A SUPPLY CHAIN MANAGEMENT STRATEGY FOR THE NON-FERROUS FOUNDRY INDUSTRY IN SOUTH AFRICA

BY

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Springs

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Abstract

In today's global knowledge economy, progressive companies must be equipped with a good balance of internal knowledge, both in scope and depth, and must adapt to the rapidly changing business environment. The ability of an organisation to manage knowledge as a corporate strategy is becoming a key competitive advantage. The essence of building an organisation's strength or capability in strategic knowledge management is to deepen the understanding of the exploitation and exploration of knowledge.

The impact of strategic knowledge management on organisations embarking on such initiatives will be significant. This is particularly crucial when organisations are focusing their efforts on improving the performance of their supply chains. Several organisations, implementing supply chain management improvements, have generated savings of millions of rands. This has prompted the CEO's of organisations to shift from individual company performance to what is called supply chain performance. Supply chain performance refers to the extended supply chain's activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner. Supply chain performance crosses company boundaries since it includes basic materials, components, subassemblies and finished products, and distribution through various channels to the end customer. It also crosses traditional functional organisation lines such as procurement, manufacturing, distribution, marketing & sales, and research & development.

Therefore, increasing international cooperation, vertical integration, along with a focus on core activities, have led to the notion that firms are links in a networked supply chain. This novel perspective has created the challenge of designing and managing a network of interdependent relationships, developed and fostered through strategic collaboration. Despite various attempts to identify stumbling blocks in the path towards improved performance and competitiveness in the non-ferrous foundry industry, no research attempt has yet been made towards a systematic development of a supply chain management strategy. This study identifies and consolidates various supply chain initiatives and factors to develop key supply chain management constructs conducive to advancing the field in the industry.
An extensive literature study was undertaken to identify effective supply chain management practices and to develop constructs that could be used in the supply chain management strategy. A questionnaire was then developed based on these different constructs and circulated among industry members to determine their perception of the validity and usage of these supply chain management constructs in their own firms. These constructs would then form the basis for the supply chain management strategy. Furthermore, the results were then discussed to identify any shortfalls or areas for improvement and the possible reasons for these shortcomings.

It was found that there is a clear shortfall or uncertainty in the use of information technology as a tool to improve the supply chain performance. There was also no clear indication that the respondents knew the benefits that could be realised from using an information system that could supply information from the entire supply chain. Another shortfall that was identified was the willingness to collaborate across the whole supply chain. The respondents were also, very undecided about the use of cross-functional teams, supplier involvement and logistics integration.

This paper also describes the characteristics, competitive factors and supply chain management issues related to a non-ferrous foundry as part of the entire supply chain. Despite the industry members being aware of most of these issues, there was a clear requirement to integrate these supply chain management processes. The management of knowledge throughout the supply chain was identified as critical to achieving competitive advantage.
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CHAPTER ONE: Nature and Scope of Study

1.1. Introduction

It is becoming apparent that a major re-appraisal of the way in which companies compete is now required and a new model of competitive strategy is emerging. It is based upon the premise that a firm increasingly competes through its capabilities and competencies; in other words, by how well it manages the fundamental processes involved in satisfying customers.

One of the most complex and therefore, potentially critical processes in gaining competitive advantage is the supply chain process. Supply chain management is concerned with achieving a more cost-effective satisfaction of end-customer requirements through buyer-supplier process integration. This integration is typically achieved through a greater transparency of customer requirement through the sharing of information. It is subsequently compounded through the establishment of “seamless” processes that link the identification of a physical replenishment need with the upstream response. A number of commentators (e.g. Cravens et al., 1996; Doyle, 1998) have highlighted the emergence of new competitive structures based upon networks and inter-firm collaboration.

Optimising the supply chain process inevitably leads to a growing interdependency among the parties in that chain. With this interdependency has come a realisation that cooperation and partnership are essential prerequisites for the achievement of long-term, mutual benefit. The implication for competitive strategy of this growth of collaborative supply chains are considerable – in particular, the need to develop those skills which enable a company to transform established buyer-supplier relationships and successfully manage them on a day-to-day basis.

Increasing global competition, the demands of customers for higher product quality, greater product selection, and better customer service, the desire of firms to shrink their supply bases while striving to contain costs, and the rising costs of natural resources today, have led many organisations to adopt cooperative, mutually-beneficial partnership strategies with suppliers, distributors, retailers, and other firms within their supply chains to maintain or improve profitability and overall firm performance.
1.2 Globalisation

There are three major ways in which globalisation has affected the South African economy over the past two decades. In each case, the pace of change has quickened over the years, particularly after the transition in 1994.

- In the realm of ideas, there has been a general move away from an often-xenophobic inward mentality towards an appreciation of foreign things and ideas.
- Particularly in recent years the falling barriers to mobility have led to a significant outflow of skilled people from South Africa. Often, these skills are lost forever and this places growing pressures on the productive sector.
- But by far the most significant aspect of globalisation for South Africa has been the change in the trade regime. Since the 1980s and especially after 1994, the South African economy has begun to emerge from this inwardly-focused developmental path. Both imports and exports have increased over the past decade.

The problem with South Africa’s growing export success is that it is not unique. South Africa is not the only country that is targeting external markets. In fact, global competition is growing rapidly. This has resulted in world prices falling in many sectors. This means that producers can only survive by:

- Increasing their productivity, or improving product offerings
- If the currency continues to devalue.
- The problem is that if growth can only be sustained with continual devaluation, there will be little chance of sustainable income growth for the SA population.

Few countries possess South Africa’s resources. So, it is not surprising that it has been a major exporter of a host of ferrous and non-ferrous ores. It seems obvious that this gift of nature should be translated into a challenge for South Africa; by the adding of value to minerals – beneficiation. This should surely lead to low cost minerals undergoing further manufacturing? The answer in the South African case is no. It all depends on the efficiency of downstream producers. If South Africa’s component producers and final product makers are inefficient, the advantage of low-cost natural resources will be dissipated.
1.3 The South African Foundry Industry Today

Reduced prices, superior product quality, excellent customer service, expanded variety, and exceptional value are examples of the ever-increasing demands being placed on businesses by their customers. This has emphasised the importance of operations management as a means to providing a competitive advantage for the company. This must be seen against the ever-increasing demand for variety and quality, as well as increasing resource costs.

The foundry industry and specifically, the non-ferrous sector in the industry in South Africa is no exception.

The evidence to date suggests that the industry has much to celebrate but there are concerns around sustainability and whether the industry really has moved out of the paradigm in which it previously existed.

The foundry industry has been identified as one of the manufacturing sectors with a significant potential for growth. The industry currently has a turnover of R 10, 255 billion, which contributes approximately 0.32% to South Africa’s total GDP. South African foundries cast approximately 500 000 tons of metal each year, of which 60% is ferrous and 40% is non-ferrous. There are two main indicators showing that the non-ferrous sector has outperformed the ferrous sector over the past few years.

The non-ferrous sector has shown the highest growth since 1992, with aluminium taking the lead with an annual growth rate of approximately 9.5%. This exceeds the national GDP growth over the same period.

The non-ferrous sector also shows the highest contribution to value-addition by metal type. This has resulted in a major growth in market share for aluminium.

Less than 50% of foundries adhere to any kind of formal quality system. Many of them do not have accreditation as they are not required to by their customers, are not exporting, or find the process to be too expensive and of little value. This viewpoint does not bode well for the future of these companies because achieving accreditation has always been seen by the global market as an indication of the ability to manage the activities of the company effectively within the total supply.
chain. This may have implications for the future development of the industry and its ability to remain competitive in the face of increasing international competition.

Other problems that have been identified within the total supply chain of the foundry industry is the lack of skills in the advanced employment categories. There does not seem to be a concern regarding skills development on the shop floor, which involves approximately 80% of employees. Another problem is the traditional viewpoint of the foundry industry that investing new capital in operations is expensive and not necessarily productive. This ageing foundry equipment can barely meet the current demands placed on it, let alone the possible doubling of demand in the next five years. This situation also hampers the sustainable reduction of scrap, which is an important pre-requisite for a competitive advantage. In today’s global economy, high quality standards is seen as an order qualifier, permitting a firm’s products to be considered as possible candidates for purchase.

These are just a few of the problems facing the foundry industry in South Africa today. The resulting survey to be conducted with this mini-dissertation will highlight additional problems. There are also indicators that the South African foundry industry needs to become more assertive regarding the challenges ahead and to keep abreast of new developments. It will have to take heed of its responsibilities in a growing market and to be aware of the actions required to accelerate quality, sustainable growth and development. These actions include the following:

- A technology innovation strategy for manufacturing enterprises.
- An integrated human resource strategy to boost skills levels.
- Access to finance for small and medium enterprises.
- The increase in efficiency of input sectors, i.e. transport, storage and wharfage costs, communications and energy costs.
- An integrated manufacturing strategy for the South African foundry industry, which addresses value chain integration.
1.4 Problem Statement

When faced with increasing competitive pressures, the first thing a firm needs to do is to assess its competitive strengths and weaknesses in relation to market opportunities. But however skilled the firm becomes in improving its internal operations, there is a limit to what it can do to improve its profitability and growth prospects. This is because the firm is embedded in a value chain, which often involves a long chain of production and other activities before the needs of final customers are met.

The idea is to apply a total systems approach to managing the entire flow of information, materials, and services from raw materials suppliers through factories and warehouses to the end customer.

This research project will aim to determine what supply chain characteristics are required in the non-ferrous foundry industry in South Africa in order to improve the industry's performance. As described earlier, the foundry industry has a lot to be proud of. One of the consequences of operating in a protected economy was that foundries were under-specialised and did not consider their position in the total value chain. For this reason, and following the improvements that many leading firms made in their internal operations during the 1990s, increasing attention has to be given to their positions in the value chain, and in steps that they can take to improve their value chains.

Another issue that will also receive attention during this research project is to determine whether there is strategic alignment between the corporate and supply chain strategies that is essential for the success of a company. This strategic fit means that both the competitive and supply chain strategies must have the same goal. It refers to consistency between the customer priorities that competitive strategy is designed to satisfy and the supply chain capabilities that the supply chain strategy aims to build.
1.5 Objectives of this research project

1.5.1 Main objective
Developing a supply chain management strategy for non-ferrous foundries in South Africa that will ensure a sustainable competitive advantage in the global market.

1.5.2 Supporting Objectives
- Determining what current supply chain management (SCM) strategies are used in the non-ferrous foundry industry, identifying the major strategies and the reasons why these were chosen.
- Determining the general perception of supply chain management practices in non-ferrous foundries in South Africa.
- What performance levels are achieved with these strategies? Performance levels such as inventory turnover, weeks-of-supply, buyer – and supplier performance and other financial management performance indicators will be used.
- Identifying the possible causes for not achieving the desired performance levels. These might include the following:
  - Mis-alignment of manufacturing and SCM strategies towards the overall corporate strategy.
  - Processes and resources do not provide the capabilities to support the desired strategic fit.
  - Not considering value density when deciding on the transportation mode.
- By performing a benchmarking exercise, the “best” SCM strategy concepts will be combined with international (global) “best” practices derived from the globally-competitive non-ferrous foundry to formulate a desirable SCM strategy (minimum requirements) aimed at achieving a sustainable competitive advantage.
1.6 Research methodology

A web survey will be used to identify the non-ferrous foundries in South Africa, who are members of the South African Institute of Foundrymen (SAIF). These foundries will be used to gather the relevant data. Because the SAIF is considered to be the organisation representing the interests of the majority of foundries in South Africa, it is believed that members have sufficient working knowledge of supply chain and manufacturing issues within their organisation to accurately complete the survey. In addition, executives (possessing the title manager or above) will be chosen as respondents because their high-ranking position should afford them a fairly comprehensive view of the firm and its functional priorities. The sampling frame will include non-ferrous foundries across South Africa that are of a sufficient size to provide a significant input into the research project. Some of the criteria that will be used to select these foundries include the following:

- Annual turnover of R 30 million or more.
- Average monthly output of 100 tons or more.
- A minimum of 50 employees.
- Must at least be in the process of considering entering the global market.

These criteria will only be used as a guideline to ensure meaningful contribution by the firms. Supply chain metrics from previous studies will be used to compose the survey, together with information gained from the literature study.

A thorough literature survey will also be conducted to investigate “best” practices around the world relating to supply chain management used in non-ferrous foundries. This literature survey will also be used to discuss relevant literature concerning supply chain management in other manufacturing industries.

Finally, discussion sessions with some of the most important suppliers, intermediaries and customers involved in the non-ferrous foundry value chain will also be conducted to elicit their viewpoints and problems that they are experiencing. These discussions will take on the form of one-on-one interviews or focus groups. Examples of firms that fall into this part of the research project include sand suppliers, consumables, other raw materials (scrap, ingots), furnaces and other equipment, transport companies and maintenance firms.
CHAPTER TWO: Literature Study of Supply Chain Management

2.1 Introduction

Superior supply chain management is about doing more with less. It’s about optimising supply chain processes and increasing their speed and effectiveness, while reducing costs and balancing customer service.

Supply chain management is not an easy task. The challenge is giving your customers what they want, when they want it, how they want it, and at the lowest cost, without tying up inventory in the channel or writing off obsolete inventory. The key to being a supply chain leader is stronger performance. Supply chain leaders perform better, with lower inventory and costs.

In recent years, many authors have paid great attention to cooperation between firms in a supply chain on a commercial and logistic basis, often referred to as partnering. Ellram & Hendrick (1995) describe partnering as “an ongoing relationship between two organisations, which involves a commitment over an extended time period, and a mutual sharing of the risks and rewards of the relationship”. According to Cooper et al. (1997:74), partnerships involve close, highly interactive relationships between business organisations. Gardner et al. (1994) analyse partnerships by the degree of cooperation between firms, which they express on a continuum, with the two extremes labeled as arm’s-length-style relationship (no partnership) and so-close coordination that the firms work together virtually as one (many elements of partnership present).

In the literature, the management of logistic channel cooperation is best known as Supply Chain Management (SCM). Cooper et al. (1997:67) define a supply chain as “three or more distinct handlers of products, where products include physical goods, services, and information.” This definition lacks two essential elements, namely first, that these distinct handlers are interrelated, and second, that they are positioned at consecutive stages in the channel. Analytically, a typical supply chain as shown in figure 1 is a network of materials, information, and services processing links with the characteristics of supply, transformation, and demand.
Bechtel & Jayaram (1997) argue that developing a good definition of SCM seems to pose many problems. These authors found 17 different, though related definitions. For the purpose of this research article, a recently stated definition by Cooper et al. (1997:68), which highlight all the important elements of SCM will be used. They define SCM as “an integrative philosophy to manage the total flow of a channel from earliest supplier of raw materials to the ultimate customer, and beyond, including the disposal process”. In recent years, the safe disposal of waste foundry products such as foundry sand has become an important and costly issue.

