this study. These questions also highlighted if a "reverse" BWE was experienced after the recession in terms of filling the supply chain with inventory to meet the demand.

2.3.2. Supply Chain impact

Carter, Carter and Monczka (2009) states that supply chain management and the relationship of role players will change fundamentally due to the recession. Two round table events were held where supply chain executives could discuss the impacts and demands on supply chains after the recession. The authors are of the view that for crisis industries, such as the automotive industry, there is an across-the-board belt-tightening effect and that across all functional areas

cost-reduction targets are in place. For these industries cash was tied up in inventories that were not moving, thus putting “cash” pressure on the companies. According to Carter et al the delegates were of the view that tighter relationships with Tier 1 suppliers, as well as their suppliers are required to ensure going forward the necessary contingency plans and sourcing strategies are in place to ensure future sustainability (Carter, Carter and Monczka, 2009). Open relationships between supply chain members are crucial to future growth and sustainability. They do however agree that supply chains going forward will fundamentally change in their way of operation and information share.

The recession identified that companies still interact with one another on a silo basis, and that the future sustainability will depend on their ability to utilise software to integrate across the company. This is highlighted with the high inventory levels within these companies (Murphy, 2009). The lack of in-time information across all role-players directly impact reaction time to these demand changes, and ultimately increases the BWE. Murphy is of the view that supply chain managers of the future will have to change their approach in terms of managing their supply chains, and that risk analysis and contingency plans will play an increased role within this field as well as introducing flexibility within supply chains (Murphy, 2009).

Escaith also confirm that companies involved with global supply chains, such as the automotive industry, have always in the past produced on a JIT basis (Escaith, 2009). This JIT process, in reality, only goes for the main manufacturer. For the other role players inventory must be kept to ensure that it is provided to the manufacturing concern on a JIT basis. Many of these inventories are held at origin as well as on route due to the long lead times of international suppliers. This impacts the 1st, 2nd and 3rd tier suppliers directly. Escaith (2009) agrees that the BWE had an impact on international inventories within global supply chains and forces upstream manufacturers to stop manufacturing and reduce staff and resources. The author is of the view that future supply chains, as a result of the recession, may even review their global footprint and revert back to a de-globalisation strategy. This strategy will

however, be based on external factors such as labour costs, lead times, input costs etc.

Question 4 in the study was asked to understand the impact of the recession on the Tier 1 supplier's inventory. Question 5 and 9 look at identifying the Bullwhip effect and impact areas and whether they were experienced within the Tier 1 supplier and the automotive manufacturing company's relationship with one another. Question 10 looked at the impact between the relationship of the Tier 1 supplier and the automotive manufacturer and how the recession impacted this relationship.

2.4. Characteristics of supply chains

Supply chains must be able to be agile to allow them to adopt and react to demand changes of their specific target markets.

2.1.1 Agile Supply Chains

Christopher is of the view that there are mainly four distinguishing characteristics that supply chains must have to be agile, namely (refer to Figure 6) (Christopher, 2000):

- Market sensitivity – ability to respond to demand changes of market
- Virtual – information technology sharing between buyers and suppliers
- Network-based – all role-players work within one supply chain as an integrated network and compete accordingly
- Process integration – between suppliers and buyers that facilitates communication.

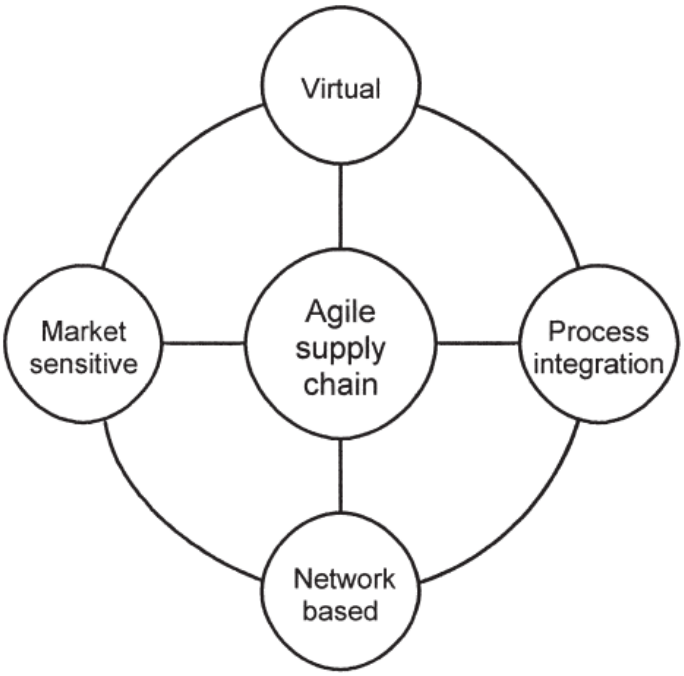

Figure 7: The agile supply chain (Christopher, 2000)

Christopher (2000) is also of the view that there will be times where a pure lean strategy (high volume, low variety / variability) and a pure agile strategy (high variety / variability and low volume) may not be the best solution and that a hybrid strategy will be more suitable. This will allow the organisation to be lean on some parts within the supply chain, and for others to be agile.

Agarwal, Shankar and Tiwari reviewed this model and modified the above model to include more characteristics within supply chains contributing to agile supply chains (Agarwal, Shankar and Tiwari, 2007). Figure 8 illustrates these new introduced characteristics however, still grouped under the original model headings as provided by Christopher (Christopher, 2000). Agarwal et al. (2007) identified lead time reduction as another important variable for agility within supply chains. By shortening lead times supply chain agility is increased by introducing reactiveness into the strategy.

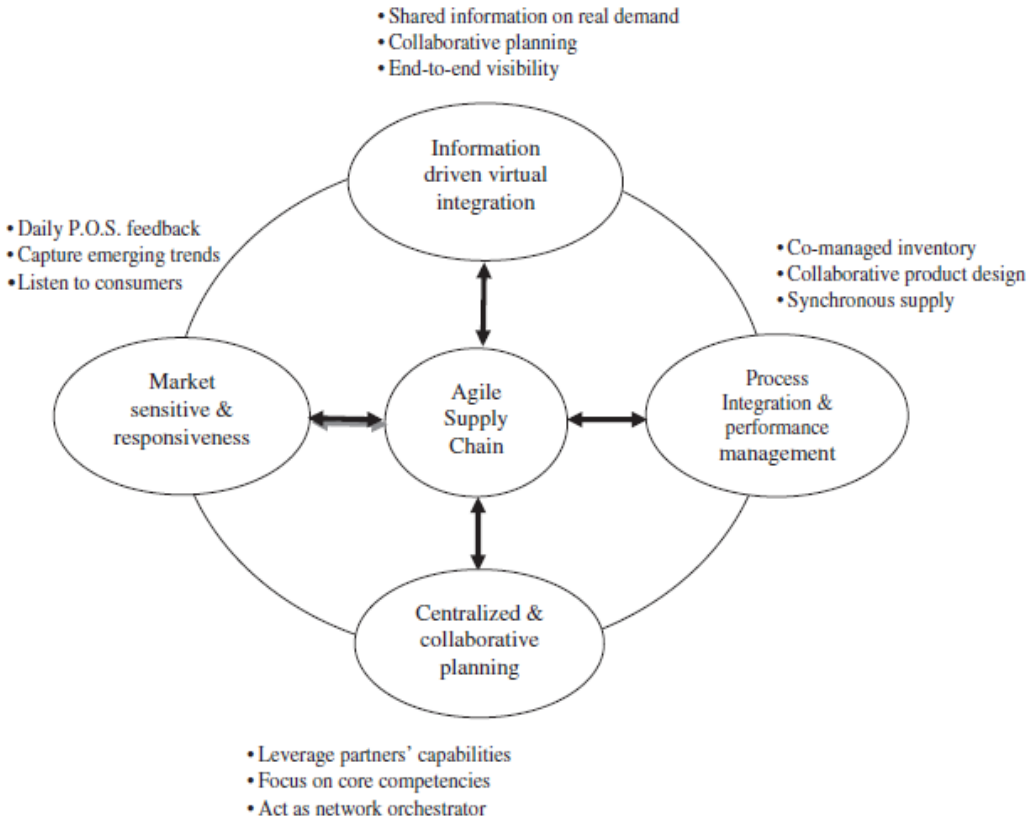

Figure 8: Characteristics of agile supply chain (modified from Harrison, Christopher and Hoek, 1999) (Agarwal et al., 2007)

Christopher (2000) states that agility is conceptually distinct from flexibility but in effect, that flexibility is key characteristic of agility. Braunscheidel and Suresh supports the view that today's marketplace is characterised by very high levels of competitive pressures as well as high levels of uncertainty and turbulence (Braunscheidel and Suresh, 2009). The author is of the view that to survive in these conditions, organisations supply chains need agility within their supply chains to ensure that they add value to the end customer and limit risk.

Swafford, Ghosh and Murthy is of the view that flexibility is a sub component of agility, and that agility is an overall organisational capability derived from the competency of flexibility within the lower level operations of the organisation (Swafford, Ghosh and Murthy, 2006). Based on this, they proposed a value chain framework (Figure 9) where the different internal components of the organization all contributing to flexibility which, when incorporating IT

Integration, contribute to value chain agility. According to the authors the primary determinants of value chain agility are the speed of improving delivery reliability and the responsiveness to changing market needs.

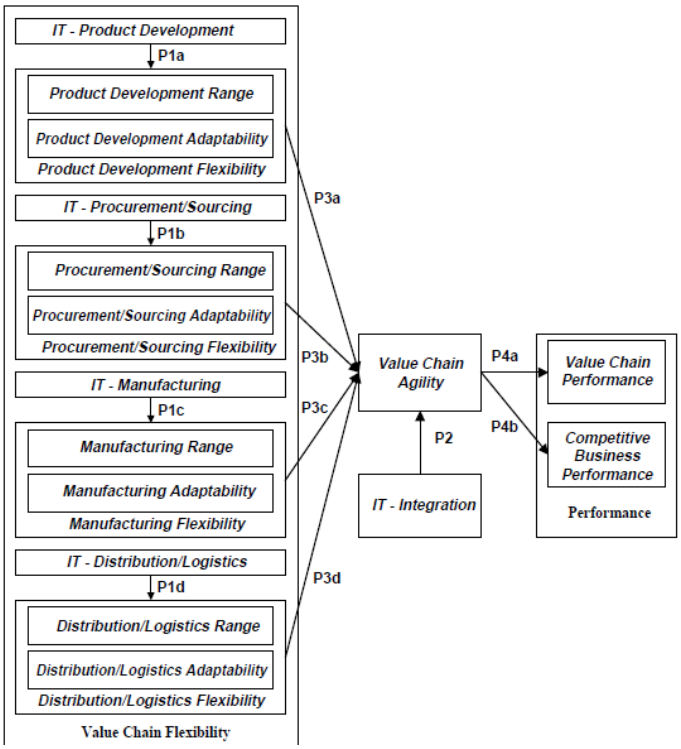

Figure 9: Value chain agility framework (Swafford et al., 2006)

According to Braunscheidel and Suresh agility is a risk management initiative that enables organisations to respond rapidly to market place changes as well as possible disruptions within the supply chains (Braunscheidel and Suresh, 2009). Figure 10 illustrates the model that the authors propose to illustrate the characteristics affecting supply chain agility. According to Braunscheidel and Suresh are of the view that factors that are antecedents to agility within an organisation are internal integration, external integration with key suppliers and customers, and external flexibility (Braunscheidel and Suresh, 2009). The two cultural elements, market and learning orientation are positioned to give rise to their three organisational practices. According to their findings internal integration, external flexibility and external integration, of which the latter was more important, all contributed directly to agility within supply chains. The agility is found in areas such as joint planning with customers, the firms' ability

to react to customer demand changes, inventory visibility and how quickly they can respond to the customers' requests.

