Supply chain management problems at South African automotive component manufacturers

M.J. Naude & J.A. Badenhorst-Weiss

ABSTRACT

The problems that automotive component manufacturers (ACMs) experience in automotive supply chains is an important contemporary issue. The role of ACMs in the competitiveness and survival of the automotive industry has never been as pronounced. Original equipment manufacturers (OEMs, also known as automotive assemblers) face pressure from government to drastically increase local content (components and services they purchase from local ACMs). The problem is that local ACMs are not as competitive as suppliers from India and China. The improvement and extension of the local ACM supplier base is therefore important. The purpose of this article is to report on a study that investigated supply chain management problems of ACMs and the extent of these problems. Supply chain problems may cause inefficiencies that impact on the competitiveness of ACMs. The study was exploratory in nature, and consisted mainly of a survey among ACMs in South Africa. It was found that of the 75 identified problems, the most significant problems were internal process problems, followed by customer-related problems. The most significant problems lie in the demand management area in the supply chain.

Key words: automotive component manufacturers, original equipment manufacturers, supply chain problems

Introduction

Simchi-Levi, Kaminsky and Simchi-Levi (2009: 1) acknowledged that intensified competition in global markets, the introduction of products with shorter life cycles,

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growing customer expectations, ongoing developments in communications, and transportation technologies have forced businesses to invest in, and direct attention to, their *supply chains*. Consequently, in order to remain competitive, there is pressure on businesses to decrease costs and enhance customer service levels. The automotive industry in South Africa is no exception. According to the Automotive Industry Development Centre (in South Africa), increasing operational complexities within the automotive industry, rising fuel prices, higher manpower costs owing to higher living costs and growing pressure from China and India to remain competitive have led to the industry's growing awareness of the impact that an efficient supply chain can have on business sustainability (Gabru 2008).

In addition, the South African automotive industry has also been adversely affected by the same economic climate (recession) as the international industry, where governments had to intervene with aid packages to save the industry from total collapse. In South Africa, the negative economic climate led to a reduction of operations (and in some cases operations were even closed down), and many employees in the industry were retrenched. In December 2008, 36 000 people were employed by original equipment manufacturers (OEMs) and 81 500 by automotive component manufacturers (ACMs). Since the global economic crisis, the number of employees in the domestic automotive industry has declined, with 16 000 job losses (approximately 20% of the total) in the component manufacturing (ACM) sector. Therefore as at March 2009, the employment figure at ACMs was estimated to have fallen to 65 500 employees (NAACAM 2009: 1).

The South African automotive industry is unfortunately not competitive, due to the low percentage (an average of 35%) of local content in the final product. On average, South Africa was 20% more expensive as a vehicle manufacturing base than Western Europe, and China was 12% less expensive than Western Europe. South Africa is thus 30–40% more expensive than China and India (Venter 2009a, 2009b).

The purpose of this article is to focus attention on the crucial role of ACMs in the South African automotive industry, and to report on a study to investigate supply chain management (SCM) problems of ACMs and the extent of these problems. This study focuses on the most significant problems experienced by ACMs that might constrain the efficiency and effectiveness of their operations and of the whole automotive supply chain.

A study of ACMs and the problems they experience in automotive supply chains is important at this time. The role of ACMs in the competitiveness and survival of the automotive industry has never been as pronounced. Blome, Groetsch, Henke and Tang (2010) noted that the automotive industry is characterised by a low degree of differentiation. One distinguishing factor that affects the survival of an OEM is the

characteristics of its supply chain and the survival of its suppliers (mainly ACMs). The current economic crisis has had a significant impact on the industry, placing about 50% of the Top 30 automotive suppliers (ACMs) in fiscal danger (Blome et al. 2010: 714). In addition, automotive supply chains are highly integrated, with highly specialised actors, significant relationship-specific investments and a high interdependency between OEMs and suppliers (ACMs). Thus, supplier bankruptcies are expected to have a significant impact on automotive OEMs and therefore the industry as a whole.

The South African government, realising the weak competitive position of the South African automotive industry, put pressure on OEMs to improve their local content to 70% (through the Automotive Production and Development Programme), in order to negate the costs of importing components using long supply chains and weathering a fluctuating currency (Venter 2009a; Mphahlwa 2008: 2). This offers many opportunities for ACMs in South Africa if they can cope in terms of capacity and technology.

Supply chain management

Today's market place is more fiercely competitive than ever before. Globalisation, technological change and demanding customers promise to eradicate traces of mediocrity. The very nature of competition has changed. Companies no longer compete against companies. Supply chains compete against other supply chains for supremacy, for example, "Toyota and its suppliers will clash with Ford and its suppliers for global competitive advantage" (Fawcett, Ellram & Ogden 2007: xvii).

The concept of supply chain management (SCM) is described in the literature in many ways by different authors. The views of various authors are provided in order to attempt to determine the various dimensions and key factors in the SCM approach.

Supply chain management (SCM) as a philosophy and concept has developed as business organisations realise that both customers and suppliers can exert considerable influence on supply processes. Organisations need their *suppliers* to assist in decreasing costs, and improving customer service and efficiency. Also, their *customers* need their cooperation as suppliers to further decrease costs, and improve customer service and efficiency, since "… the relationship between the company and its suppliers as well as its customers is included in the concept [of SCM]." When customers are willing to share important planning information with their suppliers, this will enable them to anticipate much more effectively future customer orders (Van Weele 2010: 254–255).

Lockström, Schadel, Harrison and Moser (2009), Bennett and O'Kane (2006), and Humphreys, Huang, Cadden and McIvor (2007) view SCM as a collaborative approach, spanning across firm boundaries, including various parties in the supply chain that contribute significantly to improved product quality, shorter lead times, and a more responsive supply chain, at lower cost and with increased customer satisfaction levels.

A supply chain comprises two or more parties linked by a flow of resources – typically material, information and money. SCM involves the management of activities surrounding the flow of raw materials to the finished product enjoyed by end customers, and back, in the case of recycling or returns (Webster 2008: 4). The movement of materials and information through the supply chain is core to any supply chain, since it is essentially aimed at creating a competitive advantage by providing outstanding customer service (by means of the delivery of the required products/services). The delivery of the required products at the right time and at the lowest cost (or value) enables a company to differentiate itself from its competitors in the market and enhances current and future profitability by balancing costs and service levels (Chopra & Meindl 2007: 5–6).

Supply chain management includes the purchasing of materials, transforming them into intermediate goods and final products, and delivering a product or service to the final customers (the so-called 'plan-source-make-and-deliver' process, also known as the 'Supply Chain Operations Model', or 'SCOR-model') (Swink, Melnyk, Cooper & Hartley 2011: 42–43). Thus the supply chain includes all those direct and indirect parties involved in bringing forth products through all the various input, conversion and output stages (Bailey, Farmer, Crocker, Jessop & Jones 2008: 66).

The facilities involved in an assembly type of supply chain, as in the case of automotive component manufacturers, include warehouses, factories, processing centres, distribution centres, retail outlets and offices. The activities include forecasting, planning, purchasing, inventory management, information management, quality assurance, scheduling production, distribution, delivery, disposal and customer service (Heizer & Render 2008: 434).

It is clear that supply chain management includes all those activities involved in the flow of materials through the supply chain; that it extends from the ultimate customer back to mother earth; and that there is some kind of relationship, collaboration or cooperation between supply chain members (see Figure 1). The chain is viewed as a single unit, rather than as fragmented units each performing their own task. This conclusion is clearly illustrated in the various definitions of supply chain management:

- SCM is defined by the Global Supply Chain Forum as "the integration of business processes from end-user through original suppliers that provide products, services and information that add value for customers and other stakeholders" (Cousins, Lamming, Lawson & Squire 2008: 174; Lambert 2006: 2).
- SCM is "the design and management of seamless, value-added processes across organisational boundaries to meet the real need of the end customer. The development and integration of people and technology resources are critical to successful supply chain integration" (Institute of Supply Management 2000).
- SCM includes "managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer" (in line with the SCOR-model) (Supply Chain Council n.d.).
- SCM "encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. It also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers and customers. SCM integrates supply and demand management across companies" (Council for Supply Chain Management Professionals n.d.).
- "A supply chain is a network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the final customer or consumer" (Lysons & Farrington 2006: 91).