Thus, SCM refers to firms in a channel cooperatively managing flows of material (forward and backward) through the channel. According to the literature, the main goals of SCM are

- Improving the efficiency of the processes within the channel (and thereby reducing costs) and
- Improving the effectiveness of channel outcomes (e.g. value adding, customer services) (Higginson & Alam, 1997).

As a result, the channel’s competitiveness as a whole, and the individual channel members’ competitive positions, should be increased (Cooper et al., 1997).

However, many other related objectives are possible. For example, Ellram (1995) found in an empirical study that a major reason for suppliers and buyers to enter into a
partnership is to reduce uncertainty by securing reliable markets and reliable sources. SCM encompasses a diversity of techniques by which these goals can be achieved. Higginson & Alam (1997) supply an overview of several techniques used in SCM.

2.2 Building sustained, long-term co-operation

2.2.1 Overview

Value-chain management focuses on the interests of the entire chain and defines the roles of each link in improving the value of the chain. (Chase & Aquilano, 1995). The benefits of fostering integration and partnership among companies within the value chain have been extensively asserted in the literature. Thomas and Griffin (1996) suggested that improving the co-ordination and integration of product and process decisions across the chain might reduce costs and improve service levels. According to Dyer (1996), this may also improve the company’s response to exogenous shocks due to the increasing amount of (shared) resources and information available. New (1996) indicated that long-term relationships and operational integration across the business chain might bring in commercial benefits due to better co-operation and increasing effectiveness of operations. Finally, Sako and Helper (1996) suggested that building trust between organisations might foster continuous improvement and learning as firms tend to explore opportunities to generate mutual (rather than individual) benefits. Nevertheless, increasing interfirm co-operation is not a straightforward process. Williamson (1985:120) suggests that the "unusual relationship" between Toyota and its subcontractors arose because Toyota was able to emphasise from the outset that all faced a common destiny. He provides no justification for the assertion that the "unusual relationship" commenced when Toyota began operations in 1937. Nor does he explore the conditions that may have permitted Toyota to establish an extensive, highly co-operative business network guided by "common destiny". Asanuma (1992:106) suggests that trust, mutual dependence, commitment and co-operation bind Toyota’s network together. These attributes are outcomes. Taken separately or together, they cannot explain how a highly co-operative network emerges. McMillan (1992:164) notes that repeat business is a feature of business dealings between Toyota and its suppliers and indicates that repetition can induce co-operation. Just as co-operation is an outcome, so too is repeat business. McMillan (1992:166) suggests that the maintenance of ongoing relationships is easier in Japan than in America because Japanese firms deal directly with fewer suppliers than do firms in America. There is, however, no causality link between
small numbers and co-operation. Many writers argue that at least part of the explanation for the unique nature of interfirm co-operation evident in some Japanese business groups is due to specific, non-replicable Japanese cultural factors (Williamson, 1985:122). This line of argument suggests that long-established values, norms and practices explain the unusual intragroup activities of Japanese firms like Toyota. The distinctively different outcome achieved by Toyota over American firms such as Ford and GM can best be explained by reference to a particular game theory: common interest objective. The game theory that influences the behaviour of most firms worldwide, mutually beneficial exchange, is present in business dealings in successful Japanese business organisations but has thus far remained subordinated to the common interest objective. The common interest objective differs from mutually beneficial exchange in that the payoff structure favours co-operation in a repeated game. In a mutually beneficial exchange, the payoff structure is such that players pursue self-interest despite the fact that co-operation would yield a better outcome for both. This leads to ambiguity.

Kay (1993:82) suggests that relations within and amongst firms in vertical supplier networks provide the reason why many Japanese firms have gained global competitive advantage. Kay refers to these relationships as “architecture” and argues that architecture is one of three main sources of distinctive (or non-replicable) capability, the other two being innovation and reputation. Most firms in all countries have continuing relations with at least some of their suppliers (McMillan, 1992). Yet, few have an architecture that delivers a competitive advantage comparable to that gained by Toyota.

The origins of Toyota’s success can be traced back to the unusual business environment that prevailed in Japan in the 1950’s, the main features of which were:

- An encompassing set of government interventions, which forced most manufacturers to participate in foreign technology transfer if they wanted access to the nation’s scarce resources – foreign exchange and funds for investment.
- A business milieu characterised by numerous small, independent, craft-orientated firms, which were prepared to consider a more secure alternative to continued existence in an intensely competitive and uncertain environment.
The willingness of foreign firms, especially American, to provide technology to Japanese firms. The American firms did not see embryonic Japanese firms as a credible threat.

This business environment encouraged Japanese firms to form their own network of firms. Lead firms were able to easily convince the smaller workshops of the benefit of a common interest objective, because of the rapid growth attained during this period and the smaller workshops had no experience in the lead firm's activities.

Successful Japanese business networks did not, however, rely on rapid growth to sustain the common interest objective. They consciously sought to improve the competitive advantage of their particular network. They continuously sought to identify product characteristics valued by large numbers of customers and developed products to meet these characteristics (small cars, with less frequent need for servicing and with lengthy warranty guarantees). They gave priority attention to product marketing, particularly with regard to its internal and external (supplier network and dealership network) architecture. These steps served to sustain resolution of the primary game, co-operation. At the same time, lead firms progressively worked to perfect intragroup co-ordination activities. The kanban (just-in-time) and zero-defect systems are examples. Any other firm could easily replicate these steps. What was not replicable, however, was the progressive perfection of this technique within an extensive network of firms, the situation that developed in Toyota's strategic network in the 1950's. Such achievements strengthened Toyota's competitive advantage and helped maintain a payoff structure that signaled to member firms the benefits to be derived from unqualified co-operation.

General Motors spent much of its time establishing the basic principles of co-ordination to new supplier after new supplier. In contrast, Toyota mostly concentrated on supplier performance. For instance, Porter (1980) stressed the importance of buyers and suppliers matching their individual needs with the relative capabilities of the other in order to maximise product differentiation and minimise cost. Later, Porter (1985) advanced his earlier theories by presenting discussion of the value system (today, more commonly referred to as the supply chain) and its impact on competitive advantage. These seminal works have formed the basis for the development
of supply chain management strategies today and their ties to firm competitiveness and performance. Further, Teece, Pisano, and Shuen (1997) provided an explanation of how a firm’s specific asset position and uniqueness shape its competitive advantage. The practices of logistics and supply chain management along with their associated benefits (better customer service, lower cost, higher quality, and improved competitive advantage) are linked closely with the strategic management literature. Further, these practices and strategies continue to evolve and the links between supply chain management and firm performance is beginning to be realised as firms begin to understand and implement SCM.

Specifically, the relevant literature can be classified and discussed from three perspectives: supplier management activities and strategy, customer relationship activities and strategy, and system wide supply chain management strategy. While there is certainly significant overlap existing among these classifications, the purchasing and logistics literature generally is either internally focused or spans the boundaries between the firm and its first-tier suppliers and customers, while the supply chain management literature focuses on the integrating activities taking place among a network of firms encompassing in many cases several tiers of suppliers and customers. However, the term supply chain management is not used consistently within the literature, and in many cases, the reader is left to decide how best to classify a particular piece of research (Mabert and Venkataramanan, 1998).

2.2.2 Supplier Management Strategy

The concept of SCM has evolved slowly. However, greater involvement with suppliers is noted. For example, manufacturers have utilised the knowledge and resources of key suppliers to support new product development efforts (Morgan and Monczka 1995). Further, many firms have successfully reduced their supply bases in order to form a smaller set of highly competent suppliers to achieve improvements in purchased product quality and timing (Inman and Hubler 1992). Much of the recent literature on SCM focuses on attempts to form alliances with suppliers to co-manage the purchasing and supply function. Recently, for instance, McGinnis and Vallopra (1999) found that purchasing’s strategic involvement with suppliers contributed significantly to process development and improvement in a number of industry categories. As an example, involving suppliers early on in product design efforts allows manufacturers to develop
alternative conceptual solutions, select the best and most affordable components, materials and technologies, and receive help in design assessment (Burt and Soukup 1985). Future projections indicate supplier selection will increasingly be based on strategic contributions to the supply chain and will extend beyond first-tier suppliers (Carter et al. 2000).

For a number of years, there have been significant disagreement regarding purchasing’s ability to contribute to the firm’s sustainable competitive advantage. While a number of researchers have suggested that firms cannot “purchase” competitive advantage (since freely traded assets are available to all competitors, and all purchasing activities can be replicated), others are now suggesting the contrary view: that purchasing functions and resources are not identical among competing firms, and can result in proficiencies that are impossible or difficult to copy. Ramsay (2001) provides a compelling discussion and review of this line of thinking. Several researchers have discussed or tested for the relationship between supplier management activities and various performance outcomes. Whipple, Frankel, and Anselmi (1999) discuss case studies in the grocery industry to highlight inbound supply relationships and their impact on firm effectiveness and efficiency. In a survey of 57 automotive supplier CEOs, Scannell, Vickery, and Dröge (2000) found significant positive relationships between JIT purchasing, supplier partnership, and supplier development practices and several performance measures.

2.2.3 Customer Relationship Strategy
To speed the delivery process and improve customer service, manufacturers, distributors, and retailers today are integrating their supply chain logistics functions by using transportation partners for cross docking and direct store deliveries without the need for incoming inspections (Ellram, La Londe, and Weber 1989). Transportation and other outbound logistics functions focus on a number of strategically important supply chain management issues such as JIT and customized delivery, warehouse and facility location, customized product/service issues, customer relationship management, and communication/information system deployment. Supply chain management’s origins can be traced to an effort to better manage these transportation and logistics functions (Fisher 1997).
Increasingly, product and service customisation is performed within the distribution channel to improve customer satisfaction (Lee and Billington 1995). This in turn, creates the need for third-party logistics service providers. In a recent survey of European manufacturers, Van Hoek (1999) found customised transportation services, postponement, and the need for consistent, reliable, on-time delivery to be top considerations in structuring and managing the supply chain. One of the strategic goals of the transportation and outbound logistics functions is to reduce inventory along the supply chain while simultaneously maintaining or improving customer service (Houlihan 1988). A supply chain can accomplish this task by efficiently redistributing stock within the supply chain using effective postponement and speculation strategies (Pagh and Cooper 1998). Inventory must be replenished quickly and arrive when and where it is needed, in smaller lot sizes.

2.2.4 Supply Chain Management Strategy
The short-term objective of SCM is primarily to increase quality and productivity while reducing inventory and cycle time; its long-term strategic goals are to increase customer satisfaction, market share, and profits for all members of the supply chain network. Supply chain management has a primary focus on key process integration throughout the supply chain, which should ultimately lead to a balance between customer requirements and supply chain capabilities (Lummus and Alber 1997). In general, SCM seeks improved participant performance through elimination of waste and better use of internal and external supplier capabilities and technologies (Morgan and Monczka 1996).

The SCM philosophy expands the traditional internally focused integrating activities of logistics (Kahn and Mentzer 1996) by bringing trading partners along the supply chain together with the common goals of efficiency, speed, and end-customer satisfaction (Harwick 1997). When successful, SCM creates a virtual organisation composed of several independent entities, often linked by sophisticated enterprise resource planning (ERP) systems providing global visibility of real-time information from any part of a company or its supply chain partners. The visibility enables more effective forecasting, production, and inventory decisions (Chopra and Meindl 2001). To accomplish this, SCM must integrate a number of key business functions, including purchasing, demand management, distribution planning, transportation, quality management, production planning, and materials management throughout the supply chain.
Since the wholesaling and retailing industries incorporate a logistics focus into their strategic decisions, use of the SCM concept would enable channel members to compete as a unified entity instead of merely pushing inventories down the supply chain to end customers. Thus, the benefits of vertical integration can be obtained by coordinating the logistics function of independent firms in the chain (Gustin, Daugherty, and Stank 1995). In this respect, SCM involves the integration of logistics systems to control the movement of goods from the original suppliers to satisfied end-customers without waste (Ellram 1991).

Where improving customer service once meant increasing warehouse inventories along the supply chain, today, integrated logistics systems seek to manage inventories through close relationships with suppliers and transportation, distribution, and delivery services. A goal is to replace inventory with frequent communication and sophisticated information systems to provide visibility and coordination, so that merchandise can be replenished quickly and arrive where and when it is needed in smaller lot sizes (Handfield 1994; Shapiro, Singhal, and Wagner 1993). Firms that use advanced process technology to increase flexibility while involving manufacturing and logistics managers in strategic decision making increase the role logistics play in firm success (Tracey 1998). Quick, frequent, and accurate information transfer among members of the supply chain can counteract the distortion of information (known as the bullwhip effect) as it passes sequentially up the supply chain (Metters 1997). When utilised effectively, communication systems and information technology systems can replace inventory and improve organisational performance (Lewis and Talayevsky 1997).

Recent research papers have explored linkages between supply chain management practices or strategies and firm performance, either directly or indirectly. For instance, in a survey of North American manufacturers, distributors, and retailers, Stank, Keller, and Daugherty (2001) found that supply chain management practices tended to improve internal collaboration, which, in turn, positively affected logistics service performance. Brewer and Speh (2000) examined how the balanced score card could be used to leverage a firm’s supply chain into a source of competitive advantage. An earlier work by Armistead and Mapes (1993) using a very small sample, found that an increasing level of supply chain integration correspond with increased manufacturing performance.
2.3 Planning and Controlling the Supply Chain

2.3.1 The Role of Enterprise Resource Planning Systems

Supply Chain Management involves two flows. Information flow signals the need to start the flow of material. In a supply chain, the fast flow of high quality information and material is inextricably linked and of paramount importance to SCM success. Untimely or low-quality information virtually guarantees poor performance.

Enterprise Resource Planning systems have evolved since the 1960’s from simple Inventory Control Systems to today’s integrated systems that cover every aspect of the business, from engineering, finance, and human resources to shop floor and distribution activities. ERP systems developed out of hundreds of individual and stand-alone computerised business systems that are generically referred to as heritage or legacy systems. According to Davenport (1998:123) “they [these legacy systems] represented one of the heaviest drags on business productivity and performance now in existence.” Davenport also points out that maintaining these many different computer systems leads to enormous costs. This is where the good ERP system steps in, promising the client “integration and seamless operation.” Another very important aspect of ERP systems is their use of Best Business Practices. Best Business Practices are business processes that have been derived from the best and most successful businesses in the world. These are quite literally the accepted “best way” of doing business.

