THE ROLE OF GMSA TO ASSIST THEIR SUPPLIERS WITH THE SUCCESSFUL IMPLEMENTATION OF LEAN PRACTICES.

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Submitted in partial fulfillment of the requirements for the degree of

MAGISTER IN BUSINESS ADMINISTRATION
in the Faculty of Business and Economic Sciences at the Nelson Mandela Metropolitan University

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December 2007
DECLARATION

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DECLARATION:

In accordance with Rule G4.6.3, I hereby declare that the above-mentioned treatise is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

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ACKNOWLEDGEMENTS

I hereby wish to acknowledge my appreciation to the following people. Without their guidance, encouragement and motivation, this paper would not have been completed on schedule. My sincere thanks and appreciation to all for this final result.

- All praise and thanks to almighty Allah, without Him, this would not be possible;
- My wife, Muneebah and children Kareem and Shumeez, for their love and understanding;
- My mother, Amina and brothers and sisters Colleen, Glenda, Ryan, Gaily and Garth, for their love and support; and
- Prof J.J. Pieterse, my promoter, for his professional and constructive guidance during the course of my research efforts.
ABSTRACT

The role GMSA can play to assist its suppliers with the successful implementation of lean practices.

Over the past couple of decades traditional manufacturing techniques have been replaced by lean production around the world. This change in production methodology brought about the opportunity for numerous companies to reduce costs and customer lead time through the application of this lean philosophy. The worldwide shift from traditional manufacturing to lean manufacturing can be ascribed to the success of Toyota Motor Company.

Lean manufacturing refers to a manufacturing improvement process in order to minimize or eliminate waste while maximizing production flow (Tapping, et al., 2002:30). A value stream includes all the operations and processes to transform raw material into finished products or services. Value stream is a management tool used for the planning of a production process involving lean techniques through systematic data capturing and analysis (Tapping 2002 et al., 41). Value stream is a proven process for planning the improvements that will allow companies to develop lean practices.

One key to Toyota’s success that GMSA and many other South African companies have not been able to emulate is the transformation of their suppliers to apply the lean philosophy. This lack of supplier transformation is due to various reasons including supplier proximity, supplier relationships, supplier performance levels, and the ordering policies used for supplied parts. Even though many manufacturing organizations realize the importance of practicing lean manufacturing techniques, few organizations apply lean techniques with the required knowledge and tools to transform their organization from traditional manufacturing to lean manufacturing.
This research project is based purely on the lean manufacturing principles and philosophies. The aim of the study is to make GMSA’s suppliers aware of the principles and processes of lean manufacturing and to develop a lean implementation strategy to assist organizations with the successful implementation of lean practices. In order to correctly implement and sustain lean manufacturing practices this study will also focus on supplier support and development and the behavior an organization must exhibit to make this transformation a success.

The research methodology comprised the following steps:

- A literature study was performed by the researcher to get a better understanding of the principles and philosophies of lean manufacturing;
- A second literature study was also performed to get a better understanding of the continuous improvement philosophies of lean manufacturing including supplier support & development; and
- To accomplish the objectives of this study, interview sessions were conducted with four senior managers of General Motors South Africa. The researcher selected the interviewees from the following departments within General Motors South Africa: Global Purchasing and Supply Chain; Supplier Quality and Development; Vehicle Assembly Operations and Material Supply. The interviewees from General Motors South Africa were identified as qualified data sources for this research project, as their professional opinions and viewpoints could best address the research questions.
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CHAPTER 1: PROBLEM STATEMENT AND OUTLINE OF STUDY

1.1 INTRODUCTION
General Motors South Africa is continually striving to increase the productivity and output of their operations. Their goal is to satisfy the customer with the exact product, quality, quantity and price in the shortest amount of time. In order to achieve the latter, General Motors South Africa needs the support from its suppliers.

To remain competitive in this global arena, prospective companies are developing strategies to achieve performance transcendence. At present the South African motor industry is inefficient and unproductive compared to “world markets” such as Japan and the United States of America. This is mainly due to the fact that the South African motor vehicle industry developed largely in an era of protectionism (Womack, Jones & Roos, 1990:11).

General Motors South Africa will be briefly discussed, highlighting the need for supplier support that they are now facing. The main problem will be identified and addressed by this study. This will be done by identifying the sub-problems, establishing and confirming the key assumptions, conducting literature studies and then deploying the philosophies and principles, identified in the literature study, to the current situation at General Motors South Africa.

1.2 MAIN PROBLEM
South African businesses are facing unforeseen opportunities and threats following the country’s remarkable political transformation that culminated in its first non-racial, democratic elections in April 1994 (Kruger, 1997:138).

The motor vehicle assembly industry world-wide is technically one of the most competitive and sophisticated industries. Motor vehicle assembly industries are on the leading edge when it comes to developing new techniques to find better
and improved ways to build cars, this in an effort to make them more affordable and with better perceived quality than their competitors. Peter Drucker referred to this industry as the “industry of industries” (Womack, Jones & Roos, 1990: 11).

General Motors South Africa has not been able to emulate the transformation of their suppliers from traditional manufacturing to lean philosophy. This lack of supplier transformation is due to various reasons including supplier proximity, supplier relationships, supplier performance levels and the ordering policies used for supplied parts.

Even though General Motors South Africa realize the importance of practicing lean manufacturing techniques, few of its suppliers apply lean techniques with the required knowledge and tools to transform their organizations from traditional manufacturing to lean manufacturing.

The purpose of this study is to make GMSA’s suppliers aware of the principles and processes of lean manufacturing and to develop a lean implementation strategy to assist suppliers with the successful implementation of lean practices. In order to correctly implement and sustain lean manufacturing practices this study will also focus on supplier support and the development of an efficient organizational culture that is capable of implementing continuous improvement for a long term.

1.3 RESEARCH QUESTIONS AND OBJECTIVES

Research questions

This research will address the following questions:

- What are the benefits of implementing Lean Manufacturing for GMSA?;
- How can GMSA benefit by having suppliers trained in lean practices?; and
- What are the options of supplier support & development that GMSA can pursue to support suppliers in the set-up of lean practices?
Research objectives

Objectives of this study were to:

• Identify the benefits as to why the manufacturing industry should learn more about lean manufacturing processes; and

• Identify approaches that can be used to redirect non-value-added activity into value-added activity in order to improve efficiency of production.

1.4 ASSUMPTIONS

Lean manufacturing principles and processes can be applied to all sizes of manufacturing related organizations in any environment.

It is assumed that the development of a lean implementation strategy will assist GMSA to develop a future map in an effective way to implement lean manufacturing, in order to increase productivity and output, as well as to reduce costs, inventory, and time.

1.5 LIMITATIONS

The researcher was limited to the resources available on the topic of lean manufacturing technology and was limited to the time available to complete the study.

1.6 METHODOLOGY

This research paper focuses on behaviours that organizations must exhibit to correctly implement and sustain lean manufacturing practices. The purpose of this study is to determine how a business should be implementing the lean manufacturing process. The researcher conducted interview sessions with four senior managers of General Motors South Africa. During the interviewing sessions, the interviewees were given a questionnaire. The interviewees were only asked the questions which the researcher had prepared in advance. The answers were recorded for analysis purposes. The fundamental background of
the lean manufacturing process and procedure were obtained by information gathering from academic books, the Internet, and various academic journals.

This paper also focuses on how a business should execute organizational change such as lean manufacturing implementation in the real business world from a corporate training standing point.

1.7 DEFINITIONS AND TERMS
Available production time: Determined by taking the shift time and subtracting regular planned downtime events such as breaks.

Available operating time: Determined by taking the available production time and subtracting changeover time.

Batch size: A technique used to run a determined quantity of parts at one operation prior to moving them to the next operations.

Changeover time: The time that an operator spends at a work center switching the production tools in order to change from one product type to another.

Downtimes: These are considered break times. Downtimes are regular planned times and usually involve unpaid lunch and paid breaks. During a downtime the production does not run.

Electronic data interchange (EDI): It is a tool that allows companies to process the purchasing order electronically.

Finished goods: Refers to parts that already have been manufactured and are in the completed stage waiting to be shipped to the customer.
Lead time: The time that parts take to be transformed from raw material to finished goods.

Lean metrics: A list of measurements that will help for tracking progress toward the targets selected for improvements.

Material requirement planning: It is a tool that helps manage the production process. Basically, it is a plan for the production of the components and purchase of materials needed to make an item.

Operating cost: It is all the money that the company spends in order to turn inventory into finished goods.

Operators: Involves those individuals that provide the work hand to perform an operation.

Product family: Refers to all the parts that are produced within the same value stream. All the parts for the product family group have common production processes and same pattern development.

Raw material: Material that has been purchased but not changed in any way.

Value stream: The set of processes, including value-added and non-value-added activities required to transform raw materials into finished goods that customers value (Womack & Jones, 1996: 11).

Work-in-process: Any product in the production process than began as raw material, but is not a finished good yet.
Lean manufacturing: Lean manufacturing may be seen as a coherent, composite management concept geared to avoiding waste in the inputs and outputs of production (lean production and beyond, 1993: 3) It uses half the factor inputs compared with mass production – half the human effort, half the manufacturing space, half the investment in tools and half the engineering hours to develop a new product in half the time. It also requires keeping less than half the needed inventory on site, which results in vastly fewer defects, and produces a greater and ever-growing variety of products (Womack et al, 1990: 13). The strategic concepts underlying lean manufacturing are just–in-time; short product cycles based on simultaneous engineering; continuous improvement; multi-skilled workers organized in teams; and symbiotic relationships with supplier firms.

Lean manufacturing control system: Lean manufacturing control systems are systems that are introduced into a manufacturing concern to ensure the long-term sustainability of lean manufacturing concepts and strategies. It ensures that lean manufacturing systems are adhered to.

World class manufacturer: A world–class manufacturer employs some or all aspects of Just-In-time (JIT), or the likes of, in order to reduce inventories plant wide; specialize manufacturing and/or assembly; and encourage continuous one-piece flow.
Chapter 2: LITERATURE REVIEW

2.1 INTRODUCTION

In chapter two, a review of literature related to the lean manufacturing principles is conducted and discussed. Detailed topics included in this chapter are the history of lean manufacturing, lean manufacturing philosophy, quality management concept, and employee empowerment.

Lean manufacturing is more than a cost reduction programme or problem-solving approaches (Tapping et al, 2002: 30). The main idea is that efficient production can be achieved by a comprehensive approach to minimize waste. This means eliminating excess production and inventory, redundant movement of material, waiting and delays, over-processing, excess worker motion, and the need for re-work and corrections.

Part of lean manufacturing is reviewing operations for those components, processes or products that add cost rather than value. Each step of the manufacturing process is monitored to determine if it adds value to the product. If it does not add value, the process could be delegated to a subcontractor or outsourcing company in order to focus the staff on the value-added operations of its core business.

Lean manufacturing technology is focusing on the whole production system. It examines the total production system rather than an isolated process improvement. Production management is a guiding principle of lean manufacturing. When one gets rid of wasted time, effort and processing, the flow of the production process will improve. Lean manufacturing challenges the principles of economy of scale - the larger the production run the lower the cost per unit. Smaller batch runs to smooth production is one of the principles of lean manufacturing.
In most production cycles, only a small amount of time is spent adding value to a product, with “value” being something that is meaningful in the eyes of the customers. Most manufacturing efforts are spent on activities that do not add value to the product and are not required by the process or by the customers. This is non-value added activity. Often when manufacturers would like to improve or increase production output, it is common practice to simply plan more of everything. It is very common to hire more employees, buy more equipment, or build more factory space. This actually would result in more value-added activity with higher output but also higher non-value added activity. Lean manufacturing takes a different approach. In lean manufacturing, the production output or non-value-added activity is expanded into value-added activity. The operation should be the same size as before, additional employee members should not be higher than before, unless it’s really needed, new equipment should not be purchased unless it’s really needed, and existing employees do not need to work harder or faster than before. The lean manufacturing approach is to redirect non-value-added activity into value-added activity.

2.2 HISTORY OF LEAN MANUFACTURING
Womack, Jones and Roos (1990: 11) found that “after World War II, Eiji Toyoda and Taiichi Ohno at the Toyota Motor Company in Japan pioneered the concept of Lean production”. Toyota Motor Company developed their original moving assembly line called “Toyota Production System (TPS)” to keep material flowing continuously.

Monden (1983: 1) states that the TPS was developed and promoted by Toyota Motor Corporation and was adopted by many Japanese companies in the aftermath of the 1973 oil shock. Though the main purpose of the system is to reduce costs, the system also helps increase the turnover ratio of capital, (i.e., total sales/total assets) and improves the total productivity of a company as a whole"
The Toyoda family originally owned a big textile company in Japan. After World War II, the Toyoda family decided to start a new venture from Toyota Automatic Loom Company to a Toyota Motor Company. Wren and Greenwood (1998: 218) state, “The Toyota Automatic Loom Works was the product of the inventive and entrepreneurial genius of Sakichi, who perfected Japan’s first power-driven loom and held numerous patents for automatic looms and textile production”. Sakichi sold his automatic loom patents to finance a research of automobile manufacturing system with his son Kiichiro. In the mean time, General Motors (GM) and Ford assembly plants had located in Japan. Therefore, challenging the new automotive venture for the Toyoda Group was considered a risky business.