From this discussion of supply chain management, it is clear that many parties, processes, operational and management activities, management strategies and resources are integrated and coordinated as a single process (plan-source-make-and-distribute [SCOR] from origin to final consumer and back) in the supply chain management approach. Problems with any one of those parties, activities, processes strategies and resources in the integrated process can potentially result in inefficiencies in the whole supply chain.

Key factors in supply chain management

The preceding discussion of the concept of SCM identifies the key factors in the supply chain management approach. The crux of the SCM approach perhaps lies in the summary of Van Weele (2010: 255): "SCM represents a systems approach to viewing the supply chain as an integrated entity rather than a set of fragmented parts."

Supply chain management starts with internal integration and a move away from the silo approach to the systems approach, as indicated in the quote from Van Weele. Supply chain management, however, does not stop with internal integration – as is clear from the definitions and descriptions of SCM already provided. SCM requires external integration with other supply chain partners. Burt, Petcavage and Pinkerton (2010: 529) are of the opinion that a majority of firms attempting to engage in SCM are still preoccupied with internal integration of functional activities and material and information flows. The real potential of SCM can be realised only after external integration of customers, key suppliers and information flows have been attained.

Three important aspects became clear from the discussion of supply chain management, which need to be elaborated upon – building relationships, supply chain integration and demand management. In addition to these three, an important aspect in supply chain management, particularly in South Africa, is the concept of sustainability, which will also be discussed further.

Building relationships

When the *Harvard Business Review* organised a team of leading academics in the discipline of supply chain management, it was not technology that was foremost in the discussion, but people and relationships that were identified as the major themes. For example, the opportunities and challenges of globalisation and the continual pressure for speed and cost containment are requiring businesses to establish relationships with new types of suppliers (Beth, Burt, Copacino, Gopal, Lee, Lynch & Morris 2006: 65).

Traditionally, the majority of business executives regarded the management of *suppliers* as insignificant in their overall performance. Buyers played suppliers off against one another and replaced suppliers frequently. This adversarial model was not ideal, and today the model has been transformed, with international competitors demonstrating that joining forces with suppliers could lead to competitive market benefits (Handfield, Monczka, Giunipero & Patterson 2009: 756). Stevenson (2005: 718) confirms that maintaining good relationships with suppliers is increasingly being recognised as a critical factor in sustaining a competitive advantage. Numerous businesses view their suppliers as partners, in other words a stable relationship with comparatively few suppliers that can deliver high-quality supplies, sustain delivery schedules, and remain flexible relative to changes in specifications and delivery schedules.

According to Monczka, Handfield, Giunipero, Patterson and Waters (2010: 109), most buyers and sellers recognise the need for collaboration as the best means of improving costs, quality, delivery, time and other measures of performance. The

relationship is bilateral, which means both parties have the power to shape its nature and future direction. Mutual commitment and balanced power are key features; commitment means that both parties keep the relationship working over time, and balance provides mutual benefits. This collaboration is often described as supplier relationship management (SRM), but some individuals are of the opinion that there is an essential difference, as SRM is a one-way arrangement whereby buying firms manage their supply base.

It is clear from the definitions and description of the concept of SCM that the *customer* or the customer's needs are the focus of the whole supply chain approach or philosophy. A real customer focus orientation has developed in organisations with the introduction of a customer relationship management (CRM) programme. The objective of CRM is to develop a customer-centred organisation that utilises every opportunity to delight customers, foster their loyalty, and build long-term, mutually beneficial relationships. Introducing CRM systems can ensure rapid response to customer requirements, achieving the goal of better servicing customers at lower cost and in less lead time. However, CRM is not based only on technology. It involves developing personal and organisational relationships as well (Swink et al. 2011: 274).

Supply chain integration

SCM revolves around efficient integration of suppliers, manufacturers, warehouses and stores. The challenge in supply chain integration is to coordinate activities across the supply chain so that the enterprise can improve performance by reducing costs, increasing service levels, reducing the bullwhip effect (which is described and discussed in a later section), better utilising resources, and effectively responding to changes in the market place (Semchi-Levi et al. 2009: 188).

Kwon and Suh (2005: 26) consider supply chain integration to be a strategic tool that aims to reduce costs and thus increase customer and shareholder value. Effective supply chain planning, built on shared information and trust among partners, is a vital part of successful supply chain functioning. Monczka et al. (2010: 104) define integration as follows: "the process of incorporating or bringing together different groups, functions, or organisations, either formally or informally, physically or by information technology, to work jointly and often concurrently on a common business-related assignment or purpose".

Supply chain integration is also described as:

- Supply chain members using techniques enabling them to work together to optimise their collective performance in creation, distribution and support of the end product (Sundaram & Metha 2002: 537)

- The seamless flow of products and information from supplier to customer (Van Donk, Akkerman & Van der Vaart 2008: 218)
- Coordination mechanisms imply that business processes should be streamlined and interconnected, both within and outside the organisation's boundaries (Cagliano, Caniato & Spina 2006: 283).

The basis of integration can therefore be characterised by cooperation, collaboration, information sharing, trust, partnerships, shared technology and a fundamental shift away from managing individual functional processes to managing integrated chains of processes (Power 2005: 253).

In linking this description of supply chain integration with the philosophy, description and definitions of supply chain management, the conclusion of Hugo, Badenhorst-Weiss and Van Biljon (2004: 66) becomes clear, namely that supply chain management integrates suppliers, manufacturers, warehouses and other intermediate value-adding partners so that production and distribution is synchronised with customer demand, thereby reducing overall system or pipeline costs and satisfying service level requirements. Hence, successful supply chain integration happens when the players realise that supply chain management must become part of all the business's strategic planning processes, in which the objectives and policies are jointly determined on the basis of the needs of the final customers and what the supply chain as a whole does well. Eventually, businesses act together to maximise total supply chain profits by determining optimal purchase quantities, product availabilities, service levels, lead times, production quantities and technical and product support at each level within the supply chain (Wisner, Tan & Leong 2009: 23).

Demand management

The primary reason for inaction on the part of supply chains that have been caught with excessive inventory levels is the absence of demand management. Demand management is a collaborative process that involves accurately determining how much product needs to be produced (the demand) at each level of the supply chain through to the end customer. It is used to estimate, control, smooth, coordinate, balance and influence the demand and supply for a firm's products and services in an effort to reduce total cost for the firm and its supply chain. Demand management requires the utmost in coordination and communication between the responsible parties. Demand managers must develop contingency plans with supply chain members to allow modification of short-term schedules when necessary (Burt et al. 2010: 530–531).

Failure to estimate demand accurately and share information among supply chain members can result in bloated inventory levels caused by the cumulative effect of poor information cascading up through a supply chain. Poor demand data force the supplying firm to carry additional inventory to account for uncertainty, and inventory levels in the supply chain are consequently increased (Burt et al. 2010: 532; Swink et al. 2011: 225).

A discussion of demand management and the principles that have been mentioned would not be complete without a short discussion of the *bullwhip-effect*.

Bullwhip effect

The bullwhip effect has been observed in many industries, including the automotive industry (Jacobs, Chase & Aquilano 2009: 361). It has been estimated that bullwhip-related costs can be as high as 12–25% for each member of the supply chain (Fawcett, Ellram & Ogden 2007: 515). Several definitions of the bullwhip effect are provided, and the causes and effect of the bullwhip effect are briefly discussed. The definitions include:

- The bullwhip effect is "exaggerations of fluctuating demand through the supply chain as suppliers overcompensate to avoid stock outages, and then under-anticipate future demand" (Fawcett et al. 2007: 515).
- The so-called 'bullwhip effect' is the uncertainty caused by information flowing upstream and downstream in the supply chain. Forecasts of demand become less reliable as they move up the supply chain from users or retailers to wholesalers, to manufacturers, to suppliers (Lysons & Farrington 2006: 334).
- Jacobs et al. (2009: 361) see the bullwhip effect as "the phenomenon of variable magnification as we move from the customer to the producer in the supply chain". Even a slight change in consumer sales ripples backwards in the form of magnified oscillations upstream, resembling the result of a flick of a bullwhip handle. Because the supply patterns do not match the demand patterns, inventory accumulates at various stages, and shortages and delays occur at others.
- Swink et al. (2011: 225) describe the bullwhip effect by noting that "small variations in demand at the customer end of the supply chain can produce massive variations in orders upstream" (Swink et al. 2011: 226).
- The problem of fictional demand or 'phantom' demand has been termed the bullwhip effect in SCM (Burt et al. 2010: 532).