Manufacturing needs a “big-picture” understanding to guide them to the most cost-effective, most strategically sound answers – inevitably the simplest solutions. The art of applying technology to expand business capabilities also demands methodical thinking and vast knowledge of minute details. World-class manufacturers, after all, require world-class systems integration. A few years ago, Enterprise Resource Planning was seen as a new “breakthrough technology” for the supply chain. The truth is there is no way to manage one’s supply chain with technology alone. After spending large amounts of money on these systems, many companies have reported that their IT solutions are failing to meet expectations. Technology is simply an enabler, and SCM managers need more than IT solutions to improve their supply chains. It was believed that with the overwhelming mountains of data that could be generated across the supply chain with the help of ERP systems and the Internet would automatically enable managers to make better SCM choices. There is simply too much data overwhelming and confusing the
decision making process. Without human intervention, the collection of data will only prove to remain information and not a useful tool.

An integrated enterprise system forms the backbone of internal and external communication, but the risks and costs are high. Therefore, investments in e-business solutions and initiatives must be carefully linked to the strategies and objectives of the organisation (Hammer, 2002:182). Some of the better-known ERP systems providers such as MAPICS, SAP, BAAN, PeopleSoft and LD Edwards all emphasise the importance of integration and state the following benefits of their systems:

- Reducing supply and supplier variability – such as time delays and inconsistent quality.
- It allows you to improve communications with your downstream customers, while simultaneously forming tighter relationships with your upstream vendors.
- Increasing velocity in replenishment as well as time to market for new products and product revisions.
- Immediate notification of events, both on the demand and supply sides, is possible and with it you have access to the information you need to efficiently manage your production.
- You gain detailed insight into your future critical load at each production facility. From this, you can intelligently manage make-versus-buy decisions to best balance your customer's needs against your ability to deliver. With this comprehensive and unified view of production, you know exactly what and how much you need to buy, and from whom.
- Decreasing the cost of supplier ownership for shared processes.
- Increasing ROA across the supply chain by sharing the responsibility for inventory control with suppliers.
- As customer’s needs change, your entire supply chain can adjust accordingly – even in the midst of fulfilling a particular order. By continually aligning the order fulfillment process, your customer expectations are met, if not exceeded.

Business relationships are the real focus of the new activities and collaborations sparked by the internet. Yet the question remains of how one can or should leverage these opportunities and, at the same time, avoid getting lost in the new frontier. Collaborative
commerce, a newly emerging model for supply chain operations, is more than just automating enterprise-to-enterprise connections – it is a way of establishing and formalising relationships with suppliers. Supplier Relationship Management (SRM) has emerged as a key element in attaining and sustaining a strategic competitive advantage. SRM is, according to analyst Gartner, Inc., "a set of methodologies and practices needed for interacting with suppliers of products and services of varied criticality for the profitability of the enterprise" (Spencer & Reilly, 2001). SRM integrates all aspects of the relationship with a supplier including sourcing, enablement, procurement, settlement, and analysis. A Supplier Relationship Management module in an ERP system integrates all suppliers in real-time, to control spend and dramatically improve supplier performance. It is the collaborative architecture afforded by the Internet that makes SRM possible.

2.3.2 The Bullwhip Effect
An unmanaged supply chain is not inherently stable. Demand variability increases as one moves up the supply chain away from the retail customer, and small changes in consumer demand can result in large variations in orders placed upstream. Eventually, the network can oscillate in very large swings as each organisation in the supply chain seeks to solve the problem from its own perspective. This phenomenon is known as the bullwhip effect and has been observed across most industries, resulting in increased cost and poorer service. Lee et al. (1997a, b) identified five main causes of the bullwhip effect: the use of demand forecasting, supply shortages, lead times, batch ordering, and price variations. This previous work has also led to a number of approaches and suggestions for reducing the impact of the bullwhip effect. For instance, one of the most frequent suggestions is the centralisation of demand information, that is, providing each stage of the supply chain with complete information on customer demand.

Understanding the causes of the bullwhip effect can help managers find strategies to mitigate it. Indeed, many companies have begun to implement innovative programs that partially address the effect. These include the following:

- **Avoid Multiple Demand Forecast Updates**
Ordinarily, every member of a supply chain conducts some sort of forecasting in connection with its planning (e.g., the manufacturer does the production planning, the
wholesaler, the logistics planning and so on). Bullwhip effects are created when supply chain members process the demand input from their immediate downstream member in producing their own forecasts. Demand input from the immediate downstream member, of course, results from that member's forecasting, with input from its own downstream member.

One remedy to the repetitive processing of consumption data in a supply chain is to make demand data at a downstream site available to the upstream site. Hence, both sites can update their forecasts with the same raw data. Supply chain partners can use electronic data interchange (EDI) to share data.

Even if the multiple organisations in a supply chain use the same source demand data to perform forecast updates, the differences in forecasting methods and buying practices can still lead to unnecessary fluctuations in the order data placed with the upstream site. In a more radical approach, the upstream site could control resupply from upstream to downstream. The upstream site would have access to the demand and inventory information at the downstream site and update the necessary forecasts and resupply for the downstream site. The downstream site in turn would become a passive partner in the supply chain.

Long resupply lead times can aggravate the bullwhip effect. Improvements in operational efficiency can help reduce the highly variable demand due to multiple forecast updates. Hence, just-in-time replenishment is an effective way to mitigate the effect.

- **Break Order Batches**

Since order batching contributes to the bullwhip effect, companies need to devise strategies that lead to smaller batches or more frequent resupply. One reason that order batches are large or order frequencies low is the relatively high cost of placing an order and replenishing it. EDI can reduce the cost of the paperwork in generating an order. Another reason for large order batches is the cost of transportation. The differences in the cost of full truckloads and less-than-full truckloads are so great that companies find it economical to order full truckloads, even though this leads to infrequent replenishments from the supplier. In fact, even if orders are made with little effort and low cost through EDI, the improvements in order efficiency are wasted due to the full truckload constraint. Now some manufacturers induce their distributors to order assortments of different products. Hence a truckload may contain different products from the same manufacturer.
instead of a full load of the same product. The effect is that, for each product, the order frequency is much higher, the frequency of deliveries to the distributors remains unchanged, and the transport efficiency is preserved. The use of third-party logistics companies also helps make small batch replenishments economical (Richardson, 1994).

- **Stabilise Prices**
  The simplest way to control the bullwhip effect caused by forward buying and diversions is to reduce both the frequency and the level of wholesale price discounting. The manufacturer can reduce the incentives for retail forward buying by establishing a uniform wholesale pricing policy. Activity-based costing (ABC) systems enable companies to recognize the excessive costs of forward buying and diversions. When companies run regional promotions, some retailers buy in bulk in the area where the promotions are held, then divert the products to other regions for consumption. The costs of such practices are huge but may not show up in conventional accounting systems. ABC systems provide explicit accounting of the costs of inventory, storage, special handling, premium transportation, and so on that previously were hidden and often outweigh the benefits of promotions. ABC therefore helps companies implement the Everyday Low Price strategy (Mathews, 1994).

- **Eliminate Gaming in Shortage Situations**
  When a supplier faces shortages, instead of allocating products based on orders, it can allocate in proportion to past sales records. Customers then have no incentive to exaggerate their orders. “Gaming” during shortages peaks when customers have little information on the manufacturers’ supply situation. The sharing of capacity and inventory information helps to alleviate customers’ anxiety and, consequently, lessen their need to engage in gaming. But sharing capacity information is insufficient when there is a genuine shortage. Some manufacturers work with customers to pace orders well in advance of the sales season. Thus they can adjust production capacity or scheduling with better knowledge of product demand.

Finally, the bullwhip effect results from rational decision making by members in the supply chain. Companies can effectively counteract the effect by thoroughly understanding its underlying causes. Industry leaders are implementing innovative strategies that pose new challenges: integrating new information systems, defining new
organisational relationships, and implementing new incentive and measurement systems. The choice for companies is clear: either let the bullwhip effect paralyze you or find a way to conquer it.

2.3.3 The Trend Towards Outsourcing
Within supply chain management, several trends have converged, including new business practices and new technologies. Probably the most important trend is the move from vertically integrated enterprises to outsourcing. Companies now focus on their core competencies—what they do best—and leverage suppliers with unique competencies to help differentiate their products and lower costs. As business practices have evolved, so have materials management methodologies. The just-in-time (JIT) materials management method has been credited with eliminating excess inventory, and has evolved into a collaborative supply chain management. The shortcoming of JIT was that, in many cases, inventory was merely being pushed out to the supplier. Today, collaborative supply chain management implies complete visibility of inventory throughout the supply chain—and recognition that no matter where it is or who owns it, there is an associated cost.

A crucial decision for companies is whether to outsource parts of components of the product (Prahalad and Hamel, 1990). In deciding whether an activity should be outsourced, the company should assess whether the activity is essential to perform in-house in order to sustain its competitive advantage. The danger is that the company outsources its key expertise, only to find later that its erstwhile supplier squeezes it out of the market (Anumba et al. 2000). In the meantime, with the constantly changing competitive environment and increasingly complex management in a more dynamic business setting, it is also dangerous for a single company to maintain full capacities to take every market opportunity. Thus many companies are focusing on their core business activities where they are able to expand a competitive advantage and contracting out their non-core activities to capitalise on others’ expertise, resulting in a greater reliance on suppliers and alliance partners. Small companies look to outsourcing also because they do not have enough skills or internal resources.

The above trend to outsource activities creates evident problems for the control over the supply chain. For manufacturers, this can lead to less contact with final customers. Further, this may contribute to the power shift in the supply chain. To defend themselves, manufacturers have to keep critical production/skills in house and well guarded. Building
on their core manufacturing capabilities, manufacturers are also moving downstream in the supply chain to exploit many downstream opportunities (Wise and Baumgartner, 1999). Further, manufacturers can achieve control over the supply chain by specifying the overall product architecture and mastering the flow of information, rather than through ownership (Van Hoek, 1998). In the meantime, with the development of e-commerce, manufacturers may look to more assembly, packaging and labeling postponement by building-to-stock basic common components and performing final configuration at the latest possible time. Given that the time lag between when an order is placed via the Internet and filled is sufficient. This move obviously enables manufacturers to bypass distributors/retailers and directly contact customers. According to Wise and Baumgartner (1999), it may be the only option for manufacturers to bypass distributors via the Internet (or some other new channel) in the supply chain, controlled by big and consolidated distributors. However, no matter who is a dominant player in the current supply chain, possibly another trend that cannot be ignored is that “both manufacturers and retailers have lost power to the consumer” (Anderson and Day 1997).

The decision to outsource business processes and to create a supply chain outside of the organisation is clearly one that requires an assessment of where the boundary of the organisation should reside. As such, an economic assessment is required of the various merits of integration versus market provision. Thus, the decision is based on a transaction costs approach where there is an “examination of the comparative costs of planning, adapting and monitoring task completion under alternative governance structures” (Williamson, 1981:552-3). While this has long been recognised within the supply chain management literature, it is worth restating this truism if only to highlight that this is a cognitive decision-making process that requires technical and human assessment of the business context. Since the outsourcing decision is focused primarily on the management of recurrent transactions, the key dimensions of this context are the uncertainty and asset specificity with regards to the transaction. Since these dimensions will vary, this creates a variety of contexts and the result will be diversity within governance structures.

Where the nature of uncertainty within the transaction is variable in terms of human behaviour, this can be reduced through the introduction of formal or informal contracts (Ellram and Billington, 2001). While the formal contracts are more closely associated
with standard market-based supplier-customer relations, informal contracts are the result of longer-term relations built on mutual trust and experience. They therefore have the ability to reduce transaction costs by reducing transaction risks and uncertainty (Ellram and Billington, 2001).

Asset specificity, the other dimension of the transaction cost approach, can be regarded as to be equally important for a collaborative supply chain management structure. Where specificity is high, it is more likely that the most economic governance structure will be internal, and three dimensions of asset specificity must be considered: geographical, physical and human (Williamson, 1981). It seems intuitive that, where the physical distance between organisations is closer, the relations required for supply chain management will be simplified. In terms of physical asset specificity, issues of intellectual property rights and the strategic importance of the components to the buyer will obviously impact on the transaction approach taken. Moreover, in terms of human assets, the ease of measuring performance and specialised technical and management skills are key to deciding the appropriate governance structure. However, the question is: how are these dimensions of specificity evaluated if the benefits consist of reduced transaction costs through higher levels of trust, skills, collaboration and communication? These are intangibles and, indeed, some of these benefits may only become apparent over time (Boddy et al, 2000). A proper evaluation might only be viable after the relationship has been active for a considerable period and will require evaluation systems that follow a multi-constituency and multi-dimensional approach.

When specificity and uncertainty is high, a more relational and long-term contract inside the firm will be the most likely governance structure (Williamson, 1981). However, given the possible complexity of contexts that are created through the different dimensions of the transaction, asset specificity and uncertainty may be such that it will still be desirable to support a governance structure external to the firm, but one that requires a relational and longer-term contract.

2.3.4 The role of postponement in supply chain management
Nowadays, the battle for competitiveness is increasingly fought between supply chains, not companies (Christopher, 1992). With the increasingly sophisticated customer demand (e.g. product variety and customisation), supply chains have to be responsive to
constantly changing markets. As forecasting and planning becomes very complex, producing and storing all types of finished goods based on forecast will run a high risk of stock-out and obsolescence, while lead times often make make-to-order impossible. Therefore, postponement has been increasingly used as an important supply chain strategy (Feitzinger and Lee, 1997). As a marketing, logistics and manufacturing concept, postponement has been found in the literature for a long time (Alderson, 1950). However, only in recent times has it been used as a supply chain concept. Postponement centers on delaying activities in the supply chain until real information about the markets is available. The viability of postponement is determined by the structure of the supply chain characteristics (Battezzati and Magnani, 2000). On the other hand, postponement affects the supply chain. The implementation of postponement often leads to the reconfiguration of the supply chain. Postponement application has also resulted in a blurring of warehousing, assembly and retail operations, and the warehouse is often the place where final assembly, labeling and packaging is processed. By employing postponement and combining it with a holistic view, some companies have managed to improve the performance of the supply chain (Pagh and Cooper, 1998).

Currently, postponement applications are still at an infancy stage (Brown et al, 2000). However, postponement fosters a new way of thinking about product design, process design and supply chain management. For example, it encourages companies to decide which components will be modular, standard and customisable, which parties are best suited to each task, where and when inventories are justified, and what activities are based on forecast (or order).

Postponement was visionary when it was originally introduced to reduce the risk and uncertainty costs tied to the differentiation (form, place and time) of goods in the marketing literature (Alderson, 1950). Bucklin (1965) extends it to the speculation-postponement strategy applied to the distribution channel, mainly questioning where, when and who to hold inventory in order to reduce cost and risk. He states that postponement needs to be combined with speculation since long lead times in production and distribution have made it difficult to rely on postponement. Speculation holds that changes in form and the movement of goods should be made at the earliest time. Speculation basically facilitates capturing of scale economies, but it may lead to substantial inventories. Shapiro (1984) further studies this strategy in the context of
where in the logistics pipeline inventory is to be carried. Building on the different degrees of postponement and speculation integrated to different breadth of product lines, four generic mode of operation are proposed: full service, full line/long lead time, narrow line/short lead time and low cost.

