

# **An assessment of the supplier development practices at Volkswagen of South Africa**

By

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at the NMMU Business School

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**DECLARATION**

This work has not been previously accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed: .....

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**STATEMENT 1**

This dissertation is being submitted in partial fulfillment of the requirements for the degree of Masters in Business Administration.

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**STATEMENT 2**

The dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references. A reference list is appended.

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Date: .....

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- My Lord and Saviour, Jesus Christ who has given me the strength to complete this study. “Phi 4:13 I can do all things through Christ which strengtheneth me”

## **ABSTRACT**

The underlying objective of the research is to assess the nature of the supplier training at Volkswagen of South Africa (VWSA).

To achieve this objective, a theoretical study was conducted to establish what literature reveals to be the most important theory of supply chain management as well as supplier development geared towards lean manufacturing.

The information obtained in the literature study was analysed to solve the main problem namely, an assessment of the nature of the supplier training at Volkswagen of South Africa (VWSA).

The research was divided into two questionnaires:

- The first questionnaire is targeted at the suppliers. This questionnaire has two sections namely section A, the biographical data and section B attempts to determine the quality systems and manufacturing requirements. It further attempts to gauge training support and needs as compared to other OEM's.
- The second questionnaire is targeted at the Supplier Development Manager. The aim of this questionnaire is to establish what the current training offerings are, the source of what VWSA teachers and the awareness of the Toyota Training College.

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#### **Annexure II**

**An Assessment of the supplier development practices at Volkswagen of South Africa**

An assessment of the  
supplier development  
practices at Volkswagen of  
South Africa

## **CHAPTER 1**

### **PROBLEM STATEMENT AND DEFINITION OF CONCEPTS**

#### **1.1 INTRODUCTION**

Hobbs (2004: 6) alludes to the fact that when establishing a differentiation from their competitors, manufactures are motivated to convert their factories to lean for a variety of reasons. It may be the shortened response time that can be offered to the customer with the new lean line design. It may be the improvements in inventory and corresponding working capital reduction that allows improved competitive pricing. Or it might be the enhanced quality created with parts-per-million levels of quality or the improved productivity, better floor space utilization, reductions in scrap and rework, increased employee participation, and simplified administrative routines available with the implementation of the Lean manufacturing methodologies.

According to Meredith and Shafer (2002: 260) firms, until recently primarily focused on better managing their immediate suppliers. For example, Toyota is famous for teaching their suppliers how to install and operate their famed Toyota Production System (also known as lean manufacturing). But the teaching doesn't stop there since Toyota's first tier suppliers can gain additional improvements by teaching their suppliers, the second tier, and so on up the supply chain. There is a growing interest in supply chain management primarily because of the development of new information technologies such as intranets, e-mail, EDI (electronic data interchange), and of course, the Internet. These technologies, in conjunction with greater global competition, have fostered an interest and ability in improving processes along the entire supply chain, resulting in better performance at reduced cost.

#### **1.2 MAIN PROBLEM**

Facing up to the challenge of stiffer competition and having to supply the global markets, manufacturers have quickly learned the importance of improving productivity and quality. Since most of the automotive manufacturers in South

Africa have mother companies in the major global markets, many have improved productivity and quality through lessons learned from source plants.

The problem original equipment manufacturers (OEMs) in South Africa face, and possibly all manufacturers around the world, is the constant striving towards lower costs through improved productivity, better floor space utilization, reductions in scrap and rework, increased employee participation, and simplified administrative routines. One of the major factors in this problem is the inability of suppliers to meet the required needs.

**The underlying objective of the research is to assess the extent and effectiveness of the supplier training at Volkswagen of South Africa (VWSA).**

### **1.3 SUB – PROBLEM**

In order to develop a research strategy to deal with and solve the main problem, the following sub-problems have been identified:

- a) What lean manufacturing competencies will provide VWSA with more effective suppliers?
- b) What modes of interaction are currently in existence between VWSA and its suppliers?
- c) How the two sub-problems above can be integrated into a model for future reference on which business can be built?

### **1.4 DELIMITATION OF RESEARCH**

In order to ensure that the research project remains a manageable size it was decided to only consider Volkswagen of South Africa, Uitenhage Plant and ten of its first tier suppliers that are known or required to apply lean manufacturing principles. The following suppliers have been selected:

- Johnson Controls,
- Kromberg and Schubert,
- Alucast,

- Faurecia,
- Inergy,
- Feltex,
- Bel Essex,
- Shatterprufe,
- Venture, and
- Sentech, in no particular order.

#### **1.4.1 Volkswagen of South Africa**

The study will be conducted at Volkswagen of South Africa, Uitenhage Plant manufacturer of the Citi Golf, Polo and Polo Classic, and the A5 Golf and Jetta.

#### **1.4.2 Supply chain**

This study will be delimited to production suppliers responsible for the supply of lean sequenced parts. The focus will be on suppliers who supply to other OEMs as well as VWSA. The rest of the supply is as important, but for purposes of this study will be excluded to make it possible to handle the research.

#### **1.4.3 Theoretical delimitation**

This research aims to evaluate to what extent supplier development is implemented with regard to lean manufacture sequence parts. The aim of this research is to use current guidelines found in the literature, and bringing together what is included in the theory rather than generating new theoretical principles.

#### **1.4.4 Geographical delimitation**

This study will be conducted with suppliers responsible for the supply of lean sequenced parts based in the Eastern Cape.



#### **1.4.5 Subject of evaluation**

This research is limited to the evaluation of the process of supplier training, that is evaluation of the measure to which supplier development takes place in practice according to guidelines developed for the individual steps in the model. It is not an objective of this research to evaluate either the content or the output of supplier development.

### **1.5 DEFINITION OF KEY CONCEPTS**

For the purpose of this study the following meanings are associated with the concepts in the title and problem statement of this research.

#### **1.5.1 Supply chain management (SCM)**

According to Slack, Chambers, Harland, Harrison and Johnston (1998: 474) supply chain management has been developed into a concept with a much broader span of control and a holistic approach to managing across company boundaries. It is recognized that there are substantial benefits to be gained from strategically trying to drive a whole chain in the direction of satisfying the end customer. For the purpose of simplicity this research will be limited to the supply chain of VWSA and the selected first tier suppliers responsible for lean supply principles.

#### **1.5.2 Lean manufacturing principles**

Womack and Jones (1996: 115) found, from their studies of lean manufacturing, that there are five elements managers must address to create a lean system approach. These five elements are as follows:

- Identifying practices which provide customer service and activities which yield no benefit to the customer and can result in a cost to the business;
- Identifying the value stream which supports the organisation and meets customer quality standards;

- Creating a flow of material that links the supplier and the enterprise by avoiding delays of batching and queuing of products;
- Creating pull systems with the manufacturing facility, allowing the customer in the next department to pull and not have goods pushed onto them; and
- Creating the 'perfect' production system, thus the company cannot remain static, but must continuously improve.

The table below illustrates typical manufacturing problems with the effects and remedies suggested. The remedies identify lean manufacturing principles.

**Table 1.1**

**Typical manufacturing problems with the effects and remedies suggested**

Cause	Effects	Remedy
<b>Inflexible Equipment</b>	<ul style="list-style-type: none"> <li>▶ Long, expensive setups</li> <li>▶ Large Batches</li> <li>▶ Inappropriate Layouts</li> </ul>	<ul style="list-style-type: none"> <li>▶ Setup Reduction</li> <li>▶ Smaller Scale Equipment</li> </ul>
<b>Functional Layouts</b>	<ul style="list-style-type: none"> <li>▶ Excessive Handling</li> <li>▶ WIP Queues</li> <li>▶ Disconnects</li> <li>▶ Poor Quality</li> </ul>	<ul style="list-style-type: none"> <li>▶ Cellular Layouts</li> </ul>
<b>Poor Quality</b>	<ul style="list-style-type: none"> <li>▶ Angry Customers</li> <li>▶ High Scrap &amp; Rework Costs</li> <li>▶ Unpredictable Schedules</li> </ul>	<ul style="list-style-type: none"> <li>▶ Six Sigma &amp; TQM</li> <li>▶ Workcells</li> <li>▶ Work &amp; Quality Teams</li> </ul>
<b>Inappropriate Scheduling</b>	<ul style="list-style-type: none"> <li>▶ Complex Systems</li> <li>▶ Inaccurate Inventory Records</li> <li>▶ Large Queues</li> <li>▶ Long Lead Times</li> </ul>	<ul style="list-style-type: none"> <li>▶ Kanban</li> <li>▶ Broadcast Schedules</li> <li>▶ Workcells</li> </ul>

Source: [www.strategosinc.com/inventory.htm](http://www.strategosinc.com/inventory.htm) (Accessed :03.09.2006)

### 1.5.3 Supplier Development

Supplier development is defined broadly as any activity that a buyer undertakes to improve a supplier's performance and/or capabilities (Handfield et al., 2000; Krause et al., 2000). Supplier development requires that the firms involved commit financial,

capital and personnel resources to the development task and to share timely and sensitive information. Customer firms have increasingly used supplier development strategies to improve the manufacturing performance of their suppliers (Krause et al., 2000).

Supplier development, therefore, is a broad concept aimed at strengthening the performance of subcontracting firms not only by enabling them to acquire the skills and capacities required of them by the main contracting firm but also by raising their awareness and assisting them in reducing their costs. The research will thus define the necessary assistance to be provided to subcontracting firms in regard to cost control, pricing policy, technological improvements, quality management, certification, internal enterprise organization, logistics and the environment.

#### **1.5.4 Quality**

It has become clear that high-quality products have a distinct advantage in the market place, that market share can be gained or lost over the quality issue. Therefore quality is a competitive priority.

### **1.6 PRIOR RESEARCH ON TOPIC**

The survey of the literature will be conducted by first introducing it, and thereafter by examining what is meant by supply chain management, supplier development and lean manufacturing.

#### **1.6.1 Introduction**

Companies increasingly see themselves as part of a supply chain that has to compete against other supply chains, rather than as a single firm competing against other individual firms (Christopher, 1998, 65). Supply chain management is an increasingly important organizational concern, and proper management of supplier relationships constitutes one essential element of supply chain success. However, there is little empirical research that has tested the effect of supplier development on performance. According to Krause (1999, 206), supplier development broadly refers to “any effort by a buying firm to

improve a supplier's performance and / or capabilities to meet the buying firm's short and / or long-term supply needs."

### **1.6.2 Supply chain management (SCM)**

Around 1990, academics first described SCM from a theoretical viewpoint to clarify how it differed from more traditional approaches to managing the flow of materials and the associated flow of information (Ellram and Cooper, 1990, 62). Initially, according to Bechtel and Jayaram (1997, 25), the emphasis was on facilitating product movement and coordinating supply and demand between a supplier and buyer. Logistics managers in retail, grocery, and other high inventory industries began to see that a significant competitive advantage could be derived through the management of materials through inbound and outbound channels. Although, in the beginning, SCM was mainly discussed in purchasing literature, the emphasis now lies on the process of supplying goods to consumers to fulfil their needs. The following questions, among many others, were identified by Lambert and Cooper (2000, 118) as potential research opportunities:

- How should a firm decide which internal process to link with which supplier(s) and customer(s)?
- What decision criteria determine whose internal business processes prevail across all or part of the supply chain?
- How should a firm analyse the network to determine if there is a better configuration?
- What are potential barriers to implementation and how should they be overcome?

The research aims to fill in part of these knowledge gaps concerning the redesign process of SCM. The main questions individual companies face is whether, why, how and with whom they should start SCM activities. Companies should be able to analyse what SCM can do for them and find out what the consequences might be if a supply chain view is taken together with one or more supplier and/or customer.