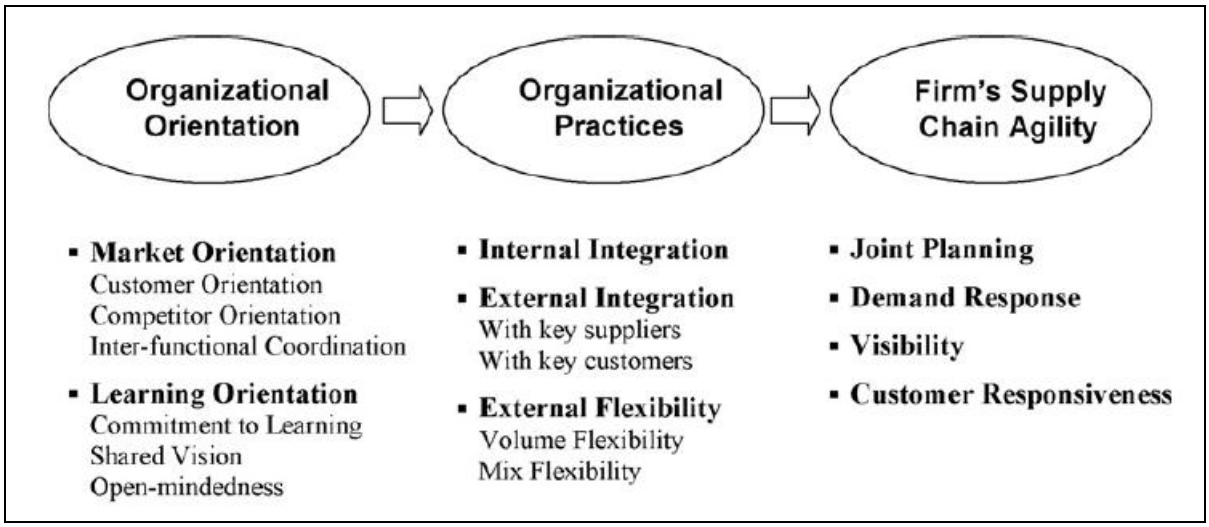

Figure 10: Overall Model Structure (Braunscheidel and Suresh, 2009)

Question 7 and 8 looked at the understanding of the concept of agility within the organisations interviewed and if the Tier 1 supplier is of the view whether agility is or is not important during recessions.

2.5. Conclusion of Literature Review

Modern automotive supply chains consist of global networks of suppliers that provide raw materials, components and parts to the automotive manufacturer. These organisations are based across the globe within various regions and countries. The dynamics of managing an international supply chain is more complex than managing a local supply chain. Many of these supply chains span across the world to leverage the ability to produce components at the lowest possible cost and highest quality. For the automotive manufacturer to be competitive the suppliers must perform their function on a JIT principle to provide the parts with a time and place utility.

Supply Chain Management has been concerned with optimising, integrating and increasing collaboration between supply chain partners to such a level where an agile supply chain is achieved. This allows the organisation to compete against their competitors based on the competitive advantage of their total supply chain's performance. The objective is to eliminate costs through the entire supply chain, from origin to point of consumption by the end user.

To enable organisations to deliver these products to their customers many programs such as LEAN, TQM, JIT etc have been implemented to enable them to provide the highest quality at the lowest possible costs. The OEM's together with the manufacturers have to plan their supply chains carefully to enable these to be agile enough to eliminate unnecessary costs and to be adaptive to the changing demand in customers.

During recessionary periods however, the demand from the customers change dramatically and quickly due to external pressures on the target market. This drastic change in demand impacts directly on the manufacturer and the entire supply chain. Due to the inherit dynamics and variability in demand the BWE is experienced within the supply chain partners during a recession, thus causing an increase in inventories throughout the supply chain. The characteristics that are built into the supply chains to enable agility have to enable organisations to react to these changes. The responsiveness, speed and ability of supply chains to react and adapt with minimum costs will be fundamental to the survival of all role-players within that supply chain. The literature review highlights that recessions and the impact of recessions on organisations are quite dramatic in nature, and that it is important to be agile during these periods to ensure the organisations future. In reviewing the characteristics of agility, and to determine if these still hold during recession periods is important to ensure that global supply chains are sustainable during all economic cycles.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Research methodology / paradigm

Qualitative research was used in analysing the research problems. Qualitative method is used when reviewing people's opinions, views and sentiment and the inquirer often makes knowledge claims based primarily on constructivist's perspectives (i.e., multiple meanings of individual experiences, meanings socially and historically constructed, with an intent of developing a theory or pattern) (Creswell, 2003). A semi-structured interviewing process was used to gather data from the industry leaders. Semi-structured interviewing was used with structured questions with a person, which in turn, steered the discussion (Willig, 2008). Qualitative data was collected by making use of a literature review, as well as utilising semi-structured interviews with industry leaders regarding the subject matter.

3.2. Research Design

For this research, a qualitative model was used to answer the research questions. For this purpose a semi-structured interview was used to gather the qualitative data.

3.2.1. Qualitative Research

The use of semi-structured interviews was use to review the research questions to allow an in depth understanding of the recession on the Tier 1 suppliers. The advantage of using qualitative research was the ability to garner an in depth understanding of the subject matter during the data gathering process. Rich details were obtained regarding the subject matter and can be explored with examples. Unique situations were explored with this method that allowed for a detailed understanding of the individuals' perception and views. The disadvantage of this method was that it was time consuming, and in some cases it was difficult to arrange the time for the interview process to be

conducted. The onus was on the interviewer to refrain from posing leading questions.

3.3. Population and sample

3.3.1. Population

The population for this study is the Tier 1 suppliers within the supply chains of automotive manufacturers within South Africa. The Tier 1 suppliers in South Africa is mainly centralised in three nodes. These nodes are situated geographically within Gauteng (Rosslyn / Brits area), Kwa-Zulu Natal (Durban area) and Eastern Cape (Port Elizabeth / East London area). The main automotive manufacturing plants are also situated in these geographical areas.

3.3.2. Sample and sampling method

The sample consisted of Tier 1 suppliers within the supply chain of the automotive industry within the above mentioned population. The sampling was completed on Tier 1 suppliers within the Gauteng, Kwa-Zulu Natal area. The sample consisted of companies that are within a vendor relationship to the automotive manufacturer. The sample was done by reviewing the companies involved within the supply chain, and accessibility to these to enable the data gathering process. Due to the special constraint of distance as well as access to the organisations, convenience sampling was undertaken. The use of random sampling of all suppliers will not be a possibility as the sampling results may identify suppliers that are not willing or able to participate.

An amount of ten interviews with industry specialists were conducted. Their views and perceptions were reviewed and analysed. One – on - one semi-structured interviews were scheduled with these individuals to gather the data required. The data was analysed in line with the theoretical literature review.

Table 1 illustrates the companies involved in this study, and the data will be collected from 1 representative in each of these organisations.

Table 1: Profile of respondents (if appropriate)

Description of respondent Companies	Number of people interviewed	Geographical area
Robert Bosh (Pty) Limited	1	Brits / Rosslyn
Sumitomo Corporation	1	Prospecton / Durban
Werma Patterns and Moulds CC	1	Rosslyn
MA Automotive Rosslyn (Pty) Limited	1	Rosslyn
Cummins Emission Solutions	1	Rosslyn
Bosal Africa (Pty) Limited	1	Pretoria
Hesto Harnesses (Pty) Limited	1	Stanger / Durban
Bridgestone South Africa (Pty) Limited	1	Johannesburg
Federal-Mogul Corporation	1	Durban
Lear Sewing (Pty) Limited	1	Rosslyn

3.4. The research instrument

DiCicco-Bloom and Crabtree describes that the interviewing process is the most frequently used qualitative research method, and that it is used within areas where the individual being interviewed divulges experience and perceptions, and based on these the hypothesis is formed (DiCicco-Bloom and Crabtree, 2006). The authors are also of the view that the semi-structured interview process is almost exclusively the only real source of qualitative data collection.

These interviews are structured around pre-determined open ended questions with other questions emerging during the interview process (DiCicco-Bloom and Crabtree, 2006). The authors are also of the view that in depth individual interviews are better sources of qualitative data as it is more direct and personal.

DicCicco-Bloom and Crabtree describe the process as follows (DiCicco-Bloom and Crabtree, 2006):

- Design the questions for the interview to ensure that they are clear rather than leading.
- Conduct the interview process with a recording devise, such as a tape recorder, video tape and some notes
- Transcribe the data
- Use software programs to assist with the data management and analysis

3.5. Procedure for data collection

3.5.1. Qualitative data collection

The specialists that were identified with whom to have interviews were approached via telephonic conversation informing them about the reason for the research, the importance of their involvement and a request for a meeting for the interview process. The individuals were ensured of confidentiality and that their views would be protected. This allowed them the security to honestly disclose their views. Times of these interviews were flexible and after hour meetings and over weekends were also accommodated to facilitate their involvement. One-on-One interviews were completed on a face-to-face basis to ensure that the feedback was personal and interactive.

Some of the interviews, where the individuals agreed to the recording of the meeting, were recorded to ensure that the transcriptions of the interviews were prepared correctly. This allowed for minimal discretion of the facts stated within the interviews. In general however, most of the interviews were done via transcribing and making notes as there appeared to be a feeling of uneasiness when the researcher requested to record the interviews.

Once the data was collected, transcribed and grouped, it was analysed to highlight the common threads and ideas.

3.6. Data analysis and interpretation

3.6.1. Qualitative analysis:

- The qualitative data analysis was conducted by reviewing all the feedback collated from the interview process. In some cases the interviews were conducted with the use of a voice recording device and transcribed.

- After transcribing the interviews, the general themes and views were grouped and reviewed.

- Once the views were grouped and compared to the theoretical literature the views were compared to that of either being in agreement or against the literature reviewed.

- The end objective was to determine if the reality in terms of the specialist perceptions and experiences were in line with the theoretical views.

3.7. Limitations of the study

The study focused on Tier 1 inbound logistics of automotive manufacturers supply chains. The interviews were conducted with the industry specialists as identified as part of the sample selection process. Numerous meetings with proposed times were scheduled with the various individuals to provide the opportunity to interview the specific experts within the company.

Distance was a factor that contributed to complexities during the study as most of the automotive Tier 1 supplier was within a specific region usually around the automotive manufacturer, and travelling and sequencing of interviews was conducted in such a way to accommodate all within the given time frames. To eliminate bias during the interview process the interviews were conducted by the same person as this ensured that external influences to the interview process was minimised.

The literature review was executed as thoroughly as possible. There might be some authors and their views that were not included in the literature review. The impact of this was minimised by reviewing the most up to date literature as well as the original founders of the theory where possible.

The views reflected in the study were the opinions of the individuals interviewed, and not necessarily the views of the company as a whole. The data analysis was solely was based on the views and perceptions of these individuals. To ensure that the opinions of the individuals will carry high objectivity only individuals within a senior management role within the company were identified and interviewed.

3.8. Validity and reliability

3.8.1. External validity

Validity can be defined as being concerned with the congruence, or a 'goodness of fit' between the details of the research, the evidence, and the conclusions drawn by the researchers (Kalof, Dan and Dietz, 2008). According to the Kalof et al. (Kalof et al., 2008) external validity is the ability to generalise from a study to a larger population. This refers to the ability of the study's sample to be representative of the population, and the ability of the results of this sample to be applicable to the total population. For the purpose of this study the population has been identified as being Tier 1 suppliers to automotive manufacturers within South Africa. From this point of reference, similar results should be found to hold for a different sample within this population. The study aimed to be representative during the selection process of the sample to signify a fair representation of the population. A senior lecturer at Wits Business School assisted with the sampling process to ensure that the sample was representative of the population and that the results would be able to be inferred to the population.

3.8.2. Internal validity

Internal validity refers to the means that the study draws appropriate conclusions from the data at hand (Kalof et al., 2008). In this regards it is important to ensure that the tool being used to measure is the correct one , and that in fact the result achieved is the one being measured. The researcher needs to ensure that the study measures what is described in the theory.