According to Wren and Greenwood (1998: 218), the eldest son of Sakichi, Kiichiro Toyoda, was in charge of loom production. He had a great interest in the automotive engine as well. He had studied the Western automotive industry to modify their management into Toyota’s way of automobile assembly line. Even though conditions to make competitive automobile products against Western automobile products were extremely difficult, both the Toyoda family and Taiichi Ohno were trying to modify a number of ideas and skills imported from the Western countries. Kiichiro was trying to modify higher production quantities into smaller production quantities in order to match with the Japanese economy size at that time. In addition to the smaller production quantities, Kiichiro was trying to establish Toyota cars as fuel-efficient vehicles that would match Japanese narrow streets and the tight expenditure of Japanese people (Wren & Greenwood, 1998: 219). Jordan and Michel (2001: 14) states, “Toyota and Japan needed a different manufacturing paradigm”.

The Japanese have defined that anything that prevents the flow of material is called “Muda” which means “Waste” in Japanese. Jordan and Michel (2001: 14) state, “Toyoda and Ohno realized they had to get the most out of each worker, and that would happen only if the workers knew how to do many different tasks effectively”. After World War II when the Japanese manufacturing industry was
suffering from a poor quality production system, Toyoda Motor Company started to develop their own efficient production principles. According to Jordan and Michel (2001: 14), “the Japanese government, with support from the United States’ occupation forces, provided a protective cover for struggling Japanese industries while the domestic manufactures tried to find the way”.

When one talk about the history of lean, one should not forget about Henry Ford who pioneered the foundation of lean production system in the manufacturing industry. Globally, Henry Ford is well known as the pioneer of Ford Motor Company and is also known as the pioneer of “mass production”. In the book “The Machine That Changed the World”, Womack, Jones and Roos (1990: 11) state that after World War I, Henry Ford and General Motors’ Alfred Sloan moved world manufacturing from centuries of craft production - led by European firms - into the age of mass production. Largely as a result, the United States soon dominated the global economy (p.11).

Henry Ford knew that he could keep the prices of his products low by reducing the production cycle by using their assembly line. However, in the book becoming lean, Liker (1997: 23) states that Ford made a dramatic wrong turn at his new Rouge complex. He maintained the assembly track but rearranged his fabrication machinery into process villages. He proceeded to run a push schedule in which growing fluctuations in end-customer demand and persistent hiccups in upstream production were buffered by a vast bank of finished units forced on the dealer network and equally vast buffers of parts at every stage of production upstream from assembly. Thus "flow" production – as Ford termed it in 1914 -became mass production (a term he also coined, in 1926, without realizing the difference), and the opportunity to carry lean thinking to its logical conclusion was lost.

The focus of the Ford flow production system was getting their automobiles out and keeping all machines and equipment busy all the time. They did not pay
attention whether the next process was ready for producing more products or not. Eventually, they produced excess inventory all the time. Unfortunately, Ford Motor Company failed to develop an efficient production system from the original vision of Henry Ford’s plan.

In the 1940s a German worker could produce three times as much as a Japanese worker, and an American worker could produce three times as much as a German worker (Ohno, 1988: 89). Therefore, the ratio of production between American and Japanese workforces was nine to one.

In order to make a move toward improvement, Kiichiro Toyoda proposed to reduce the gap with America in three years, resulting in the birth of the lean manufacturing practices.

The term lean manufacturing was first used to describe the implementation of what is now considered to be part of lean manufacturing such as a Kanban or just-in-time (JIT). It began as a description of procedures used by the Toyota Motor Corporation from 1950 through the 1980s. Now lean means much more. The Toyota production system started as part of a strategy to survive developed by Taiichi Ohno, in an effort to conserve capital, eliminate waste, reduce inventory, and reduce production times and operating expenses while at the same time increasing quality and production flexibility. The Toyota production system was proved to be successful and implemented throughout the entire company.

Toyota opened its first major operation in the United States in 1984 through a joint venture with General Motors in Fremont, CA (Ohno, 1988: 91). Since then, Toyota has made continuous progress adapting its production system to a diverse workforce and a geographically spread supplier base. The reputation of the company has grown across the world. While most companies have suffered with enormous losses in business cycle decline, Toyota has not lost money since
1960. The major contributor to their success has been the Toyota production system.

2.3 FIVE PRIMARY ELEMENTS FOR LEAN MANUFACTURING
The five primary elements to consider when implementing lean manufacturing are; manufacturing flow, organization, process control, metrics, and logistics (Feld, 2000: 86). These elements represent the variety of aspects needed to sustain a successful lean manufacturing implementation programme:

- Manufacturing flow addresses physical changes and design standards;

- Organization identifies people’s roles/functions, training in new ways of working, and communication;

- Process control is directed at monitoring, controlling, stabilizing, and pursuing ways to improve the process;

- Metrics addresses visible results-based performance measures, targeted improvement, and team rewards/recognition; and

- Logistics provide the definition for operating rules and mechanisms for planning and controlling the flow of material.

2.4 ISSUES IN LEAN MANUFACTURING
Lean manufacturing is in direct opposition with traditional manufacturing approaches characterized by the use of economic order quantities, high capacity utilization, and high inventory (Feld, 2000: 91). In changing from a traditional environment to one of lean production, cultural issues will emerge quickly, as well as resistance to change. Implementing lean manufacturing techniques will change the organizational culture because everyone needs to be more involved and accountable and people may be laid off. A fast change management
programme is needed to accompany the effort. A slow approach generally does not work or achieve significant results.

Lean manufacturing is not a magical solution (Feld, 2000: 6). It involves a change in leadership that requires considerable communication, coordination, and organizational change which will results in a change in the company's culture. Just implementing one lean technique such as a Kanban system will not result in lean implementation. Positive employee reaction to lean manufacturing is essential to success, but does not always occur since becoming lean improves productivity and can reduce the number of workers needed. Laying people off and asking the remaining employees to become more involved may not work.

Feld (2000: 7) stated that in order to create a lean manufacturing environment, the organization needs to be aware of where it is at that point. They must know why they need to change and why change is important. It is necessary to provide the answers to these questions to employees so they become more engaged in the process. Motivation, tenacity, leadership, and direction are imperatives for the successful deployment of a lean programme. Roles within the team and the way in which team members interact with one another are important. All members must understand their roles and why they were selected for their assignment.

2.5 PRINCIPLES IN LEAN MANUFACTURING

According to the Womack et al. (1990: 13), a lean organisation relies on several lean principles.

These are:
- Clear Goals

“Lean producers…set their sights explicitly on perfection: continually declining costs, zero defects, zero inventories, and endless product variety” (Womack, et al., 1990: 13);
- Low down authority for decision making

A key objective of lean manufacturing is to push responsibility far down the organisational ladder. “Responsibility means freedom to control one’s work – a big plus,” say Womack et al. (1990: 13). “Instruct workers to stop the whole assembly line immediately if a problem emerged that they couldn’t fix” (Womack et al., 1990: 57);

- Learning new skills

Lean manufacturing calls for learning far more professional skills and applying these creatively in a team setting rather than in a rigid hierarchy (Womack et al., 1990: 13). “Workers need to be taught a wide variety of skills, in fact, all the jobs in their work group so that tasks can be rotated and workers can fill in for each other. Workers then need to acquire many additional skills: simple machine repair, quality checking, housekeeping and materials ordering” (Womack et al., 1990: 99);

- No buffers of safety stock

Womack et al. (1990: 53) point out that making only a few parts before assembling them into a car caused mistakes to show up almost instantly. This proves that not retaining buffer stocks is beneficial;

- Work teams

An important aspect is to group workers into teams with a team leader rather than a foreman;

- New material handling systems

New ways are sought to co-ordinate the flow of parts within the supply system on a day-to-day basis. These include the famous just-in-time system, called KANBAN at Toyota;
Customer satisfaction
Womack et al. (1990: 64) and his colleagues give an example of the importance of customer satisfaction: “Consumers began to report that the most important feature of their car or truck was reliability. Because the Toyota system could deliver superior reliability, soon Toyota found that it no longer had to match exactly the price of competing mass-production products”;

New model development time
To change production and model specifications in mass production firms takes a long time and is very expensive. By contrast, a pre-eminent lean manufacturer such as Toyota needs half the time and effort required by a mass-producer such as General Motors to design a new car. This means that Toyota can offer twice as many vehicles with the same development budget;

Demand fulfillment
All of the variety available from lean manufacturing would be for nought if the organisation could not build what the customer wanted (Womack, et al., 1990: 66);

Make to order
At Toyota, the dealer became part of the production system as the organisation gradually stopped building cars in advance for unknown buyers and converted to a build-to-order system;

Customer involvement
The system also incorporated the buyer into the product development process. In a very direct way, Toyota focused relentlessly on repeat buyers, going directly to its existing customers in planning new products;
• Shop floor involvement
  “All information – daily production targets, cars produced so far that day, equipment breakdowns, personnel shortages, overtime requirements and so forth – are displayed on andon boards (lighted electronic displays) that are visible from every work station” (Womack, et al., 1990: 99); and

• Idea stimulation
  There is also emphasis on obtaining suggestions from employees. “Then they need encouragement to think actively, indeed pro-actively, so they can devise solutions before problems become serious” (Womack, et al., 1990: 99).

The points mentioned above are echoed by Hines (1994: 13) when he quotes Norman’s primary source of competitive advantage for the Japanese top 50 industries.

2.6 EMPLOYEE EMPOWERMENT

Employee empowerment is defined as “Enlarging employee jobs so that the added responsibility and authority is moved to the lowest level possible in the organization. Employee empowerment is one of the ways of managing complex organizations. Western managers believe they are “in charge” (Cartin, 1993: 61). According to Orf (1997: 75), the Japanese are well known as a group-orientated society. She states that one of the reasons often given to explain why Japanese managers succeeded in winning such a high degree of commitment from their workers is that instead of imposing their own decisions on the workers, they often leave decision making up to their workers.

Hand (1994: 25) states that “managers support and stimulate their people, cooperate to overcome cross-functional barriers, and work to eliminate fear within their own team”.

Often times, many supervisory levels of employees believe that they may end up losing their authority and eventually losing their jobs through empowerment. Consequently, one can expect that most of the resistance to empowerment comes from the middle management. However, employee empowerment does not mean that managers no longer have the responsibility to lead the company and are not responsible for their subordinate’s performance. Hand (1994: 15) speculates that supervisory and middle managers must be trained well due to accustom them with organizational change. Stronger leadership and accountability are required in an organization that seeks real empowerment. There are no companies that can create high quality work processes and products without making sure each employee in that company is well trained.

Initiating employee empowerment is going to help in creating a healthy work environment where employee motivation can be developed. Therefore, employees are able to make more decisions beneficial to their organizations. Communication between management and employees is one of the identifying signs of employee empowerment. It is important to recognize that there is a relationship between satisfying internal customers (employees) and meeting external customers’ needs. When organizations cannot treat their employees correctly, they cannot be expected to treat external customers with loyalty.

According to Cartin (1993: 61), involvement is most effective when organizational members are organized into teams. An organization can measure the result of empowerment only when the entire organization is willing to work as a team. Capezio and Morehouse (1993: 157) define that the process of forming teams and making them work in a productive and results-oriented way requires key elements to ensure success:

- Clear roles;
- Skill development; and
- Participative environment.
The synergy of work process improvements by teams can be significant. If an organization has not been actively initiating employee empowerment, according to Conner (2001: 171), no amount of Lean technologies will make a significant and sustainable difference in your company’s performance.

According to Clutterbuck and Kernaghan (1994: 23), the only way one can get people to improve constantly, is to empower the people to own their jobs.

Felkins et al. (1993: 17) looked at empowerment in their consultative approach and stated that consultation skills such as validation, data collection and analysis, feedback and interpretation, decisions and actions, and applications and monitoring are underdeveloped at all levels. Empowerment requires that managers, employees and customers work effectively to implement and influence change. A change management model that takes the manager beyond Mintzberg’s three categories of management (interpersonal roles, informational roles and decisional roles) is required to become an empowered change facilitator (Felkins, et al., 1993: 26).

2.7 QUALITY MANAGEMENT CONCEPT

Mighetto & Associates (2001) refers to the non-defective programme adopted by the Federal Government of the United States, which defines quality as "conformance to requirements." Application of these concepts to a service industry resulted in the new concept based on the marketing approach and the strong customer focus of Philip Kotler, Deming, Juran, and Crosby (these people began the TQM process) share the common theme of participatory management.

Deming is widely accepted as the teacher of quality management, and is known by the world for his 14 points for Management. Deming began teaching a statistical quality control system immediately after World War II in Japan, and it is
accepted that it was an important contributor to the nature of the improvement programme of Japan (Cottman, 1993: 29).