Stern et al. (1996: 92) propose the most generic chain redesign method. They lay out a marketing channel planning approach that permits the reorientation of distribution systems so that they are more responsive to customer needs. Best

practice distribution systems are designed by bringing together information on the following elements:

- Existing system. An accurate description is needed of the current distribution system, the market coverage it provides, the value-added activities it performs, and the present and future challenges it faces.
- Ideal distribution system. Starting from a blank sheet the ideal system is designed. This calls for thorough research on end-user wishes in order to segment markets before actually delivering the service outputs.
- Constraints. Current and future biases, objectives, constraints, and threats imposed by internal and external factors are identified.

The definition of supply chain uncertainty is based on the five requirements for effective system management according to De Leeuw (2000, 146). If one or more of these requirements are not fulfilled, decision makers in the supply chain will experience uncertainty resulting in ineffectiveness (i.e. not realising planned objectives):

- (1) The managing system should have an objective and corresponding performance indicators to manage the supply chain in the right direction.
- (2) To estimate future system states one has to have information on the environment and current supply chain state.
- (3) There should be enough information processing capacities to process information on the environment and supply chain state.
- (4) In order to direct the managed system in the right direction one should be able to estimate the impact of alternative actions. This requires a model of the system, presenting the relationships between available redesign variables and performance indicators.
- (5) There should be enough potential control actions. The environment at each stage of the supply chain requires one or more different control actions to manage the system in the direction of the objectives.

### **1.6.3 Supplier Development**

Organisations may find that suppliers are under-funded and under-staffed and need help to get started in a supplier development program. According to an article in Grand Rapids Business Journal (April 2001). Ford's Minority Supplier Development Program Manager Steve Larsen said for a program to succeed, a firm must help these suppliers develop. Ford did that by conducting regular progress reviews, by having an employee work closely with the minority firms, by helping companies find financial, technical and employee training assistance, and by making a long-term commitment to doing that.

Ford started out with a minority purchasing program and failed, said Larson. It was not until Ford started to work with and develop minority businesses that their purchases began to grow.

According to Zeitlin (2004:1), many scholars and practitioners have argued that current trends towards vertical disintegration of production, coupled with rising demands for continuous improvement in quality, flexibility, cost, and design, create new opportunities for the emergence of mutually beneficial collaborative relationships between large original equipment manufacturers (OEMs) and smaller component suppliers that are potentially capable of sustaining industrial employment in high-wage regions. But many participants in these discussions also recognize that how far such mutually beneficial possibilities may be realized in any specific case is not determined simply by the evolution of transactional relationships between individual firms (large and small) in the marketplace. It depends crucially, as well, on the governance arrangements available for resolving common problems across firms and supplying the collective goods needed to sustain a decentralized production system – including but by no means limited to supplier training and development.

Zeitlin makes reference to Herrigel who also identifies a series of critical governance problems associated with the vertical disintegration of production from OEMs to suppliers, notably access to development capacity and benchmarking services, as well as diffusing the ability to combine quality improvement, cost reduction, and the provision of new customer services.

These problems, he shows, are being addressed in different regions through a wide variety of institutional forms, both public and private, involving corporate, associational, consortial, and market-based mechanisms. Herrigel suggests that some of these governance arrangements, like supplier training consortia and intra-corporate technology and consulting services, are more effective than others in promoting communication and learning through monitoring, though so far only among a relatively limited circle of participants. But none of these institutional forms, Herrigel contends, so far appears to offer much leverage on what he considers the most severe problem confronting component manufacturers in high-wage regions today: the relentless price squeeze imposed by OEMs on their suppliers in the context of weak demand and global overcapacity, which threatens to destroy the diffused capabilities and know-how required for sustaining a decentralized production system.

According to Supply Chain Management Review – January and February 2006 automotive supplier Delphi launched the Quality Focus Supplier (QFS) initiative in 2003. This eight-step program is designed to encourage and enable suppliers to embrace a culture of zero defects and continuous improvement through an unrelenting focus on quality. The results to date have been impressive: a dramatic reduction in nonconforming parts, in problem cases, and in negative impacts on Delphi's facilities or on its customers. Effectively motivating our supply base to achieve this level of quality requires the successful application of four broad processes: (1) developing strong relationships based on mutual trust and information sharing; (2) acquiring, learning, utilizing, and teaching a strong set of quality tools; (3) communicating clear objectives and assuring that subsequent plans and actions are aligned to achieve the identified goals; and (4) continuously following up and standardizing the lessons learned.

## **1.7 THE SIGNIFICANCE OF THE RESEARCH**

The automotive industry is the leading manufacturing sector in the South African economy. It incorporates the manufacture, distribution, servicing and maintenance of motor vehicles and plays a vital role in South Africa's economy. The sector made up 7 percent of the Gross Domestic Product (GDP) of South

Africa in 2005, a contribution which is growing annually. Although the industry is responsible for only 0.8 percent of the world's vehicle production, it produced over 85 percent of Africa's vehicle output in 2005. One of the major industries in South Africa is the Automotives manufacture and supply industries which is a major contributor to South Africa's GDP. One of the challenges facing local manufacturers is the increased competition of vehicles entering the market, manufactured globally, where many countries have much more experience in the lean manufacturing principles.

Most of the major global motor vehicle manufacturers (OEMs) are represented in South Africa with assembly plants, and are concentrated in three of the country's nine provinces. These include BMW, Nissan, Fiat and Ford (incorporating Mazda, Land Rover and Volvo) which are operating in Gauteng, Volkswagen, DaimlerChrysler and General Motors operating in the Eastern Cape and Toyota operating in KwaZulu-Natal. Seven of these eight OEMs are wholly-owned subsidiaries of their parent companies, while Toyota is majority foreign-owned. Other global companies, notably Renault, Peugeot-Citroen, Hyundai, Kia, Subaru, Daihatsu, Tata and Mahindra, import vehicles into South Africa.

Capital investment by motor manufacturers in South Africa is in excess of R15.0 billion, of which R3 billion occurred in 2005, and a further R6 billion will be added in 2006. Investment in plant and equipment by the component supplier industry is estimated to be in the order of R8 billion, with a further R2 billion projected for 2006.

In the domestic market new vehicle sales in 2005 achieved all time record levels. High GDP growth rates from 2005 onwards should also translate into annual growth in domestic vehicle sales exceeding 10% annually. Combined with the strong export growth, this will support the industry's sustainable growth and increasing profit performance. Productivity gains have largely been already achieved, and the expansion in output is likely to translate into employment growth. South Africa has begun discussions with various countries and trade blocs on preferential and free trade negotiations. Source: TISA, NAAMSA ([http://www.naacam.co.za/key\\_info.pdf](http://www.naacam.co.za/key_info.pdf)).



## **1.8 RESEARCH DESIGN**

### **1.8.1 Literature study**

The impact of supply chain management and supplier development on overall manufacturing efficiency will be identified from literature.

### **1.8.2 Empirical study**

The empirical study will consist of:

#### **(a) Mail survey**

A mail survey will be conducted among the production managers, using a questionnaire drawn up by the researcher; to establish to what extent OEMs provide training. The reason for choosing the production managers is because they are aware of the manufacturing sequence and pitfalls.

#### **(b) Measuring instrument**

As mentioned above, the researcher will develop a comprehensive questionnaire for this research project to determine the inhibitors to supplier development.

#### **(c) Sample**

The Supplier Development Manager has provided a list of suppliers to participate in the survey. The following suppliers have been selected:

- Johnson Controls,
- Kromberg and Schubert,
- Alucast,
- Faurecia,
- Inergy,
- Feltex,
- Bel Essex,
- Shatterprufe,
- Venture, and
- Sentech, in no particular order.

(d) Statistical analysis of data

The statistical procedures to be used in interpreting and analysing the data will be determined in consultation with a statistician at the time the questionnaire is drawn up.

### **1.8.3 The development of an integrated report**

The results of the literature survey and the empirical study will be integrated to develop a report to be used for future reference.

## **1.9 OUTLINE OF THE STUDY**

A brief introductory paragraph will explain to the reader the contents covered by each chapter. Chapters two to five will cover the following topics:

- CHAPTER 2  
THE THEORY OF SUPPLY CHAIN MANAGEMENT, SUPPLIER DEVELOPMENT AND LEAN MANUFACTURING PRINCIPLES.
- CHAPTER 3  
MODES OF INTERACTION BETWEEN VWSA AND ITS SUPPLIERS
- CHAPTER 4  
THE EMPIRICAL STUDY
- CHAPTER 5  
THE RESULTS OF THE EMPIRICAL STUDY
- CHAPTER 6  
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## **10. CONCLUDING REMARKS**

In this chapter, the main problem and sub-problems were stated. Selected concepts were defined and an outline of the study was presented. Once the secondary literature study has been completed, taking note of the relevant literature resources, an empirical study will be embarked on in chapter four. Chapter five will conclude the study, and recommendations will be made regarding the main problem. All relevant annexures, lists of statistical data and tables will be attached and form part of the document. In chapter two the aim is to investigate the theory of supply chain management, supplier development and lean manufacturing.

## CHAPTER 2

### THE THEORY OF SUPPLY CHAIN MANAGEMENT, SUPPLIER DEVELOPMENT AND LEAN MANUFACTURING PRINCIPLES.

#### 2.1 INTRODUCTION

The main problem and the essential sub-problems of this research have been presented in Chapter One. The remainder of this research paper is devoted to solving the set sub-problems. Once the sub-problems have been solved, the main problem of this research will also have been solved. The focus of this chapter, however, is on solving the first sub-problem, namely, what lean manufacturing competencies will provide VWSA with more effective suppliers?

The aim of this chapter is to investigate the theory of supply chain management as well as supplier development geared towards lean manufacturing. As mentioned in chapter one, **the underlying objective of the research is to assess the extent and effectiveness of the supplier training at VWSA.**

According to Piorier and Reiter (1996:ix Preface) only by incessantly chasing every possible avenue of process improvement and seeking any beneficial enhancement to quality, productivity, cost, and customer satisfaction can companies hope to survive into the next century. To do otherwise is to abdicate the future to more effective competitors, who will find the enhancements needed to take market share regardless of historical positions or personal relationships.

Piorier and Reiter (1996:52) further put forward that if supply chain optimisation is to become a reality, the existing mentality that pervades the typical supply network has to undergo a change in philosophy. The fundamental alteration is to move from a buyer-versus-seller concept to one in which the network attempts to forge a customer-focused virtual network that has maximum effectiveness. Such a network will only be established when the constituents across the full chain are working to build a supply system that has a single organisational purpose.

## **2.2 THE IMPORTANCE OF SUPPLY CHAIN MANAGEMENT**

In this section the researcher aims to illustrate the importance of supply chain management and its impact on business based on a literature study.

### **2.2.1 What is Supply Chain Management?**

According to Spekman, Kamauff and Myhr (1998:631) the traditional view of supply chain management is to leverage the supply chain to achieve the lowest initial purchase prices while assuring supply. Typical characteristics include: multiple partners; partner evaluations based on purchase price; cost-based information bases; arm's-length negotiations; formal short-term contracts; and centralised purchasing. Under the new paradigm supply chain management is redefined as a process for designing, developing, optimising, and managing the internal and external components of the supply system, including material supply, transforming materials and distributing finished products or services to customers, that is consistent with overall objectives and strategies.

Analytically, a supply chain is simply a network of material processing cells with the following characteristics: supply, transformation, and demand (Davis, 1993:162).

Barry Saxton (2005) describes the supply chain as the mechanism through which companies ultimately respond to market demands. However, "supply chain" doesn't truly describe its character. First, "supply" infers that it's driven by what companies think consumers should buy. In fact, it's driven by end demand. Second, "chain" implies a process similar to passing a baton in a relay race. Companies really want a network that can co-operate in meeting consumer demand. Consequently, the concept of the supply chain is changing to that of a "demand network". In short, supply chain management means having the right products in the right place at the right time at the right cost.