The supply chain can also be constructed by a different combination of postponement and speculation, which is often designed and managed autonomously (Pagh and Cooper, 1998). The concept of speculation relies on forecasts of coming demand and therefore, might be seen as a push-approach, while postponement enables the customer's needs or requirements to affect product design and production processes and thus, might be described as a pull-approach (Shapiro, 1984). Traditionally, speculation has dominated the supply chain. With more changeable market demand and the development of technology (e.g. new production and information technology), postponement is increasingly appealing and available. It can thus be expected that postponement will play an increasing role in the supply chain. Pagh and Cooper (1998) focus on the downstream portion of the supply chain (from factory level to end customer) and propose four generic supply chain speculation-postponement strategies through different combinations of manufacturing/logistics and postponement/speculation. In another related paper, Ernst and Kamrad (2000) introduce a conceptual framework to evaluate different supply chain structures (rigid, modularised, postponed and flexible) based on the different degrees of modularisation and postponement. They simplify the supply chain into three steps: manufacturing, assembling and packaging and associate manufacturing with modularisation and packaging with postponement.

Companies to restructure the business processes, which underlie their supply chains, to cope better with uncertainty, also use postponement. In an environment of extreme demand uncertainty for example, a manufacturer may derive significant economic benefit from using faster manufacturing/distribution processes and/or locating production geographically closer to customers, to postpone production in time. The logic behind postponement is that additional information can be collected to reduce uncertainty during the delay. There may be little value in applying postponement in easily predictable environments. The important issue is what the relationship is between postponement and different uncertainties. For postponement to work, uncertainties in the supply chain have to be reduced as much as possible. The reduction in control uncertainties has received
much attention towards the implementation of postponement. For example, postponement calls for reducing the uncertainty induced by the bullwhip effect (Lee et al., 1997) through advanced information technology and more willingness to share information and jointly make some decisions between players in the supply chain. In today’s competitive environment, product life cycles are increasingly shortening and product proliferation continues to expand. Technological developments are also continuing at an ever-increasing pace. All these factors contribute to the extending applications of postponement.

It should be noted that for postponement to work, companies have to balance it against certain important factors. For example, postponement may result in costs to modify the sequence of a production process, the patterns of material flow through the supply chain or the product’s design. In addition, postponement can change the location of the decoupling point (DP) directly (e.g. final configuration of products by customers) or indirectly (e.g. resequence activities) and thus should consider the effect of its upstream and downstream shifting. Even though postponement will cause those costs to increase, the supply chain advantage can be considerable.

2.4 Culture and change management perspectives on supply chain management.
Brown (1998:9) defines organisational culture as: “the pattern of beliefs, values and learned ways of coping with experience that have developed during the course of an organisation’s history, and which tend to be manifested in its material arrangements.” This definition of culture clearly stresses the cumulative effects of history and experience, which have important practical outcomes, that are manifested in employee behaviour. This is important for supply chain management, since the accumulated history of relationships and experience, within and between organisations, will provide part of the context within which the inter-organisational activities are enacted. If there is a drive to closer relations within supply chains, this will involve the replacement of existing governance structures and will challenge existing supply chain behaviours associated with traditional bid-buy relations. This will also require a change to the behaviours both of the employees within the organisation, and of the supply chain partners; effectively there will need to be a change in the culture not just in one organisation, but, potentially, in all organisations within a supply chain network.
The first element of culture is the shared nature of job or role expectations. Based on a history of interactions with others working at an organisation, employees develop a shared understanding of what is expected of them. Over time, supply chain members also develop a common awareness about what is expected of them and what they can anticipate in return. In this sense, there are two aspects of shared expectations: (1) the internal culture that characterises employee expectations and (2) the external culture that designates channel member’s expectations. The second element of culture is the stability of the organisation’s norms and values. Based on repeated, consistent experiences, employees develop behavioural norms. Externally, these norms represent predictable patterns that allow a person to anticipate the behaviours and relationship requirements of channel members.

It is important to note that, because an organisation has culture, it is something that can be manipulated. The corollary of this position is that it is possible to change culture to ensure employees display the desired behaviours (Thornhill, et al. 2000). However, changing culture is not an easy task. Indeed, significant tracts of the culture change literature focus on the reasons that culture change programs fail. For example Scarborough (1998) highlights the fact that aligning the existing internal HR practices with supply chain practices will be limited by the existing structures and contexts which reduce the options available to socialise new behaviours and competences required to support supply chain management.

If culture change is difficult within an organisation, it is evident that the difficulties will increase exponentially if the change programme is taken outside of the organisation, and different role behaviours are encouraged and expected within the customer-supplier relationship. Thus, any change programme will be faced with a number of barriers to change that are not evident from a strategic organisational analysis, or transaction cost approach. From a supply chain management perspective then, the desire to change governance structures will be difficult and will be compounded both by bounded rationality and by complexity of existing cultural forces.

With regard to the actual process of change, there appear to be two major competing perspectives on how to implement a change programme. Either “top led” and “top down” culture change that relies on the internalisation of the values by the workforce that the
management considers important for competitive success (Kotter, 1995), or a more incremental "bottom up" approach to culture change by challenging existing behaviours through changing work practices (Beer et al., 1990). Whatever the perspective taken, the implications of culture change theories for moves towards supply chain management are clear. Not only will this be a management-led initiative within the organisation, but also it will be a customer-led initiative within the supply chain. Accordingly, all of the difficulties of achieving real behavioural and cultural change will be compounded by the need also to achieve change within the suppliers' organisations. The implementation of supply chain management requires a shared vision and supportive behaviours between organisations, or, at best, it will be only a relationship of power and compliance. Thus, an understanding of customer change mechanisms and values will be key to understanding the framework of supply chain management.

Although there may be a need for change, the push for change will almost entirely be from "the top". This factor means that change may not be welcome and may create varying degrees of dissonance both within and between organisations (Burnes and James, 1995). Indeed, considering that traditional inter-organisational relations are based on equalities of power, and that supply chains are easier to manage if the supplier is dependent (Cox, 2000), then it is likely that any "top led" change will be perceived as only supporting the agenda of the customer. Moreover, since culture is continually evolving, perceptions of changes that affect inter-organisational relations will be predicated on the existing cultural framework, developed through shared experiences (Hendry and Hope, 1994). These factors suggest that, not only will existing structures and cultures within the organisation act as barriers to socialising new competences, but existing relations, structures and cultures between organisations may be significant factors to overcome. Thus, real change, if it is possible at all, will happen slowly and a significant cultural shift within the supplier organisation will require a significant and concerted effort from the customer, which presupposes that the customer is willing and able to make this effort.

A myriad of potential relationship combinations exist among supply chain members that can be analysed in terms of how they partner or develop collaborative linkages with one another (Akacum and Dale, 1995). These relationships can range from arms-length to extremely close business-to-business relationships called partnership (Cooper et al.,
1997). An analogy, describes interfirm relationships as being either a bowtie or a diamond configuration. A bowtie consists of two triangles that meet at their points and represents a traditional situation where interaction between two firms is limited to the buyer of one firm and the seller from another. The focus is very much upon completing transactions. It is a fragile connection, easily broken by a competitor who needs only to offer a better price to take the business away. A diamond relationship exists when the triangles are rotated, bringing the two long sides into alignment. This connotes a situation where multiple parties from both firms interact, including engineers, management information professionals, contract administrators, logistical managers, and quality control experts. This is a more enduring relationship, where both parties are working together for the achievement of mutually agreed goals. It is now quite common to suggest that the transition required to achieve supply chain integration is akin to moving from the “bowtie” configuration to the “diamond” configuration (Figure 2).

FIGURE 2a
CONVENTIONAL BUYER-SUPPLIER RELATIONSHIP
The literature suggests that the nature of the type of relationship between a firm and its suppliers and distributors needs to be determined by a number of variables. Three variables that define a relationship include management time constraints, management experience, and market characteristics (Cooper et al., 1997). Additional factors must also be considered, including transaction cost drivers of specific assets, uncertainty and frequency, market and business share, geographic coverage, special skills required, and customer history (Gardner, Cooper, and Noordewier, 1994). Four variables were found to be important in determining the nature of supply chain relationships. These variables include volume of business, the extent to which products are specialised and require information and training for effective use, the degree to which services require a better understanding of the process in order to reduce costs. And whether previous suppliers met a firm's requirements (Akacum and Dale 1995).

Business relationships can be described along a continuum. At one extreme, two businesses interact in a transactional fashion. This means that each encounter is approached from a perspective that evaluates short-term outcomes. At the other extreme
are long-term relationships that include partnering, strategic planning, vertical marketing systems, and a willingness to overlook short-term views (Bowersox and Cooper, 1992).

Developing long-term relationships appears to benefit firms. One advantage is that relationships reduce FUD (fear, uncertainty, and doubt) among channel members (McKenna, 1987). Further, the benefits of a relationship-based approach are enhanced when a firm uses a certified and/or single source supplier (Larson and Kulchitsky, 1998). In a relationship-based approach to supply chain management, firms treat channel members as partners. To solidify the relationship, firms demonstrate commitment over an extended period of time (Brown, Lusch and Nicholson, 1995). One advantage of a relationship approach is that many advantages of vertical integration are accrued without the risk of ownership (Ellram and Hendrik, 1995). For example, a supplier may visit the manufacturer’s plant and key personnel, attend association conventions and trade shows with the manufacturer, and work with the manufacturer to anticipate changes in customer needs (Narus and Anderson, 1987). These activities help solidify the relationship through increased and improved communication (Joseph et al., 1995) and through the formation of shared norms (Heide and John, 1992). Familiarity between trade partners—enhanced by organisational memory and shared norms—results in a specialised language developing between channel partners which, in turn, leads to more effective communication (Williamson, 1979). This improved communication results in stronger relationships.

The short-term transactional end of the continuum can be described in terms of at least five dimensions (Noordewier, John, and Nevin 1990). Buyers expect the terms of an exchange with suppliers to be specific and binding (low supplier flexibility), each supply chain member has clear benefits and burdens (low supplier assistance), little information is exchanged between parties (low information provided), one member of a supply chain has little control over another member (low monitoring) and, transactions are of a short duration with little expectation of repeat business (low expectation of continuity). Using sales terminology, each party finds a win-lose outcome acceptable, as long as they are the winner. In a transaction-based approach, rather than trying to enlarge the “pie”, each party attempts to obtain the largest piece. An example of an exchange with no past history and little future is a manufacturer that always purchases from the lowest bidder.
In this case, dealing with the same supplier for 15 years does not mean that a relationship exists; it means that the selling firm has consistently bid the lowest price.
CHAPTER THREE: Research Design and Empirical Study

3.1 Theoretical framework and construct development

In considering a framework of concepts and theories for supply chain management, it is clear from the preceding discussion that the decision to pursue a closer collaboration can be rationalised using transaction cost economics, and the concepts of asset specificity, uncertainty and informal contracts provide a route to explore the subsequent relationship. Additionally, from a perspective of strategy theory, the closer collaborative relationships can be argued to support a resource-based perspective of sustainable competitive advantage, which highlights issues of flexibility and relational competences. However, the move towards supply chain management will ultimately involve a change in inter-organisation relations that will challenge the existing cultures within and between the organisations. This will require an exploration of barriers to culture change and the mechanisms used by the customer to encourage changed behaviours. While benefits may accrue from the implementation of collaborative supply chain management, this will require both an effective and comprehensive change programme, and the competences to support the change. Therefore, research into the implications of supply chain management supports an analysis of the directions and mechanisms of change implemented by supply chain originators. Consequently, analysis is also needed of the effect that this has on the activities expected of the suppliers, and the competences that will be essential to support closer supply chain relationships.

Even though suppliers are critical for buyers' success, suppliers have historically been viewed merely as the entities that represent costs to the buyer. In order to keep the purchasing cost low, buyers often pressured their suppliers to lower their prices and threatened to switch to new suppliers if they did not comply with their requests. Consequently, the trust between the buyer and supplier has been weak and the relationship has been adversarial. Management experts reinforced this behaviour. For example, Porter (1980) suggests that in order to maintain bargaining power, the buyer should source from many suppliers; commit short term contracts with the suppliers; share no information with suppliers regarding sales, cost, product design; and make (or receive) no improvement suggestions to (or from) suppliers. Some of the above strategies were common practice in the early 1980's. However, the supplier relationship changed dramatically from adversarial to cooperative since then. Prior to this time,
many companies did not realise that they were not competitive in cost, quality, delivery, and new product development. It was only later that the strategic value of suppliers were realised, and manufacturers finally developed ways to utilise their suppliers for cost reduction, quality and delivery improvements, and new product development cycle time reduction.

The rest of this chapter will be dedicated to the development of clearly defined constructs based on the above literature research. These constructs will then be incorporated into the management questionnaire and will also form the basis for the development of a supply chain management strategy for the South African non-ferrous foundry industry. The South African non-ferrous foundries can then measure themselves against these constructs that will form part of this reliable conceptual base. While the contributions from various works exist in isolation, they, when taken together, have many of the critical elements necessary for successful management of supply chains. The conceptual framework and the instrument developed herein can help management better understand the scope of both the problems and the opportunities associated with supply chain management.

Based on the above extensive review of literature, the framework incorporates some key aspects of the buyer-supplier relationship including supply base reduction, long-term relationships, communication, cross-functional teams, and supplier involvement. As environmental uncertainty appears to be a fundamental problem for both simple and complex organisations, it is included as a critical antecedent to supply chain management. Strategy and structure have also been postulated as key forces to the success of any manufacturing initiative and crucial to the successful management of supply chains. Recognising this need, the framework includes constructs such as competitive priorities, top management support, and strategic purchasing to examine their effect on the effective management of the supply chain.

As mentioned by many of the authors, supply chain management is an integrative function. Integration could occur, among others, in terms of material and information and encompasses all three links in figure 1. In the proposed framework, a single construct of logistics integration is included to study the integration of information and materials along the supply chain. As information could replace inventory and foster superior performance, an information technology construct has also been included to
study the extent of information integration. Furthermore, since it is a well-known fact that satisfying customer needs is the central purpose of any business, this framework reflects the notion that customer focus, in terms of satisfying needs and providing timely service, is a key driving force of effective supply chain management.

Supply chain management seeks improved performance through better use of internal and external capabilities in order to create a seamlessly coordinated supply chain, thus elevating inter-company competition to inter-supply chain competition. Therefore, in the context of supply chain management, a single firm no longer affects performance. Rather, performance of all members involved contributes to the overall performance of the entire supply chain. Therefore, this framework also includes both supplier performance and buyer performance. In particular, both operational and financial indicators are considered.