The following is Deming’s 14 major points of quality management:

- Create a constancy of purpose for improvement of product and service;
- Adopt the new philosophy;
- Cease dependence on mass inspection as the primary method for improving quality;
- End the practice of awarding business on the basis of price tag;
- Constantly improve the process of production and service;
- Integrate modern methods of on-the-job training;
- Develop tailored methods of supervision and management;
- Drive out fear;
- Break down barriers between departments;
- Eliminate slogans, numerical goals, posters and other pressure-creating devices;
- Eliminate procedures that require a specific output from each employee;
- Remove the barriers that stand between the engineer and his right to pride in workmanship;
- Institute a vigorous program of education and retraining; and
- Encourage every individual within the workplace to dedicate himself to this transformation (Cottman, 1993: 29).

Quality management has a big impact on the entire organization in every competitive business environment. Total Quality Management (TQM) was developed by experts all over the world to control production and quality.

According to Mighetto and Associates (2001) TQM is a participative management style which puts emphasis on the employees’ commitment to satisfy the customer. It is a holistic approach to managing complex organizations and it replaces top-down management with decentralized customer-driven decision
Total Quality Management is an integrated management system to be used for creating and implementing a continuous improvement process with the intent of producing results that exceed the customers’ expectations. It is based on the assumption that 90 percent of problems are caused as a result of process, and not employees (http://www.eskimo.com/~mighetto/lstqm.htm).

Capezio and Morehouse (1993: 1), state that Total Quality Management refers to a management process and set of disciplines that are co-ordinated to ensure that the organization consistently meets and exceeds customer requirements. After World War II, there was a growing awareness among manufacturing companies all over the world that to remain compatibly strong in a global market place, a new business culture needs to be adopted. Japan was trying to analyze the American industry after the war, and desired to take over the challenge of the direct competition with the United States (Capezio & Morehouse, 1993: 7).

TQM is one of the initiatives in the new business culture. Every one of the employees plays a part to producing and delivering quality products. Cartin (1993: 61) predicted that it will become evident that TQM is a way to manage any organization. It is being successfully adopted in industry, government, and services. But it is not a collection of tools that can merely be plugged in to produce results. Some tools used alone can produce improvement, but only adoption of the fundamental principles will result in maximum benefits.

The manufacturing industry has been quick to understand the significance of continuously improving the quality of their products and service as a means of achieving long-term business goals. The manufacturing industry has also recognized that quality must be customer-driven, from placing the order to delivering the products.

Quality improvement is an important aspect of a quality control process. Continuous improvement has to consist of diagnosing the core quality process in
the entire system. Berk and Berk (2000: 7), state that the concept of continuous improvement, focuses on finding shortfalls and sources of variability in administrative, manufacturing, and service process that can detract from a quality output, and improving the process to eliminate undesirable outputs. They have also given the outline for “Strategy for improving Continuous Improvement”. This outline is used very successfully in a large number of organizations. The outline below can provide a good road map for considering quality management.

The following is the 12 points outline:

• Define current status;
• Define objectives;
• Select improvement teams;
• Assign improvement teams;
• Define processes;
• Identify variability sources;
• Identify potential improvements;
• Perform experiment(s);
• Modify upgrades as required;
• Implement pilot upgrades;
• Measure results; and
• Implement and move to next project.

Mighetto and Associates (2001) state that, management participation and attitude, professional quality management, employee participation, and recognition reflect a philosophy making internal and external customer satisfaction the organization’s primary goal. Quality management is for all organizations. The only thing required before implementation is willingness for change. Even leading companies in the United States have recognized that, in the long term period of time, they will surely support customers further by delivering higher quality products at the lowest possible cost in a short period of time (Cartin, 1993: 65).
2.8 Kaizen

Kaizen involves continual improvement involving everyone within an organization (Ohno, 1988: 9). Kaizen is a Japanese word meaning gradual and orderly continuous improvement.

The Kaizen business strategy involves everyone in an organization working together to make improvements without large capital investments. Kaizen is a culture of sustained continuous improvement focusing on eliminating waste in all systems and processes of an organization. This strategy begins and ends with people, and involves leadership that guides people to continuously improve their ability to meet expectations of high quality, low cost, and on-time delivery, therefore transforming companies into superior global forces.

One of the most important tools for continuous improvement is the 5S housekeeping, also known as 5S-CANDO, which is a process that includes a set of techniques utilized for cleaning and organizing the workplace. 5S reduces wastes by eliminating the searching for tools because everything is in the right place. Preventive maintenance assures that the tools are ready to use, reducing setup time, and the equipments and machines will be running effectively, avoiding unplanned downtime or breakdowns.

5S CANDO comes from the Japanese words Seiri (Clearing up), Seiton (Arranging), Seiso (Neatness), Shitsuke (Discipline), and Seitketsu (Ongoing improvement).

Seiri refers to sorting the workplace and eliminating needless items (Feld, 2000: 14). It means “throw away” and separates the messes from those items that are needed to work easily, resulting in a better flow of materials, utilization of space, and organization for operators to move in their work area.
Seiton refers to arranging everything within a specific area (Feld, 2000: 14). All items and equipment must be identified with a label and organized in a specific place resulting in an easier way to recognize and find the proper tooling, resources, and materials quickly.

Seiso refers to cleaning everything and doing periodic maintenance (Feld, 2000: 15). Everything should be cleaned, organized, and well maintained at the end of every shift, including the production area, tools, and materials.

Seitketsu deals with the management strategies for institutionalizing the standard activities (Feld, 2000: 15). Managers must establish policies and procedures to keep the area organized, ordered, and clean.

Shitsuke refers to the leadership strategy to implement housekeeping involving training, communications, and motivation as fundamentals leadership practices in order to ensure that everyone follows the 5S standards (Feld, 2000: 16).

2.9 DEFINITION OF VALUE STREAM
A value stream is the set of processes, including value-added and non-value-added activities, required to transform raw materials into finished goods that the customers value (Womack & Jones, 1996: 46). Value streams bring a specific good or service through three critical management tasks: problem solving (figuring out what needs to be changed), information management (improving information flow), and physical transformation (implementing changes). Tapping et al. (2002: 27) state that, there are many value streams within an organization, just as there are many rivers flowing into the ocean.

The value stream can be defined by the customers, but in some cases companies must identify the entire value stream for each product or each product family by themselves (Tapping, et al. 2002: 27). In order to identify the value stream, product quantity analysis (PQ) is used to determine what percentages of
part numbers are running in high volumes. The results of the PQ analysis are represented graphically and the 20:80 rules can be applied to separate the most critical items. Tapping, et al. (2002: 28) state that “20:80 means that the 20% of the products types account for 80% of the total quantity of parts produced”.

2.10 VALUE STREAM MANAGEMENT

Value stream management is a management tool for planning, managing, implementing, sustaining and linking lean-manufacturing improvements to daily work (Tapping, et al. 2002: 27). Value stream management consists of eight steps: committing to lean, choosing the value stream, learning about lean, mapping the current state, determining lean metrics, mapping the future state, creating Kaizen plans, and implementing Kaizen.

The goal for any manufacturer today is to reduce costs and lead times while maintaining the highest quality of its products (Tapping, et al. 2002: 54). In today’s economies the market is very competitive and customers often set the prices or they demand price reductions.

Under these scenarios the only way to keep making money is to eliminate waste from ones value stream, increasing efficiency and reducing costs. Value stream management is a process that helps organizations systematically identify and eliminate the non-value-added elements from the value stream and generate a design and a plan to implement lean manufacturing.

2.11 COMPONENTS OF LEAN SUPPLY CHAIN

According to Tompkins and associates a lean supply chain consists of the following components (http://www.tompkinsinc.com/publications):

- Lean suppliers
  Lean suppliers are able to respond to changes. Their prices are generally lower due to efficiencies of lean processes, and their quality has improved to
the point that incoming inspection at the next link is not needed. Lean suppliers deliver on time and their culture is one of continuous improvement.

To develop lean suppliers, organizations should include suppliers in their value stream. They should encourage suppliers to make the lean transformation and involve them in lean activities. This will help them fix problems and share savings. In turn, they can help their suppliers and set continually declining price targets and increasing quality goals;

- Lean procurement
  Some lean procurement processes are e-procurement and automated procurement. E-procurement conducts transactions, strategic sourcing, bidding, and reverse auctions using web-based applications. Automated procurement uses software that removes the human element from multiple procurement functions and integrates with financials.

  The key to lean procurement is visibility. Suppliers must be able to see into their customers’ operations and customers must be able to see into their suppliers’ operations. Organizations should map the current value stream, and together create a future value stream in the procurement process. They should create a flow of information while establishing a pull of information and products;

- Lean manufacturing
  Lean manufacturing systems produce what the customer wants, in the quality the customer wants, when the customer wants it, and with minimum resources. Lean efforts typically start in manufacturing because they free up resources for continuous improvement in other areas, and create a pull on the rest of the organization. Applying lean concepts to manufacturing typically presents the greatest opportunity for cost reduction and quality improvement;
however, many organizations have received huge benefits from lean concepts in other functions;

- Lean warehousing
  Lean warehousing means eliminating non-value-added steps and waste in the product storage processes. Typically warehousing functions are:
  - Receiving;
  - Put-away / storing;
  - Replenishment;
  - Picking;
  - Packing; and
  - Shipping.

Warehousing waste can be found throughout the storage process including:
  - Defective products which create returns;
  - Overproduction or over shipment of products;
  - Excess inventory which require additional space and reduce warehousing efficiency;
  - Excess motion and handling;
  - Inefficiencies and unnecessary processing steps;
  - Transportation steps and distances;
  - Waiting for parts, materials and information; and
  - Information processes.

Each step in the warehousing process should be examined critically to see where unnecessary, repetitive, and non-value-added activities might be so that they may be eliminated;

- Lean transportation
  Lean concepts in transportation include:
• Care carrier programmes;
• Improved transportation administration processes and automated functions;
• Optimized mode selection ¾ pooling orders;
• Combined multi-stop truckloads;
• Crossdocking;
• Right sizing equipment;
• Import/ export transportation processes;

The key to accomplishing the concept above include mapping the value stream, creating flow, reducing waste in processes, eliminating non-value-added activities and using pull processes; and

• Lean customer
  Lean customers understand their business needs and therefore can specify meaningful requirements. They value speed and flexibility and expect high levels of delivery performance and quality. Lean customers are interested in establishing effective partnerships; they are always seeking methods of continuous improvement in the total supply chain to reduce costs. Lean customers expect value from the products they purchase and provide value to the customers who they interact with.

2.12 BENEFITS OF LEAN SYSTEMS
According to Tompkins and associates the benefits that can be gained from a lean supply chain are (http://www.tompkinsinc.com/publications):

• Speed and responsiveness to customers
  Lean systems allow a supply chain to not only be more efficient, but also faster. As the culture of lean takes over the entire supply chain, all links increase their velocity. A culture of rapid response and faster decisions
becomes the expectation and the norm. This does not mean that decisions are made without careful thought. It simply means that a bias for action becomes the new corporate culture and anything less will not be tolerated. Slow response or no response becomes the exception, rather than the rule;

- Reduced inventories

In the lean paradigm, inventory is considered waste. Many would argue this point, but manufacturing can take place efficiently with little or no raw material, work in process, or finished goods inventory.

Many companies today produce directly into trailers and maintain no other finished goods inventory. All quality inspections and checks are performed within the process, rather than after production is complete. In this true make-to-order scenario, all goods are shipped directly to the next link in the supply chain when the trailer is full, and overproduction is not possible and cannot be tolerated. No space is designated to store finished goods. The system is not designed to carry them.

Applying one piece flow and pull systems can reduce work in process dramatically. A kanban or visual signal for more goods to be moved forward to the next process can accomplish this procedure. Although the ultimate goal is to eliminate work in process, minimal work in process is normally the result. The elimination of bottlenecks is one goal of a lean supply chain, but a bottleneck will always exist to some degree. As a result, work in process must always exist in front of a bottleneck or the bottleneck operation will be starved and will stop.

Raw material inventory is a different matter. Although the leanest organizations have arranged just in time deliveries to support manufacturing, this approach requires the absolute highest degree of competence and co-ordination within the supply chain;
• Reduces cost

Traditional mass production tries to minimize unit costs by increasing total production over the life cycle of the product. High development costs are the result of this model. The recover the enormous development and initial capital cost sunk into the product before it was produced, mass producers forecast and run long production cycles for each product. Customer preferences and variety suffer in this scenario. Cost still need to be minimized, but not at the expense of what more sophisticated consumers now demand; and

• Improved customer satisfaction

Lean promotes minimizing new product development time and expense. This delivers the product to the market faster, making it easier to incorporate current requirements into the product. Lean also promotes the use of less capital-intensive machines, tools, and fixtures, which results in more flexibility and less initial cost to recover. As a result, product lifecycles may be shorter and product development incorporated in newer versions of the product more frequently. Profitability does not suffer and brand loyalty is increased, as customers prefer to buy products and services from a perceived innovator.