### **2.2.2 Why is Supply Chain Management an important organizational concern?**

In an article found in Finance week, 29 June 2005, Barry Saxton, a director at Barloworld Logistics, says the supply chain is integral to a business's success. But companies need to remember that the supply chain is about more than just the physical movement of goods from the producer to the end consumer, though that's one important link. Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities. Importantly, it also includes co-ordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers and customers. In essence, supply chain management integrates supply and demand management within and across companies.

Scott Elliff (2004: 24), in the article, "Why an effective supply chain matters" makes reference to a study conducted by Accenture, INSTEAD and Stanford University documenting a strong direct relationship between supply-chain operations and corporate financial performance. The bottom line is that supply-chain leaders are rewarded by the stock market with substantially higher growth in stock values than with lesser performance in supply chain management. The study used data from more than six hundred Global 3000 companies across twenty four industries covering 1995 to 2000.

According to Briggs (1996, 3) the automotive component supply industry today is under greater pressure than ever before. At the same time, successive recessions have forced companies to downsize, delay and focus on their core activities. Outsourcing has been an inevitable consequence of adopting such lean manufacturing techniques, and supply chain management has become a key issue in recent years.

New demands are being placed on supply chains in areas such as performance requirements, working relationships and partnership issues, posing new questions for forward-looking companies in their efforts to protect and enhance their competitive position in the foreseeable future.

The survey conducted revealed that working closely with component suppliers worldwide in recent years, Ingersoll Engineers have observed the development of pressures, and appreciate how crucial it is to understand the relevant key issues when dealing with individual customer and supplier companies. In conducting a survey of the views of people within the automotive component supply industry, the purpose has been to examine what is happening in the supply chain, what today's critical success factors are perceived to be and how the industry may develop over the next five years.

The resulting analysis, "Partnership or Conflict" by Briggs (1996, 3) focused on 25 factors which could be seen as critical to success. They were selected to provide a balance across the basics of cost, quality and delivery, together with technical issues, measurable performance indicators, cultural factors and market presence, both now and in five years time. In addition, the respondents, over 140 senior, profit-responsible managers across seventeen countries worldwide, commented on international competition, specific vehicle manufacturers and supply partnerships.

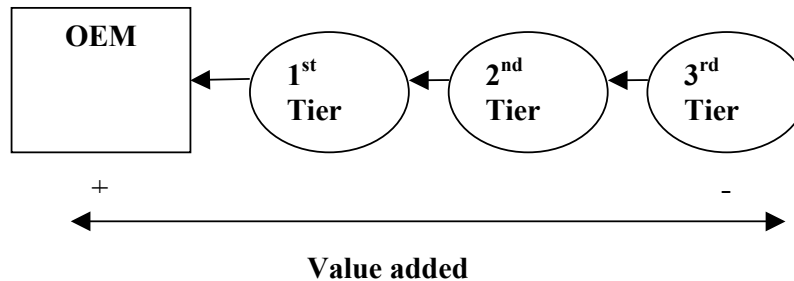
### **2.2.3 How supply chain management can provide effective suppliers.**

Doran (2004, 102) suggests that whilst the generally accepted notion of first-tier suppliers is that they possess certain attributes and maintain close relationships with their original equipment manufacturer customers, research demonstrates that the modification of first-tier requires modification in light of the emerging trend toward modularization.

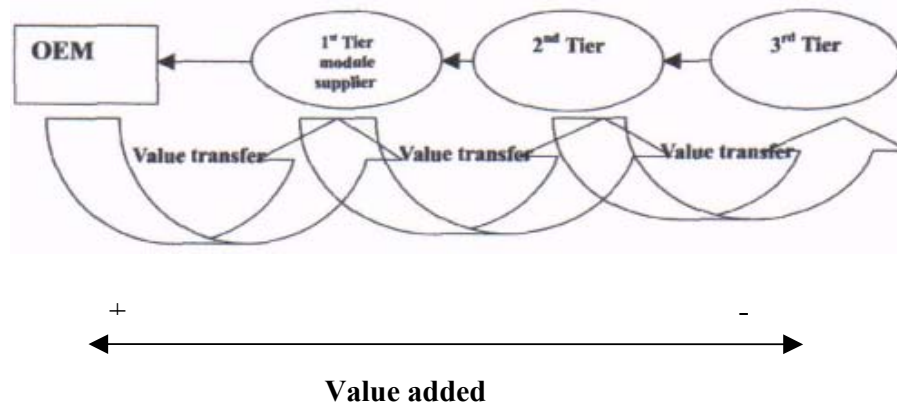
Defining what a module is, however, is difficult and what constitutes a module differs from OEM to OEM, with some OEMs defining modules in relation to function, form or element (Carbone, 1999). In terms of supply chain activity, the modular concept requires first-tier suppliers (primarily those suppliers that are considered global, modular first-tier) to deliver complete modules rather than the individual components that constitute a module. Indicative of the modular approach is the transfer of a higher percentage of value-added activity to first-tier suppliers from the OEM and the subsequent cascading of value-creation

activity between each of the key value adding elements of a modular supply chain. In essence, value-transfer activity refers to the process of identifying which value-creation activities can be pushed up the supply chain in order for modular suppliers to focus, primarily, on value-creation activities that are viewed as core to the module production process (Figure 2.1 and Figure 2.2).

**Figure 2.1 Typical value chain (non-modular supply chain)**



**Figure 2.2 Value transfer activity (modular supply chain)**



Source: Doran (2004, 103)

According to GMAC (2006) supply chain management coordinates and integrates all the appropriate and necessary activities into one seamless process. The entire chain must function as if a single organization. GMAC GRS understands the importance of effective supplier management as evidenced by the dedicated Global Alliance Management (GAM) group responsible for the procurement and management of suppliers. GAM has developed and implemented a six component SCM process:

- Identification



- Selection
- Training
- Management
- Evaluation
- Reporting

These components are not just words in an article or a model; they are the core of GMAC GRS's disciplined methodology. GAM continuously oversees the depth, breadth and quality of GMAC GRS global service providers using the six components described above. GAM designed the program to build and maintain global consistency in service and performance, with built-in flexibility to accommodate specific client requirements.

## **2.3 GUIDE TO SUPPLIER DEVELOPMENT**

Growing competition within the global economy has been forcing organizations to reduce their costs for many years. Traditional approaches however have been limited to eliminating wastage within an enterprise. Another way has opened up, through outsourcing. Cooperation with suppliers can make organizations more efficient and thus enable goods to be purchased at lower prices. Nevertheless, for their cooperation to be effective, suppliers and subcontractors have to address specific problems relating to their sectors of activity, special fields and working practices. (De Crombrugge and Le Coq, 2003, 1)

### **2.3.1 INTRODUCTION – What is supplier development?**

De Crombrugge and Le Coq (2003, 1) has defined supplier development as a broad concept aimed at strengthening the performance of subcontracting firms not only by enabling them to acquire the skills and capacities required of them by the main contracting (or client) enterprise but also by raising their awareness and assisting them in reducing their costs.

According to Clark, Chang, and Chao (2006, 55 - 56) Delphi's supplier quality team developed what is known as the Quality Focus Supplier (QFS) process in 2003. Through the QFS process, they assist suppliers on-site in identifying and

analyzing chronic systemic issues that threaten quality or delivery and work with them to ensure that their improvement plans are effective and that the desired results are actually achieved. They also help suppliers better understand and embrace the zero-defect culture by implementing problem-solving techniques to better foster an environment conducive to continuous improvement. Finally, the process ultimately helps build relationships that will be mutually beneficial for all parties.

### **2.3.2 Why Supplier Development is necessary.**

The next phase of supply management will focus on improving the management of key supplier relationships through better coordination and collaboration, improved innovation capture, and joint waste-removal and continuous improvement initiatives. That is the conclusion from a recent research study (*The CPO's Agenda*) from the Aberdeen Group Inc. (Boston, Mass.; [www.aberdeen.com](http://www.aberdeen.com)). Further, the research finds that 70% of procurement organizations will have supplier development and improvement programs in place by 2008.

Top factors driving procurement organizations to improve supplier development and collaboration, according to the research, include pressures to generate year-over-year improvements in supplier quality and performance; identify opportunities to remove non-value-added costs from the supply chain; and develop and improve capacity, throughput, and other capabilities of key suppliers.

Procurement executives prioritized the following strategies for improving supplier development and collaboration (see Figure 2.3):

**Figure 2.3 How supplier development contributes to enterprise value****How Supplier Development Contributes to Enterprise Value**

(Source: Aberdeen Group Inc.)

The basic supplier development construct pertains to those supplier development practices that require the most limited firm involvement and minimum investment of the company's resources (i.e. personnel, time, and capital) and thus, are likely to be implemented first in an effort to improve supplier performance and/or capabilities. These supplier development practices include evaluating supplier performance, providing feedback about the results of its evaluation (Krause, 1997).

The main activities used by buying firms to improve supplier performance, as described in the literature, include: assessment of a supplier's operations and performance; providing incentives for the supplier to improve; creating competition amongst suppliers; and working directly with suppliers through training, education, etc. (Krause et al., 2000).

Supplier assessment and supplier incentives are key enablers of supplier development efforts (Handfield and Nichols, 1999). Supplier incentives motivate suppliers to improve by sending a message that improved performance is rewarded with increased business and preferred status for future business. Supplier assessment allows buying firms to evaluate a supplier's performance, compare it with the performance of other suppliers, and provide suppliers with direction to drive improvement objectives. However, supplier incentives and supplier assessment affect performance improvement only indirectly, and direct involvement activities such as training of supplier personnel by the buying firm

play a direct and critical role in achieving significant performance improvement (Krause et al., 2000).

### **2.3.3 How has implementing supplier development benefited some organizations?**

The customer is always number one. This is how every Wal-Mart cheer ends. It is the driving force behind their business. According to Hahn (2005) six years ago the global relationships with suppliers were very different from today. They knew they had an opportunity to improve communications, establish a higher level of trust and more proactively develop joint business plans. They also understood that improving these relationships and increasing business visibility with suppliers would be essential to serving mutual customers and to establishing a foundation for a future in which global operations were expected to contribute more significantly to Wal-Mart's overall growth. The result of this thought process was the creation in 2000 of the supplier development group and a set of strategies they believed would help Wal-Mart better serve customers worldwide. Chief among these strategies was closer collaboration with suppliers and the creation of joint business plans that extend well beyond the upcoming year. Joint business planning enables Wal-Mart and their suppliers to align strategies to improve sales, plan key item launches, improve consumer insight and build category captains. Wal-Mart is able to better understand customers shopping their increasingly diverse array of retail formats by sharing in-depth insights and emerging category trends.

To date, Wal-Mart has collaborated to establish more than 600 business plans with their suppliers that support both local markets and global activities. This process prepares multinational suppliers to anticipate growth and build for the future. As a result of the close collaboration that comes with joint business planning, they have seen significant improvement in customer awareness of brands, successful key item launches, improved communication with their suppliers and increased sales.

## **2.4 THEORY OF LEAN MANUFACTURING PRINCIPLES**

### **2.4.1.1 An introduction to what lean manufacturing is**

Schonberger (2001: 1) recognizes that the interrelated concepts and techniques going by the words like 'lean' and 'world class' have been fused together. These two words have formed a cohesive system of assessment and application. They have been nourished, not replaced, by the best ideas from the new management movement. This being from reengineering to six sigma, and from activity based costing to balanced scorecards. World class manufacturing principles are about staying ahead of hypercompetitiveness.