For this purpose the same interview guideline and questionnaire will be used across the sample to ensure that the same results are achieved. The same people at the different levels of the organisation will be used as a sample to increase the internal validity of this study.

3.8.3. Reliability

Kalof et al, (2008) state that reliability is concerned with consistency. They are of the opinion that research is considered to be reliable if similar findings are revealed time after time in repeated application of the research.

To ensure that reliability is guaranteed during this study, all interviews were conducted by the same person, thus to ensure that all follow the same method and flow. The consistency in this approach thus increased the reliability of the research. By referring to current literature and previous studies that were conducted, it served to assist with ensuring that reliability was achieved.

CHAPTER 4: PRESENTATION OF RESULTS

4.1. Introduction

Ten Tier 1 suppliers were identified to conclude interviews regarding their experienced during the recession. During the interview process common factors that affected them during the recession were identified. Due to the interviews being semi-structured and the inherit nature of these interviews; the data was consolidated in table format to consolidate the central views of the organisations to indicate similarity of views, experiences and highlight differences in opinion.

By summarising the data within table format it allowed for grouping the central ideas into one common idea and allowed for identification of the central theme of discussion. These common views are illustrated by the use of tables, and a discussion of the views follows. To ensure that at all times the company's confidentiality is adhered to, the companies will be referred to in a general sense and no specific reference will be made to the specific view of the person interviewed within the company. The company identified as company 1 will at all times be referred to as company 1 during this study. The sequence of the companies is not linked to Table 1 in Chapter 3 to ensure that the company's views and opinions are kept confidential.

For analysis purposes a separate table was used which identified the companies. However, this has not been disclosed during the study to ensure the privacy of the companies interviewed. This was a pre-requisite for some of the interviews to take place, as the automotive industry in South Africa is a linked and integrated one. This serves to guarantee that at no time the suppliers views will be made known to the automotive manufacturer they provide a service to, as this could impact their contract of engagement with their customer. These contractual agreements require confidentiality regarding the contract and the type of services provided to the automotive manufacturer. By following this process the confidentiality was ensured at all times.

4.2. Results pertaining to the impact of a global recession on inbound supply chain management

The interviews with the ten companies selected, as part of the sampling process are discussed in this study together with the use of tables. To illustrate the general themes, the data has been consolidated and the following main areas of impact have been identified and will be discussed.

4.2.1. Global vs Local inbound supply chains

Table 2: Global vs Local inbound supply chains

Table 2: Global vs. local inbound supply chains

	Global or Local Inbound Supply Chains	
	Global	Local
Number of companies Interviewed	9	1
Total (n = 10)	9	1

Nine of the correspondents of the companies interviewed indicated that they have international inbound supply chains as illustrated in Table 2. To enable them to manufacture the product locally to the automotive manufacturer, raw materials, components or sub-assemblies are sourced from within their group of companies, or from their supplier based internationally. The impact of global inbound supply chains, as described by the Tier 1 suppliers interviewed, were mainly two fold. Firstly, they experienced the recession, and the impact of the recession, earlier than the actual automotive manufacturers based in South Africa as there was a lag in the time it took for the recession to affect the local market. Some of the indications were that the time lapsed from the United States and European recession and experiencing the effects within the local South African market was around 6 to 8 months.

The second point highlighted by the companies interviewed was that long lead times from suppliers to the Tier 1 manufacturer in South Africa also impact their ability to react to the decrease in demand, and ultimately this impacts on their inventory levels. The inbound lead times indicated by the Tier 1 suppliers varied from 6 to 8 weeks, to as long as 22 weeks. The orders for these components were placed long before the decrease in volumes from the automotive manufacturer were experienced.

Most of these imports from global markets are all ocean freight consignments due to the high costs involved in airfreight shipments. The companies interviewed indicated that in-transit inventories could not be adjusted downwards due to the decrease in demand, and thus the impact of these lead times and the ability to be flexible within these lead times caused the Tier 1 suppliers to have a rather limited ability to react timeously to the demand fluctuations from the automotive manufacturers.

One company interviewed indicated that another factor adding to the complexity of long lead times were the introduction of minimum order quantities from the suppliers. These were introduced by suppliers to manage their size of production runs. This allowed them to only incur the operational manufacturing costs once the production run was sizeable to do so. This contributed to even higher inventory levels carried by the Tier 1 supplier during the recession period as the lead times from these suppliers increased with the additional waiting time for their suppliers to receive sizable orders to justify a production run.

4.2.2. Key issues experienced during the recession

Table 3: Key issues experienced during the recession

	Key issues experienced during the recession						
	High Inventory Levels	Obsolescence High	Supplier Bankruptcy	Cash Flow impacted	Downsizing operations and Staff	Capital Investment Decisions	Exchange rate Forex Exposure
Company 1	x				x	x	
Company 2	x		x	x	x		
Company 3		x	x		x	x	
Company 4	x	x	x	x	x	x	
Company 5	x		x	x	x		
Company 6				x			
Company 7	x			x	x		x
Company 8	x			x	x		x
Company 9	x	x		x	x		
Company 10	x			x	x	x	
Total (n =10)	8	3	4	8	9	4	2

Table 3 is a summary of the key issues experienced by the ten companies during the recession. Nine out of the ten companies that were interviewed had a main challenge during the recession relating to the drop in demand for their components and the effects of this on their staff complement, especially their production line staff.

4.2.2.1 Human Resources

The impact of reducing staff within South Africa is quite an expensive and long process due to strict labour laws within South Africa that protect the rights of the workers. The process of reducing staff headcount varied from company to company; however, the loss of experience and skills were felt throughout all of these initiatives. The different options used to reduce the operational headcount varied from reducing part time labour, reducing shifts, reducing work weeks from five days to three and as last resort voluntary and normal retrenchments.

The process of Retrenchment comes at a high cost and it places more strain on a company that already experiences cash flow pressures. It is a costly and time consuming process for a company to downsize their operational workforce, as well as the impact of such a process to the morale and the general company culture. These initiatives were required to contain costs and try to operate as

leanly as possible. The trend identified from the interviews was that the part time employment used on a shift basis on the plants was the first areas where staff reductions took place. The production plans and hours of operations where reduced and priority was given to permanent staff. Two of the companies interviewed implemented reduced hours of work, thus working only four days a week. Employees' incomes were reduced by the shortened week; however, they were not retrenched during the recession.

Of the nine companies indicating this as one of the key issues to overcome, only three companies had to reduce their permanent staff complement. The process followed during this phase varied from asking for volunteered early retirement to formal retrenchments. As part of cost cutting measures, reducing employment was indicated by most of the companies interviewed as the hardest part of the recession as people's lives and futures were impacted directly by these decisions.

4.2.2.2 High Inventory Levels

Eight of the Tier 1 suppliers interviewed indicated that they experienced high inventory levels during the recession. This was mainly attributed to the longer inbound lead times, minimum order quantities from suppliers and the decrease in the demand from the automotive manufacturer. Overseas suppliers started reducing their production runs and capacity, and this coupled with the reduction in available transport nodes from overseas caused lead inbound lead times to increase.

Two of the Tier 1 suppliers also indicated that shape or model changes during this period also contributed to an increase of obsolescence as these parts was no longer required by the automotive manufacturer as part of the manufacturing process. These parts had to be migrated to the aftermarket sales support function and thus created high inventories in this market segment as well.

A BWE was thus experienced regarding inventory levels throughout the inbound supply chain. Due to the use of steel and alloys within the manufacturing

process, one Tier 1 supplier experienced obsolescence due to raw production steel used in their manufacturing process starting to rust. This attracted additional rework cost, obsolescence and writing-off raw materials before using these inflated inventories at a later stage.

The build-up of inventories was also directly attributed to low forecasting accuracy levels from the automotive manufacturer. This lack of accuracy manifested itself in “just in case” safety stocks being higher than required. During the normal economic growth periods these inflated safety stock levels gave the Tier 1 supplier the necessary flexibility to react quickly to increases in demand from the automotive manufacturer. This also reduced their risk in terms of contractual penalties. During good economic times this practice of accepting low forecasting accuracies and building in unnecessary safety stock was masked by the true impact of this practice. During the recession however, this had an adverse effect on the inventory levels of these organisations.

4.2.2.3 Cash Flow Impacted

To any organisation the available cash flow is one of the most important issues to manage to ensure that short term liabilities can be covered and paid for. Payment terms with the automotive manufacturer were only on parts delivered to the plant and on proof of delivery.

The reduction in volumes as well as the BWE also directly manifested itself in a cash flow problem, as indicated by eight Tier 1 suppliers, and the ability of the different supply chain partners to release cash tied up in work-in-progress and finished products where limited. Due to the nature of the components being supplied from overseas some of the suppliers demanded payments for orders placed upfront and standing credit terms were cancelled.

The companies interviewed also indicated that cash flow constraints were mainly generated out of some of the suppliers requesting shorter payment terms, and in some cases cash before shipment, due to their cash flow concerns. With the overseas suppliers introducing minimum ordering quantities

and requesting more beneficial payment terms for them, together with the automotive manufacturer reducing volume on their end, this caused the Tier 1 suppliers to carry the cash flow inherently as part of their inventory.

These cash flow pressures were felt by eight of the companies interviewed in various levels. In some cases they were able to receive cash injections from their holding companies overseas, and in others they were able to carry these inventories by reducing other areas of costs thus preserving cash. As indicated by the eight companies they all became very good in managing expenses and minimising costs.

4.2.2.4 Exchange rate / Forex exposure

During the recession the rand exchange rate to the major currencies depreciated, thus causing additional Forex exposure on imported goods. This pressure was a secondary effect however, quite fundamental within the Tier 1 business model. Two companies indicated that the exchange rates during the recession period added to their cash flow concerns. The depreciation of the rand impacted on the importation costs of the components as the prices of the imported components where now inflated by higher than anticipated exchange rates. This increased the cost of the components as well as directly impacting the importation costs and customs clearance fees based on the value of the goods imported. These costs were unable to be recovered against the automotive manufacturer as the Forex risk in the contracts belongs to the Tier 1 suppliers.

The Two Tier 1 companies indicated that they had the ability to extend credit payment terms with their own group of companies; however, this also impacted them regarding costly interest accruing on the purchases as well as another Forex exposure. This option to finance the Forex differential with borrowed cash from the parent company was fundamentally a way for the companies to protect short term cash flow concerns; however, it impacted long term cash flow and profitability as well as increasing debt to foreign companies.

4.2.2.5 Supplier bankruptcy

Four companies interviewed indicated that during the recession their suppliers filed for bankruptcy. These bankruptcies impacted the Tier 1 supplier in the sense that they had to source alternative suppliers during a very volatile economic environment and also ensured that quality standards as per the contractual agreements with the automotive manufacturer were upheld. During normal bankruptcy occurrences these scenarios happen over a long period of time. Bankruptcy of these suppliers during the recession did not happen over a long period of time but rather rapidly.

By the time the Tier 1 suppliers were informed about the bankruptcy of their suppliers, orders were already placed with these companies and they were only advised that they will not be receiving their orders anymore. Most of these occurrences were highlighted by the failure of these suppliers to meet their outstanding orders. The Tier 1 suppliers had to identify alternative quality approved suppliers in a very short space of time. However, the suppliers available at this time were also under immense recessionary pressures. The decline in sales volumes due to decreased demand from the automotive manufacturer directly impacted stocks on hand and cash flow throughout the supply chain. These decreases in sales volumes, as well as cash tied up in high inventory levels and cash flow constraints were the main causes of the bankruptcies identified during the interview process.

4.2.2.6 Capital investment decisions

Four Tier 1 suppliers indicated that capital investment decisions had to be reviewed as these impacted greatly on their cash flow and balance sheets. Capital infrastructure and plant decisions are usually long term decisions with break-even and return on investment over a long period. The capital equipment used in the manufacturing process of the parts and components are usually imported from overseas with long lead times. These capital investments also

had a Forex exposure during the recession as the costs of these plants increased due to the de-evaluation of the Rand against foreign currencies.