Failure to estimate demand accurately (through wrong forecasting) can result in bloated inventory levels caused by the cumulative effect of poor information

cascading up through a supply chain. Poor demand data force the supplying firm to carry additional inventory or increase lead times to account for the uncertainty. (The lead-time increases when suppliers decide not to carry the additional inventory but to order it higher up in the supply chain when larger orders are received from customers.) Either way, the inventory levels in the supply chain are increased. If the lead time is increased, the buyer (based on conventional re-order point calculations) will increase order quantities. The supplier will interpret the increase in the order quantity as increased customer demand, and will also give this information through to its suppliers. The suppliers at the various levels will then need to take action to increase capacity to meet the fictional trend. Just as the suppliers had added capacity to meet the increased demand, demand falls off because the retailer realised the mistaken over-estimation of market demand. The retailer will reduce its orders because it has excessive stock available. The supplier will then need to reduce its capacity by measures such as retrenchments or selling assets (Burt et al. 2010: 532; Fawcett et al. 2007: 10; Simchi-Levi et al. 2009: 153–154).

Webster (2008: 85) and Simchi-Levi et al. (2009: 155–156) are of the opinion that the five major *causes of the bullwhip effect* are wrong or poor demand forecasting, batch ordering, price fluctuations, rationing and shortage gaming, and long lead times. According to Lysons and Farrington (2006: 334), the most common drivers of demand distortion are:

- Unforeseen sales promotions, which have a ripple effect throughout the supply chain
- Sales incentive plans when extended to, say, three months often result in sales distortions
- Lack of customer confidence in the ability of suppliers to deliver orders on time, leading to over-ordering
- Cancellation of orders, often resulting from previous over-ordering
- Freight incentives, such as transportation discounts on volume orders, that may cause customers to accumulate orders and then order in bulk.

The *effect* or *implications* have already become clear in the discussion of the bullwhip phenomenon. The following should therefore serve as a summary of the most significant factors related to the bullwhip effect: excessive inventory quantities; poor customer service; cash flow problems; stock-outs; high material costs, overtime expenses and transport costs. In the worst-case scenario, working capital reduces, costs increase, customer service is unsatisfactory, lead times lengthen, production needs to be rescheduled, and sales are lost (Lysons & Farrington 2006: 334–335). The

bullwhip effect contributes to high cost and poor service in supply chains (Webster 2008: 85).

Supply chain coordination can *reduce the effect* and the associated costs (Fawcett et al. 2007: 515). The fundamental approach to resolving the bullwhip problem is to ensure transparency and information sharing throughout the supply chain. Many of the problems can be avoided by relying less on forecasting and more on direct demand data. Supply chain systems that provide open communication and reliable demand data avoid situations in which small demand fluctuations become high variability swings at the production stage (Lysons & Farrington 2006: 335). Centralising demand information can dramatically reduce the variability seen by the upstream stages of the supply chain (Semchi-Levi et al. 2009: 162). Point-of-sale information, provided immediately and simultaneously to all members of the chain, can reduce the bullwhip effect. Additional steps may be retailers working with distributors and manufacturers to develop collaborative forecasts as well as to plan future product promotions together (Fawcett et al. 2007: 10). Other tools and techniques are electronic data interchange (EDI) implementation (Webster 2008: 106), reducing uncertainty by centralising demand information, lead-time reduction, strategic partnership and vendor managed inventory (Simchi-Levi et al. 2009: 161–162).

Sustainable supply chain management

Sustainability or corporate social responsibility[1] has become an extremely important aspect in businesses world-wide and in South Africa. The crux of sustainability or corporate social responsibility in South Africa is found in the King III Report. King III points out that the economic value of a company can no longer be based on the balance sheet only. Rather, the economic value will be impacted by a range of non-financial issues such as brand and reputation, stakeholder relationships and goodwill, an evolving and forward-looking strategy, environmental sustainability, social responsibility and quality of governance (Deloitte 2009).

Sustainable supply chain management is a process whereby organisations in the supply chain meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only for the organisation or the supply chain, but also for society and the economy, while minimising damage to the environment (Walker 2009: 742). Corporate social responsibilities, and for that matter also purchasing and supply social responsibilities (PSSR), can be defined as meeting the discretionary responsibilities expected

by society. This definition encompasses the activities relating to environmental, economic and social aspects (Walker 2009: 745).

Although the other aspects of social responsibility in procurement and supply chain management are also important, the most prominent aspect in business in South Africa today is Broad-Based Black Economic Empowerment (BBBEE). In South Africa, the BBBEE Act (Act No. 53 of 2003) was promulgated to ensure that procurement in the public and private sectors supports the economic empowerment of previously politically disadvantaged individuals through its suppliers. Government has mandated various business sectors to collaborate in developing their own sector-specific charters that outline the sector's plans for transformation and the implementation of the BBBEE Act (Pillay & Phillips 2009: 30). One of the measures in the Act has particular implications for supply chain management. Organisations in a certain industry must, according to charter targets, purchase their supplies from previously disadvantaged organisations and use their economic power to force their suppliers to buy from previously disadvantaged suppliers and to actively engage in transformation of their organisations to include black individuals at all levels. Power and influence are thus used to force transformation through the whole supply chain. The government uses a 'balanced scorecard' to determine progress made in achieving black economic empowerment by businesses and sectors (Republic of South Africa 2003).

The aim of the discussion of the concept and philosophy of supply chain management was to identify the elements, scope and dimensions of supply chain management. Problems in the supply chain may originate with any one of the parties, nodes, links, activities, resources and processes. The eventual aim of the literature study was to serve as a basis for developing a research instrument to determine supply chain management problems experienced in the South African automotive industry.

South African automotive industry

Structure

From Figure 1, it is clear that the supply chain in the motor industry involves many parties, nodes, links and logistical processes to deliver the final product to the final customer.

The main role players are as follows (as shown in Figure 1):

- **Automotive component manufacturers (ACMs):** The ACMs supply components to OEMs, original equipment suppliers (OESs) and the independent aftermarket. The ACMs can be seen as the first tier supplier in the automotive supply chain.