Schonberger (2001: 2) states that the Japanese success was out in the open by the early 1980s. This success was due to the Toyota 'get lean' formula. The next thing that happened was that the Western industry learned and applied these Lean concepts. By the late 1980s the United States became the world's generator of new ideas on how to manage a manufacturing enterprise.

Taiichi Ohno the founder of Toyota Production System (TPS), states that when an organization wants to implement lean production, all the company must concentrate on doing is to look at the time line from the moment the customer gives the order to the point when the cash is collected. To do this, the non-value-adding time must be removed (Ohno, 1988:57). The theory that will be discussed in this chapter shows that the value stream is a method of eliminating the non-value adding wastes that Taiichi Ohno highlights in his Toyota Production System.

Womack and Jones (1996:16) define lean manufacturing as a five-step approach. The first step is to define customer value, then define the value stream, make it flow by pulling from the customer back and the fifth step in this approach is striving for excellence. This five-step approach shows the importance of value adding and non-value adding processes which highlight and action problems within a production line.

Kosiak (2005) advocates that lean manufacturing is a philosophy of production that emphasizes the minimization of the amount of all the resources and this includes time that is used in the various activities of the organization. It is important to identify the non-value adding activities in design, production, and supply chain management and also in dealing with the customers. Kosiak (2005) says that the lean manufacturers must look at employing teams of multiskilled workers at all levels of the organization and use highly flexible, increasingly automated machines to produce volumes of products with a large product variety.

Traditional manufacturing is characterised by production schedules that are based on forecasts. These organisations also schedule large batch orders that are processed through multiple departments, based on their work functions.

Kosiak (2005) indicates that these traditional manufacturing methods create excessive inventories, and an overabundance of parts, and work in process (WIP) on the factory floor. The impact on the operation is wasted warehouse and factory floor space, excessive inventory, tracking costs, labour inefficiencies, and high cycle times.

A lean manufacturing initiative launched without careful consideration of the implications for upstream and downstream logistics is a recipe for supply chain delays. Kosiak (2005) shows the costs that a traditional functioning plant incurs due to its large inventory holding costs and the inflexibility of the plant, as it only schedules large batches through the production lines. But, by incorporating the lean principles, it allows the plant to move the product through the process quicker due to the low inventory levels and the flexibility of the machines that can produce a variety of products in a short period of time.

Penkala (2005) argues that lean manufacturing, often called agile manufacturing, is an operating strategy that seeks to maximize operational effectiveness by creating value in the eyes of the end customer. The focus is not isolated to an individual department, but the focus is on optimising the entire value stream. The value stream is defined as a series of processes between receipt of customer order and delivery of finished product. Looking at the theoretical definitions of lean manufacturing, it is important to look at the entire process and to

concentrate on eliminating the non-value adding time. Another point that has been raised is the flexibility of the lean plants to manufacture a variety of products and thus meeting or even exceeding the customers' expectations.

#### **2.4.1.2 WHY ARE ORGANISATIONS IMPLEMENTING LEAN MANUFACTURING PRINCIPLES?**

Liker (2004: 28) lists the eight wastes that lean manufacturing can eliminate. These wastes are as follows: over production, waiting time, unnecessary transport, over processing, excess inventory on hand, unnecessary movement, production of defects and the eighth waste being unused employee creativity. By eliminating these wastes, the organisation will benefit financially. In the present global market, organisations need to achieve these financial gains to offer their customers better service, product prices and to even keep their customer from transferring their business to the opposition.

Schonberger (2001:11) says research shows that the majority of market leaders lose their top rankings within a two-decade period and it is therefore important to find out ways to renew and recover from regression, erosion, and complacency. Lean manufacturing is a company philosophy that looks at continually improving and not being complacent. For this reason alone, it is important to implement the lean principles and not to become listed as one of those organisations which are dethroned once reaching the top position.

Penkala (2005) sees lean manufacturing improving the operating performance by focusing on the quick and uninterrupted flow of products and materials through the value stream. To achieve this, Penkala (2005) again states that the various forms of manufacturing wastes must be identified and eliminated. Waste can include any activity, step or process that does not add value for the customer.

Ohno (1988:57) also explains that by removing the non-value added waste it will reduce the product time line and thus reduce the costs to manufacture that specific product.

Under such a system, the plant is highly customer-focused, providing the highest quality, lowest cost products in the least amount of time.

Kosiak (2005) maintains that manufacturers get lean to trim waste. He indicates that those who advocate lean strategies tout the savings in labour, space, and time on the plant floor and beyond. It is for this reason that companies run on a very traditional 1970s lean business model that was developed by Toyota after World War II. This lean model offers companies a business strategy that eliminates waste while manufacturing the product. It is for these reasons mentioned above that those organisations implement lean manufacturing as a competitive weapon in the global market place. It is important for an organisation to understand in detail, why lean manufacturing can be a competitive weapon.

#### **2.4.1.3 Lean as a competitive weapon**

Womack and Jones (1996: 13) indicate that lean manufacturing avoids high cost and rigidity in production, but strives to create teams that are multi-skilled at all levels in the organisation and uses machines that are highly flexible and automated to produce great product variety. In the ever-competitive global market lean can be used as a cost saving weapon, which is achieved through having better quality and efficiency rates.

Womack, Jones and Roos (1990: 103) note that lean production is fragile, but if the organisation totally believes in this manufacturing philosophy, it will out perform the mass production organisations. The reason is that these mass production plants are designed to have costly buffers everywhere and this is in the form of extra inventory, extra space and extra workers to make the production plant function properly.

#### **2.4.1.4 Improves shareholder wealth**

Lean impacts largely on the bottom line that the shareholders financially benefit from, as this lean philosophy strives for perfection in the work environment by continually reducing costs, striving for zero defects, striving for zero inventory and



also looking at creating a variety of products that will continuously exceed the customers' expectations (Womack and Jones, 1996: 14).

Lean takes care of the financial aspects of a business to give the shareholders a continual increase in wealth. Lean does not measure the bottom line of the financial statement on a quarterly basis, as the western world would do, but looks at improving the quality and efficiency of the processes. Doing this, the bottom line is taken care of continuously into the future, not like the western world that focuses on short term (quarterly financial) improvements that are presented on the financial statement.

With lean manufacturing the financial department is not allowed to dictate to the production and quality departments, but directs cost savings through the use of process improvements and not through short term financial planning.

#### **2.4.2 TYPES OF TOOLS USED TO CREATE A LEAN MANUFACTURING ENVIRONMENT.**

Penkala (2005) focuses on nine key elements to implement a lean system and in these elements he discusses the tools that must be used to achieve a lean manufacturing environment. These elements are now discussed.

The first element would be to capture the product value stream on paper with a cross-functional team and then to analyse the value stream to determine the factors that do and do not create value from the customer's point of view.

The second element is to streamline the manufacturing process by improving the flow of customer information to each department and determining the best flow of the materials and products through the value stream. In doing this, it will eliminate the waiting time and scrap.

The third element is to implement a quick changeover and set-up time that will reduce equipment downtime during production and between product changes. This additional time will improve the manufacturing flexibility to produce a wide variety of products.

Element four is important when one wants to hold a small amount of inventory, show up the bottleneck processes and improve the quality of the product. This element is to adopt a pull system and a one-piece flow methodology. This helps in synchronising the manufacturing processes and also to produce to order rather than to stock.

The fifth element is to create a manufacturing cell system also known as a work cell or cross-functional team. These manufacturing cells will focus on the products rather than around process departments and the cells are responsible for quality at the operating source.

This is a fundamental point that Penkala (2005) raises, as lean manufacturing looks at engineering quality into the source where the product is manufactured and not like mass production that catches quality at the end of the manufacturing line. 'Quality at the source' is a phrase that is used in the Japanese plants and it means that the operator working on that specific product line is also responsible for checking the quality of that product before handing it over to their customers (next person in the manufacturing process).

Liker (2004:139) realised that in the Toyota plants, the workers all believed that they are responsible for quality and that it is not the Quality Department's responsibility. This re-affirms that quality at the source best represents Toyota's workers commitment to quality and if an organization wants to achieve lean manufacturing standards then quality at the source needs to be instilled in the workforce.

Element six is vital for the organisation to satisfy the customers' needs, as the organisation will be blindfolded to the customers' needs if they do not respond to this element. The sixth element is to make operating performance and customer information visible on the shop floor to increase customer focus. This is important as the production operators are directly involved in making the product for the customer and is generally the only department that really adds direct value to the product.

The seventh element is to create lead-time metrics throughout the plant and in doing this it is important to continually identify ways to reduce these lead times.

Element eight is a method to get the entire company to buy into lean manufacturing and this is done through involving every employee in continuous improvement (kaizen) efforts, which in turn will improve the operating performance and accelerate the achievement of the organisational goals.

The ninth element institutes total productive maintenance (TPM) and this tool is incorporated into the manufacturing sector to increase equipment efficiency and reliability and to enhance ownership of the machinery.

Penkala (2005) summarises that the successful implementation of lean manufacturing starts by analysing the value stream of each product line. Doing this it will identify non-value added activities in the process flow. The key flow of a product and the way a product is manufactured should take place by adopting pull production and one-piece flow. This synchronises the manufacturing process. It also creates a small WIP and finished goods inventories; minimal waiting time occurs on the shop floor and reduces the manufacturing lead times of the product. Such a strategy aims to produce only what the customer requires for immediate sale and the production process is only triggered by customer demand. A push strategy in a mass production environment, on the other hand, seeks to maximise the machine utilisation at each area in the plant. This allows for building piles of inventory between work processes. This disconnects the production processes from each other and extends the lead times in the value stream.

Liker (2004:130) notes that Toyota's success has been due to solving quality problems at the source. This saves time and money downstream, as problems are fixed as they occur. For this reason, the Toyota management says that it is acceptable to run less than 100% of the time, even when the line is capable to run. The reason for this is, solve the quality at the source and the operating utilisation time will also increase.

Penkala (2005) discusses TPM and set-up time reduction as a lead-time reduction technique. In lean manufacturing it has been named as single-minute exchange of

dies (SMED). This seeks to improve the product changeover proficiency on machines that in turn will enable shorter production runs and greater manufacturing flexibility. Quick changeover capability is vital in an environment of changing customer needs. SMED allows schedule changes not to throw the production department into a chaotic situation. Manufacturing effectiveness in a lean manufacturing environment is not measured by maintaining high efficiency during long production runs, but by reacting quickly to customer changes and being able to consistently meet the daily production scheduled mix.

The lean approach is a transformation from a departmental-based organisation to one that is centred on products and product families.

Manufacturing cells are created on the shop floor to keep focus on an entire product within the plant. This allows the factory operators to take ownership of the product and it is easy to monitor, control and improve at the operating level, as the people who actually make the product are involved and held accountable by the use of hourly measurement systems.

By studying the lean manufacturing concept that Toyota coined as the Toyota Production System (TPS), there are specific continuous improvement tools that must be mentioned in detail that complement the implementation of lean manufacturing in organisations (Womack and Jones, 1996:67). These tools are discussed below.

#### **2.4.2.1 One-piece flow - Pull vs Push**

Penkala (2005) explains that the traditional manufacturing plants use a 'push' production strategy. A push production strategy creates schedules for each area in production based on the sales forecast. In doing this, each area will run at maximum capacity, pushing material to the next manufacturing process. If the upstream process is more efficient than the downstream process, then this will create a large WIP deposit at the downstream process. A mass production push system maximises the utilisation of each process and therefore creates mountains of inventory between workstations throughout the plant. This interrupts

the material flow, disconnects the workstations and lengthens the value stream processing time.

A pull system on the other hand allows the material flow to be triggered only when a customer orders material from the finished goods stock. Production is always triggered by demand from the next work centre. Ohno (1988: 13) defines the disadvantage of a push system, as having more inventory, but possibly having inventory one does not need at that specific time.