2.13 SUPPLIER DEVELOPMENT

Supplier development has been part of the Japanese automotive industry for the several decades, but has only recently received attention in the United States (Handfield, et al. 2000: 37).

According to Krause (1997: 3), supplier development may range from limited efforts, such as informal supplier evaluation and a request for improved performance, to extensive efforts, such as training of the supplier’s personnel and investment in the supplier’s operation. Firms may use a variety of activities to develop suppliers’ performance and capabilities. These activities include introducing competition into the supply base, evaluating the supplier as a prerequisite to further supplier development activities and raising performance
expectations. Other activities are recognizing good supplier performance, promising future benefits, training and educating the suppliers’ personnel, exchanging personnel between the buying firm and the supplier, and investing directly in the supplier (Krause, 1997: 3).

Hines (1994: 3) argues that the supply chain can be an important source of competitive advantage to any organisation that will devote time and effort to supplier development and co-ordination. He argues that American and Japanese firms are similar but differ in the most important aspect, that of handling relationships inside and outside their own firm between customers and suppliers. Because of the latter, the Japanese expertise allowed their firms to dominate world markets in a whole range of manufacturing products.

Lean manufacturing is ‘lean’ because it uses less of everything compared with mass production – half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products” (Womack, et al., 1990: 13).

Research shows that the intention of this approach is to eliminate the non-value-added effort out of everything. The Japanese word for waste is muda and that is what needs to be targeted for elimination by all stakeholders.

While some of these improvement efforts in the automotive industry have been successful, the majority, according to recent surveys, have not. There is continuing debate about whether the conflicting results between some Japanese companies where the concepts worked, and their United States counterparts where it did not, were due to poor management or to flaws in the programmes themselves (Maccoby, 1997: 162).
2.13.1 Origin of supplier development

Toyota Motor Corporation’s purchasing philosophy is enshrined in the 1939 purchasing rules which state: “once nominated as Toyota suppliers, they should be treated as part of Toyota; Toyota shall carry out business with these suppliers without switching to others, and shall make every effort to raise the performance of these suppliers” (Kyohokai, 1994:18). But, the post war trigger for thinking more concretely about supplier development was the so-called enterprise group diagnosis conducted by the Aichi Prefectural Government during 1952 and 1953 (Kyohokia, 1994:24; Fujimoto, 1997:76).

In the 1950’s, lectures and training courses of Toyota employees were made available to core supplier employees. The lectures and seminars were on production management and quality controlled and the course produced three hundred and seventy two graduates from supplier employees (Kyohokai, 1994:32).

Toyota is noted for two things that mark it apart from other motor vehicle manufacturers. First, its internal organization for providing supplier development is decoupled. Toyota Production System and Total Quality Control activities are taught to suppliers by different parts of the company. This internal structure helps suppliers accumulate their evolutionary capability (i.e. capability for capability building) and lower-level capabilities at the same time. Second, through Jishuken groups (self study groups), Toyota relies not just on one-on-one teaching of suppliers, but also on lateral learning among suppliers through the practice rather than the mere representation of capability.

2.13.2 Supplier development as an organizational capability

Supplier development is a procedure undertaken by a company to help improve its supplier capabilities. More specifically, it may be interpreted as a firm’s attempt to transfer some aspects of its in-house organizational capability across firm boundaries. The ability to replicate such capability is, in itself, also a
capability. In the automobile industry, automakers may send their own engineers to the supplier’s shopfloor to help solve a problem with a specific component in order to meet the product launch date. They may provide training courses for supplier’s employees in techniques such as production systems, quality, value engineering and simultaneous engineering. Suppliers will be requested to work on a specific production line for an extended period with the view of learning heuristics to achieve cost reduction, inventory reduction and quality improvements.

The organizational capabilities that are being replicated at suppliers consist of a hierarchy of practiced routines that are coherent (Nelson, 1991:68). Routines involve an important element of interaction and co-ordination between individual, organizations. Knowledge is typically distributed in different parts of the organization.

One important capability in supplier development is continuous improvement or kaizen. The practice of continuous improvement amounts to an effort to re-ignite the quest for improvement in organizational routines frequently rather than starts and stops in relation to the identification and solving of a specific problem (Winter, 1994:103). Continuous improvement is inherently firm-specific in its application and results, and therefore is part of the intangible assets for which no ready market exists. The distinctive and difficult-to-replicate character of such assets is central to the sustenance of a firm’s competitive advantage. It also explains why firms differ, even in the same industry in the same country (Nelson, 1991).

The most limited aim of supplier development is to intervene in order to teach maintenance capability with respect to a specific component. At the other extreme, the most ambitious aim of supplier development is for a company to replicate at its supplier a whole set of organizational routines underlying its own evolutionary capability.
Lambert, Stock and Ellram (1998:362) define supplier development as “a systematic organisational effort to create and maintain a network of competent suppliers and to improve various supplier capabilities that are necessary for the buying organization to meet its increasing competitive challenges”. The buying organization develops a programme for the supplier, in which areas for improvement are identified. An action plan is drawn up, and the progress with such improvements is monitored on a regular basis. Supplier development can be closely linked to the process of regular assessment to ensure progressive improvement of performance (Saunders, 1997:266). This means that supplier development cannot be performed successfully without regular assessment.

2.13.3 Assisting and developing new sources of supply
In the search for the perfect source, the organization may discover that there is no source that meets the purchase order specifications. A satisfactory source therefore needs to be created. This supplier development process is called reverse marketing. The buying organization needs to create good, better and exceptional suppliers where none existed previously (Heinritz, et al., 1991:171; Russill, 1997:115).

According to Heinritz et al. (1991:171), The benefits of reverse marketing are:

- Parts that have not previously been manufactured become available;
- The manufacturing of new and/or special designs stimulates the development of new technology;
- The technical assistance in setting up the process on an efficient basis will result in an improved or high quality product;
- An improved price may be achieved, as the price of available suppliers may be too high or out of line with the budgeted cost for the product;
- Production capacity may already be fully occupied so that new suppliers may have to be accommodated;
• The steady flow of guaranteed orders over a period of time will result in improved deliveries; and
• Local businesses owned by minority entrepreneurs will benefit.

The disadvantages of reverse marketing are:
• Assistance is required in purchasing raw material, setting up the manufacturing process, as well as the actual manufacturing of the product, which requires time and planning;
• Any waste and spoilage in the initial stage will be for the buyer’s account; and
• The cost of new equipment and tooling will have to be subsidized until the volume of business has developed to such an extent that it can absorb these costs (Heinritz et al., 1991:171).

2.13.4 Supplier training and problem solving
Dobler and Burt (1996: 437) argue that progressive organizations are fully aware of the extensive benefits gained by them when providing training to their suppliers. These organizations generally also provide their suppliers with active assistance and support when problems are encountered, in the realization that their success is dependant on their suppliers’ success. No longer do they view the suppliers’ problems as theirs to sort out alone.

According to Chadwick and Rajagopal (1995:71), suppliers are too often left to concentrate on just the little detail of their work, with scant opportunity to see how it fits in as a vital part of a greater whole. Suppliers are absorbed in their responsibilities and the day-to-day running of their own operation. This often results in a total loss of perception of the buying organization’s requirements and the impact they may have or not have on the buying organization.

Van Weele (2000:163) is of the opinion that the focus should also be on continuous improvement by establishing supplier improvement teams consisting of specialists from both parties. Ideas of cost reduction, technical information,
lead time reduction and service improvement must be exchanged. The entire supply chain should be analysed for possible improvement.

The ideal situation is that the suppliers should be seen as an extension of the purchasing organization. Saunders (1997:291) also states that the team concept has emerged in recent years as an ideal continuous improvement tool. The Honda Corporation in America, for example, has a best practice program which shows suppliers how to eliminate the seven major wastes in their production process, namely to reduce machines that are out of commission temporarily or for longer periods; reduce the excessive movement of material; defects and failures; production disturbance; over-production; lead time and stock (Van Weele, 2000:165).

Hughes et al. (1998: 49) contend that capturing and deploying innovation provided by suppliers ahead of competitors is a much neglected area of supply chain transformation. According to Scheuning (1989: 225), an organization has to conduct supplier clinics on a regular basis to discuss concerns and plans, and to stimulate supplier suggestions. The suppliers’ valuable perspectives should be used to capture new ideas, because they are closer to the customers and are continually exposed to innovations from other organisations. The increase in competition, complexity in technology, the cost involved and the time it would consume, make this impossible to undertake alone.

2.14 SUPPLIER DEVELOPMENT STRATEGIES

Hahn et al. (1990: 2) were among the first to propose a conceptual model for supplier development. In latter years, Krause et al. (2000: 33) characterized four useful supplier development strategies:

- Competitive pressure
  Organizations make use of market forces to develop competitive pressure by using multiple sources (Dyer and Ouchi, 1993: 51 and Tezuka, 1997: 83). With
the use of multiple suppliers to provide an item, an organization can distribute the volume of business such that the best performing supplier gets the higher volume of business. This motivates other suppliers to improve quality, while maintaining pressure on the primary supplier not to let performance deteriorate. Suppliers demonstrating improved performance may be rewarded with increased business over time (Tezuka, 1997: 83);

• Evaluation and certification system
The perception of the organization and its suppliers regarding the current and expected performance affects the performance of the supply chain. Routine supplier evaluation and feedback ensures that suppliers are aware of their performance and the customer organization’s expectation of performance. Firms use formal supplier evaluation systems and supplier certification programmes to communicate their expectation, plus motivate suppliers to improve performance (Carr & Pearson, 1999: 497 and Krause et al., 2000: 33);

• Incentives
To motivate a supplier, an organization can also offer incentives. They include the sharing of achieved cost savings (Giunipero, 1990: 19), giving consideration for increased volumes, future business and recognizing supplier improvements through awards (Krause et al., 1998: 39).

• Direct involvement
Organizations take a proactive approach to developing suppliers through direct involvement. Direct involvement can be in many different ways. A) The procuring firms can make capital and equipment investments in supplier operations, like an investment in dies and fixtures. B) Manufacturers can partially acquire the supplier firm. For example, manufacturers such as Toyota and Nissan typically have a twenty to fifty percent equity position in their largest suppliers (Dyer, 1996: 271). Such direct involvement involves huge financial investments by the procuring firm. C) Firms may choose to invest human and organizational
resources to develop supplier performance. Human and organizational resources are the knowledge the organization has accumulated over the years in its employees.

Knowledge is distinguished as being of two types: 1) explicit knowledge or information, which can be easily codified, such as facts and 2) tacit knowledge or know-how, which is difficult to codify, such as production knowledge.

The transfer of know-how can be extremely difficult and time consuming because it resides within the individuals and can only be observed through application, and acquired through practice.

2.15 SUPPLIER DEVELOPMENT IMPLEMENTATION

Many aspects of the supplier development implementation process are similar across most companies (Hahn, et al., 1990: 3). This is a five step processes that has to be followed to ensure the successful implementation of a supplier development process. The steps are:

- Gaining commitment from the suppliers' top management.
  Gaining commitment from the suppliers' top management for development is the most critical success factor. Management must set objectives, provide resources, remove barriers and reward change.

  The suppliers’ managers recognize the room for improvement within their firms and thus welcome the customers help. This is especially true in the automotive industry, with its intense pressure to lower costs. Without assistance, some suppliers have difficulty meeting cost reduction targets;

- Identify a leader in the suppliers’ organization.
  The suppliers’ project team leader is pivotal to the success of development efforts. A team leader must understand the firm’s processes and have strong
problem-solving skills. Having credibility with operators, middle management and top management throughout the firms is perhaps even more important. The leader must be able to persuade others in the firm that the change is necessary and beneficial to employees and the entire organization.

During development, suppliers sometimes suggest using someone who is merely available as team leader. In this case the customer must intervene to ensure that the team leader is the very best candidate the supplier has to offer. The most difficult challenge facing the team leader occurs after the initial customer intervention is complete. Continuing the change process can be very difficult as the suppliers’ normal day-to-day activities again begin to take precedence over improvement activities;

- Forming a capable buyer-supplier development team.
  Supplier development needs to be anchored firmly in both the customers’ and the suppliers’ organizations, leading to a joint team structure. To create the joint buyer-supplier team, the customers’ team joins forces with a cross-section of the supplier employees. Diversity increases the teams’ creativity. The size of the team depends on the size and amount of projects that will be handled by this team;

- Implementing data driven changes
  Before any changes are made, a development team must thoroughly understand the suppliers’ processes and systems. Historical supplier production performance data, such as downtime, daily production rates, cycle time, rework and scrap rates are used to pinpoint problem areas. If the supplier does not routinely collect this data, measures must be developed and data must be collected.

  Actual observation of the process is a key step for several reasons. On the shop floor, opportunities for improvement as elimination of waste motion or layout changes to improve ergonomics are often obvious to a trained outsider, who
doesn’t take the existing layout as a given. Another benefit of observing the process is that team members are able to interact with the shop floor operators. Through interaction, the team builds support for changes from among those employees who will be affected the most. Because the operators have firsthand experience with the process, they are the major source of improvement ideas; and

- Demonstrating success using a “model line”.