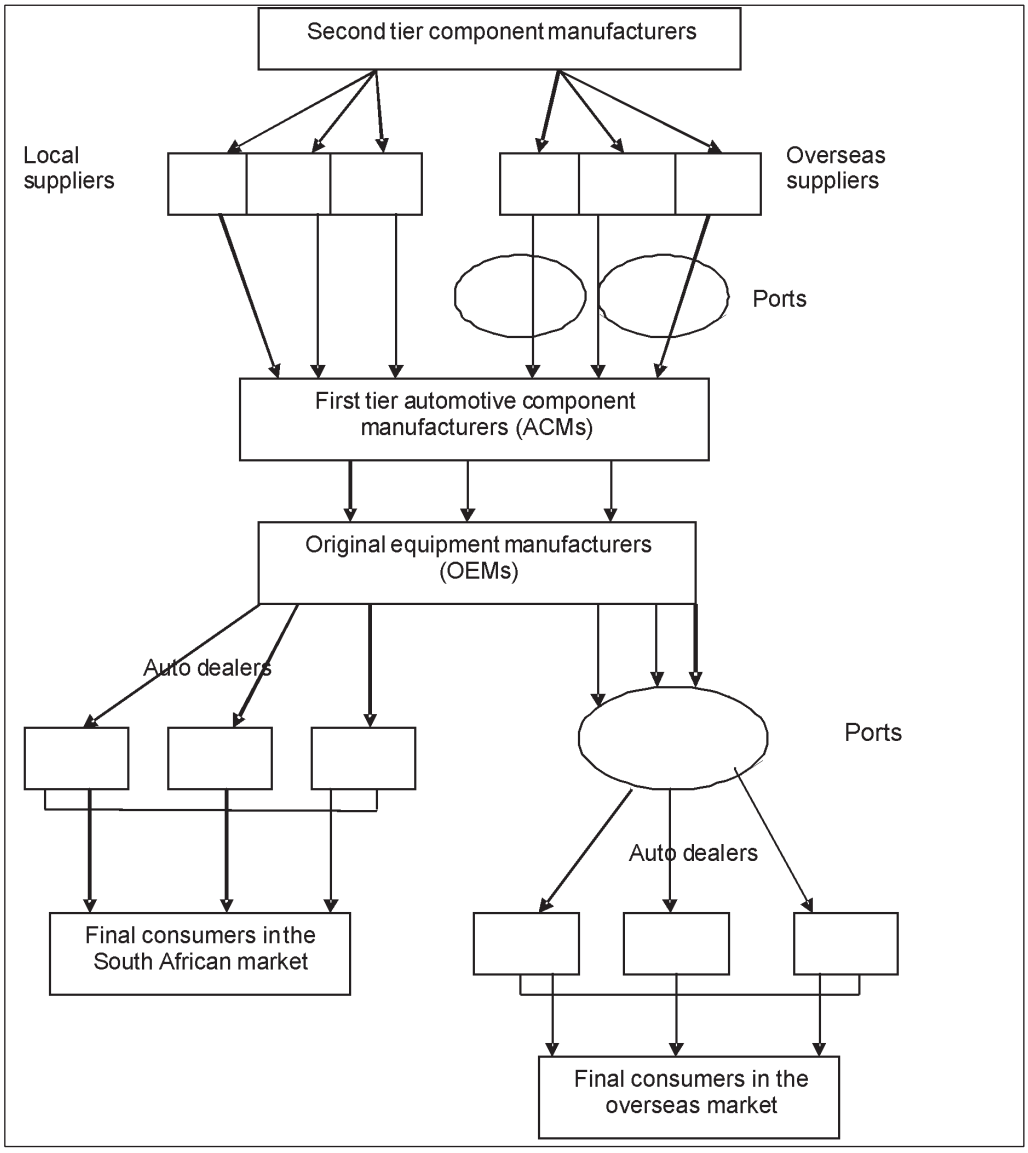

Figure 1: Role players in a typical supply chain in the South African motor industry

This study will focus on these role players (ACMs) in the South African industry, for example Aunde and GUD.

- **Original equipment manufacturers (OEMs) or automotive assemblers:** This category comprises both passenger and commercial vehicle assemblers, for example Toyota and Ford.

- **Original equipment suppliers (OESs):** This category comprises automotive parts and accessory sales through the OEMs.
- **Automotive retail and aftermarket:** This category consists of automotive parts and accessory sales, through independent retailers and repair shops.

Approximately 60% of ACMs, including the most prominent ones, belong to the association NAACAM (the Authority on the South African Automotive Components Industry). The annual sales for NAACAM members totalled around US$6 billion in 2008. The split of sales was 43% to OEMs, 8% to OEMs for their aftermarket, 11% to the independent aftermarket and 38% to export sales (*SA Automotive Week* 2009; NAACAM n.d.). It can therefore be reasoned that OEMs are the most important customers of ACMs.

Due to the scope and complexity of the motor industry supply chains and the important role of ACMs in automotive supply chains, it was decided to limit the study only to ACMs in South Africa. This focus means that the study was done from the perspective of ACMs (first tier suppliers). Due to the interdependent nature of parties in a supply chain, a study focusing on the supply chain problems of ACMs will also have to include interaction with other parties in the supply chain, particularly with direct suppliers (second tier suppliers of materials, parts and components) and with the customers of ACMs, namely OEMs.

Importance

The automotive industry is an important industry for the South African economy. This is clear from the number of employment opportunities that the industry creates (see Table 1).

In addition to creating employment, South African ACMs had annual sales totalling US$10 billion in 2008 and capital spending of US$1.4 billion and used 70–80% local content in their own manufacturing processes (*SA Automotive Week* 2009; Venter 2009a).

It is clear that ACMs are important contributors to the South African economy and the automotive industry. The importance of ACMs is also recognised by government. The South African government therefore puts pressure on OEMs through the Automotive Production and Development Plan (APDP) – which replaced the Motor Industry Development Programme – to increase their local content (purchased from local ACMs) from 35% to over 70% (Venter 2009b; *SA Automotive Week* 2009).

Table 1: Number of employees in the domestic automotive industry (June 1998–June 2008)

SECTOR	1998 ('000)	1999 ('000)	2000 ('000)	2001 ('000)	2002 ('000)	2003 ('000)	2004 ('000)	2005 ('000)	2006 ('000)	2007 ('000)	2008 ('000)
Automotive assemblers (OEMs)	33.7	32.0	32.3	32.7	32.4	31.6	31.8	34.3	37.9	38.4	36.0
Component manufacturers (ACMs)	70.0	67.2	69.5	72.1	74.1	75.0	75.0	78.0	78.0	81.0	81.5
Tyre industry	9.1	6.7	6.6	6.3	6.0	6.0	7.2	6.8	6.5	6.9	7.0
Motor trade, distribution and servicing	170.0	175.0	180.0	182.0	185.0	191.0	194.0	198.0	198.0	200.0	200.0

Source: NAAMSA, in *South African Automotive Yearbook* (2009: sections 9:1 & 9.2)

Methodology

As indicated in the introduction, this article reports on a study that was conducted to investigate SCM problems of ACMs as important role players in the South African automotive industry. This study is by nature exploratory and contains quantitative and qualitative aspects. To achieve the objectives of the study, a literature review and empirical research were undertaken. The empirical research comprised two phases. The first phase of the empirical research consisted of semi-structured interviews with managers at executive and senior levels at two leading OEMs (which are the most important customers of ACMs) in South Africa. These were carried out in order to gain better understanding of the problems of the automotive industry and to identify possible supply chain problems facing ACMs in South Africa from the OEMs' perspective. The knowledge obtained from the literature and the qualitative study (semi-structured interviews) was used to design a questionnaire for the survey of ACMs (which is the focus of this article). In the questionnaire, a seven-point Likert response format, varying from 1 (to a lesser extent) to 7 (to a greater extent) was used. The questionnaire made provision for qualitative inputs in the form of an optional motivation for respondents' answers. There is thus some element of qualitative inputs from the respondents. The questionnaire was used as an instrument for determining the extent of supply chain problems facing ACMs. The population of this study consisted of ACMs that were NACAAM members, which is not a representative sample of all ACMs. However, 60% of the largest and most important ACMs are members of NACAAM. A total of 181 ACMs belong to NACAAM. Because a pilot

study had been conducted at three ACMs, only 178 questionnaires were sent out, and a response rate of 30.6% was achieved. The completed questionnaires were coded; the responses were captured in Excel and then exported into SPSS. The results of this study are dealt with under the analysis of the findings section.

Limitations of the study

The discussion of the theory of supply chain management showed that supply chain management stretches from the original source, through all the processes and organisations, to the final consumer, and back. However, this study focuses only on the problems experienced at one stage of the supply chain, namely at ACMs. Although the problems may originate upstream from the supply-side or downstream from the customer-side, the problems are judged from the perspective of ACMs. The qualitative part of the questionnaire did not yield sufficiently rich information for more in-depth insight into the problems. This study should therefore be followed up with a qualitative study at various stages of the supply chain, and with the different parties, in order to pinpoint the origin of the identified problems.

Furthermore, only component manufacturers that are members of NACAAM were included in the study. Even though the members make up 60% of the population of ACMs, they are not a random sample of all ACMs. The findings can therefore not be generalised to all ACMs in South Africa.

Findings

Significant supply chain problems

The conceptual model (Figure 2) was created to demonstrate relationships between the direct parties in the ACMs' supply chain and possible cause-and-effect relationships. From the ACMs' perspective, the supply chain problems may therefore consist of supply-side problems, problems in internal operations (internal supply chain) and distribution-side problems. The questionnaire was designed around this conceptual model.

In Table 2, the statistically significant problems are listed. It is clear that of the 75 identified problems, the most significant was in internal processes, followed by the customer-side category. (Problems with incoming transportation, internal movement and outbound transportation are not covered in this article.)