Penkala (2005) maintains that the objective of a pull manufacturing system is to simplify scheduling of production. By creating a pull system, it benefits the organisation by minimising the lead times and inventories. Due to the ever-changing global markets, the pull system is designed to respond with minimal cost and waste and enables the manufacturing process to be flexible to customer product changes in both volume and mix.

Kanban, which is a card signal system, is the tool used to control the process in a pull production environment. The kanban system triggers the upstream operation when additional product is needed at the downstream operation. Permission to produce is given not by upstream to downstream processes as in the mass production environment but visa versa. The mechanism that is used to trigger the supplier to produce more of that specific part the customer requires is the parts container. The empty container is the automatic signal to make more of those parts (Womack, Jones and Roos, 1990: 62).

A pull manufacturing system means that production stoppages are minimal. For this reason a pull system requires that the implementation of a TPM programme and a quality improvement system are present on the production floor. In a push manufacturing environment, manufacturing problems are hidden in WIP inventory. A pull system exposes the problems and deals with these problems making the organisation more profitable for the shareholders. It is vital that the organisation lowers the WIP inventory incrementally, to create an environment of solving the most detrimental problems first. It also shields the organisation from being inundated with problems all at once, but sorts the problems out in a methodical manner (Liker, 2004:101).

Ohno (1988:59) says that by running a one-piece flow process (manufacturing one part at a station and then moving it to the next station before manufacturing another part) and not batch producing, will stop operators from producing quantities that they would like to produce at a station. This will frustrate the operator, but will also make that operator think how to get the quantity that is required by the customer.

A tool that can be used to aid the creation of a one - piece flow process, as mentioned previously, is the cellular manufacturing layout.

#### **24.2.1.1 Cellular manufacturing**

An integral part that creates a one piece flow manufacturing system is the cellular manufacturing layout, also known as flexible manufacturing cells (FMC). This machine layout lends itself to the lean manufacturing philosophy, as it seeks to reduce manufacturing lead times, improves product cost through reduction in inventory, builds in quality, creates real flexibility, frees up floor space and creates an atmosphere of employee involvement and continuous improvement (Liker, 2004:96).

Penkala (2005) states that cellular manufacturing is a series of product-focused work groups or cells, which contain all the operations that manufacture a family of products. The cellular manufacturing system is dedicated to manufacturing those products that require similar operations. While the mass manufacturing environment is laid out functionally with similar machines in one area, cellular manufacturing operates by starting with the raw material process and ending with the finished product that will be sent to the external customer. All the operations are performed in the manufacturing cell.

The machines in the manufacturing cells are located within close proximity to minimize the manufacturing waste of over transportation and the cell assists in maintaining a continuous flow with zero inventories between operations. The manufacturing cell must contain operators that are multi-skilled and who will take complete responsibility for quality and delivery performance within the cell.

Cellular manufacturing will highlight the unskilled operators in the cell through the inventory build up in front of their workstation.

Penkala (2005) says that it is important to start a cellular manufacturing system with the right people and success will be carried throughout the rest of the organization with this pilot group. The process engineers must ascertain what machines and equipment are needed in the cells and also allocate an area with enough space to create the cellular manufacturing process. The cell's products should be located together and this will minimise the cell's dependence on resources or the operations that are external to the cell. It is important to focus on the common set of operations that is needed to manufacture the products in the cell.

For cellular manufacturing to be a success, the cell must contain multi-skilled operators who can move freely as needed between work centres within a cell, as to balance the cells' workload between the operators. The idea is teamwork - it is important not to consider the individual performance, but to consider the team's performance (Ohno, 1988: 24).

#### **2.4.2.2 Total Productive Maintenance (TPM)**

Schonberger (2001: 109) explains that TPM does not imply "We did our TPMs", but that it is a philosophy of continuous improvement, as it seeks to achieve zero breakdowns and zero defects. This TPM philosophy is achieved through equipment maintenance and sustained operator involvement. The benefit of TPM is the elimination of losses due to breakdowns on the shop floor.

The overall equipment effectiveness (OEE) as Schonberger (2001: 111) states has only two uses, the first is to raise an alarm after a number of months and the second reason is to benchmark against other companies. Utilisation of machines has no merit as a measure of performance. TPM on the other hand can eradicate production losses and should therefore be the philosophy that an organisation should concentrate on. The losses that TPM can eradicate are as follows.

The first loss would be through machine breakdowns and this is due to unexpected equipment repairs. Costs that can be associated with machine breakdowns are output losses and higher labour dependant costs.

The second loss that can be eliminated is the set-up and adjustment time losses that occur during product changeovers, shift change and changes in operating environmental conditions.

Speed losses occur when equipment is slowed down to prevent quality defect stoppages. The speed losses have a negative effect on productivity and asset utilisation.

The fourth loss would be quality defect losses and this is caused by the manufacture of defective or sub-standard products, which must be reworked or scrapped. These losses include the labour costs to rework the defective part and material costs associated with the material that must be scrapped.

Yield losses are the fifth type of loss that occurs and is reflected through wasted raw materials associated with the quantity of rejects and scrap that result from start-ups, changeovers, equipment limitations and poor product design.

The overall equipment utilisation is affected by these losses stated and TPM is a lean manufacturing tool that seeks to reduce these losses. TPM can be used as a tool to solve the root cause of machine downtime and OEE measurement can be a tool for the plant manager to see how TPM is progressing in the plant.

Penkala (2005) explains that TPM involves small group activities with participation from maintenance and the manufacturing personnel on the shop floor. The objective of a TPM system is to teach the operators how to maintain their equipment and to perform minor repairs on their machines before a breakdown or loss occurs. In doing this, the operator does not need to wait for a maintenance technician to fix the minor breakdowns that occur on their production line.



### **2.4.2.3 Total Quality Management (TQM)**

When transferring from a mass production operation to a lean operation that has just enough inventories, and is delivered Just-In-Time, the quality must be observed at the source and not at the end of the production line. TQM also affects the organisation's political system, as the decision-making processes will be placed at the lower levels in the organisation and not only at management level. The decision-making base is incorporated in the TQM process to assist the employees that are adding the value to the product. It is an important step for South African organisations to implement these cultural changes, as this will set the company atmosphere where TQM can be implemented successfully. The Japanese organisations have shown that the cultural atmosphere is vital for continuous improvement. Senge (1992: 274) affirms that organisations striving to achieve successful management cultures like TQM will not be a success, unless the cultural and political part of an organisation is attended to.

A personal programme of leadership development for South African managers that will create a participative management style in their leadership skills is important. It will assist the managers to function as an internal TQM change agent. Instead of telling the employees what to do and punishing the employees when they deviate from the correct method, the leader should rather help individuals to do a better job and the result will be an objective learning environment for all in the organisation (Walton, 1986: 35).

For the TQM culture to be present in a South African organisation, all the organisational systems must be aligned. So it is important for the human resource systems, such as job design, selection processes, compensation and rewards, performance appraisal and training and development to be aligned to the TQM system. TQM integrates fundamental management methods, existing improvements and tools under one disciplined approach (Besterfield, 1995: 2). The information systems will need to be redesigned to measure and track the correct information that can be acted upon, to assist the company to achieve TQM.

Senge (1992: 299) explains that the learning organisation is important for an organisation to achieve TQM and this involves staff always learning how to do better and management learning how to be more responsive to staff. The leaders will facilitate this process, by helping the staff develop their own visions and aligning these visions with that of the organisation's quality vision.

Jablonski (1992: 60) recommends that management must implement process action teams, who are interested in the TQM organisational change and who will evaluate, improve and implement change. Less energy will be needed to get greater results through this core team and this will start a positive wave of TQM. Leaders need to be persistent, using constant reinforcement, through continuous training.

The leaders must make sure that the organisation sees TQM as a process and not a programme that could be phased out. It should be integrated into ongoing operations and the focus should be on how an organisation can continuously improve its goals and objectives. It is important not to overemphasize techniques such as statistical process control and the use of charts. The employees should rather focus on the systems, the analysis and the improvement of processes.

The implementation should be gradual, so that meaningful culture change is ensured and frequent feedback must be given to the leaders.

It can never be overstated that involving the employees in the decision making process at each stage and every level is vital for the success of TQM.

Besterfield (1995: 68) believes that union representatives must be involved in programmes that involve employees and it is therefore important for the organisation to have discussions with the unions about the TQM roll out. Leaders must create an atmosphere that allows the workers and managers to feel free to share improvement ideas. Emphasis on client feedback must be made known to the relevant employees and quantitative and qualitative performance tracking must take place in the self-directed work team forums.

The concept of 'management by walking around' is a useful way to stay in contact with the plant operations and to be accessible to the employees on the floor when they highlight improvements. This again eliminates the organisational levels, as the manager is accessible to all employees and there is no need to go through the long red tape system to get an improvement implemented. The leaders must meet weekly with middle managers regarding their personal efforts to use TQM in the plant. It is important that the employees are trained in horizontal and vertical communication, as this will get the groups to communicate with each other.

Liker (2004: 38) believes that the company culture must be one of: "stop and fix the problem, to get quality right the first time". It is important that the organisation first learns to see the problems before learning to fix problems. The managers must continuously check with the employees, their comfort with the process. If people are feeling threatened, the process pace should be reduced to address this issue.

The suppliers and the employees must feel like partners and there should be a mutual commitment from every one. As mentioned previously, it is important for the top management to lead in this roll out. Quality needs to be built in at the source. A dynamic tool that the Japanese use is the 'poka -yoke' system and this means to error proof the operation so that the operator can only produce that part the correct way every time (Liker, 2004:132).

#### **2.4.2.4 Create uniform production - Kanban and Just-In-Time**

Sandras (1989:1) describes how just-in-time works, the principles that hold it together, and the motor that propels it and what the operator must do to drive it. Lean manufacturing is a constant series of small steps, which is a safe, economical and rapid way to drive continuous improvements into the manufacturing organisation. Sandras (1989: 2) identifies four factors, which play a role in promoting a lean manufacturing organisation. For the organization to implement a uniform production process, it needs to take the following four factors into account.

The first factor to consider when creating a pull system would be the kanban (card signal) system, which acts as a signal to replace what has been used. If the kanban authorization is present, one can act. If it is not, one does not act. In lean manufacturing it is important to control inventory and the kanban system does just that. It again promotes one-piece flow rather than large batch production. The customer will signal to the supplier when to manufacture the next parts. It will allow for fewer inventories on the line and this will help the reduction of scrap parts (Liker, 2004:23).

Ohno (1988:95) shows how reducing and avoiding set-ups gives an organisation the flexibility of running smaller batches. In lean manufacturing, it is important to reduce unnecessary and non-value adding production time. Reducing and avoiding set-up times can assist in achieving these results. The objective is to make sure that the set-up time is an external process time that can occur while the machine is operational or the set-up time can be reduced by using the SMED philosophy (Womack, Jones and Roos, 1990: 52). This system gives the organisation flexibility, but also allows the organisation to hold fewer inventories on the factory floor. So this is a key tool to achieve a Lean manufacturing plant and it aids in developing a production line that is uniform.

The third factor to consider is the importance of linking the supplier and customer together. This reduces the value chain time by linking the supplier to the operation and linking the manufacturing operation to the customer. A proven method is to supply just-in-time and even have the supplier on the customers' manufacturing sight. This close relationship sets the perfect scene for communication and creates the 'customer-in' relationship rather than the fatal 'product out' policy. It is important for the organization to be based close to the customer. If the supplier cannot be based close by, then a well set-up communication system must be implemented to alert the supplier when to manufacture the next good parts (Liker, 2004: 24).

The fourth factor is to measure performance, as it is important to see where the organisation is at present. The best way of doing this is to measure the performance of the operation by first looking at quality and then looking at the efficiency.