Success gets everyone’s attention. Most firms use a portion of their suppliers’ production plants called a “model line” to demonstrate the improvement techniques. Each model line selected is considered to have low hanging fruit so that changes can demonstrate dramatic results. The significant improvements in productivity that accrue from demonstrating the techniques using the model line generally win over those in the suppliers’ organization, such as middle managers and manufacturing engineers, who may have been skeptical of the potential benefits.

2.16 STRATEGIC SUPPLIER DEVELOPMENT PROCESS

The strategic supplier development process is founded on Krause et al (1998: 40) extensive research of how eighty four international companies deal with the subject supplier development. By analysing the respondents, Krause offers a validated model of the supplier development process that includes steps critical to supplier development activities.

Once supplier performance is measured and assessed, a supplier performance database identifies those suppliers that consistently are unable to perform. To further improve the performance and capabilities of the supply base, the firms should engage in supplier development.
Firms that had implemented the strategic approach to supplier development typically utilised a corporate-level executive committee to assess the relative importance of the goods and services purchased by the company or business unit. The result of this assessment was a portfolio of commodities that were essential for success in the targeted industry segment. Several companies used a purchasing portfolio analysis, which for example separates low-risk commodities from high-risk commodities, and low-volume purchases from high-volume purchases;
• Identify critical suppliers of strategic commodities
A majority of the companies that employed a strategic approach to supply base development did not only identify candidates for improvement by their poor performance. Instead they also often used a formal process where they analysed supplier performance, using a variety of different methods. One example was when a buying company benchmarked supplier performance to world-class performance expectations. If any performance gaps were identified, these suppliers were identified as supplier development prospects;

• Form cross-functional supplier development teams
The research states that it is important to use cross-functional teams to drive the supplier development effort. Core team members were often assigned on longterm or permanent basis, and included quality, procurement, operations and design personal. An alternative is to form ad hoc cross-functional teams to correct specific problems as they occur. A risk with the latter solution is that companies might loose the long-term benefits;

• Initiate communication with supplier’s management
The respondents indicated that the next step in the supplier development process involved approaching suppliers and arranging a meeting of the buying firm’s cross-functional team with top management at each of the suppliers. Here matters like improving the flow of materials, services and information between the supplier and the buying firm should be discussed to achieve mutual benefit;

• Identify critical performance areas for improvement to gain competitive advantage
At meetings with each supplier’s top management team, areas for improvement must be identified along with a specific measure for each area and in this phase the objectives for improvement must be set. In some cases, these objectives are driven by the buying firm’s customer expectations. In other cases, companies
shared technology road maps to identify opportunities for joint development of new technologies;

- Identify opportunities and probability for improvement
  Respondents indicated that once potential supplier development opportunities had been identified, they were evaluated in terms of feasibility, resources and time required to carry out the project, and potential return on investment. Some of the criteria used by the companies to evaluate opportunities included cost benefit analysis and the willingness and ability of the supplier to implement changes;

- Develop agreement on improvements and performance metrics
  Once a feasible supplier development initiative has been identified, the parties must come to an agreement on the specific metrics that will be employed to measure the success of the agreement. The agreement should also specify the role of each party that is responsible for the success of the project, and the manner and timing for deploying allocated resources;

- Deploy resources and implement development effort
  Once companies reach agreement with suppliers on performance metrics, the development effort must be put into motion. The companies emphasised that supplier development requires joint improvements by both parties, not just improvement on the part of the supplier. Moreover, there must be mutual deployment of resources, whether in the form of facilities, training, personnel, information, capital, and technology in order to sustain a successful development effort. The respondents indicated that a supplier is unlikely to fully embrace a set of changes required for improvement, unless there is tangible evidence that the purchasing organisation will support their efforts with matched resources;
• **Rewards and recognition**
Many of the researched companies used supplier recognition programmes to motivate the suppliers’ to continued performance increases after the supplier development effort is finished. These programmes varied from recognition in company newsletters to more formal and public recognition in the form of supplier award banquets and supplier council meetings. Furthermore many of the companies indicated that if progress toward continuous improvement was not evident in supplier performance evaluations, corrective action might be taken, including reducing or disqualification of the supplier’s share of business. This outcome contrasts markedly with successful suppliers that might be rewarded with repeat business, increased sales and profitable growth; and

• **Institute ongoing continuous activities**
Once a supplier development project has been completed, the supplier’s continued progress must be monitored and tracked over time. Ongoing exchange of information is needed to maintain momentum of such projects. The researched companies indicated that this momentum could be sustained by creating visible milestones for objectives, updating goals, open communication, and adopting continuous improvement strategies.

**2.17 CONCLUSION**
The principles of lean manufacturing and supplier development have been discussed so as to give the reader a good understanding of the disciplines of lean manufacturing and supplier development.

Lean manufacturing and supplier development are two very powerful approaches that an organization can engage in towards achieving a world-class supply chain. The focus should be on developing suppliers to become self-sufficient at developing, implementing and maintaining world-class performance on all tiers of the supply chain.
CHAPTER 3: RESEARCH METHODS

3.1 INTRODUCTION
Research methodology applies to ways the researcher approaches problems and seeks answers. This chapter describes the subject of the study and how it was selected for inclusion in this study and the methods used to gather information.

Much has been written about research. Some authors follow a philosophical approach to research design, while others follow a pragmatic approach. The importance of including both schools of thought in a study of research is increasingly emphasised by contemporary social scientists (Leedy 1993:143; Yin 1994:93; Neuman 1994:65)

The objective focus of this chapter is to establish an appropriate research strategy for a given research problem. The research strategies must be applicable to the problem.

The main objective of this research project was to eliminate non-value-added activities and increase company’s profitability while increasing production and reducing costs at the same time.

The purpose of this study was to determine the role GMSA can play in the development of a lean implementation strategy to its suppliers with the successful implementation of lean practices.

3.2 RESEARCH DESIGN
3.2.1 The concept of research
The concept research can be given various definitions. Mouton and Marais (1992:7) define research as a collaborative human activity in which social reality is studied objectively with the aim of gaining a valid understanding of it. The Oxford Dictionary (1995:1169) defines research as a systematic investigation into
sources in order to establish facts and reach new conclusions or collate old facts by the scientific study of the subject or by a course of critical investigation. Finally, Leedy (1993:11) define research as studious enquiry or examination, having for its aim the discovery of new facts and their correct interpretation.

A closer look at the latter definition of Leedy (1993:11) and Leedy and Ormrod (2001: 4) reveals the importance of the words discovery and interpretation in comprehending the nature of basic research.

The ideas are listed below:
- If there is no discovery, there is no research;
- There must be the interpretation of data for the enlightening awareness of what the facts mean;
- Research must always answer questions to solve problems;
- Research is a human activity that promotes critical thinking in a cross-functional approach; and
- Effective research is rational, systematic and is guided by constructive, critical assumptions and measurable data (Leedy 1993:12).

3.2.2 The concept of design
The Oxford Dictionary (1995:1169) states that design is a preliminary plan, concept of purpose. Yin (1994:20) defines design as the preparation of a working plan aimed at systematically assembling, organizing and integrating data, in order to solve the research problem. Leedy and Ormrod (2001:91) state that research design includes the planning, visualization of the data and the problems associated with the employment of the data in the entire research project.

Basic to design are four fundamental questions that must be resolved with respect to the data:
- Why are the data needed?;
- Where are the data located?;
• How will the data be secured?; and
• How will the data be interpreted?

3.2.3 Validity and reliability
There is a broad consensus amongst theorists on a framework for research design. Some researchers focus on the philosophical aspect of design (Mouton & Marais 1992: 7; Dooley 1995: 51), while others have developed useful pragmatic frameworks (Yin 1994: 34; Neuman 1994: 67).

The views of these authors have been consolidated into a conceptual model of decision steps. This model, as illustrated in Diagram 1, forms the foundation on which the research design for this research project has been based.

With any type of measurement, validity and reliability are very important. Validity is concerned with the soundness, the effectiveness of the measuring instrument.

The following questions can be asked:
• Does the measuring instrument measure what it is supposed to measure?
• What is the accuracy of the measurement?

There are several types of validity, the more common types according to Leedy and Ormrod (2001: 103) are:
• Face validity – relies basically upon the subjective judgement of the researcher;
• Criterion related validity – employs two measures of validity, the second as a criterion check against the accuracy of the first measure;
• Content validity – is the accuracy with which the instrument measures the factors or situations under study;
• Construct validity – is any concept such as honesty that cannot be directly observed or isolated;
• Internal validity – is the freedom from bias in forming conclusions in view of the data; and
• External validity – is concerned with the generalisability of the conclusions reached from a sample to other cases.

Reliability deals with the accuracy of the research.

According to Leedy and Ormrod (2001: 31), it is the extent to which, on repeated measures, the indicators yield similar results. Reliability in quantitative research projects can be evaluated by repeating a question in a questionnaire. Reliability asks one question above all others. With what accuracy does the measurement, test, instrument, inventory or questionnaire measure what it is intended to measure?

To maximize the validity and reliability of the research findings is the focus of research design.

According to Leedy (1993: 128), the use of human subjects in research raises the question of ethical standards and should not go without careful scrutiny.
DIAGRAM 1: A CONCEPTUAL MODEL OF RESEARCH DESIGN

Source: Structure of literacy study and theoretical model.
3.3 METHODOLOGICAL APPROACHES

There are three important contemporary methodological research approaches, namely: the positivist, interpretative and the critical approach. One of these approaches is usually adopted by researches. The researcher would then formulate a strategy that is consistent with the approach selected.

- The positivist approach

The positivist approach is the approach used in the physical sciences, and believes society is organised according to scientific observations and experiments (Dooley 1995:5). With this paradigm it is always possible to establish a cause and effect relationship between variables systematically and statistically. Scientists supporting positivism would argue that the general laws of science would be just as applicable to the social sciences as to the physical sciences. Positivist research is likely to do quantitative research and use experiments, surveys and statistics.

- The interpretative approach

According to the interpretative approach, doubt is expressed over the question whether it is always possible to establish cause and effect between variables in the social sciences. An example is the effect of poor project management decision-making on a project always be linked to a specific objective cause? The interpretative approach represents a reaction against an unqualified application of positivism in the social sciences. Instead of trying to explain causal relationships by means of objective truth and statistical analysis, hermeneutics provides a process to interpret, understand or re-construct reality. Language, pictures, sound, text and symbols play a central role in qualitative projects and replace quantitative data such as facts and figures as the primary sources of information (Neuman 1994:61).
• The critical approach

The critical approach is based on the argument that the researches cannot distance themselves from people in the research. They have to empower people through their research in order to bring about social justice (Neuman 1994:63). The relative success of the democracy in South Africa may in future be measured against its ability to conform to the requirement of the critical approach.

It is important to state that there is no specific method or technique associated with this research approach and this method or technique does not seem to be that important. According to Neuman (1994:63), researches using this approach show a preference for the historical method of research.

3.4 Models and modeling

Mouton and Marias (1994:138) describe the term “model” as one of the most ambiguous in the vocabulary of the social scientist. The term “model” and “theory” are frequently used as synonyms. Mouton and Marias (1994:138) maintain that a model performs a heuristic function as apposed to theory that performs an explanatory function.

Dooley (1995:348) defines a model as “one set of causal paths that can be compared with observed data”. According to Dooley (1995: 348) modeling is the process of constructing a model representing a designed, actual objective, process or system or a representation of a reality.

Emory and Cooper (1991:64) point out that there are three types of models; descriptive models, that seek to describe the behaviour of the elements in the system; explicit models, that seek to extend the application of the current theories; and the simulation models, that replicate current phenomena. The model to be used in this study is a descriptive model as the study sets out to
establish the role GMSA can play in the development of a lean implementation strategy.

According to Gains and Shaw (2004), descriptive exploratory research means that hardly anything is known about the matter at the outset of the project. The researcher begins with a rather vague impression of what should be studied, and it is also impossible to make a detailed work plan in advance. Gains and Shaw (2004) believe that in the absence of tried models or definite concepts, the exploratory study must start from what is available such as one or more objectives of study. Gains and Shaw (2004) believe it is common that in the beginning of exploratory studies, a holistic look at the objectives is taken, this means gathering as much information about the objectives as possible and the cutting away of unnecessary data to form a better picture.

The goal of research is to create a theoretical picture of the object of study which resides in the empirical world. All the theoretical knowledge, concerning empirical things, more or less makes up a picture of the empirical world. The researcher’s task is to construct a model of the objects of study into the world of theory (Gains and Shaw 2004).

According to Audet and d’Amboise (2001: 3), understanding a phenomenon that has barely been researched requires a qualitative approach that is both adaptive and innovative to give insight to this phenomenon. Strategic scanning must be done to gain an in-depth knowledge of the organisation’s environment. Audet and d’Amboise (2001: 14) define strategic scanning as the collection, dissemination and interpretation of information related to a company’s environment. Scanning is directed towards those sectors that are the most strategically uncertain.