Capital invested in these expansion projects just before the recession was tied up in new dormant infrastructure and manufacturing plants. There was no investment return being realised on these investments as they did not yield any manufacturing volumes and returns. Upgrade and new investment required for new vehicle types, and or parts, had to be reviewed due to the costs involved and impact on payback experienced. Orders placed with the suppliers of the capital equipment could not be cancelled and had to be taken up as per the original agreements. Expensive excess capacity had to be cross subsidised with current production capacities also under pressure due to the decrease in the demand.

A general sense of cost containment was experienced by all the companies interviewed. The main objective was to still to be able to supply the automotive manufacturer with quality components and high service levels needed and at the same time to be able to do so at a break even, or in some cases to minimise the loss to the company. The Tier 1 suppliers reviewed their normal operational processes and implemented business process “re-design” initiatives and well as LEAN manufacturing principles to facilitate low cost operations. Cost optimisation and cost reduction strategies and initiatives were implemented across the board and in some cases global cost cutting initiatives were controlled from the corporate head office level on an international basis. A general centralisation of cost approval was implemented, and only the Chief Financial Officer and Chief Executive Officer had the signing powers to approve for normal run of the day expenses. These policies were introduced to ensure that all individuals within the organisations would review their expenses and decide whether or not they were necessary as they were aware that the top executives would have to approve these payments.

4.2.3. Supply chain agility during the recession

Table 4: Perceived supply chain agility during the recession

	Perceived supply chain agility during the recession.		
	High Level of agility required	Medium Level of agility	Low Level of agility Required
Company 1	x		
Company 2	x		
Company 3	x		
Company 4	x		
Company 5	x		
Company 6	x		
Company 7	x		
Company 8	x		
Company 9	x		
Company 10	x		
Total (n = 10)	10	0	0

Table 4 indicates the view of the companies regarding the perceived level of agility during the recession. During the interviews it was apparent that most of interviewees were unfamiliar with the term supply chain agility as purely defined within the literature review; however, the term supply chain flexibility was mainly used to describe the ability required to meet the customers demand. During the interview process the components that make up agility as per the literature review came to the foreground, namely market sensitivity in understanding demand virtually in terms of information technology sharing between buyers and suppliers, network-based as an integrated network as well as process integrated between suppliers and buyers.

It was however, well understood and identified that the Tier 1 supplier had to be as flexible as possible to meet the demands of the automotive manufacturer. During the recession the demand from the automotive manufacturers were erratic in terms of quantities of components required as well as the times when these where required at the manufacturing plant. This flexibility does come at a cost in terms of inventory levels and the ability to meet this variability in demand.

To ensure flexibility, executing functions such as information flow regarding future forecasts and demand, understanding the lead times of all the inbound components required for manufacturing, reviewing and re-designing current supply chain processes, delaying the import decision as far as possible to limit exposure on cash flow and the moving towards manufacturing to order rather than manufacturing to stock were highlighted by the Tier 1 suppliers as initiatives implemented to ensure flexibility.

Overall the term JIT is used and assumed loosely within the automotive industry in identifying the strenuous supply methodology implemented and demanded by automotive manufacturers. During the interview process it was apparent that the automotive manufacturers call-off stock to be within their plant and available according to JIT principles, thus within a short period of time. Due to the strenuous contractual agreement and high penalties within these agreements the Tier 1 suppliers, and by implication their suppliers, have to keep components in stock to facilitate a smooth and continuous supply to the manufacturing plant. For the Tier 1 supplier to be able to render this service to the automotive manufacturer supply chain flexibility is imperative as part of the service offering and becomes a differentiation factor between Tier 1 suppliers. The ability to supply continuously to the manufacturing plant and the ability to upscale and downscale volumes was seen by most of the interviewees as being flexible to the demands of the customer and introducing flexibility into the supply chain. Four Tier 1 companies also indicated that their ability to be agile was directly impacted by the forecasting and demand accuracy received from their customers and that the forecasting accuracy were directly linked to their ability to be flexible within a cost effective operation. According to them agility comes at a cost and this cost is manifested in the forecasting accuracy of the automotive manufacturer.

4.2.4. Key issues to overcome after the recession

Table 5: Key issues to overcome after the recession

	Key issues to overcome after the recession					
	Demand / Forecast accuracy	"Bullwhip" effect - Stock Availability	Up scaling Operations	Continuously drive Agility	Cash Flow	Cost Sensitivity
Company 1	x			x		
Company 2	x	x	x		x	
Company 3	x		x			
Company 4	x	x	x	x	x	x
Company 5					x	x
Company 6	x	x	x			x
Company 7	x	x	x	x		
Company 8	x				x	x
Company 9	x	x			x	x
Company 10	x	x	x		x	
Total (n = 10)	9	6	6	3	6	5

Table 5 illustrates the key issues the companies had to overcome after the recession. Understanding the automotive manufacturers' demands was one of the key issues experienced by the Tier 1 suppliers. They experienced the openness and sharing of forecasted demand and predicted sales volume information from the automotive manufactures differently. On the one hand certain automotive manufacturers viewed their Tier 1 suppliers as an integral part of the supply chain, and consequently shared quarterly, updated bi-monthly and monthly forecasts with their suppliers. Within these partnerships it was apparent that information sharing occurred, and this enabled the suppliers to adjust their purchase orders of inbound inventory accordingly, allowing them to carry lower inventory levels as per normal operational requirements. On the other hand other suppliers were "kept in the dark" so to speak, and were not communicated to regarding expected changes in demand over the next few months. This complicated the forecasting function for the Tier 1 suppliers and made it extremely difficult for them to forecast the future demand from the automotive manufacturers, and adjust their inbound inventory accordingly.

Eight of the Tier 1 suppliers interviewed supply numerous automotive manufacturers within South Africa of components, and they indicated they experienced the willingness and openness to share information regarding changing demand differently from one automotive manufacturer to another.

The ability to receive the information timeously depended on the level of trust and relationship between the supplier and the automotive manufacturer, as well as the type of contractual agreement between these parties. This formed the basis of the type of communications and information shared between the parties concerned. Three Tier 1 suppliers indicated the updated demand figures were communicated through electronic systems linking the manufacturer with the Tier 1 supplier, on an electronic data interchange real time basis. This integration allowed for the Tier 1 supplier insight into the expected demand fluctuations within the short and medium term, and allowed for the ability to change inbound orders accordingly.

In contrast to these scenarios, seven Tier 1 suppliers information regarding daily call-offs and future demand forecasts were communicated via normal e-mails and weekly meetings from the automotive manufacturers. These e-mails and meetings did not allow for the Tier 1 supplier enough detail and future scope to facilitate good decision making on inbound freight, safety stocks, inventory levels of raw material and finished goods decisions. These meetings disclosed their requirements for the immediate future and did not go into strategic long term expected volume decline or uplift in demand.

Nine of the Tier 1 suppliers interviewed identified understanding demand better, and in specific changes in demand from the automotive manufacturer after the recession, and being able to increase forecast accuracy where overall key outcomes from the recession across all the parties interviewed. In general there was a view that the current integration with the automotive manufacturer, whether it was via electronic data interchange (EDI) or manually via meetings or e-mail, was not sufficient enough to allow for the ability to adjust timeously for the new demand. The parties interviewed were of the view that the automotive manufacturers themselves did not understand when the recession would be over and when the demand for their products would increase.

The relationships between the two parties were crucial in understanding the impact, and how to recover after the recession. Increased communication and openness to freely sharing of information across all parties were mentioned as key focus areas going forward. Forecasting inaccuracy manifests in excess

inventory, and the impact of the excess inventory on cash flow was previously not really understood. After the recession it became apparent to nine companies interviewed that it was crucial to understand the forecasting error on the side of the manufacturer and within their own companies better to ensure that they could be more agile in the future.

Six Tier 1 suppliers indicated that old lead times were no longer correct as the lead times increased right through the supply chain after the recession. All role-players within the Supply Chain had to start up operations, improve skills, increase orders on raw materials and this caused delays in terms of longer lead times. Production plants had to increase their hours of operations, increase their staff complement as well as train new staff to be able to perform their daily activities correctly and safely. The restructuring of people and operations during the recession and the downsizing of staff that followed this process also created a new stumbling block to overcome after the recession. During this time critical skills were lost. After the recession new staff had to be retrained with the necessary skills required to enable manufacturing. Three of the Tier 1 suppliers experienced that they cut too much staff during the recession, and that they struggled to re-staff the critical skills lost. This also contributed to the inability to meet the increased demand on time.

Orders thus placed on old lead times were not able to be fulfilled within the original timeframes indicated, and components and parts had to be imported via airfreight at extremely higher costs to the Tier 1 supplier, to enable them to meet the demand of the automotive manufacturer. The costs of these airfreights could in some cases be passed onto the manufacturer however, not in all instances, depending on the contractual agreement between the parties. This was in essence the reverse of the BWE at play. The ability to fulfil the supply chain in time to meet the increased demand, at the most cost effective manner was a challenge to overcome.

Six Tier 1 suppliers identified that they were still under immense cash flow constraints after the recession, and the ability to increase volumes with limited funds, as well as meeting the strict buying terms from their suppliers, put strain on their company's finances. It was a balancing act to determine which

expenses and liabilities were more important to cover with the limited cash available. Due to this, five companies indicated that they were more cost sensitive after the recession than in the past. There was a renewed focus on the elimination of unproductive and un-effective processes and activities that incurred unnecessary costs. Expansion decisions and capital expense approvals where centralised under top management and a close eye on all expenses where kept at all times. The companies also identified this as a mistake before the recession as the increase in business did not focus their activities on cost elimination but rather on expansion initiatives. This was seen as a positive outcome of the recession. The recession allowed them to critically review their current cost structures and supply chain networks, and re-design these to allow for a lower cost of operation.

Furthermore, these 5 companies advised that during good economic climates companies have ample cash that allows them to run inefficient supply chain and distribution networks. Recession forces companies to review networks, processes and systems to allow for more cost effective operations. In the same way staffs are also forced to look at the business more critically and with deeper understanding than in the past. Decisions in the past were made without a clear understanding of the financial impact to the business and the greater supply chain. A recession forces the employees to review and re-look their decisions more critically. In similar fashion capital investment decisions are also executed with more care and due diligence.

Three Tier 1 suppliers also experienced other operational constraints such as routine maintenance that was not executed as per the normal operational requirement during the recession due to the costs constraints. With the increase in demand and strain on the production plans, downtime due to breakages increased forcing emergency maintenance at high cost and in some cases emergency airfreights of parts from overseas to meet the demand, thus causing a secondary cost incurred.

Contractual obligations and renegotiation of trading and payment terms with inbound suppliers of components and parts was another key issue to overcome after the recession. Two of the Tier 1 companies indicated that due to cash flow

concerns and obsolescence created by the decrease in the demand, the suppliers changed their payment terms to mostly cash on delivery. These new payment terms accompanied by the increase of volumes after the recession also put pressure on the Tier 1 suppliers that were already under cash pressure. To enable the Tier 1 suppliers to buy the necessary raw materials, more favourable, new negotiated payment terms were required as their balance sheets could not carry the outlay in cash for long periods. This introduced a review of all existing contracts within the two Tier 1 suppliers interviewed. It became apparent that the current contracts signed with suppliers where not detailed enough to allow for implementation during non-conformance to these contracts. These contracts where renegotiated with stricter and more detailed terms enforceable during periods where the pressure is on the suppliers. In general, the contracts were a contentious point of discussion. The details of the surrounding current agreements that were in place were not disclosed as per the stipulation in the contracts regarding the ability to enforce the contracts, as well as the outcomes of enforcing the contracts. This is mainly due to the sensitive nature of these agreements and the fact that this was seen as confidential in nature.

In general, all ten of the companies are of the view that a recession really focuses all role players on the extended supply chain, and the importance of having the right relationship with all parties within the supply chain. During times of vulnerability the impact of the different role players and possible impact on the total supply chain is highlighted. It forces all parties to review their role as well as importance within the total supply chain, thus entrusting and forcing true supply chain integration.