Schonberger (1982:103) states that it is important to standardise and simplify the operation. By simplifying the process, one avoids mistakes. The process can then be stabilised and goods will flow like water.

## **2.5 CONCLUDING REMARKS**

In this chapter, research revealed the importance of SCM, supplier development and lean manufacturing. This chapter primarily looked at the “what, why and how” of SCM and supplier development. By covering the meaning of lean manufacturing, its importance for today’s manufacturers and the types of tools required to create a lean manufacturing environment. The underlying purpose is to establish what lean manufacturing competencies the research reveals will provide VWSA with more effective suppliers.

Chapter three will essentially deal with the second sub problem, namely what modes of interaction are currently in existence between VWSA and its suppliers?

## **CHAPTER 3**

### **MODES OF INTERACTION BETWEEN VWSA AND ITS SUPPLIERS**

#### **3.1 INTRODUCTION**

In chapter two, research revealed the importance of SCM, supplier development and lean manufacturing. Chapter two primarily looked at the what, why and how of SCM and supplier development covering the meaning of lean manufacturing, its importance for today's manufacturers and the types of tools required to create a lean manufacturing environment. As mentioned in chapter two the underlying purpose is to establish what lean manufacturing competencies does the research reveal will provide VWSA with more effective suppliers.

Chapter three will essentially deal with the second sub problem namely, what modes of interaction are currently in existence between VWSA and its suppliers?

Some of the aspects evaluated in this chapter, included in the current supplier development initiatives, will be quality capability suppliers assessment guidelines, quality management agreements between the Volkswagen group and its suppliers, qualification programme new parts (QPNP) and the Quality Framework agreement for commissioning suppliers of module and system assemblies.

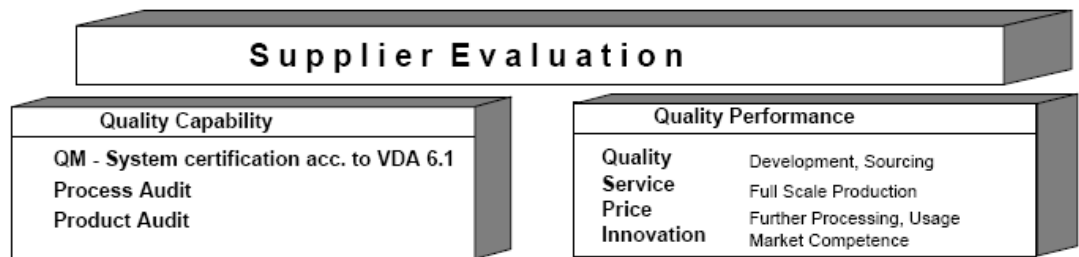
#### **3.2 QUALITY CAPABILITY SUPPLIERS ASSESSMENT GUIDELINES**

According to Volkswagen Group (AG) the evaluation system for the quality capability of Volkswagen group suppliers is based on a quality standard for the automotive industry that was developed by the Verband der Automobilindustrie (VDA) or in English the Association of German Motor Manufacturers and German Quality Association (DGQ) expert group. According to this quality standard, the Quality Management (QM) system according to VDA 6.1 is the

basis for suppliers of production material, and the fulfillment of the requirements must be proven to the Volkswagen group by a certificate third party.

The process audit facilitates the evaluation of the planning activities in the product creation process at a very early stage after the decision regarding the placement of the order was made to ensure that the processes and the process sequences are free of defects when series production starts; the as-delivered quality and the function of the products must comply with the customer requirements.

The quality capability evaluation is a component of supplier assessment. The effectiveness of the QM system and of the processes is measurable by evaluating the quality performance of delivered products or services (see Fig. 3.1). A positive supplier evaluation is a pre-requisite for receiving a purchase order.



**Figure 3.1 Quality capability evaluation**

Source: Volkswagen AG. 2000. Quality capability suppliers assessment guidelines. 4<sup>th</sup> Edition., pg. 6

### **3.2.1 Quality system audit according to VDA**

#### **3.2.1.1 General**

The quality management system requirements of the VW group are based on agreements between car manufacturers and suppliers, to which a QM system according to VDA 6 Part 1 or International Standards Organization (ISO/TS 16949) must be effective. The requirements for the QM elements correspond with German Industry Standard (DIN EN) ISO 9001/9004-1 with specific

additional requirements for the automotive industry and refer to the basic definitions and requirements for the quality management system and the respective practical application. Structural and functional aspects are analysed; the interaction of interface functions and interface tasks is considered in a decisive scope.

In the audit, the presence and effectiveness of installed quality management systems at the individual production site are determined and compared with the requirements of the products produced at the supplier.

The knowledge and the action of the management and the employees responsible for the individual quality management elements are systematically assessed and, if necessary, improvement actions are agreed upon.

The assessment bases for the quality management system audit are the quality management manual of the supplier, quality management instructions and procedure guidelines as well as guidelines for company management, order documents and customer and legal requirements. The effective application of the individual QM system requirements must be proven.

#### **3.2.1.2 Recognition of QM System Audit Results and Certificates**

An audit of the quality management system and the processor procedure steps is very time-consuming and ties up a host of personnel and represents a high cost factor to both the audited company and the company performing the audit. Based on QM system requirements according to VDA 6.1, it is possible to recognise certificates or audit results of QM elements that have already been assessed. The Volkswagen group recognises a certification according to ISO/TS 16949 as equivalent to VDA 6.1 certification according to this standard is, however, not demanded.

Accredited certification authorities that are approved by the VDA must execute the certification and all the audit certificates must be available (including deviation reports) so that the certificates can be recognised. second party audits are only recognised for individual elements according to VDA 6.1 – however,



not as an overall evaluation – if these were realised by certified auditors that are registered as “lead auditors VDA 6.1” in the VDA.

The recognition refers to the QM elements according to VDA 6.1 that must be audited in addition to the process audit if no certification exists. However, not more than two years may have passed since the execution of the last audit.

In the event of any serious deviations in the process audit and the supplementary auditing of the QM system elements referred to, the certificate will not be recognised for QM system elements with less than eighty percent compliance. Volkswagen will request the supplier to arrange for a subsequent auditing by the certifying authority.

### **3.2.2 Potential analysis**

#### **3.2.2.1 General**

The quality capability and the development know-how of the applicant must be assessed when preparing a decision regarding the placement of an order with an unknown supplier, in particular when ordering technically sophisticated products. Technically sophisticated products are products with special requirements in terms of the manufacturing technology, high quality demands, special technological requirements compared to the competitors and special requirements in terms of the development performance of the supplier.

Such determination of the quality capability with the aim to prepare for the purchasing order decision is carried out within the framework of a **potential analysis**. This involves experts of different business areas of the Volkswagen group to determine the technical and organisational facilities on the production site of the supplier at short notice and with minimum time expenditure.

The auditing team is usually composed of experts from the quality audit supplier group, the development and the purchasing departments as well as, depending on the individual case, other experts from the relevant departments, such as production or logistics and QA purchased parts from the purchasing plant.

The potential analysis serves for evaluating the development and process potential of the applicant, referring to the parts and the processes as indicated and specified by the purchasing department. The experience of the supplier with regard to similar product and the potential in the core processes of product realisation are assessed.

The potential analysis requirement list is used for the systematic and reproducible analysis. The questions or requirements that are not applicable at the time when the audit is carried out are not included in the evaluation. The product development potential can also be evaluated by a supplementary requirement list of the development “component specific evaluation of development partners” in this same context.

### **3.2.2.2 Auditing and evaluation process**

The “process” potential analysis is the determination and the evaluation of the potential with regard to the offered parts, the suitability of processes and process sequences as well as the capability to fulfill the customer requirements or expectations.

#### **The following evaluation elements exist:**

- Compliance with important component requirements (important characteristics)
- Experience or references
- Process development or project planning potential
- Q methods or Q techniques used
- Pre-material or purchased parts (sub-contractor qualification)
- Customer care or customer satisfaction (service)
- Production (all process stages) with process specifications, process installations, quality control activity or test technology, material flow or logistics.

### 3.2.3 Total evaluation

The rating is individually determined for the process total completion score series production each product group ( $E_P$ ) and total completion score for product creation process ( $E_{DE}$ ). The overall evaluation according to rating A, B or C is, according to the “obstacle” principle, always the lower individual rating.

Rating scale:

**Table 3.1 Rating scale**

Rating	Degr. of fulfilment $E_P$ [%] $E_{DE}$ [%]		Determination regarding the purchase order decision	Determination
<b>A</b>	at least 90	at least 90	Can be used	Without any series individual weaknesses
<b>B</b>	80 – 89	75 – 89	Can be used with conditions	Improvement/investment program can be implemented by the start of the development/SOP
<b>C</b>	0 – 79	0 – 74	Cannot be used	Implementation of an improvement/investment program by the start of the development/SOP cannot be foreseen/cannot be fulfilled

Source: Volkswagen AG. 2000. **Quality Capability Suppliers Assessment Guidelines**. 4<sup>th</sup> Edition., pg. 21

An improvement program that might be necessary is co-ordinated with the audited company on the date of the audit. The auditing team specifies the deadlines for the implementation and deadlines for the follow-up activities. The Supplier Quality Audit Group or the development department monitors the improvement program and the initiation for a subsequent audit, where necessary.

A process or product audit must always be carried out by the start of production (SOP) and an A-rating should be aimed at. Even in the event of a rating “cannot be used” (C Rating), the audited company is requested to correct the determined weaknesses and to report the implementation of improvement

action to the evaluation team so that the improvements can be considered for future purchasing order decisions.

### **3.2.4 Process audit**

#### **3.2.4.1 General**

In addition to the QM system audit, which as a rule is carried out by certification organisations authorised by the VDA, a process audit is carried out for production parts with special requirements of the Volkswagen group; the audit considers these requirements of the Volkswagen group and includes the **verification of secure processes and process sequences**. If necessary, the series production of applicants will be audited using comparable competitor parts and the currently used processes.

The process audit provides the assessment or measurement of the process and procedure quality of the product and process development steps, suppliers or purchased material (purchased parts) of the individual process steps in the parts manufacture as well as the compliance with all customer requirements right up to complete customer satisfaction.

Processes, for which this audit is particularly suited as an investigation method, can be identified by the following characteristics:

- New products
- New processes or new factories
- Numerous processing steps
- Numerous variables
- High quantities or volumes
- Numerous single purpose equipment
- Enforced long term planning and usage
- Technological special features compared to the competition

#### **3.2.4.2 Process audit in the production creation process Part A**

The process audit can be carried out very early or shortly after nomination, even if no series production has occurred, or if new factories are planned. Here the

audit is based on requirements and their compliance within the individual project dates in the product development process and contains the strategic orientation to supporting processes in the planning and implementation phases.

The product development process is always an individual audit element compared to the process development and is therefore generally calculated and awarded with an individual level of achievement. Process development is also assessed as an individual element and designated as a separate second element until the start of series production. Existing or comparable processes for series production are included in the audit. Failures must be traced back to the process planning for the new product and must be improved at that stage.

Product and process development is important for later customer satisfaction in series production. Therefore the individual requirements must be checked at suitable intervals for adherence or deviations and if necessary newly specified in the project.

#### **3.2.4.3 Process audit of series production**

Process audits performed during the series production require that the product generation process (product and process development) is completed. Volkswagen consider to a large degree customer satisfaction and supporting processes. The implementation of defined actions after finalization of the product creation process is a prerequisite for and a subject of the audit.

Auditing in the series production without process development can be performed at start of production or at any time during the entire manufacturing process. The result of this process audit can be used individually or in conjunction with a quality management system audit or certification as a measure of the total assessment of the quality capability and rating of the supplier.