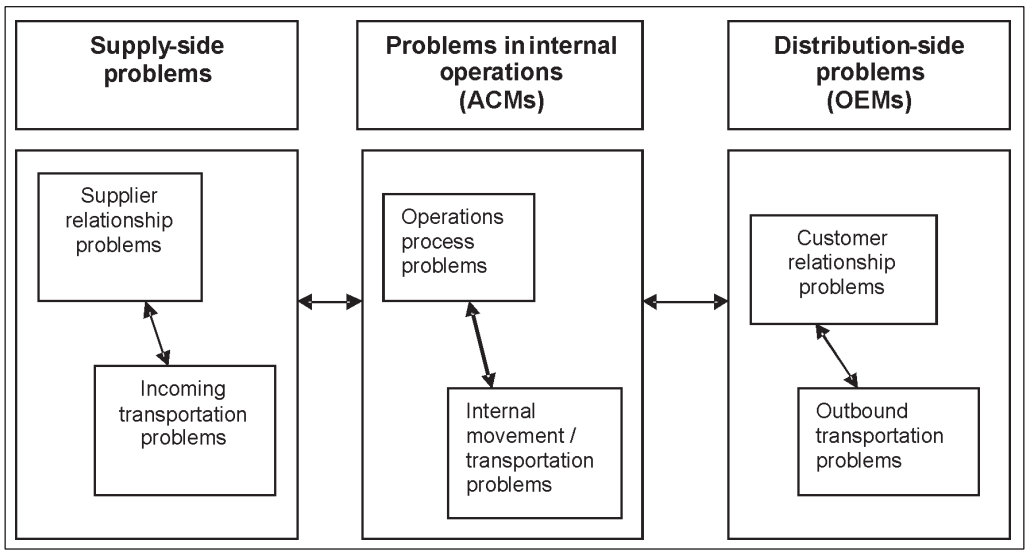

Figure 2: Conceptual model for the investigation of supply chain management problems

A binomial test was used to test whether the problems relating to the supply-side, internal process and customer-side were significant. The test determines whether the proportion of respondents in two groups was equal or significantly different. Two groups were formed by grouping responses 1 and 2 (to a lesser extent) together, coded as a 1 (category 1), and 3, 4, 5, 6 and 7 (to a greater extent) together, coded as a 2 (category 2). In this way, it was possible to determine whether a problem was perceived as being statistically significant (the proportion of 'to a greater extent' responses) or not. Only the problems that proved to be significant are included in Tables 3, 4 and 5.

Supply-side problems

Hypothesis 1

H_{01}: Supply-side problems are not significant SCM problems.
H_{a1}: Supply-side problems are significant SCM problems.

The *price of purchased materials* proved to be a statistically significant problem (with a mean rating of 4.38). Respondents indicated in the comments part of the questionnaire that local raw material suppliers are usually monopolies and the materials purchased from them contain commodities with prices fixed internationally, which leads to inflexibility relative to price and volume.

Table 2: Statistically significant supply chain problems

	Problem	Mean	Median	Quartiles		No. of valid cases*	% of valid cases
				25	75		
	Supply-side problems						
1.	Price of materials	4.38	4.50	3.00	6.00	50	94.34
2.	BBBEE – achieving and verifying BEE scorecards (in respect of OEMs' target)	4.29	4.00	3.00	6.00	41	77.36
3.	Financial stability of suppliers	4.09	4.00	3.00	5.00	43	81.13
4.	Material lead times too long resulting in obsolescence	4.02	4.50	2.00	6.00	46	86.79
5.	Trust between you and your 'worst 10%' of suppliers	3.73	4.00	3.00	5.00	44	83.02
	Internal operations process problems						
5.	Cost of replacing outdated technology	4.79	5.00	4.00	6.00	39	73.58
6.	Capacity limitations due to capital funding	4.21	4.00	3.00	6.00	28	52.83
7.	Planning for output based on customers' forecasts	4.20	4.00	3.00	5.00	41	77.36
8.	Labour problems – availability of skills	4.16	4.00	3.00	6.00	43	81.13
9.	Labour problems – time consuming to resolve	4.08	4.00	3.00	5.00	37	69.81
8.	Capacity limitations due to customer order fluctuation	4.05	4.00	3.00	5.25	40	75.47
9.	Reducing cycle time	3.97	4.00	3.00	5.00	34	64.15
10.	Balancing inventory levels	3.91	4.00	3.00	5.00	43	81.13
11.	Integrating information systems internally	3.88	4.00	3.00	5.00	40	75.47
12.	Capacity limitations due to availability of skilled labour	3.75	4.00	2.00	5.00	36	67.92
13.	Integrating technology with suppliers and customers	3.67	3.00	2.5	5.00	39	73.58
	Customer-side problems						
14.	Pressure by OEMs to reduce prices	5.51	6.00	4.00	7.00	49	92.45
15.	Cancellation of orders (after the recent economic crisis)	5.02	5.00	4.00	6.00	49	92.45
16.	Excessive inventory due to cancellation of orders that are slow moving	4.83	5.00	3.50	6.00	47	88.68
17.	Rapid changes in demand (in terms of quantity patterns)	4.18	4.00	3.00	5.00	44	83.02
18.	Advance communication about market demand	4.15	4.00	3.00	5.00	41	77.36
19.	Too dependent on business of a particular customer	4.15	4.00	2.00	6.00	41	77.36
20.	Trust between you and your 'worst' customers	4.13	4.00	3.00	6.00	39	73.58
21.	Relationship with 'worst 10%' of customers	4.12	4.00	3.00	6.00	34	64.15
22.	Little/no assistance from customers in complying with their requirements	3.79	4.00	2.50	5.00	43	81.13

* The number of respondents who indicated this to be a problem

The second statistically significant problem for ACMs is *complying with BBBEE conditions* set by the government for the industry. According to BBBEE agreements, organisations (in this case OEMs in the automotive industry) must put pressure on their suppliers (ACMs) to apply black economic empowerment (BEE) within their organisations as well as in awarding contracts to, or purchasing from, their suppliers

Table 3: : Binomial results: Supply-side problems (N = 53)

	Problem						**Mean rating**
Question no.	**Supply-side problem**						
2.1.1.6	Material lead times too long						4.02
2.1.1.7	Price of materials from suppliers						4.38
2.1.1.11	Financial stability of suppliers (after the recent economic crisis)						4.09
2.1.1.15	BBBEE – achieving and verifying BEE scorecards by ACMs						4.29
Binomial tests							
		Category	**N***	**Observed prop**	**Test prop**	**Asymp Sig (2-tailed)**	**Statistical significance (p < 0.05)**
2.1.1.6	Group 1	1	14	.30	.50	.001[a]	Significant
	Group 2	2	32	.70			
	Total		46	1.00			
2.1.1.7	Group 1	2	39	.78	.50	.000[a]	Significant
	Group 2	1	11	.22			
	Total		50	1.00			
2.1.1.11	Group 1	2	36	.84	.50	.000[a]	Significant
	Group 2	1	7	.16			
	Total		43	1.00			
2.1.1.15	Group 1	2	32	.78	.50	.000[a]	Significant
	Group 2	1	9	.22			
	Total		41	1.00			

a Based on Z approximation

* The difference between the total number of responses and those reflected in the binomial tests is due to the number of responses that did not identify problems with supply-side issues.

(ACMs as second tier suppliers). In terms of BBBEE (with a mean rating of 4.29), the findings of the study indicate that OEMs expect ACMs to achieve BBBEE targets that they cannot meet. Black suppliers are scarce in the raw material market, or are available at a premium that ACMs cannot afford.

The *financial stability of the suppliers* is an expected problem (with a mean rating of 4.09) due to the condition of the automotive industry worldwide and in South Africa after the economic meltdown. Governments in other countries had to take measures to avoid the collapse of their automotive industries and have injected large amounts of financial resources into these industries. This did not happen in South Africa. In addition to high interest rates, the banking sector in South Africa is also reluctant to allow credit facilities to those within the motor industry affected by the economic crisis, thus exacerbating the situation.

Too long material lead times was indicated as a statistically significant problem, with a mean of 4.02. When material lead times are long, one way to ensure a continued supply to customers is to increase stock levels. However, holding *excessive stock* may result in many other problems such as a shortage of cash flow and the stock becoming obsolete.

Internal supply chain process problems

Hypothesis 2

H_{o2}: Internal supply chain process problems are not significant SCM problems for ACMs.