To conclude, it is sometimes difficult to define what is relevant in advance, it only becomes apparent through research and analysis.
3.5 QUANTITATIVE VERSUS QUALITATIVE RESEARCH

Quantitative research is usually associated with positivism and qualitative research with interpretativism. It is best to visualize the distinction between quantitative and qualitative research as a continuum. All research methods could be placed somewhere between the extremes of pure quantitative and pure qualitative research (Neuman 1994:310).

It is plausible to indicate whether research projects have a more qualitative or more quantitative nature. This in turn would play an important role in decisions on process to follow and the measuring instruments to select (Mouton and Marais 1992:151). A summary of the differences between qualitative and quantitative research is given in Table 1.
<table>
<thead>
<tr>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Test hypothesis that the researcher begins with. Hypotheses are stated</td>
<td>• Capture and discover meaning once the researcher becomes immersed in</td>
</tr>
<tr>
<td>explicitly and are formulated beforehand.</td>
<td>data. Hypotheses are frequently undeclared or stated in the form of a</td>
</tr>
<tr>
<td></td>
<td>research goal.</td>
</tr>
<tr>
<td>• Concepts are in the form of distinct variables. Concepts have an</td>
<td>• Concepts are in the form of themes, motifs, generalizations, taxonomies.</td>
</tr>
<tr>
<td>ambiguous meaning.</td>
<td>Concepts can be interpreted in a number of ways.</td>
</tr>
<tr>
<td>• Measures are systematically created before data collection is</td>
<td>• Measures are created in an ad hoc manner and are often specific to the</td>
</tr>
<tr>
<td>standardized. The researcher remains largely aloof.</td>
<td>individual or researcher. The researcher is involved with the events /</td>
</tr>
<tr>
<td></td>
<td>phenomena.</td>
</tr>
<tr>
<td>• Data are in the form of numbers from precise measurement.</td>
<td>• Data are in the form of words from documents, observations and transcripts.</td>
</tr>
<tr>
<td>• Theory is largely causal and is deductive.</td>
<td>• Theory can be causal or non-causal and is often inductive.</td>
</tr>
<tr>
<td>• Procedures are standard, and replication is assumed.</td>
<td>• Research procedures are particular, and replication is very rare.</td>
</tr>
<tr>
<td>• Analysis proceeds by using statistics, tables or charts and discussing</td>
<td>• Analysis proceeds by extracting themes or generalizations from evidence</td>
</tr>
<tr>
<td>how what they show relates to a hypotheses.</td>
<td>and organizing data to present a coherent, consistent picture.</td>
</tr>
</tbody>
</table>

Source: Neuman (1994:317); Mouton and Marais (1992:159)
An important choice that researchers face is the research methods to be used. Leedy (1993:145) believes that the answer to this question can be found in the nature of the data, the problem of the research, the location of the data, obtaining of data and the intention with the data. If the data is verbal, the methodology is qualitative, if it is numerical; the methodology is quantitative.

- **Quantitative research**

Mouton and Marais (1992:159) define quantitative research as more highly formalized as well as more explicitly controlled, with a range that is more exactly defined, and which, in terms of methods used, is relatively close to the physical sciences. Once again this definition shows a preference for the positivist approach.

Quantitative research seeks to quantify, through numbers, observation about human behaviour. The emphasis is on precise measurement, the testing of hypotheses base on a sample of observations, and a statistical analysis of the data. Relationships among variables are described mathematically and the subject matter is, as in the physical sciences, treated as an object. Variables play key roles in quantitative research. Variables take on two or more values. Attributes, on the other hand are the values of categories of a variable and people sometimes confuse variables with attributes.

A quantitative research project would usually test the most important causal links to be found in the research domain. The relationship between variables is usually expressed as a hypothesis, and hypotheses are tested to answer the research question or to find empirical support for a theory (Neuman 1994:99).

- **Qualitative research**

Qualitative research relies on interpretative and critical approaches to the social sciences. The aim of qualitative research is to study individuals and phenomena in their natural settings in order to gain a better understanding of them. It is also
evident that qualitative research does not follow a fix set of procedures. A set of strategies and tactics will have to be developed by the researcher in order to organize, manage and evaluate the research (Neuman 1994:317; Dooley 1995:258). Quantitative researchers manipulate figures and statistics, the data of the qualitative researcher is in the form of words, sentences and paragraphs. Qualitative research is more at risk in terms of validity and reliability (Miles & Huberman 1994:2).

Mouton and Marais (1992:155) define qualitative research projects as those in which the procedures are not strictly formalized, while the scope is more likely to be under-defined, and a more philosophical mode of operation is adopted.

It is not always easy to describe the meaning of qualitative research and it is also not always possible to classify methods in terms of the level of qualitativeness. According to Miles and Huberman (1994:7), these features can be referred to as core and recurring features for naturalistic studies, configured and used differently in any particular research tradition.

3.5.1 Inductive versus deductive logic
According to Patton (1994:15), qualitative research methods are particularly orientated towards exploration, discovery and inductive logic.

- Inductive designs begin with conjecture, guesses, ideas and expectations;
- No hypotheses are designed, nor are any theory-building exercises performed;
- Data is collected through observation, interviews and other qualitative methods; and
- The product of the research is a new model, theory or hypotheses.

On the other hand, quantitative research methods support deductive reasoning and analysis. Deductive design begins with an explicit conceptual framework
developed from existing theory and models. It requires the development and formulation of specific research hypotheses leading to a theory-building exercise. A known data collection instrument, the fixed alternative questionnaire, is used to collect the data. The hypotheses are accepted or rejected and a causal relationship between variables is established (Miles & Huberman 1994:44; Dooley 1995:65).

3.5.2 Choosing the most appropriate qualitative research method
The model shown in Table 2 can solve the problems of a qualitative method.

**TABLE 2: RESEARCH METHODS SELECTION MODEL**

<table>
<thead>
<tr>
<th>Form of research question</th>
<th>Requires control over behavioural events?</th>
<th>Focuses on contemporary events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>How? Why?</td>
<td>Yes</td>
</tr>
<tr>
<td>Survey</td>
<td>Who? What?</td>
<td>No</td>
</tr>
<tr>
<td>Archival analysis</td>
<td>Who? What?</td>
<td>No</td>
</tr>
<tr>
<td>History</td>
<td>How? Why?</td>
<td>No</td>
</tr>
<tr>
<td>Case study</td>
<td>How? Why?</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: Adapted from Yin (1994:6)
The most appropriate research method or strategy to use depends on three conditions:

- The type of research question posed;
- The extent of control an investigator has over actual behavioural events; and
- The degree of focus on contemporary as apposed to historical events.

3.5.3 Triangulation

Leedy (1993:143) describes the situation where it is possible to combine qualitative research methods with quantitative research methods in the same project. This process is called triangulation and many research projects could be enhanced considerably if a triangulation approach were taken.

According to Leedy (1993:143), the triangulation method could include various methods such as interviews, Likert type questions and focus groups.

In Diagram 2; the interactions between quantitative and qualitative research are illustrated.
**Diagram 2: Interaction between Quantitative and Qualitative Research**

The Methodology of research

- **Qualitative research** (Data: principally verbal)
  - Observations
  - Survey studies
  - Historical studies
  - Case studies
  - Unstructured interviewing

- **Quantitative research** (Data: principally numerical)
  - Surveys
  - Experimental studies
  - Quasi-experimental studies
  - Statistical-analysis studies

**Triangulation**
A compatibility procedure designed to reconcile the two major methodologies by eclectically using elements from each of the major methodologies as these contribute to the solution of the major problem

Source: Adapted from Leedy (1993:145)
3.6 DATA COLLECTION

Research is a viable approach to a problem only when there are data to support it. Data refers to those pieces of information that any particular situation gives to an observer. According to the different research approaches and its design, the methods of data collection are different. Basic to research design are four basic questions about the data posed by Leedy and Ormrod (2005:104):

• What data are needed?;
• Where are the data located?;
• How will the data be secured?; and
• How will the data be interpreted?

There are mainly two types of data involved in the research which are primary data and secondary data. Primary data are the new data that are collected for the research project, while secondary data are available data from sources other than the current research project. As in the case of this study, researchers need to collect data from either primary or secondary sources in order to provide adequate information and the comparativeness of the data (Leedy & Ormrod, 2005:89).

3.6.1 Primary data

Researchers might use observation, interviews, objects, written documents, audiovisual materials, electronic documents (e.g. e-mail messages, Web-sites) and anything else that can help answer research questions (Leedy & Ormrod, 2005:140). The primary data can be collected by the following methods:

• Interviews

In either qualitative research or quantitative research, interviews are composed of two types, personal interviews and telephone interviews. Advantages and disadvantages of both interview types are described as follows (Leedy & Ormrod, 2005: 141):
• Personal interviews. An advantage of personal interviews is that the respondents are willing to co-operate in terms of good response rates while the disadvantage is that it is expensive and time consuming in terms of transport costs and long lead time; and

• Telephone interview. An advantage of telephone interviews is the quick and direct response from respondents, lower cost compared to the personal interviews. However, it is difficult to obtain sufficient quality answers from respondents as the respondent may lose interest if the interviewer asks lengthy questions.

• Observations
Observations conducted in quantitative research are structured and objective while in qualitative research observations are intentionally unstructured and free flowing (Leedy & Ormrod, 2005). When the observation method is used, data is collected by recognizing and noting people’s behaviour, objects and occurrences. The major advantage of this method is that the researcher does not have to rely on the willingness and ability of respondents to report data accurately.

• Literature review
In this study, the researcher needed to collect information by conducting literature review. Data collected in the literature review are mainly from library resources and internet resources.

3.6.2 Secondary data
Secondary data can be classified into three broad categories, namely raw data already collected; summaries of numbers and, written treatises. Researchers must examine the reliability and validity of the data as the secondary data may have been gathered and tabulated using different definitions of key terms.

Four questions should be considered when collecting secondary data (Leedy & Ormrod, 2005):
1. What should be read?;
2. How should the source be read?;
3. What should be recorded or noted?; and
4. How should material be recorded or noted?

3.7 RESEARCH GOALS
The research goals provide a broad indication of what the researcher wishes to accomplish with the research. The researcher needs to determine whether the aim of the project is to describe, explain or to explore (Neuman 1994:18).

3.7.1 Descriptive projects
The primary aim of descriptive projects is to accurately portray the characteristics of a particular individual, group, situation, organization, tribe, sub-culture, interaction or social objective. The outcome of a descriptive project is a detailed picture of the subject.

The aim of descriptive projects may be to:
• Provide an accurate profile of a group;
• Describe a process, mechanism or relationship;
• Give a verbal or numerical picture;
• Find information to stimulate new explanations;
• Present basic background information in context;
• Clarify a sequence, set of stages or steps; and
• Document information that contradicts prior belief about a subject.

The description of some phenomena may arise from a narrative type of description as in an historical analysis to a highly structured statistical analysis (Mouton & Marais 1992:43; Neuman 1994:19).
3.7.2 Explanatory projects

Explanatory projects are built on exploratory and descriptive projects and furthermore, identify the reason something occurs. To test a hypothesis of a cause and effect relationship between variables is the primary aim of explanatory projects. A given phenomenon is explained in terms of specific causes (Mouton & Marais 1992:46; Neuman 1994:20).

The aim of explanatory projects may be to:

- Determine the accuracy of a principle or theory;
- Find out which competing explanation is better;
- Advance knowledge about a underlying process;
- Link different issues or topics under a common general statement;
- Build and elaborate a theory so it becomes more complete;
- Extend a theory or principle into new areas or issues; and
- Provide evidence to support or refuse an explanation.

3.7.3 Exploratory projects

The main aim of exploratory research is the exploration of a relatively unknown topic, situation or phenomenon.

The objective of such a project may be to:

- Gain new insight into the phenomenon by becoming familiar with facts, people and concerns involved;
- Undertake a pilot investigation and determine feasibility before a more structured study of the phenomenon;
- Generate many ideas and develop tentative theories and conjectures;
- Determine priorities and develop techniques for future research; and
- Develop new hypotheses about an existing phenomenon.

Exploratory projects usually lead to insight and comprehension rather than the collection of accurate and replicable data. The methods frequently used in
exploratory projects include in-depth interviews, the analysis of case studies and the use of informants (Mouton & Marais 1992: 43; Neuman 1994:18).

**3.8 RESEARCH STRATEGIES**

Mouton and Marais (1992:49) believe it is possible to distinguish between the different types of research strategies.

Yin (1994:5) points out five different types of research strategies:

- Case study;
- Experiments;
- Surveys;
- Histories; and
- Analysis of archival information.

Each of these five strategies has their advantages and disadvantages, which depends on three circumstances:

1. The sort of research question;
2. The degree of control over the actual behavioural events;
3. Is the focus on contemporary phenomena versus historical events?

Yin (1994:6) defines a case study as “an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”.