3.2 Environmental uncertainty

Davis (1993) suggests that there are three different sources of uncertainty that plague supply chains: supplier uncertainty, arising from on-time performance, average lateness, and degree of inconsistency; manufacturing uncertainty, arising from process performance, machine breakdown, supply chain performance etc; and customer or demand uncertainty, arising from forecasting errors, irregular orders, etc. Increased competition in the market place and the increased pace of technological innovation are two primary factors driving companies, needs for world-class suppliers and for supplier development (Hahn et al., 1990). Supply uncertainty includes indicators that represent quality, timeliness and the inspection requirements of the suppliers. Demand uncertainty is measured in terms of fluctuations and variations in demand. Technology uncertainty measures the extent of technological changes evident within the industry.

3.3 Customer Focus

The pressure to revitalise manufacturing over the last decade has been rooted in customer’s demand for a greater variety of reliable products with short lead times. As customer expectations are dynamic in nature, organisations need to assess them regularly and adjust their operations accordingly. Satisfying customer needs is the central purpose of any business. The clear message is that the more attention a company pays to researching its customer base in order to identify customer needs, the more rewarding the exchange transaction in the supply chain will be for that company. One
approach to getting the voice of the customer into the design specification of a product is quality function deployment. This approach uses interfunctional teams from marketing, design engineering, and manufacturing to study and listen to customers to determine the characteristics of a superior product.

3.4 Top Management Support
The important role of top management has been greatly emphasised in the supply chain literature. Top-level managers have a better understanding of the needs of supply chain management because they are the most aware of the firm's strategic imperatives to remain competitive in the market place. Top management must commit the time, personnel and financial resources to support the suppliers who are willing to be a long-term partner of the company through supplier development. One of the major functions of top management executives is to influence the setting of organisational values and develop suitable management styles to improve the firm's performance. Top management support is characterised by in terms of time and resources contributed by the top management to strategic purchasing, supplier relationship development and adoption of advanced information technology.

3.5 Supply Strategy
Supply strategy is inherently broader than manufacturing strategy, because it incorporates interactions among various supply chain members. The position of a company with respect to others reflects its capacity to provide values to others (productiveness, innovativeness, competence). The term competitive priorities is used to describe manufacturers' choice of manufacturing tasks or key competitive capabilities, which are broadly expressed in terms of low cost, flexibility, quality, and delivery. The list has also grown with the additions of innovativeness, time, delivery speed, and delivery reliability. Supply chain strategy should not be based on cost alone, but rather on the issues of quality, flexibility, innovation, speed, time, and dependability. Historically, purchasing was considered to have a passive role in the business organisation. The ability of purchasing to influence strategic planning has increased in a number of firms due to the rapidly changing competitive environment, and evidence reveals that purchasing is increasingly seen as a strategic weapon to establish cooperative supplier relationships to enhance a firm's competitive stance. Thus, contemporary purchasing is now best recognised as a fundamental unit of supply chain
management. Strategic purchasing is conceptualised by its proactive as well as long-term focus, its contributions to the firm's success, and strategically managed supplier relationships.

3.6 Information Technology
More than ever before, today’s information technology is permeating the supply chain at every point, transforming the way exchange-related activities are performed and the nature of the linkages between them. A more recent perspective on linkages within the supply chain considers the role of inter-organisational systems, which are sophisticated information systems connecting separate organisations. The strength of inter-organisational systems has been particularly crucial with respect to enabling the process transformation needed to create effective networks. Information technology also enhances supply chain efficiency by providing real-time information regarding product availability, inventory level, shipment status, and production requirements. It has a vast potential to facilitate collaborative planning among supply chain partners by sharing information on demand forecasts and production schedules that dictate supply chain activities. In particular, the goal of these systems is to replace inventory with perfect information.

3.7 Supply Network Structure
Traditionally, structure has been studied within a single firm or organisation. In the context of SCM, the structure refers to a group of firms: a firm plus its suppliers and customers. Therefore, the topics of interest are the task, authority, and coordination mechanisms across distinct firms or organisational units that enhance supply chain performance. There are two extremes of governance forms: perfectly competitive markets and vertically integrated hierarchies. An intermediate form of governance is the network. A network structure is a difficult concept to define precisely, although the idea is relatively easy to grasp intuitively. Network firms are characterised by strong linkages between supply chain members with low levels of vertical integration. In addition, the lack of influence or power, personified in terms of interdependence, is also seen as a key determinant of effective supply network structure. There is a definite need to move away from what might be termed power-based relationships in which there is some hierarchical dependence, towards more of a network model in which there is a sense of mutual development within a partnership. The optimal supply network structure
therefore emphasises non-power based relationships and inter-firm coordination as well as the informal social systems that are linked through a network relations.

3.8 Managing buyer-supplier relationships

3.8.1 Supplier base reduction

When dealing with multiple suppliers, it is often costly to coordinate the procurement process and to monitor the quality consistency of different suppliers. Recently, a significant shift has occurred from the traditional adversarial buyer-seller relationships to the use of a limited number of qualified suppliers. Many firms are reducing the number of primary suppliers and allocating a majority of the purchased material to a single source. This action provides multiple benefits including:

- Fewer suppliers to contact in case of orders given on short notice,
- Reducing inventory management costs,
- Volume consolidation and quantity discounts
- Increased economies of scale based on order volume and the learning curve effect,
- Reduced lead times due to dedicated capacity and work-in-process inventory from the suppliers,
- Reduced logistical costs,
- Coordinated replenishment,
- An improved buyer-supplier product design relationship,
- Improved trust due to communication,
- Improved performance, and
- Better customer service and market penetration.

Supply base reduction includes indicators measuring the domain of reduced numbers of suppliers, contractual agreements and supplier retention policy utilised by the buying firm.

3.8.2 Long-term relationships

Supplier contracts have increasingly become long-term, and more and more suppliers must provide customers with information regarding their processes, quality performance, and even cost structure. Through close relationships, supply chain partners
are more willing to share risks and rewards and maintain the relationship over a longer period of time. Companies can also gain benefits by placing a larger volume of business with fewer suppliers using long-term contracts. A long-term perspective between the buyer and supplier increases the intensity of buyer-supplier coordination. Strategically managed long-term relationships with key suppliers will have a positive impact on a firm's supplier performance. Moreover, through a long-term relationship, the supplier will become part of a well-managed chain and will have a lasting effect on the competitiveness of the entire supply chain.

3.8.3 Communication
The necessity of two-way inter-organisational communication for supplier relationships to be successful has been demonstrated earlier. Effective inter-organisational communication can be characterised as frequent, genuine, and involving personal contacts between buying and selling personnel. In order to jointly find solutions to material problems and design issues, buyers and suppliers must commit a greater amount of information and be willing to share sensitive design information. When communication occurs among other functions between the buyer and supplier firms in addition to the purchasing-sales interface, the supplier's quality performance is superior to that experienced when only the buying firm's purchasing department and supplier's sales department act as the inter-firm information conduit. Many supplier product problems are due to poor communication.

Because tool design and manufacture almost invariably lies on the critical path of a development project, and hence affects the time to market, information concerning key project dates is of vital importance to component suppliers and tool manufacturers. It is also very important that the tool, product or item, when delivered is able to function almost immediately, without the need for time-consuming trimming and rework. Open communication improves understanding of the present situation, whilst poor communication results in misunderstanding and subsequently mistrust.

3.8.4 Cross-functional teams
Cross-functional teams have been identified as important contributors to the success of such efforts as supplier selection and product design. Expertise is required from various functions within and outside a firm in order to address the wide range of product and process related problems. These teams usually include representatives from
development, purchasing, product management and pre-production engineering. By letting the team have their own workspace improves informal communication between the functions involved. Delegating responsibility to deliver a particular product function instead of working to detailed specification increases the level of commitment of suppliers and also increases the quality of the result. Cross-functional teams dedicated for strategic purposes have been organised either around the material being purchased or according to the supplier's needs so team members can interact with their supplier counterparts.

3.8.5 Supplier involvement

Considerable importance is placed on the integration of suppliers in the new product development process. The involvement may range from giving minor design suggestions to being responsible for the complete development, design and engineering of a specific part or assembly. Instead of focusing on cost, buyers should begin to evaluate their suppliers on other dimensions such as quality, delivery, production process, R&D capabilities, and service. In order to compete for supply contracts, suppliers should start to provide information to their buyers regarding production process, internal cost, and quality control process. When a long-term relationship has been established with a few key suppliers, the buyer can benefit from sharing information with those suppliers. Also, the trust level between buyer and supplier is often higher when a long-term contract is established. As a result, there is incentive for the buyer and the supplier to exchange improvement ideas. First, the supplier can provide improvement ideas to the buyer that can help lower the system-wide cost. Second, the buyer can offer improvement ideas to the supplier.

3.9 Logistics Integration

Logistics provides industrial firms with time and space utilities. Logistics should be able to guarantee that the necessary quantity of goods is in the right place at the right time. The reduction of organisational slack, of which inventory is a typical example, requires an intensive and closely coordinated exchange of information between the supply chain partners. The current trend of using strategic partnerships and cooperative agreements among firm's forces the logistics integration to extend outside the boundaries of the individual firm. It reflects an extension of the manufacturing enterprise to encompass the entire supply chain, not just an individual company, as the competitive unit. Higher
levels of integration are characterised by increased logistics-related communication, greater coordination of the firm’s logistics activities with those of its suppliers and customers, and more blurred organisational distinctions between the logistics activities of the firm and those of its suppliers and customers. Collaboration and logistics integration need to be achieved across enterprise boundaries, linking external suppliers, carrier partners, and customers through seamless integration of the logistics function of the various supply chain partners.

3.10 Supply Chain Performance Measurement

To win in the new competitive environment, supply chains need continuous improvement. To achieve this firms need performance measure, or “metrics”, which support Supply Chain Performance improvements rather than narrow company-specific or function-specific (silo) metrics, which inhibit chain-wide improvements. The following is a number of supply chain performance measures that are expressly designed to support and monitor Supply Chain Performance improvements across the supply chain.

Supply Chains need to perform on three key dimensions:

- Service
- Assets
- Speed

Service relates to the ability to anticipate, capture and fulfill customer demand with personalized products and on-time delivery; Assets involve anything with commercial value, primarily inventory and cash; and Speed includes metrics which are time-related – they track responsiveness and velocity of execution. Every supply chain should have at least one performance measure on each of these three critical dimensions. Note that Quality is absent here; in modern Supply Chain Management thinking, Quality is taken as a given. The diagnosis and improvement of Quality involves factors, which are quite separate from factors used to improve Supply Chain Management.
3.10.1 Supplier Performance
Suppliers play a more direct role in an organisation's quality performance than is often recognised. Poor quality of incoming parts or consumables adds significantly to buyer's cost in terms of inspection, rework and returns, purchasing, and overproduction. Therefore, quality orientated organisations maintain a few reliable, competent, and cooperative suppliers on a long-term basis. The supplier quality management strategies, however, must result in good supplier performance in terms of reliability, competence, and cooperation. This performance, in turn, affects the final product quality. Thus, supplier quality, flexibility, delivery, and cost performance are intermediate outcomes of the implementation of an appropriate supply chain strategy.

3.10.2 Buyer Performance
Financial performance measures are more likely to reflect the assessment of a firm by factors outside of the firm's boundaries. These measures would include conventional indicators of business performance such as market share, return on investment, present value of the firm, firm's net income, and after-sales profit. Operational performance measures, on the other hand, provide a relatively direct indication of the effects of the relationship between the various supply chain constructs. The key dimensions of time-based performance include delivery speed, new product development time, delivery reliability/dependability, new product introduction and manufacturing lead-time. In addition, customer responsiveness has also been recognised as a key aspect of time-based performance. Keeping the various limitations in mind, the buyer performance can be measured using indicators of operational performance in addition to financial indicators such as return on investment, profit, present value, and net income.

3.11 Empirical Study
During the literature study the existing research and accompanying findings was reviewed to identify relevant world-class practices comprising the supplier management, customer relationship, and supply chain management strategies. Supplier management initiatives and relationships formed the core of many supply chain management strategies found in the literature. These initiatives focused on the relationship between the buyer and the supplier firms. Although the theoretical constructs identified in the study were mainly related to the buying firm, they reflect the strategic initiatives taken by these firms and the nature of the relationship they maintain with their suppliers.
These world-class practices were then incorporated into the questionnaire used in this study. Additionally, feedback was received from senior managers in the industry through interviews to gather information on the practical problems experienced and the main issues facing the South African foundry industry today regarding the implementation and use of supply chain management strategies. This was done to determine to what extent supply chain management practices are used in the industry and how effective they are. These interviews were also used to examine the relevance of the issues that had emerged during the literature review regarding the nature and direction of supply chain management practices and relations. Thus, the practices used in each of the research constructs were based on the literature research and the management feedback received during the interviews.

The focus of the research undertaken was on major non-ferrous foundries and relevant supplier firms across South Africa who were willing to participate in this landmark survey. The aim of the research included uncovering the perceptions of those involved in the supply chain processes in the foundry industry in order to make an informed decision about the usage and view of supply chain management practices. It was therefore, considered that a qualitative approach would not only be more appropriate, but would also provide a richer source of data, and would provide a conceptual framework of the expectations of those involved in the process of supply chain management.

The purpose of the research study is to find a general perception on supply chain management practices in the South African non-ferrous foundry industry. This will include an analysis of the companies’ views on aspects that are significant to the level of integration between collaboration partners. In addition, the study will also analyse how the companies look at the number of processes included in supply chain management as identified in the preceding literature study.
3.12 Data Collection

To examine the relationship described above, a survey was designed and distributed to senior managers and foundry personnel from non-ferrous foundries and supplier companies throughout South Africa. These survey participants were identified from the 2003 Directory of Southern African Foundries & Suppliers, which contains a comprehensive list of relevant information about the South African Foundry industry. This information includes foundry and supplier company details, production figures and areas of activity. This directory is published by Castings SA, the official magazine of the South African Institute of Foundrymen and can be obtained by contacting the publishing editor at online@engnews.co.za. These participants were asked to complete the survey irrespective of whether they practiced some form of supply chain management. The questionnaire starts with an introduction into the importance of supply chain management in today’s world economy and how new principles of production has evolved in today’s global knowledge economy. The introduction also explains the purpose of the questionnaire and that the survey has also been designed to allow the participant an opportunity to express their opinions concerning the use of supply chain management concepts in their own companies. The following definition was used in the survey:

“Supply chain management is the integration of key business processes from end user to original suppliers to provide products, services, and information that add value for customers.”