H_{a2}: Internal supply chain process problems are significant SCM problems for ACMs.

In the semi-structured interviews with OEMs (the pre-survey investigation), it was indicated that there are deficiencies within the local ACM supplier base with regard to lack of technology. As a result, OEMs need to import too many of their parts requirements. This study found that the *cost of replacing outdated technology* is a statistically significant problem for ACMs (with a mean rating of 4.79). The ACMs also indicated that they experience capacity limitations due to capital funding (mean rating of 4.21).

There are five statistically significant process problems that could be linked together, namely: problems of *planning for output based on customers' (OEMs') forecasts* (mean rating of 4.20); the problem of *reducing cycle times* (with a mean rating of 3.97); *balancing inventory levels* (with a mean rating of 3.91); *integrating information systems in the company* (with a mean rating of 3.88); and *integrating technology with suppliers and customers* (with a mean rating of 3.67). The reason that they could be grouped together is that they are all related to demand management, specifically to the bullwhip effect.

Labour problems are not limited only to the supply chain. However, labour is an important resource in the supply chain. The ACMs indicated two labour issues that present significant problems, namely: the *availability of skills* in the workforce (with a mean of 4.16) and the *time it takes to resolve labour disputes* (with a mean of 4.08).

Despite the opinion expressed previously that the "automotive industry has skills" (*SA Automotive Week* 2009), this study found that the availability of skills presented problems. Respondents also indicated (in the qualitative section) that the work ethic and attitude of the workforce in South Africa is problematic, and that this needs to

Table 4: : Binomial results: Internal process problems (N = 53)

	Problem						**Mean rating**
Question no.	**Internal supply chain process problem**						
2.2.1.2	Planning for output based on customers' forecasts (suppliers to OEMs)						4.20
2.2.1.4	Reduce cycle times						3.97
2.2.1.5	Balancing inventory levels						3.91
2.2.1.8	Cost of replacing outdated technology						4.79
2.2.1.9	Integrating information systems in the company						3.88
2.2.1.10	Integrating technology with suppliers and customers						3.67
2.2.1.12	Labour problems – availability of skills						4.16
2.2.1.13	Labour problems – time consuming to resolve						4.08
2.2.1.15	Capacity limitations due to availability of skilled labour						3.75
2.2.1.16	Capacity limitations due to customer order fluctuations						4.05
2.2.1.18	Capacity limitations due to capital funding						4.21
Binomial tests							
		Category	**N***	**Observed prop**	**Test prop**	**Asymp Sig (2-tailed)**	**Statistical significance (p < 0.05)**
2.2.1.2	Group 1	1	7	.17	.50	.001[a]	Significant
	Group 2	2	34	.83			
	Total		41	1.00			
2.2.1.4	Group 1	2	26	.76	.50	.003[a]	Significant
	Group 2	1	8	.24			
	Total		34	1.00			
2.2.1.5	Group 1	2	34	.79	.50	.000[a]	Significant
	Group 2	1	9	.21			
	Total		43	1.00			
2.2.1.8	Group 1	2	33	.85	.50	.000[a]	Significant
	Group 2	1	6	.15			
	Total		39	1.00			
2.2.1.9	Group 1	1	9	.22	.50	.001[a]	Significant
	Group 2	2	31	.78			
	Total		40	1.00			
2.2.1.10	Group 1	2	29	.74	.50	.003[a]	Significant
	Group 2	1	10	.26			
	Total		39	1.00			
2.2.1.12	Group 1	2	33	.77	.50	.001[a]	Significant
	Group 2	1	10	.23			
	Total		43	1.00			
2.2.1.13	Group 1	2	28	.76	.50	.003[a]	Significant
	Group 2	1	9	.24			
	Total		37	1.00			

Continued

Table 4 continued

		Category	N*	Observed prop	Test prop	Asymp Sig (2-tailed)	Statistical significance (p < 0.05)
2.2.1.15	Group 1	2	25	.69	.50	.029[a]	Significant
	Group 2	1	11	.31			
	Total		36	1.00			
2.2.1.16	Group 1	2	32	.80	.50	.000[a]	Significant
	Group 2	1	8	.20			
	Total		40	1.00			
2.2.1.18	Group 1	2	24	.86	.50	.000[a]	Significant
	Group 2	1	4	.14			
	Total		28	1.00			

a Based on Z approximation

* The difference between the total number of responses and those reflected in the binomial tests is due to the number of responses that did not identify problems with internal supply chain processes.

change. Both skilled and unskilled staff do not have an urgent drive to execute their tasks efficiently and effectively, resulting in lower productivity in comparison with labour in regions such as Asia. As a result, many multinational manufacturers resort to producing parts in the Far East as it is often cheaper. This importation of cheaper parts from the Far East translates in increased competition for local manufacturers, congestion at South African ports and, ultimately, increased unemployment in the country.

It is important that ACMs have the capacity available in the near future, as OEMs are under pressure from government to improve their local content and purchase more of their components locally at ACMs in South Africa. ACMs indicated that they experience significant *capacity limitations* due to the *availability of skilled labour* (with a mean rating of 3.75); *customer order fluctuations* (with a mean rating of 4.05); and *capital funding* (with a mean rating of 4.2).

Distribution-side problems

Hypothesis 3

H_{03}: Distribution or customer-side problems are not significant SCM problems for ACMs.

H_{a3}: Distribution or customer-side problems are significant SCM problems for ACMs.

Table 5: Binomial results: Customer-side problems (N=53)

	Problem						Mean rating
Question no.	**Customer-side problems**						
2.3.1.2	Relationship with 'worst 10%' of customers						4.12
2.3.1.4	Trust between you and your 'worst' customers						4.13
2.3.1.5	Advance communication about market demand						4.15
2.3.1.7	Cancellation of orders (after the recent economic crisis)						5.02
2.3.1.8	Excessively slow-moving inventory due to cancellations of orders						4.83
2.3.1.10	Pressure by OEMs to reduce prices						5.51
2.3.1.14	Rapid changes in demand (in terms of quantity) patterns						4.18
2.3.1.15	Too dependent on the business of a particular customer						4.15
Binomial tests							
		Category	**N***	**Observed prop**	**Test prop**	**Asymp Sig (2-tailed)**	**Statistical significance (p < 0.05)**
2.3.1.2	Group 1	1	6	.18	.50	.000[a]	Significant
	Group 2	2	28	.82			
	Total		34	1.00			
2.3.1.4	Group 1	1	9	.23	.50	.001[a]	Significant
	Group 2	2	30	.77			
	Total		39	1.00			
2.3.1.5	Group 1	1	7	.17	.50	.000[a]	Significant
	Group 2	2	34	.83			
	Total		41	1.00			
2.3.1.7	Group 1	2	44	.90	.50	.000[a]	Significant
	Group 2	1	5	.10			
	Total		49	1.00			
2.3.1.8	Group 1	1	6	.13	.50	.000[a]	Significant
	Group 2	2	41	.87			
	Total		47	1.00			
2.3.1.10	Group 1	2	45	.92	.50	.000[a]	Significant
	Group 2	1	4	.08			
	Total		49	1.00			
2.3.1.14	Group 1	1	8	.18	.50	.000[a]	Significant
	Group 2	2	36	.82			
	Total		44	1.00			
2.3.1.15	Group 1	2	29	.71	.50	.012[a]	Significant
	Group 2	1	12	.29			
	Total		41	1.00			

a Based on Z approximation

* The difference between the total number of responses and those reflected in the binomial tests is due to the number of responses that did not identify problems with customer-side issues.

Pressure by customers (OEMs) to reduce prices proved to be the most statistically significant customer-side problem (with a mean rating of 5.51). This issue is also the most statistically significant of all the identified supply chain problems. Of note is that the second most significant problem on the supply side, as already discussed, is Binomial results: Customer–side problems (N=53) the *price of purchased materials* (with a mean rating of 4.38). ACMs find themselves in a predicament. On the supply side there is almost no price flexibility (as already indicated), and on the other side they are pressured by powerful OEMs to reduce their prices to improve the value for the final customer.