4.3. Summary of the results

The various companies interviewed in this study supply different components, sub-assemblies and products as Tier 1 suppliers to automotive manufacturers. The business dynamics and business models used by the various Tier 1 suppliers vary in operational design and execution. The impact of the recession was however, quite generic in nature across all role-players. Nine of the ten

Tier 1 suppliers experienced similar key issues and constraints within their supply chain however, some were more severe than others depending on the company's operational model and complexities, supplier base, type of component supplied to the automotive manufacturer and the extent of their supply chains across continents. The recession introduced complexities such as extended lead times, new credit terms and exchange rate risk.

The level of operational complexities also varied based on the type of components supplied to the automotive manufacturer, as well as which automotive manufacturer they supplied. The general trends and thoughts derived from the interviews were as follows:

- The level of inventory, and the extent of the impact of the BWE on the companies varied on the accuracy level of the demand forecasts supplied by the automotive manufacturer. The inaccuracies in the demand forecasting, or the lack of sharing the demand by the automotive manufacturers, impacted directly on the decision of the Tier 1 supplier regarding inventory levels. These decisions caused inflated inventory levels to compensate for the inaccuracies in demand. The principles of "Just in time" is lost at this point as only the automotive manufacturers are able to run operations without any inventory levels. The BWE and the impact down the line to tier 2 and 3 suppliers were quite severe with quite a few of these suppliers going under and filing for bankruptcy.

- Cost control and understanding the cost drivers, and the ability to move fixed costs to a more variable model are also apparent at some of the Tier 1 suppliers. There seems to be a renewed focus on agility to meet the varying demand of the automotive manufacturer however, a new focus on operational scalability has been introduced. Tier 1 operations are in nature capital intensive and not scalable to react quickly to the change in demand. It was the fixed costs within the business models that directly tied up their cash flow and did not allow them to scale down as the volumes decreased.

- Cash flow, in general, impacted the Tier 1 suppliers and this also manifested itself higher up the supply chain to Tier 2 and Tier 3 suppliers. Cash tied up in inventory and the impact of long lead times resulted in a lack of cash to be utilised for normal operational expenses. The indications from all parties interviewed were that the automotive manufacturer is responsible to supply forecasts and based on these forecasts the Tier 1 suppliers will order inventories. The automotive manufacturer will only pay for products delivered at the plant. This caused some points of discussion regarding the contracts between the parties concerned and who is really responsible for the inventory's cost. At this stage numerous discussions with various solutions took place between the Tier 1 suppliers interviewed and the different automotive manufacturers. In essence, contracts did not make provision for handling economic occurrences such as recessions.

- From the interviews it was deduced that the type of relationship with the automotive manufacturer and the level and openness of the information share that occurs between the parties impacted their ability to render the service during the recession. In some cases the communication occurred with open channels and it was seen as good information sharing, updated details regarding demand changes and thus a strategic benefit to the overall supply chain. On the other hand some also experienced a lack of open communication and frequent and accurate information sharing between the supplier and the customer. This silo approach from the automotive manufacturer has a direct impact on the ability of the supplier to manage their operations and their ability to supply. This inherit risk was only identified, and the impact really understood, once the recession started and was in full effect.

- One of the Tier 1 supplier's results were not in line with the remainder of the suppliers and this was mainly due to this particular supplier experiencing some operational restructuring and staffing cuts before the recession, due to a loss of contracts. In reality they went through the restructuring process before the recession hit. During the recession they

were able to secure new contracts that enabled them to start employment processes, upscale manufacturing and operations in general. The misfortune before the recession was indirectly a *blessing* in that it prepared them to become cash and operationally focussed before the recession took place.

Overall the companies interviewed were open to information sharing. There was a general sense of openness of the issues being discussed and this assisted with the whole process of understanding their constraints and concerns. The view is that the feedback received was a true reflection of the actual events that occurred during the recession within these companies. What was also apparent was the general feeling of the impact of the recession, not only on the companies but also on the employees of the organisation and how lives were impacted by such an economic event.

CHAPTER 5: DISCUSSION OF THE RESULTS

5.1. Introduction

Chapter 5 will review the theory and the actual outcomes of the interviews and highlight where the experiences of the various companies interviewed and the theory either aligns or differs. The impact of the key areas will be discussed in line with the theoretical review and differences as well as similarities will be highlighted. The chapter is structured in such a way as to highlight the main areas where the Tier 1 suppliers were impacted during the recession.

5.2. Discussion pertaining to the impact of a global recession of inbound supply chain management

Recessions have an impact on countries and companies supply chains operating within those countries. Malik, Niemeyer and Ruwadi support this by stating that supply chains today are not designed to cope with the world that they are entering in (Malik, Niemeyer and Ruwadi, 2011). They are of the view that supply chains today were engineered to cope with stable, high volume environments. Due to globalisation and the ability to extend supply chains across countries and across continents introduces new complexities in managing these supply chains on a global basis. Economic impacts such as recessions can have detrimental impact on the ability of such global supply chains to be sustainable in the short and medium term. They (Malik et al., 2011) go on to state that some of the challenges facing modern day supply chains are turbulent trade, capital flows and currency values, which are complicated by the nature of global supply chains. These factors are also amplified with events such as recessions.

Automotive supply chains are global in nature, with suppliers based in both developed and emerging markets. The global span of operations and the distance from manufacturing nodes and markets are normal constraints that the automotive manufacturers, and by implication the Tier 1 suppliers must deal

with. The results from the study on the Tier 1 suppliers emphasised the following key areas of impact.

5.2.1. Supplier Bankruptcy, Cash Flow and Exchange Rate

Globally the recession of 2007 / 2008 first affected the international markets of the United States and Europe. The impact of the recession on the global markets affected the South African Tier 1 suppliers' suppliers internationally. Supply and demand nodes were within these economies, and the impacts on these markets were the leading indicator for the local Tier 1 suppliers that the recession was occurring. Four of the Tier 1 suppliers indicated that they experienced the recession the moment the United States and European markets went into recession, and this caused them to experience the direct impact six months prior to the local market experiencing any impact. The international car sales demand decreased and due to export volume of the local automotive manufacturers decreasing, the production was also impacted accordingly.

Global procurement of components and parts within the South African automotive manufacturing process is a well-established practice. Based on the companies interviewed, nine companies indicated that they import raw materials, components and parts used in their assembly process. The Motor Industry Development Program (MIDP) initiated by the government of South Africa also incentivised Tier 1 suppliers to add value to the manufacturing process by introducing local content during the manufacturing process. This allowed the Tier 1 companies some tax and rebate incentives. In order for them to take advantage of these incentives, the organisations have a business model of importing components and semi- knock down kits and assembling it within South Africa with the introduction of some local content and thus gain the advantages of the MIDP program.

These global supply chains consist of numerous parties that contribute to the end objective to deliver the components and parts to the automotive

manufacturer. This is in line with the theory described by Mentzer et al. (2001) in that global supply chains have role players such as supplier's suppliers and suppliers within a global industry and market. The model proposed by Mentzer et al (2001) as per Figure 1 is applicable to the automotive industry within South Africa. Global procurement is usually underpinned by the fact that better quality products can be sourced from international markets at reduced costs to the manufacturing concern, as well as gain the tax and rebate advantages offered by the MIDP program. The main decision to use international content is based on these 2 principles and indirectly also assumes that this decision is based under normal economic activity.

During recessions however, the theory on global supply chains introduces new concerns such as longer lead times and the build-up of inventory through the supply chain. This is supported by the views of Arntzen (2009) when he states that economic downturns have dramatic effects on supply chains, and that these effects manifest in the slowing down of inventories and slowing down of cash flow. He (Arntzen, 2009) is of the view that when the demand decreases and suppliers continue to ship parts and inventory, the producer will experience the "inventory bulge" effect, also known as the 'working capital bulge". This was experienced by eight of the companies interviewed which all described the occurrence of an "inventory bulge" within their global supply chains. The efficiencies that global procurement and inbound supply chains can offer the Tier 1 supplier could also become the reason for their demise during recessions, as they mainly experience two factors that could contribute to companies being liquidated.

These factors are the tying up of cash flow in inactive inventory, whether the inventory is on the premises of the Tier 1 supplier or en route from suppliers abroad, and the inability to convert these inventories into cash flow required to covering operational overheads. Also contributing to these two factors was the changing of buying terms from the international suppliers. This also contributed to the severity of the increase in inventory and cash flow. The overseas suppliers required early settlement of invoices, or even cash upfront before orders where accepted and processed. This behaviour introduced a third

dynamic to the Tier 1 supplier described by Arntzen (2009) as the “profit squeeze” that occurs when suppliers demand early settlement for products. However, the payment for the parts and components to the automotive supplier occurs under the same terms, and the result is that it directly impacts the cash conversion cycle and places pressure on cash flows as described by the Tier 1 suppliers who were interviewed.

Houlihan (1985) was of the view in the 1980s that international supply chains have inherently two types of vulnerability that they face, namely internal and external vulnerability, the latter being vulnerability that increases with increased length in the distribution chain (Houlihan, 1985). This was apparent in the interviews that the Tier 1 suppliers experienced an external vulnerability during the recession that was heightened by the extended lead times on components and parts as well as exasperated by the new demands of the suppliers on shortened payment terms.

Crone supports the view on global supply chains and that these supply chains introduce new risks to the organisation not previously experienced (Crone, 2006). He states that some of these risks are the cost of security in both time and money, and that these risks are mainly lead time risk which increases due to more constraints being introduced to the supply chain, and a cost risk where companies are forced to make use of other more expensive transportation modes due to demands to shorten lead times. The cost risk came into play for the Tier 1 suppliers after the recession and the “reverse” BWE impact was experienced where inventories had to be imported via airfreight to facilitate the pull on demand from the automotive manufactures. Tier 1 suppliers, due to the nature of their relationship with the automotive manufacturer, should be conscious of these risk factors within their global supply chain and ensure that they understand and actively manage these risks to minimise the impact on their own organisations.

Exchange rate risk also plays a role within the 2007/2008 recession as indicated by two Tier 1 suppliers. The rand devalued against the major overseas currencies during this time and thus also increased additional costs to the importation process. Figure 11 illustrates the de-evaluation of the South

African rand against the Euro over the recession period. The Rand was devalued (GoCurrency, 2011) from R9.31/Euro in Jan 2007 to R13.39/Euro in May 2009, a 43.8% difference. This caused an increase directly to the cost of imported goods that was not able to be recovered against the automotive manufacturer. A secondary cost increase was an increase in customs import charges as this is based on the value of the goods at time of importation. All these cost pressures are accompanied with a decrease in demand and were all external vulnerabilities as described by Houlihan (Houlihan, 1985).