A five point Likert scale with end points of “strongly disagree” and “strongly agree” was used to measure the items. The buyer and supplier performance were measured using a five point Likert scale with end points of “decreased significantly” and “increased significantly”.

The questionnaire, together with the covering letter was sent to the e-mail addresses of all the companies identified from the directory. For time and economy reasons, the data collection was done by an “e-mail-out & e-mail-return” method. To achieve a satisfying sample size, the questionnaire was distributed to a fairly high number of firms. A total of 119 questionnaires were sent out through this method to the managing directors of each company. The request was also made in the covering letter for each managing
director to forward the questionnaire to any of his personnel who would be able to provide a meaningful contribution towards the survey. This would include employees such as the foundry manager, logistics manager or chief buyer. During a technical meeting of the South African Institute of Foundrymen held on the 14th September 2004, a total of 27 questionnaires were handed out to interested persons who attended the meeting. Johan Delport from Eskom convened the meeting to discuss Demand Side Management in the South African Foundry Industry.

Therefore a total of 146 questionnaires were distributed for the purpose of the survey. Of these 146 questionnaires, 14 were returned with error messages from the e-mail server. From the resulting sample size of 132, a total of 35 were received, resulting in a response rate of 26.5%. A total of 6 were discarded due to incomplete information, resulting in an effective response rate of 22.0%. There are several possible reasons for the relatively low response rate. First, the respondents were not informed about the survey prior to receiving the questionnaire. Second, respondents who did not return the questionnaire was not contacted, and third, respondents can be subordinated to IT-policies that prohibit them to open any documents from unknown senders. Fourth, many respondents were possibly not familiar with this method of survey. Fifth, respondents did not in general see the direct benefits for them in answering this questionnaire.

The final sample included only non-ferrous foundries while the supplying firms serviced both the ferrous and non-ferrous foundry industry. The foundries in the final sample consisted of both jobbing and production operations and also in some case a combination of both types. There were 18 jobbing foundries (51.2%), 11 production foundries (31.7%) and 6 jobbing and production foundries (17.1%). The average number of foundry related employees in these foundries were 23, with the actual numbers ranging from as little as 4 up to 250 in some cases. The average monthly tonnage of castings produced was 69 tons, with the actual tonnages ranging from 2 tons per month up to 2000 tons per month for the alloy wheel manufacturers.

Senior foundry managers from six well-known foundries in the Ekhuruleni Metropolitan area were interviewed in order to gain further practical insight into the challenges facing the South African foundry industry today. The results from these interviews were then
linked with the theoretical constructs developed from the literature survey during the development of the questionnaire.
CHAPTER FOUR: Analysis and Discussion of Results

4.1 Introduction

This study intends to identify and validate key constructs underlying the supply chain management process in order to develop a supply chain strategy for the non-ferrous foundry industry. The constructs were identified based on a thorough review of literature across diverse disciplines. The results of the survey instrument that was developed from this literature study in chapter three is a set of values that represent the viewpoint of a sample of industry members on the relevance and usefulness of the supply chain management constructs that will form part of the supply chain management strategy.

There are a few shortcomings or limitations that have to be born in mind before a thorough discussion of the results can commence. Though one or two indicators were removed or left out from the original constructs due to insufficient theoretical information, the underlying theoretical domain of these constructs was not significantly affected. These elements will have to be researched and refined further before being included in any further studies. The construct of top management support was characterised in terms of time and resources contributed by the top management to support strategic purchasing, supplier relationship development and the adoption of advanced information technology. Because the last element was deleted from the final construct, the construct at its present state cannot be used to study the impact of top management support on the adoption of advanced information systems. Nevertheless, this construct still represents the key theoretical domain in top management’s support for strategic purchasing and supplier development practices. Strategic purchasing includes indicators that denote the purchasing function’s proactive and long-term focus, its contributions to the firm’s success, and strategically managed supplier relationship. Two indicators relating to the long-term focus of the purchasing function were deleted from the final instrument. Therefore, the final construct did not include the aspect of long-term focus. Future studies should extend this construct by including appropriate measures on this aspect. The construct of supply base reduction was operationalised to include the domain of reduced numbers of suppliers as well as the contractual agreements and supplier retention policies utilised by the buying firm. The final
construct, however, included only the indicators representing a reduced number of suppliers. In summary, all the constructs were made up of four or more items, which were used to measure the dimensions of the supply chain constructs.

The supply chain encompasses every effort involved in producing and delivering a final product, from the supplier’s supplier to the customer’s customer. It is clear that the entire domain of this concept is very extensive and cannot be covered in just one study. Moreover, measurement instrument development is an ongoing process and the instrument can be strengthened only through a series of further refinement and test across different populations and settings. Future research should be directed not only to refining and strengthening the constructs identified in this study, but also to expanding the domain by considering additional factors. Relevant factors such as manufacturing uncertainty, competitive environment, trust and commitment, supplier selection, supplier certification, internal logistics integration, leanness, and agility should also be considered.

Having drawn from a list of foundry industry members supplied by the South African Foundryman’s Institute, the results of the research can be generalised to the population of the firms represented in the South African Foundry Industry. Though the final sample in this study spanned a wider range of firms based on demographics such as the number of employees and annual tonnages, future research endeavors should attempt to include a mixed population of respondents from both the non-ferrous and ferrous sectors to extend the generalisability of the results, since the sample firms were limited to non-ferrous foundries only.

4.2 Analysis of Results
The respondents were asked to express their opinions concerning the use of supply chain management in their own companies and also how they perceive the influence on the total supply chain. According to a Likert scale from 1 to 5, where 5 was the most positive value or “strongly agree”, the results were distributed as shown in table 2 below, followed by a graphical representation of the results in figure 4. This was done to give a birds eye view of where the problem areas might be. For the last three constructs, the values in the Likert scale were from 1 - “decreased significantly” to 5 - “increased significantly”. In general, if the result is found above the gridline marked “3”, it
indicates that the respondents generally agree with the statement and that the specific construct is determined to be relevant to the supply chain management strategy for the South African Foundry Industry. If however the result is found to be close to the value 3 on the graph, it shows that most or all of the respondents were undecided as to the relevance or influence of that specific construct on the supply chain management process. Finally, if the result was below the value 3 it indicates that the respondent did not agree that either the construct has any significance in the strategy or that some or all of the dimensions have not been implemented and used fully to improve the performance of the supply chain.

The respondents' attitudes towards the supply-, demand- and technology uncertainty constructs shows that a large proportion of them are undecided or agree on the dimensions in both the supply- and demand uncertainty constructs but for the technology construct, the result is more between undecided and disagree. This concentration is reflected in a relatively high average value of 3.54 and 3.37 for the supply - and demand uncertainty while for the technology uncertainty, the value is much lower at only 2.75. For the demand uncertainty construct, the respondents had fairly differing view as shown by the standard deviation of 1.3 while for the other two constructs the standard deviation was very close to 1.

For the construct customer focus, the respondents showed a strong inclination towards agreeing with the dimensions as shown by the high value of 3.62 attained. The standard deviation value of 1.2 shows that some of the respondents were undecided on customer focus and should be seen as a major source for concern in these companies.

The construct competitive priorities showed the highest value attained throughout the questionnaire. The value of 4.11 achieved with a standard deviation of only 0.67 indicates that most of the companies realise that price alone cannot be used as the only competitive advantage and that there are various other factors that must be taken into consideration when competing in the global market today.

In terms of the companies' attitudes towards strategic purchasing, the responses concentrate predominantly around the indifferent and agree values. It is worth noticing that, unlike the responses to competitive priorities, the average value is much closer to
the indifferent value (3.48). This could possibly indicate to less emphasis on purchasing as part of the overall strategic planning process. The deflection in the responses is also higher as shown by the standard deviation of 1.1.

With regard to top management support, the responses concentrates very close to agree although some respondents are still undecided on this issue. The results have an average value of 3.88 and a standard deviation of 1.0. This indicates that most companies realise the importance of top management support and that they should rank the purchasing function high in the overall company structure.

The construct for information technology scored the lowest in the survey with an average value of only 2.39. But with a standard deviation of more than 1.3, shows that the respondents are very much divided in their attitudes towards the importance or position of information technology in the supply chain management process. This low value could also indicate that either the respondents do not realise the functionality of information technology or that they have tried to implement an enterprise resource planning system but that it failed miserably in their expectations.

The attitudes towards the construct for supply network structure showed a response between indifferent and agree with a standard deviation of 1.0. This indicates that there are quite a few companies that do not see the supply network structure as an important element in the supply chain management strategy. This indecision indicates that these firms have never thought about the total supply chain and how their actions can influence the efficiency of this structure.

The next two constructs are related because reducing the supply base will hopefully result in forging long-term relationships with the few suppliers left over. The response for the long-term relationship construct showed a higher value (4.03) and a much lower standard deviation. This indicates that the respondents mostly agree that forging long-term relationships with suppliers is beneficial to managing the overall supply chain. The value for supply chain reduction is slightly lower at 3.37 with a standard deviation of 1.0. This indicates that most firms are undecided as to the benefits of reducing the supplier base. This could lead to a problem if long-term relationships are developed with many suppliers without being able to separate the good suppliers from the bad ones.
The companies' attitude towards communication with suppliers is very positive. The average value for this construct was found to be 3.50 with a standard deviation of only 0.74. This indicates that most of the companies agree that proper communication with suppliers forms an integral part in the efficient operation of the supply chain. It is also noteworthy that none of the respondents actually responded with strongly agree towards this construct, while some of the respondents strongly disagreed. This indicates that there is still a lot of room for improvement within this construct.

The use of cross-functional teams does not seem to be high on the priority of most of the companies that took part in the survey. The indifferent score for this construct, only 2.97, indicates that these companies have either not used cross-functional teams or do not realise the benefits that can be achieved from using such teams in problem solving. The standard deviation was low at 0.89. This is also reflected in the similar score for supplier involvement, only 2.80. For this construct the standard deviation was slightly higher at 1.2. The use of cross-functional teams will include the involvement of suppliers during problem solving sessions.

If we look at the attitudes towards logistics integration, the responses show that the majority of the respondents have indifferent attitudes towards logistics integration. There is no large imbalance in the distribution of the responses, resulting in the very close average value of 2.93 to the undecided value of 3. Similarly, the standard deviation is relatively low at 0.9, indicating some agreement among the respondents.

The respondents all indicated that they believe there was an improvement in the operational and financial performance of both the suppliers and buyers (customers). This indicates that the respondents believe that the supply chain process they are using so far has resulted in the improved performance of both the suppliers and the buyers. This is shown by the relatively high average score for all three the last constructs of 3.89, 3.73 and 3.96. It is also noticeable that all the respondents seem to agree on this because of the very low standard deviations of 0.71, 0.57 and 0.81. There is still room for improvement though because the score only shows that the respondents agree. There must be a few of them that either are undecided or do not agree as shown by the minimum values achieved.
4.3 Discussion of Results

There was a difference apparent in the level of efforts taken by the organisations to rationalise and integrate their supply chains. This was evident mainly through the extent to which organisations had embarked on formal strategic programmes to address issues of supply chain synergy and effectiveness. Some companies had fully implemented a strategic sourcing programme and completed a thorough review of all suppliers, while others were still in the early phases of similar initiatives. Nevertheless, despite differences in the scale and depth of efforts to integrate supply chains, due to competitive pressures within the wider economic context, there was also clear evidence that all companies were focusing significant levels of attention on their supply chains as a source of competitive advantage.

While in the past twenty years, organisations had looked internally for performance efficiencies, the volatility of market forces and the intensely competitive environment were forcing organisations to seek greater efficiencies and to leverage savings through all business processes, both within, and external to the organisation. The impact of this for supply chains was evident in the outsourcing of peripheral functions that did not provide sufficient added value through either economies of scale or scope. In addition, the outsourcing activity had been happening over a number of years, and there was considerable evidence that this had resulted in inefficient supply networks, with a proliferation of suppliers. Consequently, a significant amount of effort was being put into the rationalisation of the supply chain. This was mainly done on capital spend but more effort should be put into reducing the supplier base and screen suppliers more carefully. In addition, suppliers should be able to provide “total contract solutions” and to manage the lower tier suppliers on behalf of the customer. Where new product development is taking place, or where large supply chain re-organisations where being considered, it should be commonplace to involve cross-functional teams, and where necessary, key suppliers. As shown by the results as discussed above, both these constructs scored relatively low with most of the respondents showing that they were undecided.

When assessing the performance of suppliers, there was a significant move to the benchmarking of supplier performance against worldwide competition. Although benchmarking was not a universal theme, evaluation of suppliers was. While in the case
of the organisations being interviewed this always focused on quality and on-time delivery, it also included elements of responsiveness, flexibility, communication, service levels and other qualitative measures. The difficulties in measuring these qualities meant that in addition to the objective data, subjective judgements were used to assess performance. Where smaller suppliers were retained within the supply chain, it was due to the specific strategic capabilities, assets, or services that they provided. The process of rationalisation had provided some customers with the opportunity to identify and assess the risk associated with particular suppliers and to evaluate the supplier dependency and strategic contribution. Where this had been achieved or attempted, this had required closer working relations in order to reduce risk through standardization of products, critical assessment of long-term capabilities or supportive and collaborative relationships. In some cases, this included sharing risks and benefits and providing training support. However, there was no clear evidence of a more formalise approach to all supply relationships, with a full strategic capabilities and benchmarking exercise conducted, and the systematic introduction of longer-term and more open contracts intended to build relationships from a baseline expectation of performance. There was also no consensus that the effect of the development and integration of e-purchasing/supply systems would be to increase flexibility to change suppliers, increase transactional efficiency and to allow competitive sourcing of suppliers.

Levels of product quality, performance and competitive pricing should be seen as a baseline for new, or continuing, commercial relations between the customer and supplier. Since this can be demonstrated, or compared, relatively easy through benchmarking, quantitative performance data and quality assessments, each of these elements should be considered a “given” in any supplier-customer relationship. Thus, in the evaluation of suppliers, and particularly smaller suppliers, the customer nowadays considers that the organisation has to provide “something extra”. While it is not necessary that this “something extra” should be evaluated formally, nevertheless, the customers require a strong informal and/or semi-formal evaluation process. The suppliers’ actions and abilities are, therefore, key to their inclusion in the supply chain. During the discussions it was determined that the evaluation was clearly focused in terms of both reduced uncertainty and increased asset specificity. The asset specificity was either the ability to provide a particular or unique product, or more usually, centred on key activities and interactions with the suppliers. In essence, the relationship,
product, or service provided by the supplier constituted a unique selling point and created asset specificity. This point of difference, however, had to be supported by firm foundations of performance, quality and cost included in the formal contract that reduced uncertainty. In addition, longevity of relations built up informal social contracts, further reduced uncertainty, and provided the opportunity for suppliers to increase their asset specificity. For example, suppliers should work with the customer in product development or the supplier could be asked to provide, or suggest, solutions to existing problems. However, it was evident that the impetus for supplier involvement was often due to the unique skills or expertise within the supplier organisation, a long-standing relationship that provided knowledge of the supplier’s organisational capabilities and/or the proactive and innovative nature of the supplier.