For process observations and process improvements it is necessary to operate production non-conformity analysis in-house and to introduce continuous improvements derived there from. Suppliers with their own processes must also

be included in the total process chain observation and make their contribution to continuous improvement. A further process to be considered is product observation after delivery and customer care. Rapid recognition of problems and decrease of customer satisfaction must trigger immediate process improvement activities.

#### 3.2.4.4 Individual assessment of the questions and process elements

Each question is rated with regard to the respective requirements and their fulfillment for securing the process. This rating may be 0, 4, 6, 8, or 10 points with the evidence of the degree of fulfillment being the standard for the scoring:

**Table 3.2 Points assessment**

Points	Assessment
10	requirements <b>fully</b> met
8	requirements <b>mainly</b> met; minor deviations present
6	requirements <b>partially</b> met; major deviations present
4	requirements <b>unacceptably</b> met, serious deviations present
0	requirements <b>not</b> met

Source: Volkswagen AG. 2000. Quality capability suppliers assessment guidelines. 4<sup>th</sup> Edition., pg. 19

#### 3.2.4.5 Overall evaluation

##### 3.2.4.5.1 Overall evaluation of the product creation process Part A

The evaluation of a product group depends on the respective situation after the decision regarding a purchase order has been made. Thus, for instance, the product development process can only be evaluated as long as no manufacturing processes have been installed, i.e. all the planning activities are evaluated.

#### **3.2.4.5.2 Total evaluation of series production Part B**

With or after the SOP, once the production creation process has been completed, the evaluation is exclusively executed according to Part B, and the rating is carried out according to these requirements. All the required action from the planning and realisation phase must have been implemented by this time. Owing to the different process steps for the respective product groups in the production element, the process steps must be summarised for the respective product group.

As the evaluation is carried out over various process steps, the interfaces to the QM system are recorded and deficiencies are indicated. In the event of serious deficiencies repeated auditing for applicable QM elements according to VDA 6.1 might be required.

### **3.3 QUALITY MANAGEMENT AGREEMENTS BETWEEN THE VOLKSWAGEN GROUP AND ITS SUPPLIERS**

According to the quality management agreements between the Volkswagen group and its supplier's document more than half of a vehicle is made up of parts which the Volkswagen Group purchases from its suppliers. To a large extent these parts are of decisive significance both for vehicle functions and for customer-oriented quality appeal – and thus for customer satisfaction. In this context, and on the basis of a traditionally high standard of quality, the Volkswagen Group has developed a quality strategy which is an integral component of a comprehensive, contemporary purchasing strategy.

The present quality management agreement “Formel Q-konkret”, which originally emerged from collaboration with a small group of suppliers, and which has since then been constantly improved with the incorporation of ideas from the supplier industry, is divided into four main sections:

1. Supplier qualification and continuous improvement,
2. Quality planning at suppliers,
3. Pre-series activities in the Volkswagen Group and at its suppliers, and
4. In-series quality measures.

### **3.3.1 Supplier qualification and continuous improvement**

#### **3.3.1.1 Quality management – system requirements**

The Volkswagen Group expects a quality management system in accordance with the internationally valid standards and the supplementary industry-specific standards of the automotive industry to be installed and practiced at suppliers.

In certain cases it may be necessary for Volkswagen Group auditors to re-examine either individual elements of or the entire QM system. The supplier will be notified of this where necessary.

#### **3.3.1.2 External process and product audit**

As a supplement to the QM system requirements, Volkswagen Group Qualitätssicherung Lieferanten department conducts process and product audits at the suppliers. Using an industry-specific checklist of the VDA, processes and procedures are assessed which are applied for product and process development and to the manufacture of the parts in question.

The special customer-specific requirements of the Volkswagen Group are additionally taken account of in the context of this process auditing. Normally the processes to be assessed are already running under series conditions. The results of process audits provide information on the quality capability of these processes, and point to possibilities for improvement. A forecast of the process capability for agreed important characteristics is required prior to series start-up.

For new processes a programme for the securing of process capability prior to series start-up must be furnished. Important findings for the process are also provided by the results of the product audit for series products. This product audit is generally conducted together with the process audit.

#### **3.3.1.3 Assessment of quality capability**

The assessment of quality capability of suppliers is based on the results of the QM system certification on the one hand, and of the process and product audit



on the other. The results of these audits affect the assessment of quality capability. The auditing result leads to a grading as follows:

**Table 3.3 The audit grading result**

Grade	Designation	Measure
A	Quality-capable	Continuous improvement
B	Conditionally quality-capable	Supplier improvement programme
C	Not quality-capable	Immediate measures No further order placements

Source: Volkswagen brochure “Supplier Q – Capability” assessment guidelines  
Volkswagen AG

#### **3.3.1.4 Supplier assessment**

A supplier assessment is the basis for the Formel Q Award. It is undertaken by the client's specialist divisions. Each division has developed assessment criteria corresponding to its requirements and expectations. On the basis of these criteria an assessment is made which ensures that all relevant quality data are taken into account. Because the criteria have been formulated as quantifiable values, the assessment can be readily followed in its entirety.

Measurement and assessment is of the quality capability of the individual processes and the quality of products and services of individual manufacturing plants over a period of one year.

Each criterion is considered individually, and assessments are reached by the individual Volkswagen Group divisions in separate processes. The resulting values have equal weighting in the final assessment.

### **3.3.1.5 “Formel Q” supplier award**

The supplier assessment forms the basis of the supplier award, presented in recognition of outstanding performance. The award is made to the management and workforce of a manufacturing plant which meets the requirements and expectations of all client factories. They are awarded the Formel-Q trophy, and announcements to this effect are placed in the media. The award is designed to provide motivation for the continuous improvement of products and services.

### **3.3.2 Quality planning at suppliers**

This section contains a list of the requirements made of the supplier's quality planning by the client. It is a requirement that all relevant activities are planned and documented, and can be reconstructed in retrospect.

#### **3.3.2.1 Preparation of a quality business plan**

The quality business plan serves to highlight the strategic and operational quality objectives. The key data of the objectives and results must be made available to the client's purchased parts department on request. The business plan supports the introduction of formal procedures for measuring the achievement of the quality targets set (technical controlling).

The procedure here is two-way: Firstly, strategies and operational targets are presented to the operational divisions by corporate management; secondly the relevant measures planning is carried out by the operational divisions and passed back to corporate management. The outcome is the formulation of objectives done jointly by corporate management and the operational divisions – that is, the quality business plan, which must be updated at regular intervals.

#### **3.3.2.2 Nomination of quality officers**

A prerequisite for productive co-operation between client and suppliers is that each should nominate quality officers. These must be contact persons competent in all quality matters, having clear responsibilities and authority to act

within the context of DIN EN ISO 9000. The structure of quality assurance must be formulated in writing in the form of an organization chart giving the names of the officers and their deputies.

### **3.3.2.3 Nomination of an order overseer**

The Volkswagen Group expects the supplier to have a specially designated person for each order who is responsible for overseeing this order, and who is the contact person for the product concerned. In the same way the Volkswagen Group client will designate a contact person responsible in each case.

The object is to ensure an efficient management to schedule of each order by the supplier in cooperation with the client. The name, function and deputy of the supplier's order overseer must be communicated to the client. The order-overseeing contact person at the suppliers is also responsible for adherence to deadlines.

### **3.3.2.4 Scheduling**

In order to meet the requirements of the market for ever-shorter development times for new products and projects, the use of a standard flow plan taking in certain milestones is recommended.

Suppliers' scheduling must take account of the applicable key project data in each case. It is expected of the supplier that he will assist in a "design" sense in the continuous improvement of these key data in the context of a simultaneous engineering process. As required, suppliers will be involved in pre-development prior to the final definition of the objectives catalogue. In such cases each supplier is expected to produce his own project flow plan, to be constantly harmonised with the client's order overseer and adjusted where necessary.

### **3.3.2.5 Ascertainment and prompt implementation of customer wishes.**

The Volkswagen Group and its suppliers jointly apply methodical procedures for translating the "voice of the customer" into technical prescriptions and process

designs. This procedure must be represented and documented in a suitable manner.

The methods to be applied relate to all characteristics which have to be optimised. At the same time, those points which may signify a competitive advantage are dealt with specifically. This procedure also serves to move the quality management approach into the design and development process, and also provides a basis for determining important characteristics for process control.

### **3.3.3 Activities prior to series start-up in the Volkswagen Group and at suppliers**

#### **3.3.3.1 Activities in the Volkswagen Group**

##### **3.3.3.1.1 Simultaneous engineering (SE)**

A drastic reduction of product development times is imperative if the Volkswagen Group and its suppliers are to remain effective in international competition. A major contribution to the reduction of necessary development times is made by the application of simultaneous engineering (SE). SE means a departure from the traditional progressive approach.

Through the parallel, simultaneous development of product and production equipment, the available development time is used to the best advantage. It also makes a longer modification period for the production equipment possible. Despite longer development phases, considerable time savings are made in the innovation phase of the product as a result of simultaneous development of the product and planning of the production equipment.

Part of the aim is to involve the supplier in the preparation of the technical specifications. This collaboration at an early stage results in advantages such as:

- A considerable reduction in development times and costs,
- Early integration of customer wishes and statutory requirements,
- Lasting savings in tooling, materials and logistics costs,

- Better-quality products as a result of matured designs and production equipment,
- International competitiveness.

#### **3.3.3.1.2 Co-operation and experience-sharing**

The suppliers are involved on a partnership basis as early as the pre-development stage for complete assemblies (as development supplier). As a rule the development supplier becomes first supplier. The development supplier ensures that as many standard parts as possible are used. The Volkswagen Group client provides the supplier or sub-supplier with all findings related to the sphere of the product to be developed – in particular the requirements of the cross-marque platform strategy (platform, “hats”, first sample deadlines and locations, etc.). For the supply of modules, competency and responsibility must be determined jointly and in good time, and interfaces defined. In the case of product development by the Volkswagen Group, the technical manufacturing possibilities of potential suppliers on the basis of similar processes and comparable products must be taken account of.

#### **3.3.3.1.3 Objectives catalogue, technical specifications list**

Both the objectives catalogue and the technical specifications list comprise stipulations approved by the client concerning development projects for the individual phases of product development and preparation for introduction.

These stipulations are based on market requirements relating to vehicle technology, manufacturing technology, quality, costs and deadlines. The objectives catalogue sets out the consequences arising from the stated objectives. The technical specifications list comprises the stipulations binding as at styling freeze. Styling freeze is the conclusion of the concept phase of a development project. At this time a harmonised data control model is in existence. After this has been determined, normally no further changes are possible.

The development supplier is required to develop his own technical specifications or requirements list on the basis of information received from the

client, including field experience, which contains the necessary stipulations relating to product requirements, quality, unit numbers, costs and deadlines.

#### **3.3.3.1.4 Matching or installation trials in the pre-series phase**

In the case of parts and modules which require matching, each assembly must be considered individually on the basis of trial installations involving all suppliers and sub-suppliers concerned, and the client. The result must be documented.

After scheduling, the supplier will be given the opportunity of evaluating his parts on the cubing, the “Meisterbock” a master jig constructed of bolted-together aluminium profiles which gives constant reference points throughout the lifespan of the vehicle. These reference points are defined in the design drawing. All assemblies making up the whole vehicle are aligned to these reference points. For this purpose, subject to consultation with employees of the client’s relevant departments, employees of other suppliers can also be made available.

#### **3.3.3.2 Activities at suppliers**

##### **3.3.3.2.1 Qualification programme for new parts**

The qualification programme for new parts serves the objective of creating the preconditions for the production of new parts by means of quality planning processes at the suppliers.