During the economic meltdown in 2009, automotive dealers cancelled orders with OEMs. OEMs in turn cancelled orders with ACMs. Hence the ACMs in the study indicated that *cancellation of orders* (with a mean rating of 5.02) is a statistically significant supply chain problem. This problem received the second highest rating as a supply chain problem. The result of cancellation of orders is *excessive stock,* which also proved to be a statistically significant problem (with a mean rating of 4.83).

Rapid changes in market demand are identified as a statistically significant problem for ACMs (with a mean rating of 4.18); almost equally significant is the *problem of advanced communication about changes in the market demand* (with a mean rating of 4.15). As already indicated, these two problems are closely related to the previous problems of excessive stock and cancellation of orders. It is clear that ACMs experience particular problems with communication with customers and therefore battle to balance supply and demand.

ACMs are of the opinion that they are *too dependent on the business of a particular customer*, and that this is a statistically significant problem (with a mean rating of 4.15) for them. The business risk increases when ACMs are more dependent on one customer's business.

There is a statistically significant problem with *trust* between ACMs and their 'worst customers' (with a mean rating of 4.13) and the *relationship* with the 'worst 10%' of customers (with a mean rating of 4.12). In general, relationships with customers, including issues of trust, was not a significant problem with OEMs as customers.

Recommendations

From Table 2, it is obvious that many problems can be related to demand management and the bullwhip effect. The problems on the supply-side relating to demand management and the bullwhip effect are related to material lead time being too long and the financial stability of suppliers. On the internal process side, the problems include: planning for output based on customers' forecasts, reducing

cycle times, balancing inventory levels, integrating information systems internally, and integrating technology with suppliers and customers. On the customer-side, the problems include: advanced communication about market demand, cancellation of orders, excessively slow, moving inventory, and rapid changes in demand patterns.

The answer to solving these problems was discussed in the literature. Better supply chain *coordination* can reduce the effect and the associated costs. The fundamental approach to resolving the bullwhip problem is to ensure *transparency and information sharing* throughout the supply chain. Problems can be avoided by relying less on forecasting and more on *direct demand data*. *Supply chain systems* that provide *open communication* and *reliable demand data* avoid situations in which small demand fluctuations become high variability swings at the production stage. Centralising demand information can dramatically reduce the variability seen in the upstream stages of the supply chain. Point-of-sale information, provided immediately and simultaneously to all members of the chain, can serve to reduce the bullwhip effect. Additional remedies might include retailers working with distributors and manufacturers to develop collaborative forecasts and to jointly plan future product promotions. Other tools and techniques include EDI implementation, reducing uncertainty by centralising demand information, lead-time reduction, strategic partnerships and vendor managed inventory.

ACMs are pressured by process on both the customer and supply sides. Suppliers' prices are high and fixed, and on the customer-side, OEMs pressure ACMs to reduce their prices.

It is recommended that efforts be made to improve relationships with suppliers. ACMs should try to convince suppliers to enter into a collaborative relationship in which collaborative efforts are made to reduce costs and improve on inefficiencies to the advantage of both parties. In particular, the purposeful development of appropriate supplier relationships is recommended (that is, relationships that are appropriate for the particular market condition and money spent). The fact that some raw material suppliers are in a strong position, in that they face little competition, makes a personal and long-term relationship even more crucial. The ACM purchasers should try to negotiate a better value package. ACMs might consider coming together to form purchasing consortia or engaging in cooperative buying to increase their leverage in the supply market.

OEMs pressurise ACMs for price reductions. The only alternative is for ACMs to become more efficient and effective by mobilising the cooperation of partners in the supply chain and improving internal processes and productivity. It is recommended that ACMs vigorously examine all their processes with the aim of eliminating waste, thereby generating cost savings. It is also recommended that ACMs embark on a

purposeful customer relationship management programme (CRM) to establish better communication and relationships with customers and to solicit their assistance in improving the performance of the supply chain as a whole. Better demand management; reducing organisational waste and total costs; pursuing supply chain objectives and planning rather than organisational objectives and planning; and cooperative problem-solving may steer the focus away from price and price reductions.

Complying with BBEEE targets is also a significant problem for ACMs to cope with. It is recommended that while ACMs are struggling to survive and retain market share during the economic crisis, the time span for achieving BEE targets and verifying BEE scorecards be relaxed until the economic situation stabilises. It is also recommended that ACMs communicate this problem and seek assistance from OEMs and the supplier development division of the Automotive Industry Development Centre.

Capacity limitations are a serious problem that needs to be addressed urgently. Capacity limitations due to order fluctuations will be addressed by the recommendations already made. Capacity limitations due to the availability of skilled labour will be addressed later in this section.

Other capacity limitations are due to capital funding and the cost of replacing outdated technology. Government and development funding organisations such as the Industrial Development Corporation and the Southern African Development Bank need to pay special attention to technology needs in the automotive industry. Government has already introduced the new Automotive Production and Development Programme (APDP), which is set to replace the Motor Industry Development Programme (MIDP) that expires in 2012, but progress is slow. However, there were promises that certain elements of the ADPD would be introduced before 2012, such as an investment allowance (in the form of a direct grant to support investment in new plant and machinery), originally intended for launch in June 2009 (Venter 2009a). This kind of aid will help ACMs replace their outdated equipment, ensuring improved effectiveness in supplying the local market and perhaps even assisting in obtaining additional sales volumes in other countries. Technology can also be accessed through international alliances or agreements. The idea here is to have access to technology, world-class processes and expanding market opportunities.

Labour problems seem to plague the automotive industry and specifically ACMs. It is recommended that at an operational level, ACMs should increase their focus on training and developing their employees through the various industry Sector Education and Training Authorities (SETAs) by effectively utilising the 1% training levy. In this way, the training levy becomes more of a developmental tool to be used by the ACMs, rather than the current situation in which some ACMs regard the

levy as just another 'tax'. During the economic crisis, ACMs could concentrate on introducing 'learnerships' into their businesses, using the appropriate 'tax breaks' provided by tax legislation and the Manufacturing, Engineering and Related Services SETA (MERSETA) programme (NAACAM 2009: 8). In terms of this scheme, ACMs pay a basic stipend to the learner, with other costs being borne by the MERSETA programme. Additional costs to the business are thus minimal. This focus on learnerships will ensure that the automotive industry skills base continues to develop. Closer and more open communication with labour unions is also recommended. At a national level, it is suggested that government look at ways of developing skills and improving, revitalising and extending programmes such as the Automotive Experiential Careers Development Programme; as well as introducing other apprenticeship training programmes, improving training at technical colleges and focusing on training in auto industry skills.

Lastly, ACMs believe that they are too dependent on the business of one customer. The solution for ACMs might lie in more innovative thinking and diversification. For example, a gearbox specialist (SEW Eurodrive) increased its turnover by 22% and production volume by 10% and could reduce process by 7% during the economic crisis by shifting the company's product mix, including higher-priced products and entering other industries with bigger market opportunities (O'Donnell 2009).

Conclusion

The role of ACMs in the competitiveness and survival of the automotive industry has never been as important as now. ACMs are main contributors to employment in the automotive industry, and it is acknowledged that they can make a considerable contribution to the cost-competitiveness of the South African automotive industry. There is pressure on OEMs from government to drastically increase local content (components and services they purchase from ACMs). The extension and improvement of the local ACM supplier base is therefore important. This study focused on ACMs and the problems they experience with the supply side, internal operations and distribution side of their supply chains.

The study found that the most significant problems facing ACMs are internal process problems. The most significant problems are those relating to demand management and extend across the whole supply chain, from the customer side where customer demand drives the supply chain, internally in ACMs, to the supply side of the supply chain. It is quite clear that automotive supply chains experience the bullwhip effect.

Concluding remark

ACMs are entering a difficult time, but also a time of many opportunities. On the opportunity side, there is pressure on OEMs to increase the local content, which means increased sales for ACMs. However, on the difficulty side, ACMs experience capacity problems that need to be resolved soon.

Endnote

1 In interpreting King III, 'sustainability' is the umbrella term for economic accountability, environmental sustainability, social responsibility (ensuring a positive impact on the community within which the company operates), respect for human rights and stakeholder relationships. Broad-based Black Economic Empowerment (BBBEE) may fall within the 'social responsibility' category, because it is aimed at the correction of social and economic imbalances created by the past.