In terms of activities that suppliers are expected to perform, the push for quality, performance and cost will drive an expectation for continuous improvement; the supplier will be expected to provide a higher level of product or service for the same or better costs. This could involve line delivery, consignment stock arrangements, stock management or higher-order production delivery. In short, the levels of service provided and the transactional efficiency of the supplier are key criteria. In addition to this, the suppliers who can respond to changing requirements most effectively will be seen as valuable resources. Customers expect suppliers to provide quality and timely information to ensure to allow early contingency planning for potential problems. The degree of information sharing and communication is also key in developing relationships of trust and collaboration, to allow benefit and risk sharing, and to support innovation and continuous improvement. In terms of supplier activities, then, the business performance has to be competitive, and the other supplier activities has to increase asset specificity, reduce uncertainty and support constructive inter-organisational relations. Indeed, so highly rated are these extra activities, that they would be offset against a competitor with a lower price, making it very difficult for new suppliers to gain entry to the supply chain.
Chapter 5: Conclusion

Supply chain management represents one of the most significant shifts of modern business management by recognising that individual businesses no longer compete as solely autonomous entities, but rather as supply chains. SCM, along with a number of other emerging areas in operations management, is, however, still in its embryonic stage. The scientific development of a coherent supply chain management discipline requires that advances be made in the development of measurement instruments as well as in theoretical models. This must be done to improve our understanding of supply chain phenomena. So the research agenda in supply chain management must not be driven by industrial interest alone. This is even truer in the South African Foundry Industry context. The first steps taken toward improving the competitiveness of the industry members took the industry in the global market themselves. These first steps culminated in the first draft of the "Foundry Technology Roadmap" which was completed in July 2004. The report was compiled from various workshops held with experts from the industry. They provided their thoughts and opinions on the current situation in the foundry industry, the obstacles or barriers on the path to improved performance and what needs to be done to overcome these barriers. This whole process was not based on any proper scientific research method and does not address the critical phenomena of supply chain management anywhere in the report. Indeed, it is necessary to understand the broader context before robust prescription is possible.

Any scientific research discipline can be viewed in terms of two interrelated streams: substantive and construct validation. While the former reflects the relationships among theoretical constructs inferred through empirically observed relationships, the latter involves the relationships between the results obtained from empirical measures and the theoretical constructs that the measures purport to assess. Since all theories in science concern statements mainly about constructs rather than about specific, observable variables, the process of construct conceptualisation and measurement development is at least as important as the examination of substantive relationships. While research on various supply chain relationships has been growing, there has not been a comprehensive approach to construct development and measurement. This could largely be attributed to the fact that astronomical efforts are required to undertake the development and validation of constructs and measures of SCM. Recognising the interdisciplinary nature
of SCM, this study, through successive stages of analysis and refinement, has arrived at an initial set of constructs and operational measures. This study can therefore form the basis for refinement and extension in the best tradition of cumulative theory building and testing, and ultimately result in a coherent theory of supply chain management in the South African foundry industry.

The transactional cost approach explains the transactional efficiency of more collaborative relations and there is evidence that the supply chain members are seeking to achieve this. Further more, this collaboration creates the opportunity for a complex web of inter-organisational relations. The respondents clearly demonstrated that they consider these inter-organisational relations can be a source of competitive advantage by increasing flexibility, innovation and improvement in business processes, but this requires increased levels of trust and communication. Indeed, if increased transaction costs are incurred by a short-term focus on the relationship and are to be overcome, then a key function will be the frameworks that support the open provision of information between organisations. However, achieving this requires changes to traditional bid-buy market relations and the development of appropriate supportive competences. It is part of the conceptual framework that requires further exploration, especially when considering that the information technology construct scored so low during the survey. In order to enhance or improve communication between the supply chain members and thereby properly develop long-term relationships, the use or importance of information technology, as a tool in the SCM process needs to be highlighted and encouraged. Following the next nine steps as part of a roadmap to e-manufacturing can do this.

1. *Embrace the Internet.*

All parties in the company must recognise the organisational change required to adopt an e-manufacturing strategy – and the greater influence of the Internet and of customer demand.

2. *Plant engineers have an important place in the decision-making process.*

Plant engineers bring expertise in the plant-floor process, as well as the information available (and required) for seamless integration. Their plant floor experience and perspective will prove to be invaluable as e-manufacturing efforts proceed.
3. **Build an internal team, and draw the company’s roadmap for e-manufacturing.**
Draw from various departments and functions within the organisation, and discuss the common and specialised benefits each would receive from information transparency. Each segment of the organisation should have a vision for success reliant on information transparency.

4. **Find a company leader to serve as a champion.**
Whenever possible, secure the CEO as the e-manufacturing driver for the enterprise. If an e-business strategy is in place for the company, it’s especially critical to be sure that e-manufacturing is a key element of that broader strategy. Thus, the e-commerce director or CIO is another good champion to enlist.

5. **Take one step at a time on the roadmap.**
Don’t attempt to do everything at once – that is a lesson to be learned from the original ERP implementations. It took many years for plant floor, front office, and supply chain to evolve to where they are today; take a logical path to evolve them via e-manufacturing, and measure successes along the way.

6. **Measure the success and failure of the roadmap.**
Put metrics in place to determine the real savings and efficiencies from a transparent enterprise.

7. **Evaluate your traditional channels – and listen to their needs.**
Analyse the way the company works with customers, suppliers, distributors, and others to determine their effectiveness, and find ways to streamline relationships and processes.

8. **Build on your existing foundations, and on your incremental successes along the way.**
An e-manufacturing strategy will help your organisation embrace information transparency that will foster operational excellence, while not creating more work, major overhauls, or enormous investments. It won’t happen all at once, but once you begin, your organisation can build upon the successes until the full e-manufacturing
approach is realised — and the organisation excels in its own design, operations, maintenance, and synchronises competencies.


Consider the outsourcing trend in manufacturing. When competition and pressure for bottom-line performance are high, companies outsource basic production, manufacturing engineering, automation engineering and other capabilities to suppliers that specialise in these competencies. Employ experts for implementation.

The operational and interactive competencies highlighted throughout the study include adaptive and development elements that require a positive attitude to change. However, change competences are different from those normally used in a stable organisational environment, and, it is likely that the competences will have to be developed in both organisations. In addition, if we consider that competence involves not only the skill and knowledge to perform an activity, but the actual application of that skill and knowledge, then convincing the supplier to apply their skill and knowledge in support of developing customer-supplier relations will be key. From the research, it was not clear if the customer organisations were making significant efforts within their own organisations to encourage the development of appropriate relational competences in order to enhance collaboration. Indeed, the indications of change appeared to be focused mainly on optimising business processes. In addition, the demands of the integrated supply chain are such that, if they are to be a source of strategic advantage, foundries will have to support the suppliers and customers competences. Thus relationship management competences in the customer organisation will be a key factor in inter-organisational culture change. However, if it is the asset specificity and reduction of uncertainty that make the customer invest in closer relations with some suppliers, and then this will mean that for the suppliers, there will only be a limited number of suppliers where this will be appropriate. Therefore, while culture change theories highlight the difficulties of overcoming previous inter-organisational structures from the perspective of the customer, they do not account for how smaller firms can influence supply chain structures and benefit from market opportunities available. New suppliers or suppliers trying to maintain their position not only have to compete with the existing performance criteria, but also against existing relational capabilities of their competitors. In other words, an understanding of culture change efforts and whole systems thinking may be
required from within customer organisations to effect integrated supply chain management. But if suppliers are to make themselves attractive to customers, they must recognise the need to grow their own developmental, change and interactive competences. In short, they need to provide non-product-related services, to meet customer needs and to add value to be effective in the supply chain.

Firms should not view or evaluate their supplier or customer practices independently. Instead, a systems approach should be used, wherein firms recognise for instance that inbound delivery timing and material quality, price, and quantity all impact the firm’s outgoing product and customer services. Increasing information and coordination capabilities with suppliers tends to increase those same capabilities with customers as well. Managers should be cognisant that increasing a firm’s external relationship capabilities in one area has a synergistic impact on yet other external capabilities. With supplier management - and customer relationship strategy positively affecting the supply chain management strategy requires that firms seek to initially develop or further refine their supply chain management capabilities should look to improve or expand their immediate supplier and customer relationship capabilities first. For instance, finding and developing suppliers that can deliver on time, in the right quantities with more flexibility, and directly to the points of use in the firm, can improve the integration of these activities in the supply chain. Building and improving interdependent and trusting relationships and then expanding them throughout the supply chain should begin with sound logistics practices. Managers investing resources in the implementation of various external relationship practices will find they lead to the generation and adoption of more effective supply chain management strategies later.

The notion that a supply chain management strategy positively affects firm performance implies that immediate and second-tier supply chain management strategies all impact firm performance either directly or indirectly. Specifically, managers wanting to improve market share, competitiveness, product quality, and customer service should begin a process of internal assessment whereby their firm’s immediate supplier and customer relationship capabilities are assesses and potentially modified. Following this, firms should consider identifying highly capable supply chain partners, creating better inter-firm cooperation and integration capabilities through information sharing and exchange, reducing response times throughout the supply chain, and sharing future strategic plans.
and requirements. These relationships between supplier and customer strategies supply chain management strategy, and firm performance may well be the key to sustained competitive advantage.

The results obtained from this study of the perceptions of industry members of the use of supply chain management processes has shown that most of the respondents are either indifferent or agreeable on most of the constructs. There are only three constructs that indicate a clear positive attitude, i.e. competitive priorities, top management support and long-term relationship. There are also four other constructs that despite scoring very close to the indifferent value of 3, still shows signs that some respondents do not agree. These constructs are technology uncertainty, cross-functional teams, supplier involvement and logistics integration. The construct that scored the lowest value by far was information technology with 2.39. This necessitated the inclusion of the nine-point roadmap as discussed earlier.

So why do most of the respondents feel indifferent or undecided towards supply chain basics? The following four reasons could be given.

- Most companies do not have good visibility of their supply chain performance. Only a few companies indicated that they have full information on what is happening in their own companies. Even among firms that say supply-chain improvement is a priority, only a few have got all the necessary information.

- Too many companies have a narrow definition of supply chain. Too many companies fail to adequately recognise that the supply chain extends far forward to customers, and back, to suppliers and their suppliers. Not many companies are going outside their four walls to track the performance of supply-chain activities at their vendors, logistics providers, distributors and customers. Imagine how difficult it is for a supplier to plan production effectively when a key customer holds forecast data. The benefits of opening up are many.

- Incentives do not tie to supply-chain improvements. Only a few companies actually use performance rewards to motivate their supply-chain executives. But, even those doing so often make the mistake of using the wrong targets. These incentives fail to take into account customer feedback and vendor results. Companies that reward buyers when they avoid running out of stock, but do not
offer anything when they improve inventory turns, are penny-wise and pound-foolish. It's just as bad when transportation managers are measured on delivery cost but not on on-time performance. By using the cheapest, slowest route, a fortune can be lost in carrying costs, speed to market, and lost inventory turns. The supply-chain leaders go further, fostering collaboration between key functions such as purchasing and distribution.

- There is still a bias towards quick IT fixes. Businesses have looked to sophisticated software to solve their supply-chain problems. Yet most turn their inventories no faster than they did a decade ago. Rather than rebuilding their supply-chain IT systems, the companies should look at improving their supply-chain talent.

So what can businesses do to improve the situation and make sure they fully realise the benefits from proper supply chain management? They can emulate the supply-chain stars by sticking to these five fundamentals.

- **Align the supply chain with the goals of the overall business.**
  Most managers are unclear about their firm’s strategic underpinnings. So it's not surprising that they do not know which supply-chain improvements can drive real advantage, which service enhancements customers will value, and how they should hook their operations into those of suppliers and customers so the whole chain is competitive.

- **Take an integrated systems approach – starting with the customer.**
  The best performers have already linked their operations with those of their customers, suppliers and logistic providers. They drive decisions starting from an understanding of customer needs. They know their own performance metrics, and those of all partners in the supply chain. They have visibility from the beginning to the end of their supply chains, and can make cost and volume adjustments before it's too late.
• **Build specialist expertise and align the organisation.**
  Supply-chain roles are rarely seen as glamorous. But the supply chain stars recruit top-caliber people who can save them millions of rands with better forecasts, vendor strategies, and execution. They ensure that the organisation’s structure, skills, decision-making processes and incentives are aligned. The best companies also work to redirect many departments under a senior executive whose job is to plan, measure and optimize the performance of the whole chain – both internally and externally.

• **Invest in systems as a means to an end, not an end in themselves.**
  Senior managers sometimes ask: “What software should we use to match the world class players?” That is meaningless is, for instance the sales forecast is off by 50%, suppliers are late 40% of the time, and inventory reports are 10% inaccurate. Technology by itself is not the answer. Dell and Wal-Mart are avid users of IT, certainly, but their software does not differentiate their cost position. That distinction goes to their business processes, which harness technology. Moreover, 80% of a company’s supply chain challenges can be met without new IT investments.

• **Measure what matters and think top-line and capital, not just cost.**
  If you do not track performance – the performance of the whole supply chain – you are in the dark about what your supply chain inefficiencies cost you. Yet many companies are guessing when setting inventory targets. They do not know how much of their products will sell at what prices, and they do not analyse what they have sold at different prices. So they leave money on the table – or overpriced goods on shelves.

With real growth so elusive nowadays, the supply chain is an essential place to look for gains. It is a real source of competitive advantage, as leaders in the global foundry industries have proved. They continue to prove it: they are accelerating so fast that they may never be caught. So who has a chance to catch up? The businesses that understand that supply-chain practices have to run on data, not on instinct.
Bibliography


Alderson, W., (1950), Marketing efficiency and the principle of postponement, Cost and Profit Outlook, 3, pp.15 – 18.


APPENDIX A: The Questionnaire

The South African Foundry Industry
Supply Chain Management Strategy Questionnaire

Until recently, there was a widely accepted view of best practice in the foundry industry. Companies normally sold into stable and relatively undemanding markets. Supply-shortages meant that as long as companies could provide the volume at a reasonable price and quality, they would continue to thrive. Given these stable and favourable market conditions, the “model” which companies generally tried to achieve was based on the following main characteristics:

- Logistics were organised around the principle of mass production
- Quality procedures were designed so as not to get in the way of production-flow
- Work organisation was designed to support this system
- Companies were viewed as separate entities, each striving for their own competitive advantage.