**3.9 RESEARCH PROCEDURE FOLLOWED**

The main objective of this research project was to eliminate non-value-added activities and increase company’s profitability while increasing production and reducing costs at the same time. The purpose of this study is to make GMSA’s suppliers aware of the principles and processes of lean manufacturing and to develop a lean implementation strategy to assist organizations with the successful implementation of lean practices.
Research design

The participants in this study were four senior managers of General Motors South Africa. Following a review of the related literature, an interview session was used to gather data from the management team of General Motors South Africa.

This research will address the following questions:

- What are the benefits of implementing lean manufacturing for GMSA?;
- How can GMSA benefit by having suppliers trained in lean practices?; and
- What are the options of supplier support & development that GMSA can pursue to support suppliers in the set-up of lean practices?

The research objectives of this study were to:

- Identify the benefits as to why the manufacturing industry should learn more about lean manufacturing processes and not to be concerned with the size of a company; and
- Identify approaches that can be used to redirect non-value-added activity into value-added activity in order to improve efficiency of production.

Instrumentation: Interview

The intention was to elicit an honest, straightforward response from the senior managers about their attitudes and perceptions toward lean manufacturing. The researcher conducted the interview sessions at the offices of General Motors South Africa. The purpose was to gather data from the managers of General Motors South Africa on the importance of lean manufacturing, to identify the key points of making corporate changes within the organization, identify solutions to stay competitive and evaluate the training encountered by the employees and employers. The instrumentation process involved an interview questionnaire. The research instrument was developed for the study and as such the questionnaire and the data obtained from the questionnaire were original. The questionnaire was designed to determine the role GMSA can play in the development of a lean
implementation strategy that is capable of implementing continuous improvement for a long term. The main purpose of the interview was to attain answers to the objectives previously discussed in the methodology introduction and research design section. In order to collect and classify the main data for this research project, the questionnaire was chosen as a research tool.

Sample collection
To accomplish the objectives of this study, interview sessions were conducted with four senior managers of General Motors South Africa. The researcher selected the interviewees from the following departments within General Motors South Africa: Global Purchasing and Supply Chain; Supplier Quality and Development; Vehicle Assembly Operations and Material Supply. The interviewees from General Motors South Africa were identified as qualified data sources for this research project, as their professional opinions and viewpoints could best address the research questions.

Research procedure
The interviews were conducted by October 31, 2007 at the offices of General Motors South Africa. During the interviewing sessions the interviewees were given questionnaires. The interviewees were only asked the questions which the researcher had prepared in advance. Prior to the date of interview sessions, the interviewees were informed that the participation in the study was voluntary, and there were no consequences for choosing not to participate. Their answers were recorded by digital recorder for quotation and analysis purposes. The fundamental background of lean manufacturing and supplier development will be learned by information gathering from academic books, the Internet, and various academic journals.

Data Analysis
The data collected during the interview sessions was analyzed to determine the scale that raising potential profit through increased production size or reduced
operational costs at the same time. Data analysis for this study consisted of compiling responses to open-ended questions. All open-ended responses were listed by the researcher and summarized into appropriate headings. The data is clearly displayed through appropriate headings that could potentially be improved. Qualitative data was analyzed by identifying and organizing the qualitative responses that introduced distinctive concepts. The following chapter displays a complete review of the data gathered at the interview sessions.
CHAPTER 4: RESULTS

4.1 INTRODUCTION
This chapter reports on the results from the interview sessions with the management group from General Motors South Africa. The data gathered from the interview questionnaires based upon the responses of the management group from General Motors South Africa was used to meet the objectives of this study.

The research objectives of this study were to:
- Identify the benefits as to why the manufacturing industry should learn more about lean manufacturing processes and not to be concerned with the size of a company; and
- Identify approaches that can be used to redirect non-value-added activity into value-added activity in order to improve efficiency of production.

The interviewees provided responses that assisted in meeting the objectives for this research study. The following questions were the questions used in the interview session instrument.

4.2 INTERVIEW SESSION REVIEW
1. How do you define lean manufacturing? Interviewees responded that lean manufacturing is a philosophy or strategy eliminating non-value-added or waste in a business environment.

2. What are the benefits of lean manufacturing? Interviewees responded that a typical benefit is usually to have a reduction of floor space requirements, and increase capacity of the units produced. It would also reduce direct labour costs, indirect labour costs and floor activity improvements. Interviewees responded that organizations also expect cycle time reduction, WIP reduction and inventory reduction.
3. What techniques are used by lean manufacturers? Interviewees responded that diagnostics need to occur before actual implementation of Lean. Then the need arises to start working on a value stream mapping tool. It is a graphical and a quantitative review of the current state of the organization. This is a projection of what the future state might look like. Some other tools that might be used to implement Lean is set up production, kanban system, pull system, preventative maintenance, process kanbans, material kanbans and line balancing. Those are the tools of lean might be used for the company of traditional batch manufacture into lean manufacture environment.

4. What is the history of lean manufacturing? Interviewees responded that lean manufacturing can be traced as the Toyota Production System (TPS). TPS is the origin of the assembly line. Most of the companies and most teachings credit lean manufacturing back to the TPS.

5. When an organization does not have a budget to implement lean, how much does it cost to implement lean manufacturing? Interviewees responded that how much money an organisation has will determine how much money organizations can spend. It is based on plant capacity, finance and time. Interviewees also responded that it can be inexpensive. Interviewees speculated that usually a smaller shop’s ability to change is more significant than a big company. Big organizations have bigger organizational cultures and egos. Therefore, it’s usually slower to implement lean thinking in bigger organizations. Smaller companies have limited financial status but typically they can implement lean much quicker and more aggressively than bigger companies.

6. Can lean manufacturing be implemented in any size organization; big or small? The interviewees responded that a common misunderstanding of lean is that many people think lean is only for high volume and repetitive product manufactures. Interviewees speculated that even though a lean concept in
high volume and repetitive product manufacturers is advantageous, the biggest return of investment is in small job shops.

7. Can lean methodologies be applied to the administration and indirect areas of a business? Interviewees responded that lean is the way of eliminating waste. Wherever waste exists or non-value-added activity exists, the concept of lean can be applied.

8. How is the effectiveness of lean implementation measured? Interviewees responded that the effectiveness of lean is measured from a financial standpoint, especially in the manufacturing industry. Interviewees speculated that financial measures often lead one in the opposite direction of lean thinking. The best way to measure the effectiveness of lean is with the ratio of value-added and non-value-added time. Interviewees responded that the ideal way to measure value-added time is calculating the percentage of total times of value-added time.

9. What kind of waste does lean manufacturing eliminate? Interviewees responded that organizations could eliminate time. Waiting is the biggest waste of time in all organizations. Waiting for machines, people or products has a direct correlation to costs.

10. Some companies seem to use lean manufacturing as just another way of getting rid of people’s jobs. Job security is one of the biggest issues for front line staff or shop floor people. Is that a purpose? Interviewees responded that company’s values are varied. There are two sides of the equation for making money. Organizations can increase output with the same input or keep the same output with less input. Otherwise, organizations can keep constant output while reducing the input in order to make more profit. Interviewees responded that the implementation of lean can reduce the input required
while increasing the output. It is very important to understand the balance of reducing both input and output ratio.

11. How do you deal with employees or suppliers who resist the change to lean manufacturing? Interviewees responded that resistance to change is the most difficult thing to deal with. Most times, people do not like to change because people like the things as they were and want to keep the things as they are. Interviewees responded that this is human nature. It depends on the personality of the individual and each situation. In a lean implementation process, dealing with changes, motivating people with new environment and having management to deal with employees who do not want to change are the most difficult part. When an organization have well trained employees, the work will be very enjoyable. Following discipline and having an efficient work process makes everybody a lot happier in the long run.

12. How do you define supplier development? Interviewees responded that supplier development forms part of the monitoring of the supplier quality process. Supplier development mainly focuses on making sure the supplier delivers the correct quality level material to the plant, so as to prevent any component failures out in the field. This process is managed on two levels. The first is managed by the advanced quality team who look after projects up to implementation and a current quality team whose main focus is on maintaining the standard of quality as implemented by the advanced quality team.

13. How does one identify which suppliers to develop? Interviewees responded that supplier development requires substantial commitment of resources by both firms. Therefore, the selection of which suppliers to develop is a strategic decision rather than simply reactive. Cost is one of the key considerations.
14. Why develop suppliers? The interviewees responded that customers typically have two objectives for supplier development programmes. The first is to reduce cost, improve quality, and improve delivery performance by completing projects jointly. The second objective is to teach the suppliers a systematic process they can use to continue making improvements.

15. What are the benefits of supplier development? Interviewees responded that a typical benefit is usually to have a reduction in field concerns, and customer complaints. It would also reduce lost time as a result of poor quality components being delivered to the production facility. Interviewees responded that suppliers are measured based on a part per million (PPM) rating scale and poor performing suppliers would be given focus based on supplier development.

16. How is the effectiveness of supplier development measured? The interviewees responded that the effectiveness of supplier development is measured at the production plants based on incidents per thousand vehicles (IPTV). The target for GMSA is 6 IPTV.

17. Why does supplier development work? The interviewees responded that supplier development works for several reasons. One of the main reasons identified by the interviewees is the fact that many suppliers would like to improve their processes and systems, but frequently find themselves caught up in daily activities and therefore welcome the support from the customer.

18. How do you deal with suppliers who do not want to be part of the supplier development programme? The interviewees responded that supplier development is a mutually beneficial process for both the customer and the supplier and it would be naïve for a supplier not to be part of this process. Therefore, it is unlikely that a supplier will not participate. However, if it should
happen the supplier will most probably not have a long term future with the customer.

19. What are the key factors to sustaining the improvement process? The interviewees responded that four factors are important for sustaining the improvement process within the supplier base, namely 1) hands-on training of supplier team members, 2) follow-up and measurement on a regular basis, 3) fit of the approach to a firm’s corporate culture and 4) the support structure within the supplier’s organization.

20. What are the barriers to change experienced by suppliers? The interviewees responded that organizational policies and procedures are often barriers to change in the supplier base. People can also sometimes be a major obstacle to change. Employees seem to be more susceptible to change when they know the customer is driving the change process.

21. Is supplier development the tool to improve the supply chain? The interviewees responded that in the long run, creating a responsive value chain composed of fewer suppliers and closer working relationships may prove to be the critical competitive tool for all the firms in a value chain. From the perspective of the suppliers, the ability to learn and adopt the improvement techniques their customers demonstrate may provide them with the critical competitive advantage they need to succeed. The most successful suppliers will be those that have the ability to continue improving their performance beyond their customers’ requirement.

The information gathered in this part of the study revealed that the managers at GMSA have competent philosophies in place on lean manufacturing and supplier development. The one area of concern is the lack of emphasis placed on the execution of lean manufacturing and supplier development philosophies amongst its suppliers.
CHAPTER 5: SUMMARY; CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION
This chapter contains the conclusions and recommendations drawn from all the information gathered in the previous four chapters. Based on the findings, a number of conclusions are made, with specific recommendations suggested for each conclusion. This chapter is divided into three sections:
- A summary of the study;
- Conclusions based on the results of the study; and
- Recommendations for further study.

5.2 SUMMARY
This section addresses several elements as related to this study. Included in this section will be a restatement of the problem and a review of the methods and procedures used to gather all the information found in this research.

Restatement of the problem.
The purpose of this study is to make GMSA’s suppliers aware of the principles and processes of lean manufacturing and to develop a lean implementation strategy to assist organizations with the successful implementation of lean practices. In order to correctly implement and sustain lean manufacturing practices this study will also focus on supplier support and development, and the development of an efficient organizational culture that is capable of implementing “Continuous Improvement” for a long term.

The research objectives of this study were to:
- Identify the benefits as to why the manufacturing industry should learn more about lean manufacturing processes and not to be concerned with the size of a company; and
- Identify approaches that can be used to redirect non-value-added activity into value-added activity in order to improve efficiency of production.
This research addressed the following questions:

- What are the benefits of implementing Lean Manufacturing for GMSA?;
- How can GMSA benefit by having suppliers trained in lean practices?; and
- What are the options of supplier support & development that GMSA can pursue to support suppliers in the set-up of lean practices?

5.3 METHODS AND PROCEDURES
The method used for gathering all the information in this research was obtained by information gathering from academic books, the Internet, and various academic journals. The researcher also conducted interview sessions with four senior managers of General Motors South Africa. During the interviewing sessions, the interviewees were given a direction questionnaire which the researcher prepared in advance. The purpose of this study was to determine how the business should be implementing the lean manufacturing process. The interviewees from General Motors South Africa were identified as qualified data sources for this research project, as their professional opinions and viewpoints could best address the research questions.

5.4 CONCLUSION
The research and the senior managers from General Motors South Africa who participated in this research indicated and mentioned the many benefits of the lean manufacturing process. Whatever the industry, many organizations agree that lean thinking and lean manufacturing processes are the continuous process that must be driven even further down the supply chain. The positive compensation of lean implementation in the near future can be significant and remarkable. Lean environment involves the total elimination of waste due to providing customers with high quality products within targeted delivery due dates at an efficient cost.