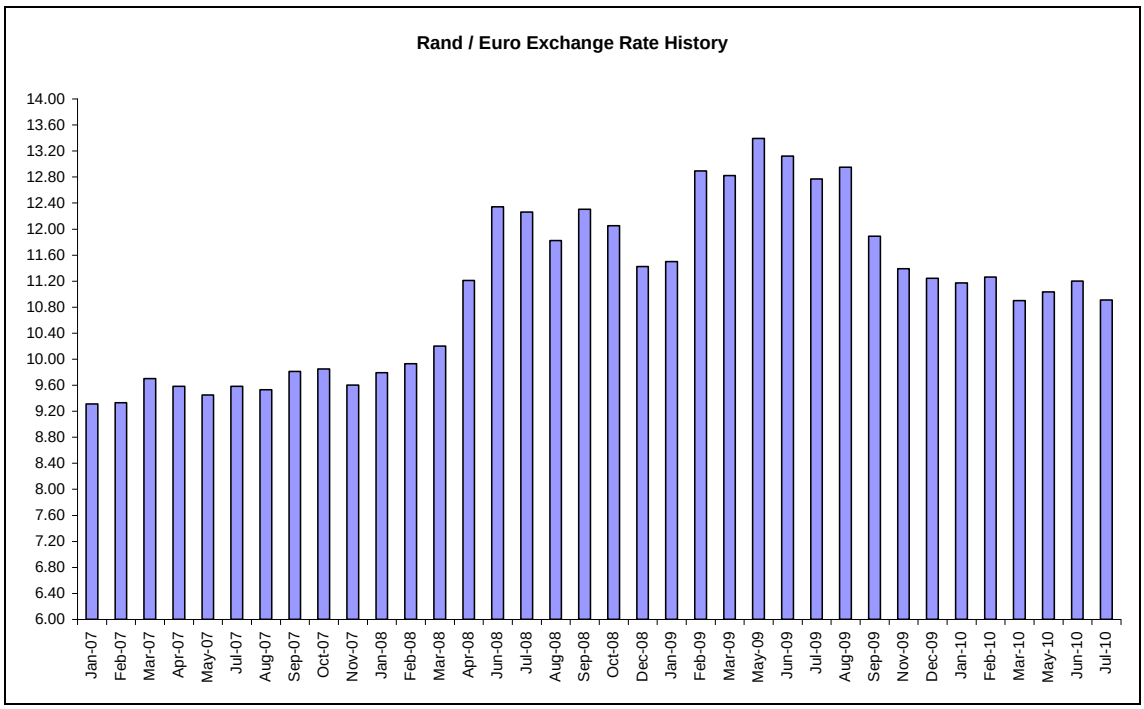

Figure 11: Rand/Euro exchange rate history (GoCurrency, 2011)

These cost pressures on the Tier 1 suppliers are confirmed by a report issued by (Solidarityresearch, 2009) where they state :

> ”General Motors SA has indicated that it will reduce the number of local suppliers of components to its operations, as many of its 140 local suppliers were unable to provide components at competitive prices”

The results regarding the supplier bankruptcy and cash flow was expected as direct outcomes of the recession however; the impact of the recession and exchange rates was not expected before the interview process started. This was another area of financial impact not normally directly highlighted. The indirect impact of the cash flow on capital investment decisions was also evident. These decisions had to be reviewed where purchases were not yet made, and in the case where these investments where made the assets had to be stored, or in some cases commissioned and not used. The impact on the capital investment decisions were also not highlighted as an expected outcome. The importance of this was evident due to four of the interviews highlighting this aspect.

5.2.2. Reduction in staff compliment

During the interview process, nine companies indicated that the most important issue they had to deal with during the recession was the reduction in demand and the direct impact this reduction in demand had to their overhead cost. The overhead mainly impacted was the cost of labour, thus the staffing complement. It is one of the most dramatic areas where the impact of the recession was felt.

Companies had to reduce their operational costs as much as possible, and this included reducing the staff complement. Sheffi (2010)touched on the impact of the recession on staff when he alluded to the fact that companies were furloughing employees. Arntzen (2009) supports the view of reviewing the workforce as part of what to do during a recession by stating that one of the challenging areas is reducing the workforce. He states that this includes areas such as promoting early retirement, reducing hours, enforce vacation usage and implementing plant furloughs. Similar initiatives were introduced by the nine companies involved with cutting their workforce. The various strategies between the nine Tier 1 suppliers varied in application as every company's workforce makeup, labour intensity of operations, number of people involved, cash position of the organisation and other factors all contributed to the different strategies applied by the companies. These initiatives also go along with impact to the organisation's staff morale. Companies all exist due to the fact

that they are social entities and the loss of friends and relationships formed over a long period of time impacts the overall morale of the people left behind. Recessions are emotional times as unemployment increases and the ability of individuals to cover financial responsibilities become more difficult.

Table 6 (Solidarityresearch, 2009) below illustrates the impact of the recession on the various industries and especially the impact on the number of people retrenched within the automotive manufacturers as well as the dealership retrenchments. The impact on the Tier 1 suppliers is not reflected directly within the table; however, the impact of the recession on their staff complements can be inferred. The Solidarity research report (Solidarityresearch, 2009) states that after the mining industry, the automotive industry had the second largest recessionary impact on job losses. The research group illustrated that the impact to the automotive industry from Q32008 to Q12009 was estimated with a loss of 3,963 job losses within the automotive manufacturing industry and a further 3,500 jobs within the automotive dealerships.

Other areas of risk to companies during recessions and staff retrenchments is a typical “brain drain” from the organisation as most of the companies implement initiatives to workers where they can take early retirement. The impact of these retirement packages is not only a financial expense; it is also quite severe regarding the retention of knowledge and the experience within the organisation. Of the companies interviewed, three stated that one of the problems experienced after the recession was to upscale the operations again, and to re-train the people in accordance to the required business processes and procedures.

The training of new staff is a costly exercise as the quality standards and training programs within the automotive industries are fairly strict as the technical knowledge required to operate the production lines of the Tier 1 suppliers are detailed and highly quality controlled. Companies thus spend time and money to train staff to become skilled in their work; as well as the training involved with internal human resources and policy issues. This training also impacted the ability of the companies to start up quickly after the recession.

Table 6: Possible job losses from Q32008 to Q12009 so far (Solidarityresearch, 2009)

	Company	Location	Province	Number of permanent employees possibly affected	Number of contract employees possibly affected	Sector
1	Afgri	South Africa	multiple	352		Agriculture
2	Clover	Wesselsbron	Free State	92	12	Agriculture - dairy
3	Alcoa	Johannesburg	Gauteng	undetermined		Manufacturing - aluminium
4	Hulamin	Pietermaritzburg	Kwa-Zulu Natal		150	Manufacturing - aluminium
5	Ford	Struandale plant	Eastern Cape	220		Manufacturing - automotive
	Ford	Silverton plant	Gauteng	485		Manufacturing - automotive
6	Mercedes-Benz	East London	Eastern Cape	800		Manufacturing - automotive
7	Nissan	South Africa	multiple	150		Manufacturing - automotive
8	Volkswagen	South Africa	multiple	400 (may be through a voluntary process)		Manufacturing - automotive
9	Various auto component manufacturers	South Africa	multiple	808+ (many individual firms' numbers are undetermined - a further 1100 jobs already lost due to 6 firms closing)		Manufacturing - automotive
10	ArcelorMittal	South Africa	multiple		2000	Manufacturing - steel
11	Columbus Stainless	Middelburg	Mpumalanga	160	undetermined	Manufacturing - steel
12	Various brick-makers	South Africa	multiple	undetermined (possibly as many as 8200)		Mining - clay
13	Thaba Nchu Mining & Construction	Phalaborwa	Limpopo	undetermined		Mining contractors
14	BRC DiamondCore	Mining and exploration	Northern Cape	59		Mining - diamonds
	BRC DiamondCore	Sandstraat exploration	Northern Cape	78		Mining - diamonds
	BRC DiamondCore	Silverstreams	Northern Cape	122		Mining - diamonds
	BRC DiamondCore	De Kalk	Northern Cape		undetermined	Mining - diamonds
	BRC DiamondCore	Paardeberg East	Northern Cape	60		Mining - diamonds

15	De Beers	Various locations	Northern Cape (mostly)	800+		Mining - diamonds
16	Namakwa Diamonds	Various locations	North West	355	undetermined	Mining - diamonds
17	Petra Diamonds	Helam mine	North West	350		Mining - diamonds
	Petra Diamonds	Star mine	Free State	undetermined		Mining - diamonds
18	Rockwell Diamonds	Wouterspan, Saxendrift & Services	Northern Cape	143 (would have been 342 but 199 cuts avoided)		Mining - diamonds
19	Xstrata & Merafe	South Africa	multiple		390	Mining - ferrochrome
20	Hernic	Brits	North West		undetermined	Mining - ferrochrome
21	Assmang	Machadodorp	Mpumalanga		undetermined	Mining - ferrochrome
22	Intl. Ferro Metal	Lesedi mine	North West		582	Mining - ferrochrome
23	Samancor Group	Eastern Chrome Mines	Mpumalanga	390	undetermined	Mining - ferrochrome
	Samancor Group	Western Chrome Mines	North West	210	undetermined	Mining - ferrochrome
	Samancor Group	Ferrometals	Mpumalanga	85	undetermined	Mining - ferrochrome smelter
	Samancor Group	Tubatse Ferrochrome	Mpumalanga	127	undetermined	Mining - ferrochrome smelter
	Samancor Group	Middelburg Ferrochrome	Mpumalanga	90		Mining - ferrochrome smelter
24	DRD Gold	ERPM	Gauteng	1335 (additional 109 took voluntary packages)		Mining - gold
25	Simmer & Jack	Buffelsfontein	North West	5 (Would have been 500, but avoided by union)	57	Mining - gold
26	GoldFields	Driefontein (among others)	multiple	1500 (not yet officially confirmed) (A further 10% (about 4500) of staff offered voluntary packages)	undetermined	Mining - gold
27	Consolidated Murchison Mine	Gravelotte	Limpopo	(Would have been 400, but avoided by union)		Mining - gold and antimony
28	Kudu Granite Operations	Brits (Marlin Granite)	North West	59		Mining - granite
29	Albidon	Cape Town	Western Cape	56		Mining - nickel exploration

30	AngloPlat	South Africa	multiple	(4000 positions to be left vacant in 2009)	6000	Mining - platinum
31	Lonmin	Marikana	North West	4000+	1400	Mining - platinum
	Lonmin	Messina Platinum	Limpopo	1550		Mining - platinum
32	Aquarius Platinum	Everest mine	Mpumalanga	1912		Mining - platinum
33	Uranium One	Dominion mine	North West	1013		Mining - uranium
34	McCarthy Group	South Africa	multiple	300		Tertiary - automotive
35	New-car dealers	South Africa	multiple	3500+		Tertiary - automotive
36	Used-car dealers	South Africa	multiple	1500+		Tertiary - automotive
37	Absa	South Africa	multiple	1210		Tertiary - banking
38	First National Bank	Housing Finance	Gauteng	23		Tertiary - banking
	First National Bank	FNB Life	Gauteng	26		Tertiary - insurance
39	Nedbank	South Africa	multiple	80		Tertiary - banking
40	Investec	Cape Town	Western Cape	12		Tertiary - financial services
41	Mutual & Federal	South Africa	multiple	623		Tertiary - insurance
42	Symantec SA	South Africa	multiple	5+		Tertiary - IT
43	Media24	South Africa	multiple	(Would have been as high as 152, but avoided by union)		Tertiary - print media
44	Sunday Independent	South Africa	multiple	2+		Tertiary - print media
45	Rawson Property Group	South Africa	multiple	8		Tertiary - real estate
46	Murray & Roberts	South Africa	multiple	3385 (at least 136 of these in mining)		Secondary - construction
	TOTAL (not including estimated figures)			**28440+**	**10591+**	**GRAND TOTAL 39019+**

The overall outcome of the impact of the recession on labour was expected. However, the detailed impact on the individual staff members as well as the financial impacts on the downsizing and the up-scaling after the recession was not expected. The areas such as re-training of new staff, the retention of intellectual property and know-how, as well as the impact on the remainder of the workforce after the retrenchments was not expected to the extent that it was experienced by the Tier 1 suppliers.

5.2.3. Demand accuracy and high inventory

High inventory levels, as indicated by eight of the Tier 1 suppliers, were experienced throughout the recession. These inflated inventories were caused by the long lead times from their international suppliers as well as the impact of the BWE. As described by Dooley et al. (2010) and Sheffi (2010) the BWE will occur when there is a variance in the consumer demand and the increase of upstream demand variation caused by this. Eight of the companies interviewed stated that they experienced an increase in stock and inventory build-up, and that the demands from the customers were very unstable and difficult to predict. They also indicated that the high inventories led to cash flow concerns due to the inability to convert inventory to cash. One factor that could also indicate the extent of the problem is the point of forecasting accuracy. The more accurate the forecasts are from the supplier, the easier it is for the suppliers to manage their stock levels accordingly. These allow for the accurate estimation and facilitation of JIT operations. The availability of long term forecasts and the accuracy of the forecasts received from the automotive manufacturers were highlighted by nine of the Tier 1 suppliers as future areas where focus will be needed. Without a high level of forecasting accuracy, inaccuracy in demand is introduced to the supply chain, which in turn manifests itself in the BWE.