These principles of mass production were appropriate as long as markets were stable and undemanding. But once final markets became more heterogeneous and changeable, new principles of production had to be established. In today’s global knowledge economy, progressive companies must be equipped with a good balance of internal knowledge, both in scope and depth, and must adapt to the rapidly changing business environment. This is particularly crucial when organisations are focusing their efforts on improving the performance of their supply chains. The supply chain represents a major opportunity for the industry. Efficient supply chains can lead to huge cost savings and also become a source of competitive advantage. The following definition of supply chain management is therefore supplied:

“Supply chain management is the integration of key business processes from end user to original suppliers to provide products, services, and information that add value for customers.”

This study has identified and consolidated various supply chain initiatives and factors to develop key supply chain management constructs that will assist in developing a supply chain management strategy for the foundry industry in South Africa. This questionnaire has therefore been designed around these constructs, which were developed from a prodigious body of knowledge in the supply chain management literature. The purpose of this questionnaire is to collect relevant information about the current view of supply chain management practice in the foundry industry today, and then compare the findings with the relevant constructs developed in the literature study. The questionnaire has also been designed to give you an opportunity to express your opinions concerning the use of supply chain management in your company.
Please answer each question by filling in the one response category that best describes your opinion. The questionnaire will be of value only to the extent that it is answered honestly and correctly.

Participation in this survey is open to all interested companies in the South African foundry industry. There is no obligation to answer all of the questions, but having as many completed answers as possible will enhance the value of the survey. The results of this survey and any conclusions based on these results will be made available to all interested parties by contacting the originator of this survey. His contact details appear below.

This survey forms part of a research project undertaken by the originator as part of the fulfillment of the requirements for the Masters in Business Administration degree presented by the Potchefstroom Business School.

Your participation in this survey is appreciated very much and it is hoped that you have found the experience rewarding.

Yours truly

Arland Slater

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A five-point Likert scale with end points of “strongly disagree” and “strongly agree” is used to measure the constructs. The buyer and supplier performance is measured using a five-point Likert scale with end points of “decreased significantly” and “increased significantly”.

Please indicate your opinion by placing a cross “x” in the appropriate category.

The scale is broken down as follows:
1 = strongly disagree
2 = disagree
3 = undecided
4 = agree
5 = strongly agree

1. Supply Uncertainty

1.1 The suppliers consistently meet our requirements.
1.2 The suppliers produce materials with consistent quality.
1.3 We have extensive inspection of incoming critical materials from suppliers.
1.4 We have a high rejection rate of incoming critical materials from suppliers.

2. Demand Uncertainty

2.1 Our master production schedule has a high percentage of variation in demand.
2.2 Our demand fluctuates drastically from week to week.
2.3 Our supply requirements vary drastically from week to week.
2.4 We keep weeks of inventory of the critical material to meet the changing demand.
2.5 The volume and/or composition of demand is difficult to predict.

3. Technology Uncertainty

3.1 Our industry is characterised by rapidly changing technology
3.2 If we don’t keep up with changes in technology, it will be difficult for us to remain competitive.
3.3 The rate of process obsolescence is high in our industry.
3.4 The production technology changes frequently and sufficiently.
4. **Customer Focus**

<table>
<thead>
<tr>
<th>4.1 We anticipate and respond to customers' evolving needs and wants.</th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<tr>
<td>4.2 We emphasise the evaluation of formal and informal customer complaints.</td>
<td>1</td>
<td>2</td>
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<tr>
<td>4.3 We follow up with customers for quality/service feedback.</td>
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<tr>
<td>4.4 We interact with customers to set reliability, responsiveness, and other standards.</td>
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<td>4.5 Satisfying customer needs is the central purpose of our business.</td>
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<td>4.6 Customer focus is reflected in our business planning.</td>
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<td>4.7 We produce products that satisfy and/or exceed customer expectations.</td>
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5. **Competitive Priorities**

<table>
<thead>
<tr>
<th>5.1 Our strategy does not primarily offer products with the lowest price.</th>
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<th>2</th>
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<tr>
<td>5.2 Our strategy is based on quality performance rather than price.</td>
<td>1</td>
<td>2</td>
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<tr>
<td>5.3 We place greater emphasis on innovation than price.</td>
<td>1</td>
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<tr>
<td>5.4 We place greater emphasis on customer service than price.</td>
<td>1</td>
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<tr>
<td>5.5 Our strategy places importance on delivering products with high performance.</td>
<td>1</td>
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<tr>
<td>5.6 We emphasise launching new products quickly.</td>
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6. **Strategic Purchasing**

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<thead>
<tr>
<th>6.1 Purchasing is included in the firm’s strategic planning process.</th>
<th>1</th>
<th>2</th>
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<tr>
<td>6.2 The purchasing function has a good knowledge of the firm’s strategic goals.</td>
<td>1</td>
<td>2</td>
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<td>4</td>
<td>5</td>
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<tr>
<td>6.3 Purchasing performance is measured in terms of its contributions to the firm’s success.</td>
<td>1</td>
<td>2</td>
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<td>6.4 Purchasing professionals’ development focuses on elements of the competitive strategy.</td>
<td>1</td>
<td>2</td>
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<td>5</td>
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<td>6.5 Purchasing department plays an integrative role in the purchasing function.</td>
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<td>2</td>
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<td>5</td>
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<td>6.6 Purchasing’s focus is on longer term issues that involve risk and uncertainty.</td>
<td>1</td>
<td>2</td>
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<td>6.7 The purchasing function has a formally written long-range plan.</td>
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7. Top Management Support

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<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Top management is supportive of our efforts to improve the purchasing department.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2 Top management considers purchasing to be a vital part of our corporate strategy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.3 Purchasing’s views are important to most members of top management.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.4 The chief purchasing officer has high visibility within top management.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.5 Top management emphasises the purchasing function’s strategic role.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.6 Requests for increased resources are mostly satisfied by top management.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.7 Top management supports the need for interorganisational information systems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

8. Information Technology

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1 There are direct computer-to-computer links with suppliers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.2 Interorganisational coordination is achieved using electronic links.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.3 We use information technology-enabled transaction processing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.4 We have electronic mailing capabilities with our key suppliers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.5 We use electronic transfer of purchase orders, invoices and/or funds.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.6 We use advanced information systems to track and/or expedite shipments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

9. Supply Network Structure

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1 We have a permeable organisational boundary that facilitates better communication and/or relationship with our key suppliers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.2 Our relationship with the suppliers is based on interdependence rather than power.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.3 Our organisational structure can be characterised as a flexible value-adding network.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.4 Our organisational/supply network structure does not involve power-based relationships.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.5 The decision making process in our organisation is decentralised.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.6 We have few management levels in our relationship with suppliers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
10. Supply Base Reduction

| 10.1 We rely on a smaller number of high quality suppliers. | 1 2 3 4 5 |
| 10.2 We maintain close relationship with a limited pool of suppliers. | 1 2 3 4 5 |
| 10.3 We get multiple price quotes from suppliers before ordering. | 1 2 3 4 5 |
| 10.4 We drop suppliers for price reasons. | 1 2 3 4 5 |
| 10.5 We use hedging contracts in selecting our suppliers. | 1 2 3 4 5 |

11. Long-term Relationship

| 11.1 We expect our relationships with key suppliers to last a long time. | 1 2 3 4 5 |
| 11.2 We work with key suppliers to improve their quality in the long run. | 1 2 3 4 5 |
| 11.3 The suppliers see our relationship as a long-term alliance. | 1 2 3 4 5 |
| 11.4 We view our suppliers as an extension of our company. | 1 2 3 4 5 |
| 11.5 We give a fair profit share to key suppliers. | 1 2 3 4 5 |
| 11.6 The relationship we have with key suppliers is essentially evergreen. | 1 2 3 4 5 |

12. Communication

| 12.1 We share sensitive information (financial, production, design, research, and/or competition). | 1 2 3 4 5 |
| 12.2 Suppliers are provided with any information that might help them. | 1 2 3 4 5 |
| 12.3 Exchange of information takes place frequently, informally and/or in a timely manner. | 1 2 3 4 5 |
| 12.4 We keep each other informed about events or changes that may affect the other party. | 1 2 3 4 5 |
| 12.5 We have frequent face-to-face planning/communication. | 1 2 3 4 5 |
| 12.6 We exchange performance feedback. | 1 2 3 4 5 |

13. Cross-functional Teams

| 13.1 We collocate employees to facilitate cross-functional integration. | 1 2 3 4 5 |
| 13.2 We coordinate joint planning committees with our suppliers. | 1 2 3 4 5 |
| 13.3 We promote task force teams with our suppliers. | 1 2 3 4 5 |
| 13.4 We share ideas and information with our suppliers through cross-functional teams. | 1 2 3 4 5 |
| 13.5 We use supplier-involved, ad hoc teams based on our strategic objectives. | 1 2 3 4 5 |
| 13.6 We encourage teamwork between our suppliers and ourselves. | 1 2 3 4 5 |
### 14. Supplier Involvement

| 14.1 We involve key suppliers in the product design and development stage. | 1 2 3 4 5 |
| 14.2 We have key supplier membership/participation in our project teams. | 1 2 3 4 5 |
| 14.3 Our key suppliers have major influence on the design of new products. | 1 2 3 4 5 |
| 14.4 There is a strong consensus in our firm that supplier involvement is needed in product design/development. | 1 2 3 4 5 |
| 14.5 We involve our key suppliers in business and strategy planning. | 1 2 3 4 5 |
| 14.6 We have joint planning committees/task forces on key issues with key suppliers. | 1 2 3 4 5 |

### 15. Logistics Integration

| 15.1 Interorganisational logistic activities are closely coordinated. | 1 2 3 4 5 |
| 15.2 Our logistics activities are well integrated with the logistics activities of our suppliers. | 1 2 3 4 5 |
| 15.3 We have a seamless integration of logistics activities with our key suppliers. | 1 2 3 4 5 |
| 15.4 Our logistics integration is characterised by excellent distribution, transportation and/or warehousing facilities. | 1 2 3 4 5 |
| 15.5 The inbound and outbound distribution of goods with our suppliers is well integrated. | 1 2 3 4 5 |
| 15.6 Information and materials flow smoothly between our suppliers firms and us. | 1 2 3 4 5 |
For the last three constructs, a different Likert scale is used as described below:

1 = decreased significantly
2 = decreased slightly
3 = unchanged
4 = increased slightly
5 = increased significantly

For example, the opinion concerning the increase or decrease in “volume flexibility” of the supplier should be based on recent experiences.

### 16. Supplier Operational Performance

<table>
<thead>
<tr>
<th>16.1 Volume flexibility.</th>
<th>1 2 3 4 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.2 Scheduling flexibility.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>16.3 On-time delivery.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>16.4 Delivery reliability/consistency.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>16.5 Quality.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>16.6 Cost.</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

### 17. Buyer Operational Performance

<table>
<thead>
<tr>
<th>17.1 Volume flexibility.</th>
<th>1 2 3 4 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.2 Delivery speed.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>17.3 Delivery reliability/dependability.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>17.4 Product conformance to specifications</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>17.5 Cost.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>17.6 Rapid confirmation of customer orders.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>17.7 Rapid handling of customer complaints.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>17.8 Customer satisfaction.</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

### 18. Buyer financial performance

<table>
<thead>
<tr>
<th>18.1 Return on investment.</th>
<th>1 2 3 4 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.2 Profits as a percentage of sales.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>18.3 Firm’s net income before tax.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>18.4 Present value of the firm.</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
### APPENDIX B: Table of Results

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Supply Chain Management Constructs</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply Uncertainty</td>
<td>2</td>
<td>5</td>
<td>3.54</td>
<td>1.0624</td>
</tr>
<tr>
<td>2</td>
<td>Demand Uncertainty</td>
<td>2</td>
<td>5</td>
<td>3.37</td>
<td>1.2726</td>
</tr>
<tr>
<td>3</td>
<td>Technology Uncertainty</td>
<td>2</td>
<td>5</td>
<td>2.75</td>
<td>1.0195</td>
</tr>
<tr>
<td>4</td>
<td>Customer Focus</td>
<td>1</td>
<td>5</td>
<td>3.62</td>
<td>1.1884</td>
</tr>
<tr>
<td>5</td>
<td>Competitive Priorities</td>
<td>2</td>
<td>5</td>
<td>4.11</td>
<td>0.6667</td>
</tr>
<tr>
<td>6</td>
<td>Strategic Purchasing</td>
<td>2</td>
<td>5</td>
<td>3.48</td>
<td>1.1096</td>
</tr>
<tr>
<td>7</td>
<td>Top Management Support</td>
<td>2</td>
<td>5</td>
<td>3.88</td>
<td>0.9927</td>
</tr>
<tr>
<td>8</td>
<td>Information Technology</td>
<td>1</td>
<td>5</td>
<td>2.39</td>
<td>1.3369</td>
</tr>
<tr>
<td>9</td>
<td>Supply Network Structure</td>
<td>1</td>
<td>4</td>
<td>3.28</td>
<td>1.0032</td>
</tr>
<tr>
<td>10</td>
<td>Supply Base Reduction</td>
<td>1</td>
<td>5</td>
<td>3.37</td>
<td>1.0334</td>
</tr>
<tr>
<td>11</td>
<td>Long-term Relationship</td>
<td>2</td>
<td>5</td>
<td>4.03</td>
<td>0.8447</td>
</tr>
<tr>
<td>12</td>
<td>Communication</td>
<td>1</td>
<td>4</td>
<td>3.50</td>
<td>0.7368</td>
</tr>
<tr>
<td>13</td>
<td>Cross-functional Teams</td>
<td>2</td>
<td>4</td>
<td>2.97</td>
<td>0.8899</td>
</tr>
<tr>
<td>14</td>
<td>Supplier Involvement</td>
<td>1</td>
<td>5</td>
<td>2.80</td>
<td>1.2429</td>
</tr>
<tr>
<td>15</td>
<td>Logistics Integration</td>
<td>1</td>
<td>4</td>
<td>2.93</td>
<td>0.9072</td>
</tr>
<tr>
<td>16</td>
<td>Supplier Operational Performance</td>
<td>2</td>
<td>5</td>
<td>3.89</td>
<td>0.7082</td>
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<tr>
<td>17</td>
<td>Buyer Operational Performance</td>
<td>2</td>
<td>5</td>
<td>3.73</td>
<td>0.5739</td>
</tr>
<tr>
<td>18</td>
<td>Buyer Financial Performance</td>
<td>3</td>
<td>5</td>
<td>3.96</td>
<td>0.8065</td>
</tr>
</tbody>
</table>
APPENDIX C: Radar Graph of the Results

South African Non-Ferrous Foundry Industry
Attitudes towards Supply Chain Management Constructs
October 2004