It is important for General Motors South Africa to establish goals for the supplier development programme. The first objective is to assist suppliers in the
successful implementation of lean supply methodologies within their manufacturing facilities. It is extremely important to set realistic goals and both General Motors South Africa and the supplier must accept the goals. The programme must also be well communicated and understood by the supplier. The supplier must accept and support the development programme one hundred percent. Any misunderstandings of the intent of the supplier development programme will make it less effective. Therefore, it is recommended that the obligations of the supplier should be stated in the contract.

The following were a few important findings from the literature review and the interview sessions.

5.5 MAJOR FINDINGS

- What are the benefits of implementing Lean Manufacturing?

This research indicates that the labour force will be definitely flexible, and all the workers would have the ability to move from one workstation to another while maintaining the highest production rate and operation standards. Furthermore, an organization will see the total elimination of non-value-added time because of the efficiencies achieved by practicing Lean thinking. Production levels will be stabilized because of improved operation systems, standardized work processes and improved labour skill and knowledge. By defining success in implementing lean manufacturing processes into the organization, the overall focus will be on operational systems and processes that affect the organization’s manufacturing operational level. This will include the workforce, machine productivity to products, operational costs, finance and engineering processes. This will be done with the view to improve the plant’s productivity and often its quality performance as well.

Most of the organizations that are focusing on quality in process are more likely to see significant improvements in productivity of their quality products. Those two areas are intimately linked to each other because when an organization is
improving one aspect, it will usually improve the other aspect at the same time. Organizations paying attention to the simplified work process often is the resulting benefit of high quality products with less resources and capital. Moreover, improved process engineering and product design will reduce the need for inspections and quality control activities at the plant. Less rework can be done at the end of the work process, as well as fewer defects at the customer level.

- Can lean manufacturing be implemented in any size organization; big or small?

Lots of manufacturers have expressed their doubts about lean manufacturing implementation. Often, manufacturers assume that lean is only for high volume and repetitive manufacturing operations. However, the reality is that, in most respects, lean manufacturing processes can be implemented faster, cheaper and better in a small job shop. Smaller job shops have a smaller number of people, this make it easier to implement. While implementing lean concepts into bigger organizations, teamwork is a critical point to the success of lean manufacturing. Organizations must recognize how to best provide the leadership, training, support from management and the understanding required for the lean system to succeed. A lean environment requires that management should go to the shop floor more often and pay special attention to the employees who are actually doing the job.

- How is the effectiveness of lean implementation measured?

When organizations would like to track lean progress, performance measures are essential. Performance measurement is a critical aspect, but primal targets after the implementation of lean manufacturing processes must be more than cost reduction. Lean thinking and processes need to provide proper customer driven quality production systems and not be internally focused. Performance targets have to consider not only cost reduction, but also standardisation of work and the long term continuous improvement of their work processes and quality. Lean
thinking will offer a positive approach and methods for meeting these objectives. The best approach is to merge the principles, objectives, tools and methodology behind lean thinking into the strategic and business plans of the organisation. Researchers in previous chapters indicate that common performance measures and typical targets for improving through lean implementation are listed below.

- **Lead-time**
  Speed and consistency of quality product delivery is one key factor among many customers. Customers are seeking the supplier who could offer the shortest lead-time possible and consistent delivery;

- **Cost and Price**
  Usually customers are seeking the lowest product cost possible. Make sure to use lean thinking to reduce costs along the whole supply chain, while sustaining high quality products and service; and

- **Consistency**
  Customers are looking for vendors who consistently can deliver a high quality product. One key measure for lean process is that fixed standards of work processes can be set and acceptable variances can be established. When lean manufacturing is employed, organizations are able to track and analyze the outcome to identify the organizations’ major quality problems. When lean manufacturing is deployed in the correct way, organizations can expect reductions in scrap, rework, returns and waste from the customers.

- **How do you deal with employees or suppliers who resist the change to lean manufacturing?**
  One of the common mistakes that organizations make while implementing lean manufacturing processes is assuming that lean systems are going to be one small process change over their existing operational system. The implementation of lean manufacturing process is a continuous and often rough road to follow.
The concepts of lean thinking can be difficult for all the labour force who are experienced in mass production techniques. In addition, lean concepts such as stop producing products when there is no reason to produce them, would be hard to understand for managers and operators. Resistance from those operators and managers can be expected. They will need to be gently brought round over time to the lean way of thinking. Organizations must make sure that their entire labour force completely understands the necessity of changing the production method into the lean way. If necessary, organizations need to begin with a needs analysis to evaluate their work processes, their existing technical knowledge, and the impact the system will have on their roles. This research indicates that lean thinking usually requires managers and employees to do more or different tasks that do not add obvious value to their jobs. It can be very confusing for managers and employees why they need to do some extra work that they have never needed to do before, especially if managers do not understand why that work process is important to produce high quality products, they will find ways to work without it. Organizations really need to make an effort to connect the task back to the managers and employee’s key performance measures. Otherwise, no labour force will make a commitment to practice lean manufacturing processes. Knowing the commitment of top management is critical in the process of creating a climate of change where employees are not afraid to try new systems.

- What is supplier development?

Most medium to large size organizations have supplier development programmes in place. Most of these programmes however, are nothing more than supplier quality award programmes, in which suppliers receive an award for maintaining a certain level of quality and on-time delivery. While there is nothing wrong with this, it falls short of what is truly needed in a successful supplier development programme.

At a minimum, a supplier development programme should be aimed at achieving the following:
• Lower supply chain total costs;
• Increased profitability for all supply chain participants;
• Increased product quality; and
• Near perfect on-time-delivery at each point in the supply chain.

Most supplier development programmes do not do enough to meet these goals. Supplier development is actually developing suppliers in much the same way employees are developed. Those organizations that do well in this area provide the training, tools and incentives that will make the supplier and the organization successful. Thus, a supplier development programme must be aimed at improving suppliers’ performance, not browbeating them into reducing costs or simply auditing and rewarding them. Instead, supplier development is all about providing suppliers with what they need to be successful in the supply chain. Two of the most important aspects of a supplier development programme are:

• Providing information about products, expected sales growth and size of market etc. Poor communication is one of the biggest wastes with a lean supply chain. Lack of information translates into additional costs, usually in the form of buffer inventory. Suppliers need to become extensions of their customers; and

• Training in the application of lean and quality tools. Asking suppliers to drop their price without giving them the know-how to lower their costs through lean implementation is not sustainable in the long-term. In other words this will drive suppliers out of business, which goes against the purpose of supplier development.

If suppliers have more information about the entire supply chain and have a true lean transformation underway, they would become more profitable and provide a better quality and lower-cost product on-time.
• Why involve suppliers in the company’s lean journey?

This research indicates that the five principles of lean are:
• Specify value;
• Identify the value stream;
• Flow;
• Pull; and
• Perfection.

Each of the five principles will be examined in the context of supplier involvement in a lean programme. In most cases supplier involvement falls into perfection, that is, involving suppliers is part of seeking perfection.

• Specify value. Value is defined by the customer. The end customer defines value as does each customer in the entire supply chain process. If an organization are on a lean journey and involve suppliers, the organization are the customer to the tier one suppliers, the tier one suppliers are the customers to their tier two suppliers, etc. looking at the entire value stream helps determine what creates value for each customer in the process, as well as the end customer. For manufacturers whose products consist of many purchased components, understanding the entire value stream and what customers need at each point is critical. Leaning the internal operations of such an organization is good; however, stopping at this point would be a mistake.

• Identify the value stream. The value stream includes all of the information and material flow steps necessary to bring a product to the end customer. This obviously involves suppliers. In many cases, both the information and material flows going in and out of each player in the value stream are full of wastes that would go unseen without mapping the value stream.

• Flow. Flow means moving material or information from one value-added step to the next with as little delay as possible. In many cases it is
associated with internal manufacturing only. However, it is applicable to both information and material flows within an extended value stream. Having information flow through the value stream without delays or errors can result in dramatic improvements in customer service and reduction in lead-time and inventory. Better material flow inside supplier plants and between plants can result in improvements as well.

• **Pull.** This is a very obvious implication for suppliers. Most organizations do not pull from suppliers, and many of those who do have pull systems in place are pulling from a supplier that is operating in mass production mode. This means that additional costs, in the form of inventory, defects, and other wastes are inside the supplier’s manufacturing facility. Any customer that assumes that those costs are not passed on to him is naïve. Thus, it is important to set-up true pull systems with suppliers, who have bought into the philosophies of lean.

• **Perfection.** For the extended value stream, seeking perfection simply means continuing to remove wastes in the entire value stream by working closely with suppliers on programmes such as product design for manufacturability, supplier associations and other programmes that aim at leaning the value streams.

### 5.6 RECOMMENDATIONS

Based on the review of literature and the findings of this study, the following recommendations are made for further investigation:

• This study involved only a small segment of the General Motors South Africa management group. The sample size for the volunteer interview could be larger. A study that involves the entire General Motors South Africa management group would seem appropriate. Especially for the following areas; Procurement, Material Supply, Quality and manufacturing;
The research indicates that there are varieties of methods for success when implementing lean manufacturing into an organisation. A research of all the different methods to implement lean would be helpful in determining how prevalent and different the methods would be; and

For further study, the researcher can conduct a study on the actual implementation of lean manufacturing process through the entire supply chain including a supplier (first & second tier) through supplier development in the lean journey.

The study found there is a significant amount of information available about lean manufacturing tools and techniques, and that many people do not realize that lean manufacturing is a philosophy. When organizations implement this philosophy, they can avoid total waste in the manufacturing system. The study also points out the importance of involving employees and suppliers in the lean journey.

Many lean efforts are industrial engineering initiatives driven from the manager with little employee input and involvement. Each employee must be given the tools, training and the opportunity to provide input as to how his or her job should be done.

Involve suppliers in the process of lean implementation. Lean requires a change in the way supplies are bought and final products are sold. More frequent deliveries, less inventory and less lead-time cannot be achieved without supplier and customer involvement.

The researcher encourages organizations to develop a supplier development programme that will positively impact on the organization’s business, as supplier development can help the organization to reduce costs, streamline operations and minimize defective products.
A generalized process for managing supplier development projects is presented in the following six steps:

Step 1: Initiating the project.
The main activities are to develop and confirm a preliminary supplier development charter, define the supplier’s processes, assess the customer’s needs and assess the business environment;

Step 2: Mapping and measuring.
In this phase, the team maps the supplier’s process and determines the measurement required. Deliverable from this phase include: process maps, a final project charter and a baseline of "before" process improvement status;

Step 3: Developing the process.
In this phase, a project implementation plan that addresses performance gaps in current processes and identifies measures to bridge the same. The following critical activities occur in this phase: create solutions, select solutions, develop new processes and plan implementations;

Step 4: Achieving results.
The project team executes the implementation plan, conducting any necessary simulations, pilots and releases the outcomes. The deliverables from this phase are a new, lean process that has been implemented, documented and is actually demonstrating results;

Step 5: Controlling the process.
In this phase, plans and documents are created to ensure consistent implementation of the process with minimized variation. Ongoing metrics are defined to allow review of the process. A closed-loop corrective action procedure system is identified to review the process, address gaps in performance, and
continuously improve performance. The deliverables from this phase are a process control plan and a corrective action plan; and

Step 6: Recognizing the team.
The final phase provides team recognition. Activities are organized by the project team, project champion and process owners to promote the success of the project. In this phase, the team shares the lessons learned and best practices with the suppliers.

Supplier development is one of the most powerful approaches that GMSA can engage in on the path to the development of a world class supply chain. The focus should be on developing suppliers to become self-sufficient at developing, implementing and maintaining world-class standards and performance. The perfect supply chain can only be achieved through the development efforts that go beyond first tier suppliers.
REFERENCES


APPENDIX 1: INTERVIEW QUESTIONNAIRE

1. How do you define lean manufacturing?

2. What are the benefits of lean manufacturing?

3. What techniques are used by lean manufacturers?

4. What is the history of lean manufacturing?

5. When an organization does not have a budget to implement lean, how much does it cost to implement lean manufacturing?

6. Can lean manufacturing be implemented in any size organization; big or small?

7. Can lean methodologies be applied to the administration and indirect areas of a business?

8. How is the effectiveness of lean implementation measured?

9. What kind of waste does lean manufacturing eliminate?

10. Some companies seem to use lean manufacturing as just another way of getting rid of people’s jobs. Job security is one of the biggest issues for front line staff or shop floor people. Is that a purpose?

11. How do you deal with employees or suppliers who resist the change to lean manufacturing?

12. How do you define supplier development?
13. How does one identify which suppliers to develop?

14. Why develop suppliers?

15. What are the benefits of supplier development?

16. How is the effectiveness of supplier development measured?

17. Why does supplier development work?

18. How do you deal with suppliers who do not want to be part of the supplier development programme?

19. What are the key factors to sustaining the improvement process?

20. What are the barriers to change experienced by suppliers?

21. Is supplier development the tool to improve the supply chain?