Pycraft et al. stated that the Forester effect (or BWE) will contribute to companies inherit ability to compensate for the unknown (Pycraft et al., 2001). This compensation is usually contributed to by the extent of the unknown demand, thus higher inventories are kept for the unknown, and this leads to

increased inventories. Nine of the companies interviewed indicated that they would like to increase their accuracy in demand and forecast figures after the recession. The impact of the lack of accuracy can be inferred as being manifested within the supply chain as inventory. Morash and Clinton support the view that JIT systems must be supported with accurate and timely information (Morash and Clinton, 1997). JIT systems can only operate accurately in accordance with the theory if the demand and the forecasts are accurate and the information is shared across the supply chain. The BWE lead to inflated inventory levels throughout the supply chain. For the Tier 1 suppliers to deliver a service to the automotive manufacturer in line with JIT principles, it forces the Tier 1 level to keep an inventory and this exuberates through the Tier 2 and Tier 3 levels in accordance with the BWE. Escaith (Escaith, 2009) states:

> "Even under 'Just in time' management (production-to-order), geographically fragmented networks need to maintain a minimum level of inventories (buffer stock) in order to face the usual risk attached to international transportation. While large players try to keep their inventories at the lowest possible level considering their sales plans and the acceptable level of risk, they tend in the same time to force their suppliers to maintain large stocks (production-to-stock) in order to be able to supply them quickly upon request."

This view was shared by eight Tier 1 companies as they were also of the view that a JIT system only works for the automotive manufacturer and not for them as a supplier to the manufacturers.

5.2.4. Relationship of role players and contractual agreements

Another area also contributing to the high inventory levels was the contractual agreements between the automotive manufacturers and the Tier 1 suppliers. It was apparent that some of the Tier 1 suppliers were managed as purely a supplier-manufacturer relationship with minimum information sharing and this relationship was mainly measured on performance, based on the contractual agreements and penalties of inability to render service. In other cases the

relationship between the parties concerned was one where they were an extension of the business, and operated as an integrated business unit. It was apparent that in these cases the flow of information was open and that the companies were seen as one supply chain delivering one product to the customers.

Lambert is of the view that the management of supplier relationships is a focal area for supply chains, and that it is one of the eight essential supply chain processes required to run successful supply chains (Lambert, 2004). Carter et al. states that the managing of suppliers is a critical function that needs to be performed when assessing supplier financial risk (Carter et al., 2009). They go on to state that the relationship between the parties are of such a crucial nature that in some instances automotive manufacturers are investigating the option to buy out strategic Tier 1 suppliers.

Contracts, as a norm, are documented during normal economic cycles, and as part of risk management these contracts must be drawn up with all types of eventualities. The contracts between the parties concerned will govern this relationship. In some cases these contracts will dictate the type of engagement between the two parties and if this will occur as a supplier-customer relationship, or a real partnership.

The detail of the agreements and the impact of the penalty clauses as well as the contracts' inability to protect both parties during a recession was an area that would attract much more focus after the recession, as indicated by three Tier 1 suppliers that were interviewed. In the past, contracts were documents that were signed and filed. However, recessions are typical economic occurrences that require these contracts to be pulled from filing and put into action. Issues such as demand accuracy, procurement of parts based on automotive manufacturer's demand, ownership of inventories not used, and payment terms were some areas which were highlighted as shortcomings within the current contracts. During the recession the contracts were found to be lacking in crucial clauses. The Tier 1 suppliers had very little protection and recourse within the contracts. The automotive manufacturer had the right to

only accept the volumes that they required, and the Tier 1 supplier was required to deliver these, irrespective the impact on their supply chain.

The end objective is to facilitate a cross supply chain collaboration to ensure that these parties operate as an extension of one business unit and not as separate business entities. The expected outcome of the study was that due to the automotive manufacturing process being based on a Just in Time principle that the parties would work closely together and operate as an extension or sub division of the other. This was found to be lacking in certain parts. This was against the expected outcome of a well-integrated, cross-company supply chain.

5.2.5. Supply chain agility

Supply Chains within the automotive manufacturing industry must inherently have the ability to be agile to meet the demand of the customer. Agility is even more important during recessions as the ability to meet the changing demand becomes more demanding on all role players within the supply chain. This was evident as all of the parties interviewed identified it as one of the requirements that is seen as not negotiable and accepted as a given.

Braunscheidel and Suresh found that internal integration, external integration and external flexible practices were all direct antecedents of a firm's supply chain agility (Braunscheidel and Suresh, 2009). During the interviews it was highlighted that the companies share these views as they indicated internal processes (such as redesigning business processes, inter departmental alignment), external integration (such as cross company integration of processes and systems with customers and suppliers) were all implemented within their companies. The term mainly used by the Tier 1 suppliers is flexibility and this was used in terms of the ability to adapt to the changing demand of the customer. By implementing internal and external integration as well as ensuring external flexibility to the automotive manufacturer the view was that they enhance supply chain agility.

Some of the areas of importance that was identified by the Tier 1 suppliers as areas of focus for them to ensure agility is similar to the variables identified by Agarwal et al (Agarwal et al., 2007). These variables include areas such as:

- Market sensitivity
- Delivery speed
- Data accuracy
- New product introduction
- Centralized and collaborative planning
- Process integration
- Use of IT tools
- Lead time reduction
- Service level improvement
- Cost minimisation, manly driven by economic climate
- Customer satisfaction
- Quality improvement

Some of these variables of agility were introduced to the Tier 1 suppliers as part of the contractual agreement with the automotive manufacturer as part of their annual initiatives to reduce cost and achieve efficiencies. The importance of flexibility or agility was identified by all of the Tier 1 suppliers as key to their success with the automotive manufacturer. In contrast though the areas of market sensitivity, centralised and collaborative planning were highlighted as areas where forecast accuracy and the demand for accuracy were low.

The demand for accuracy was identified by nine Tier 1 suppliers as a focus point after the recession. The impact of this on inventories and costs were well

understood after the recession. The study did not anticipate the demand for accuracy to be such a large focal area as it was anticipated to already be highly developed, accurate and integrated through the supply chain with integrated IT systems. The study highlighted that this perception was incorrect.

5.3. Conclusion

The automotive manufacturing industry is no longer a localised industry only active within one country. Due to globalisation and companies' inherent desire to maximize profit, grow market share and volume and increase profitability for their shareholders, manufacturing is concentrated on a global scale where input costs are at their lowest. Global procurement and global supply chains will form part of the future supply chains of automotive manufacturers between developed countries, with the off-take and demand for the products, and the developing countries with the low cost manufacturing capability. The dynamics around managing inbound supply chains within this environment will continue to become more dynamic and per definition more complex with inherent risk. The impact of external risks on the total supply chain, especially during economic recessions, should be understood and managed to such an extent to ensure that these events do not only occur and are reacted upon; however, they are also anticipated and planned for as part as a normal business practice. These new modern supply chains must be agile to adapt, in all aspects, to the changes that the global economies of the world might enforce on it.

The recession of 2007 / 2008 had an impact on the inbound supply chains of the automotive industry, and in particular the Tier 1 suppliers. Areas where the Tier 1 suppliers felt the recession were supplier bankruptcy, cash flow constraints, exchange rate pressures, operational cost reduction in the form of staff retrenchments, high inventory levels accompanied with a demand for accuracy, contractual agreements with the automotive manufacturers and supply chain agility.

Figure 12 illustrates these areas of impact or risks on the Tier 1 suppliers. Customer demand decreased from the automotive manufacturers, which

caused the Tier 1 suppliers to cancel or delay orders. Due to the long lead times from international suppliers, the BWE caused an increase in inventories at the Tier 1 supplier as well as through the entire inbound supply chain. The increase in inventories, accompanied with the bankruptcy of suppliers, new payment terms from suppliers and an increase in the importation cost associated with the de-evaluation of the rand (exchange rate risk) created cash pressures on the Tier 1 suppliers. Thus cash flow constraints and high inventories where the norm and the only way to limit expenses within the Tier 1 suppliers was to limit operational costs. This led to reduced working hours, cancellation of temporary staff and the retrenchment of permanent staff.

In essence, the Tier 1 suppliers where on the receiving end of the economic downturn and felt various effects on their organisations accompanied by strict contractual agreements accompanied with penalty clauses from the automotive manufacturer.

Overall the outcome of the study is supported by the literature in that the experiences of the Tier 1 suppliers were in line with what the literature stated would happen in times of recession. What was not evident were the compounded effects of numerous environmental, external and internal factors occurring at the same time. The daily decisions of top management during such an event, combined with all the various issues impacting the company at the same time, combined with the human aspect made navigating through these tumultuous economic recessions quite challenging.

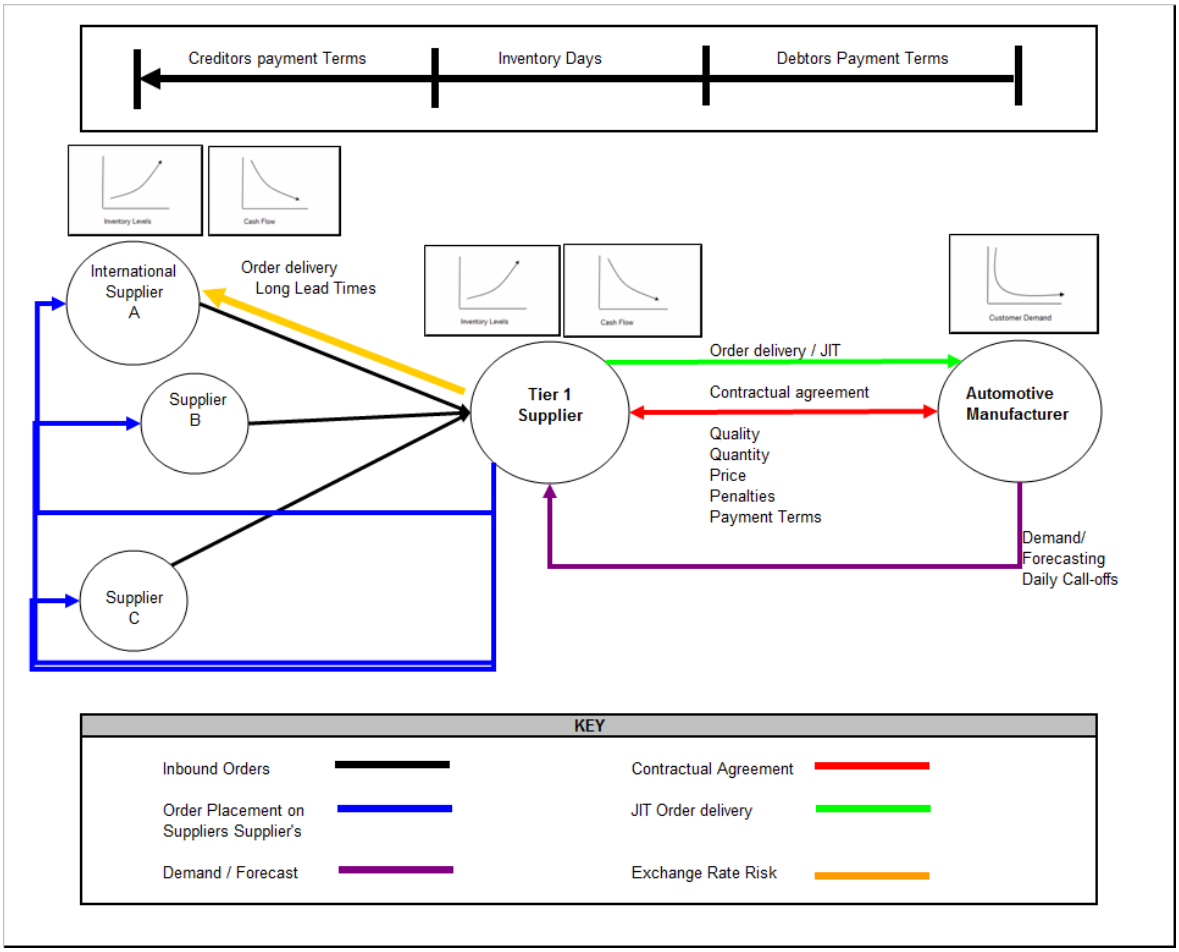

Figure 12: Recessionary impact on Tier 1 supplier

Numerous factors must be kept in mind and trade-offs must be made to ensure the best suitable solution is put in place. The extent to which the numerous issues were experienced were also determined by the inherit complexities and extent of the international footprint of the Tier 1 suppliers. These factors contributed to a dynamic environment which had to be managed on a daily basis on various levels within the organisation itself as well as across the total supply chain. During these times companies tend to go into preservation mode and long term profitability, strategy and growth is traded for short term survival and cost reduction, ultimately trying to limit shareholder risk.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

Tier 1 suppliers are key role-players within the automotive manufacturing process. They provide key components and parts to the automotive manufacturers that enable them to produce products at the lowest cost and highest quality. In essence, the Tier 1 suppliers could be an in-house activity within the automotive manufacturer themselves as they provide a strategic activity within the total supply chain process. They are an integrated and integral contributor to the success of the automotive manufacturer. The final chapter will focus on the outcome of the study and the areas where it contributes to the existing pool of knowledge and identify areas where this research could be applied as well as highlight areas of future research.