References

Bailey, P., Farmer, D., Crocker, B., Jessop, D. & Jones, D. 2008. *Procurement Principles and Management* (10th edition). Harlow, England: Prentice-Hall.

Bennett, D. & O'Kane, J. 2006. 'Achieving business excellence, through synchronous supply in the automotive sector', *Benchmarking: International Journal*, 13 (1/2): 12–22.

Beth, S., Burt, D.N., Copacino, W., Gopal, C., Lee, H.L., Lynch, R.P. & Morris, S. 2006. 'Supply chain challenges: Building relationships', *Harvard Business Review on Supply Chain Management*. Boston: Harvard Business School Press.

Blome, C., Groetsch, V.M., Henke, M. & Tang, C.S. 2010. 'Differentiating winning and losing supply chains from a supply and risk manager's perspective: A comparative study of financial and operational measures in the automotive industry', *Proceedings of 19th IPSERA Conference*, Lappeenranta, Finland, 16–19 May.

Burt, D.N., Petcavage, S. & Pinkerton, R. 2010. *Supply Management* (8th edition). Boston MA: Irwin McGraw-Hill.

Cagliano, R., Caniato, F. & Spina, G. 2006. 'The linkage between supply chain integration and manufacturing improvement programmes', *International Journal of Operations and Production Management*, 26(3): 282–299.

Chopra, S. & Meindl, P. 2007. *Supply Chain Management: Strategy, Planning and Operations* (3rd edition). Upper Saddle River, NJ: Pearson, Prentice-Hall.

Council for Supply Chain Management Professionals. n.d. CSCMP supply chain management definitions. [Online] Available at: http: //cscmp.org/aboutcscmp/definitions. Accessed: 13 March 2011.

Cousins, P., Lamming, R., Lawson, B. & Squire, B. 2008. *Strategic Supply Management, Principles, Theories and Practice*. Essex, England: Pearson Prentice-Hall

Deloitte. 2009. Every decision counts. [Online] Available at: http://www.deloitte.com/view/en_ZA/za/services/audit/deloitteaudit/kingiii/index.htm. Accessed: 13 February 2011.

Fawcett, S.E., Ellram, L.M. & Ogden, J.A. 2007. *Supply Chain Management: From Vision to Implementation*. Upper Saddle River, NJ: Pearson Prentice-Hall.

Gabru, F. 2008. 'Audit tool identifies supply chain gaps and improvement strategies', *Engineering News*, 25 July. [Online] Available at: http://www.aids.co.za/index. Accessed: 19 January 2010.

Handfield, R.B., Monczka, R.M., Giunipero, L.C. & Patterson, J.L. 2009. *Sourcing and Supply Chain Management*. (4th edition). USA: South-Western, Cengage Learning.

Heizer, J. & Render, B. 2008. *Principles of Operations Management* (7th edition). New Jersey: Prentice Hall.

Hugo, W.M.J., Badenhorst-Weiss, J.A. & Van Biljon, E.H.B. 2004. *Supply Chain Management: Logistics in Perspective*. Pretoria: Van Schaik.

Humphreys, P.K., Huang, G., Cadden, T. & McIvor, R. 2007. 'Integrating design metrics within the early supplier selection process', *Journal of Purchasing and Supply Management,* 13: 42–52.

Institute of Supply Management. 2000. Glossary of key supply management terms. [Online] Available at: http://www.ism.ws. Accessed: 13 March 2011.

Jacobs, F.R., Chase, R.B. & Aquilano, N.J. 2009. *Operations and Supply Management*. New York: McGraw Hill.

Kwon, I.G. & Suh, T. 2005. 'Trust, commitment and relationships in supply chain management: A path analysis', *Supply Chain Management: An International Journal* 10(1): 26–33.

Lambert, D.M. 2006. *Supply Chain Management: Processes, Partnerships, Performance* (2nd edition). Saresota, FL: Supply Chain Management Institute.

Lockström, M., Schadel, J., Harrison, N. & Moser, R. 2009. 'Status quo of supplier integration in the Chinese automotive industry: A descriptive analysis', *Proceedings of 18th IPSERA Conference*, Wiesbaden, Germany, 5–8 April.

Lysons, K. & Farrington, B. 2006. *Purchasing and Supply Chain Management* (7th edition). Essex, England: Pearson Education.

Monczka, R., Handfield, R., Giunipero, L.C., Patterson, J.L. & Waters, D. 2010. *Purchasing and Supply Chain Management* (4th edition). Hampshire, UK: Cengage Learning.

Mphahlwa, M.P. 2008. Automotive development programme announcement. [Online] Available at: http://www.dti.gov/za/articleview.asp. Accessed: 20 July 2010.

NAACAM. n.d. The Authority of the South African Automotive Component Industry. [Online] Available at: http: //naacam.bluebox.co.za/?profile. Accessed: 24 July 2010.

NAACAM. 2009. *NAACAM Newsletter,* No. 9, March. *NAACAM BBEEE Bulletin*. [Online] Available at: www.naacam.co.za. Accessed: 8 August 2009.

O'Donnell, M. 2009. 'Price reduction aimed at gaining competitive advantage', *Engineering News*, 27 November. [Online] Available at: http://www.engineeringnews.

co.za/article/gearbox-supplier-reduces-prices-2009-11-27. Accessed: 19 January 2010.

Pillay, V. & Phillips, S. 2009. Overview of the policy and institutional landscape for enterprise development and preferential procurement in South Africa. Unpublished research report, Human Sciences Research Council.

Power, D. 2005. 'Supply chain management integration and implementation: A literature review', *Supply Chain Management: An International Journal*, 10(4): 252–263.

Republic of South Africa. 2003. South Africa's Economic Transformation: A Strategy for Broad-Based Black Economic Empowerment, *Government Gazette*, Vol. 463, No. 25899, par 3.5.1 and 3.5.3.1.

SA Automotive Week. 2009. Focus on partnerships, 22 July. [Online] Available at: www.saaw.co.za/News/09-07-22/focus_on_partnerships.aspx. Accessed: 19 January 2010.

Simchi-Levi, D., Kaminsky, P. & Simchi-Levi, E. 2009. *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies* (3rd edition). New York: McGraw-Hill.

South African Automotive Yearbook. 2009. Definitive reference, statistics and data on the SA motor industry (12th edition). Cowies Hill: Balgair Publications.

Sundaram, R.M. & Metha, S.G. 2002. 'A comparative study of three different SCM approaches', *International Journal of Physical Distribution and Logistics*, 32(7): 532–555.

Supply Chain Council. n.d. SCOR Frameworks. [Online] Available at: http://supply-chain.org/resources/scor. Accessed: 17 March 2011.

Swink, M., Melnyk, S.A., Cooper, M.B. & Hartley, J.L. 2011. *Managing Operations across the Supply Chain*. New York: McGraw-Hill.

Stevenson, W.J. 2005. *Operations Management* (8th edition, International edition). Boston, MA: McGraw-Hill.

Van Donk, D.P., Akkerman, R. & Van der Vaart, T. 2008. 'Opportunities and realities of supply chain integration: The case of food manufacturers', *British Food Journal*, 110 (2): 218–235.

Van Weele, A.J. 2010. *Purchasing and Supply Chain Management* (5th edition). Hampshire, UK: Cengage Learning.

Venter, I. 2009a. 'SA auto industry could be dead in 7 years, warns VWSA', *Engineering News*, 7 October. [Online] Available at: http://www.engineeringnews.co.za/article/sa-auto-industry-could-be-dead-in-7-years. Accessed: 10 January 2010.

Venter, I. 2009b. 'Auto bosses wring their hands over SA's declining competitiveness: Can the situation be salvaged?', *Engineering News*, 30 October. [Online] Available at: http://www.engineeringnews.co.za/article/auto-bosses-wring-their-hands. Accessed: 20 July 2010.

Walker, H. 2009. Sustainable procurement: A literature review, Paper presented at 18th IPSERA Conference, Wiesbaden, Germany, 5–8 April.

Webster, S. 2008. *Principles and Tools for Supply Chain Management*. New York: McGraw Hill.

Wisner, J.D., Tan, K. & Leong, G.R. 2009. *Principles of Supply Chain Management: A Balanced Approach* (2nd edition). Mason, OH: South-Western Cengage Learning.