6.2. Conclusions of the study

The study's purpose was to assess the impact of the global recession on inbound supply chain management within the automotive industry of South Africa. The global recession had a far reaching impact on the global economies of the world. Due to the nature of the automotive industry and its global inbound supply chain, the impact was just as quick and severe. The Tier 1 suppliers had huge areas of risk that they had to manage and resolve during this period. The study found that these areas of risk included, but were not limited to, downsizing of staff, high inventory levels, supplier bankruptcy, cash flow pressures, forecasting accuracy and exchange rate exposure to mention a few.

The research found that the Tier 1 suppliers experienced the above risks within their organisations. The severity of the recession was however, impacted by the simultaneous occurrence of these key areas of impact or risks. This directly

affected their ability to render a quality service to the automotive manufacturer while ensuring their own financial profitability and sustainability. The study found that the nature of the supply chain's sourcing of components on a global basis, as well as being subjected to the global recession on all fronts, had a direct impact on the Tier 1 suppliers. The study found that due to the requirements of the automotive manufacturer on its vendors to provide them with Just-In-Time inventory for their manufacturing processes, as well as the strict contractual agreements and penalty clauses within these contracts, the Tier 1 suppliers were indirectly "forced" to keep additional inventory. The required operational flexibility required by the automotive manufacturer also contributed to the Tier 1 suppliers keeping more inventory than necessary. The forecasting inaccuracy contained in the demand forecasts from the automotive manufacturer caused the Tier 1 suppliers to minimise their supply risk and keep additional stock to buffer them from the forecast inaccuracy, in line with the Forester effect (Pycraft et al., 2001).

In a normal economic climate, where global economies and organisations are growing, organisations find themselves within situations where these inefficiencies are part of everyday business, and the focus to address these areas of risk are hidden by good profits and good cash flow. These in-efficiencies are thus inherent and accepted within good economic climates. With the global recession these risk areas soon became an Achilles heels for organisations, and in this study it was found that the Tier 1 suppliers experienced there risks.

The study also found that the operational risks experienced by the Tier 1 suppliers where documented within the theoretical review of the literature. The key areas effected, and the impact of these on the Tier 1 suppliers was well documented in the literature review. What was not clearly documented was the combination of all these risks impacting at once. This was the true impact of the recession on the organisation. The speed at which the recession occurred as well as the severity of the recession caused multiple risks to occur at once. The Tier 1 suppliers experienced a "perfect storm" in the sense that all constants within their supply chains became variables and that the risks all occurred at

once. This puts pressure on the senior management of these organisations to make the right decisions for the companies' survival as well as for the shareholders.

6.3. Recommendations

Companies' abilities to review their external environment and identify factors that could impact their organisation are paramount to ensure a productive future. It is thus important to review the external environment, and specifically the global economic environment, especially if one operates within a global supply chain. The leading indicators of the impact of the recession occurred in March 2008 with the bailing out of companies such as Bear Sterns by JP Morgan with funds supplied by the United States Federal Reserve (Bordo, 2008). This was followed by the liquidation of Lehman Brothers in September 2008. By keeping a strategic view on the global economy the local Tier 1 suppliers could have anticipated the possible impacts of events in the United States, and by developing strategic scenarios of the impact of the recession on their organisations could have developed action plans that could be implemented during specific scenarios. All of the companies interviewed indicated that they became aware of the recession only when the demand from the automotive manufacturer declined.

The study highlights to supply chain executives and engineers the impact areas experienced during the recession and the impact on the various Tier 1 suppliers across the industry. In reviewing the risk areas experienced by the various Tier 1 suppliers, executives and engineers can critically examine their own organisations and review these areas and the impact that these areas have on their organisations. It is important to note that the objective is not to review these risk impacts in isolation but to review the impact of these as part of the supply chain process. This will allow the stakeholders to develop action plans during good economic growth phases and incur the expenses associated with these action plans, which will assist them in executing the scenarios during economic recessions. Every company's design in terms of capital investment in infrastructure (such as the actual manufacturing plant and facilities), payment

terms with suppliers, staffing compliment, inventory policies and design of inbound supply chain will differ. The impact of a recession on these areas simultaneously should be understood and well as developing policies and actionable operational plans for execution during these recessions.

These scenarios should include identifying alternative suppliers and developing multi sourcing strategies, developing and testing alternative inbound distribution routes, designing internal operations with scalability and flexibility. This would allow for increasing and decreasing volumes through the organisation without effecting the organisations' cash flows and ability to deliver quality parts and components to the automotive manufacturer.

A pivotal focus area for the supply chain executive should also include the importance of understanding the customer's customer. By understanding and monitoring their markets the Tier 1 suppliers can also pick up trends and possible risks that these customers signal from a point of purchase. The importance of understanding and developing cross company supply and operations planning scenarios are essential in understanding the demand of the customer. Forecasting accuracy is extremely important as this will facilitate lower inventories and increase ability to design inbound supply chains with flexibility to meet the changing demand of the customer. Forecasting is a function of past demand (actual sales), thus the trends in the past are used to determine the future. Innately, these models bare an assumption that the trend of the past will be the trend of the future. However, recessions have shown us that this is not the case.

Automotive manufacturers and Tier 1 suppliers should develop recessionary models which emulate the impact on demand on their supply chains during such events. The information coming from these recessionary models could then be built into the demand models which can be executed as soon as the recession starts. By designing these models the broader impact will be understood across the supply chain, and solutions to areas such as payment terms and cash flow could be well understood. This can form the basis in designing supply chain policies across various companies and role-players that

could be executed during recessions to facilitate the sustainability of all within the supply chain during these events.

6.4. Suggestions for further research

This study focussed on the impact of recessions on Tier 1 suppliers. To fully understand the impact of a recession on the total automotive industry is important. Further areas of study could include, but are not limited to:

- Reviewing the impact of the recession on the automotive manufacturers themselves, and the constraints they experienced from a market / sales perspective.

- The demand models currently used for forecasting future demand within the market is another area of possible research. In developing a model which is dynamic and not only reviews past sales to predict future demand could assist in developing a dynamic model which will incorporate the ability to understand recessionary effects. By monitoring the economy and affecting the model to be able to react to recessions as they occur would assist the automotive manufacturers and the Tier 1 suppliers to be more reactive towards economic downturns.

- The strategic sourcing strategy of an organisation could be beneficial during good economic climates. However, during recessions these global sourcing models could be the models that constrain the organisation and impact on their survival during recessions. Further research into global vs. local sourcing strategies could be completed in order to investigate which strategy would be more suitable during which economic climate; or even reviewing the feasibility of developing a hybrid strategy that will be sufficient in both economic climates.

- Globalisation has caused economies of the world to be reliant on each other for economic prosperity and future growth. The balance between developed countries' demand for products and services and the ability of developing countries to provide products and services at low cost to

these developed countries are critical to comprehend. As these economies becomes more interwoven and global souring within markets such as the automotive industry is more common, the need for companies to become more externally focussed becomes important for survival. A future study could review the impact of companies' global footprint and their ability to understand and interpret global events on their future sustainability.

- This study highlighted the importance of communicating across the supply chain to the various stakeholders the market demand. By ensuring good communication across all parts of the supply chain, role players will ensure that the total inventory carrying costs and flexibility is improved. An area of investigation could focus on how effective the current strategies are in reality and could examine how strategies ensure that the necessary communication and information flow occurs to all parties across the supply chain.

- An area highlighted within this study was one of ownership. Who is responsible in designing the total inbound supply chain? Is it the individual role players throughout the supply chain's responsibility to design the supply chains suitable for them, and by doing so design inherent risks into the supply chain that could not be suitable to the automotive manufacturer themselves. A possible study would be to review this process to ascertain whether this should be driven from an automotive manufacturer's point of view or from a supplier point of view.

- Another possible research avenue would be to review whether possible Forex strategies could be implemented by Tier 1 suppliers during different economic cycles, or to propose possible Forex hedges that would limit Tier 1 suppliers' exposure.

This study reviewed the recession and its impact on the inbound supply chains of Tier 1 suppliers within the automotive industry of South Africa. The conclusions were made based on the interviews and the information received and interpreted during the interview process. Further study within this field is

still required to fully understand recessions and their impact on Tier 1 suppliers within South Africa.

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CHAPTER 8: APPENDIX A

Actual Research Instrument

Semi-structured Interview Questionnaire

Qualitative Data Gathering

DATE: _____

Company: _____

Speciality: _____

Tier 1 or 2 Supplier: _____

Person Interviewed: _____

Designation: _____

Question 1:

Kindly describe your company's supply chain and role within the automotive manufacturing process?

Question 2:

Kindly explain when your company became aware of the recession and its possible impact to your organisation?

Question 3:

Please explain the impact of the 2009 recession on your company's supply chain and the key issues experienced?

Question 4:

Please describe the impact on your inventory within your supply chain during the recession?

Question 5:

What key lessons did you gain from the past recession with regards to your relationship and service to the automotive manufacturer?

Question 6:

Please describe the impact of integrated, or a lack of integrated IT systems between you and your customer, and how did this impact your business during the recession?

Question 7:

Please describe what your understanding is of supply chain agility?

Question 8:

Please describe the impact and importance, (or not) of supply chain agility during the recession?

Question 9

In your opinion, what were the key issues for your organisation to overcome after the recession?

Question 10

In your opinion, how was the relationship between you and the automotive manufacturer impacted by the recession and the effects thereof?

CHAPTER 9: APPENDIX B

Consistency matrix

Research problem stated here The purpose of this research is to assess the impact of global recessions on inbound supply chain management within an automotive manufacturing company's supply chain during recessionary periods.					
	Literature Review	**Hypotheses or Propositions or Research questions**	**Source of data**	**Type of data**	**Analysis**
The research problem is to describe the impact of a recession on Tier 1 suppliers to the automotive manufacturing concern's supply chain in South Africa	(Dooley et al., 2010) (Sheffi, 2010) (Pycraft et al., 2001) (Carter et al., 2009) (Murphy, 2009) (Escaith, 2009) (Christopher, 2000) (Agarwal et al., 2007) (Swafford et al., 2006) (Braunscheidel and Suresh, 2009)	The objective is to determine the impact of the recession on a South African automotive manufacturing concern, which makes use of a global supply chain, and to determine if a bullwhip effect occurred during the recession within their global supply chain as well as the impact on the supply chain	Interview Questionnaire Attached Appendix A	Qualitative data	Transcription Organise Data Themes

Table 7: Consistency Matrix