Among other things this comprises:

- Provision to deadline of sample and series parts
- checking of design documentation for completeness, plausibility and feasibility
- Production of the dimensional stability and process capability forecast
- Monitoring of the preparation of equipment aids such as original model castings, gauges, etc.

After procurement type determination, the client selects key parts of the project concerned, for which the qualification programme is to be implemented by the supplier together with the client.

Key parts are parts which

- manifest a novel type of design
- incorporate new manufacturing technologies
- Are known from past experience to be problem parts with corresponding reject rates in further processing or in customer use.

In addition to the key parts, which are processed by the team, it is expected that all other parts shall be dealt with by the supplier on his own initiative in line with the qualification programme.

#### **3.3.3.2.2 Dimensional stability forecast**

The supplier of prototype and pre-series parts produces a measurement record of the parts relating to important characteristics (prior to any repairs or reworking for the purpose of achieving status as per drawing). These measurement records are a component of the part's life-history and should be kept constantly available for reference purposes. In this connection the comments of experienced employees in prototype manufacturing, going beyond pure measurement data, are often very helpful at a later date.

Prototype and pre-series parts must be ordered and manufactured as such, in line with requirements for the various construction stages. The units supplied must be identified accordingly. Any deviations in respect of important characteristics must be agreed with the client's prototype or engineering departments. The dimensional stability indicator must be calculated for each measurement record on the basis of the six measured parts. The dimensional stability indicator is a yardstick showing to what extent the characteristics examined correspond with the requirements of the drawing.

### **3.3.3.2.3 Process capability forecast**

For selected important characteristics the process capability indicator is required as early as the time of delivery of prototype or pre-series parts. This value serves to estimate to what extent the planned or installed manufacturing processes can be deemed reliable. If series production processes for the manufacture of prototype or pre-series parts are not yet available, then substitute processes will be selected on the basis of identical process arrangement, and parts from this “surrogate production” used for ascertaining the process capability indicator (PI).

### **3.3.3.2.4 First samples and approval conditions**

First samples are products and materials which have been manufactured entirely using series manufacturing equipment and under series conditions. The first sample inspection is designed to furnish proof prior to series start-up that the quality requirements as agreed in drawings and specifications, together with any measures additionally called for by the Corporate Sourcing Committee (CSC) decision, are met. All quality characteristics agreed in drawings and specifications in respect of dimensions, material, function, reliability, appearance, texture and identification (e.g. manufacturer code) are sampled. The supplier is responsible for carrying out the sample inspection. The client reserves the right of counter-inspection.

### **3.3.3.2.5 Pre-production run (2 days production)**

As a rule, a pre-production run must be carried out especially for modules, complex components, component groups and assemblies. Chronologically this will come between the Nil-series and series start-up.

The aim of a pre-production run is for the supplier to furnish evidence in respect of

- Process and quality performance of the entire production process under series conditions,



- The capability, with the personnel and machine capacities deployed, of manufacturing the required numbers of acceptable units to deadline for the client, and
- The suitability of the scheduled packaging, transport and storage containers and pallets, and of the modes of transport and routes.

### **3.3.3.26 Quality management handbook**

Each supplier must produce his own quality management handbook and keep it up-to-date. The guiding principle for this handbook should be the currently valid edition of DIN EN ISO 9004.

### **3.3.4 Quality measures in series production**

#### **3.3.4.1 Ascertainment of ongoing process capability**

Process capability is a measure of the quality of a process as related to the specification of the products to be manufactured in the process. Ascertainment of the ongoing process capability requires a long-term observation of the process results. For the ascertainment of process capability it is necessary for the process to be under statistical control, i.e. that all systematic influences are known and under control. Process capability is customarily determined using control cards.

The range of important characteristics for ascertaining Process Capability Index (Cp) and Process Capability corrected (Cpk) values must be defined in the product and process Failure Mode and Effect Analysis (FMEA). This documentation may be inspected by the client at any time.

#### **3.3.4.2 Control of the manufacturing process**

Control of the manufacturing process is achieved through the constant monitoring

- a) of specified important product characteristics and/or
- b) the process parameters influencing these.

re: a) These are specific component characteristics such as dimensions, weight, surface texture.

re: b) These are process-relevant parameters such as pressure, temperature, time, atmospheric humidity, current, voltage.

Definition of the important characteristics for a) and b) is made primarily in product or process FMEAs.

#### **3.3.4.3 Internal system audit**

In order to assess and improve the quality capability of company divisions, internal audits must be carried out at set intervals as instructed by suppliers' corporate management.

#### **3.3.4.4 Conduct of internal process audits**

The purpose of a process audit is to establish whether the processes and procedures used, correspond with the stipulations and conditions for the adherence to specifications. The basis for this is procedural and process specifications, technical requirements and quality demands.

Weaknesses revealed in the audit result must be defined, together with effective measures for rectification, in an improvement programme with accompanying timetable.

#### **3.3.4.5 Conduct of internal product audits**

A product audit is the checking of a small number of finished products for their adherence to prescribed specifications, drawings, technical documentation, packaging requirements, standards, statutory provisions and other stipulations of the client.

In the process the product is always scrutinized from the viewpoint of the client and his customers, for example in regard to its function, dimensions and outward appearance. Weaknesses revealed in the audit result must be listed in

a timetable together with effective measures for rectification, which must be implemented.

#### **3.3.4.6 Measuring and test equipment for important characteristics**

The supplier is obliged to make use of test equipment (measuring appliances, gauges and test appliances) for securing the quality of parts, for ascertaining process capability and for purposes of analysis. All equipment required for the control of internal processes must be at hand. The same applies to all measuring equipment which is needed for ascertaining the required variable data (e. g. statistical process control characteristics).

In order to ensure that, where several suppliers manufacture the same purchased part, all important characteristics can be measured identically by each supplier, design of the necessary measuring equipment should be carried out or co-ordinated by the development supplier. This will also ensure the comparability of the various measured results. Since there is only a limited range of testing equipment available at the clients' factories, analyses must also be carried out by the supplier.

### **3.4 QUALIFICATION PROGRAMME NEW PARTS (QPNP)**

#### **3.4.1 Purpose**

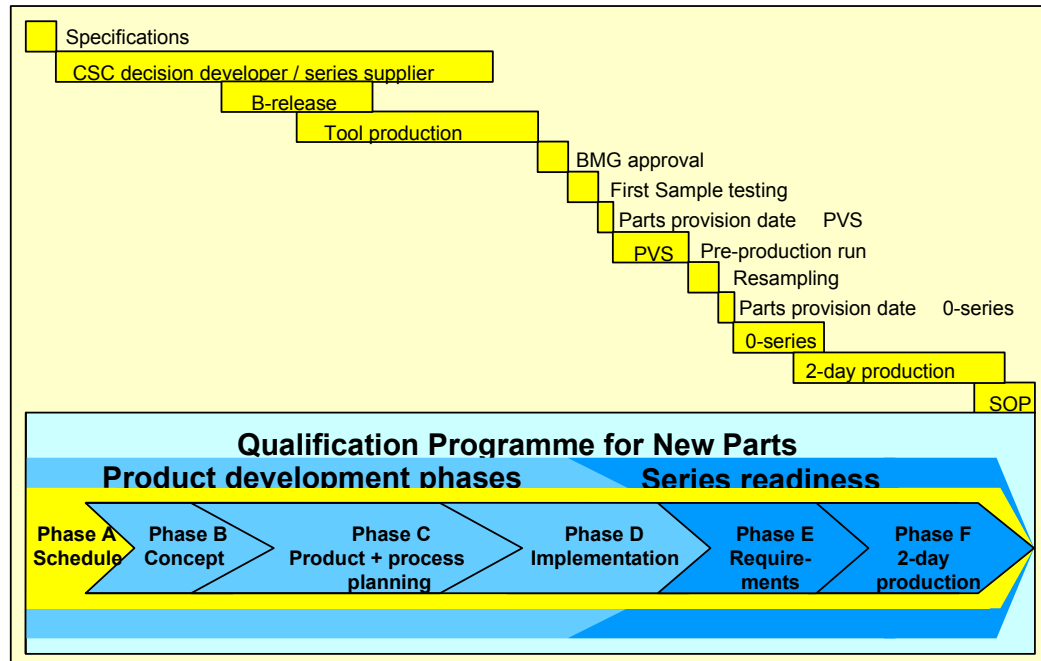
The qualification programme new part (QPNP) of Volkswagen is a tracking system for purchased parts. The main objective is to achieve the quality agreed upon and the amount of purchased parts for a specific vehicle project on time.

The QPNP is a guideline with a standardised procedure and will be used throughout the entire Volkswagen Group. It simplifies the cooperation between our suppliers and the plants that use their components for the first time.

The basis for the implementation of the QPNP is the quality management agreement, "Formula Q – Konkret", between the Volkswagen Group and its suppliers. The quality management agreement is a supplement to the purchasing conditions for production materials and constitutes an integral part

of the delivery contract. The supplier has to start working on the QPNP as soon as he receives an order.

**Figure 3.2: The Qualification Programme for New Parts:**



Soure: Qualification Programme New Parts. Procedures with integrated acceptance of 2-day production. Pg. 4

To suit the project and part specific requirements, the qualification programme for new parts was built in a modular way and structured according to the phases of product development and series readiness. In the **product development** phases, the project progress of the purchased parts is determined. Individual parts with the same or a similar production process are allocated to part families and their Q-status is evaluated with questionnaires or checklists.

In the **series readiness** phases, the supplier has to prove that he can produce the product on time, to the quality standard and in the quantities agreed upon. The necessary requirements are checked with a checklist. If the quality assurance department of the customer plant accepts that the component requirements are fulfilled, a 2-day production audit can take place. If it is successfully concluded, the QPNP has been completed.

The quality assurance department of the plant that uses the product for the first time, hereinafter referred to as QA customer, provides a preliminary prioritisation of the order. The prioritisation also defines the intensity of the cooperation between the QA customer and the supplier

### **3.4.2 Application area and handling information**

The qualification programme for new parts is used for all new parts in new projects (except standard parts) as well as for all new suppliers for existing projects. The individual parts (part numbers) of a project scope can be combined and processed as a "parts family" in the qualification programme for new parts to reduce the processing.

Complex order scopes (many versions) can be combined to form a "parts family" if the complexity is based on a basic version and results from:

- Additional processing steps (e.g. painting, etc.)
- Assembly of different components of the respective versions

Order scopes for which no specific part number can be defined for reasons concerning system or production control (usually modules or JIT orders), are always classified with Priority 1 – important parts with special monitoring. For these scopes, the reference part number has to be determined in cooperation with the parts manager who acts as a contact person for the QA department of the plant that uses this product for the first time.

The processing of the Qualification Programme for New Parts always starts with Phase A, if no other arrangements were made with the QA department of the customer. Phase A includes the detailed coordination of all current and quality-relevant deadlines and project data.

In the software version of the QPNP, the processing of Phase A also includes the standardised preparation (basic data capturing) for all evaluation documents used.

### 3.4.3 Evaluation procedure and documentation of results

The individual QPNP phases are evaluated by answering the questions provided. If part-specific, additional questions are asked in the respective project phase, they must be included in the evaluation.

**The evaluation is performed according to the following grading:**

- 10 points = Requirements completely fulfilled.
- 5 points = Requirements largely fulfilled, minor deviations.
- 0 points = Requirements insufficiently fulfilled, major deviations.
- X = Question not relevant for this evaluation  
(Q. should be temporarily or permanently excluded from the evaluation)

After the first question that was evaluated with 0 points or the third question that was evaluated with 5 points, the project status is set to yellow. It is mandatory to provide information concerning the corrective measures initiated, the implementation deadline and the person responsible for the implementation for requirements that were evaluated with 0 to 5 points. For requirements that were evaluated with 10 points, a short entry should be made in the "measures" field (e.g. done, completed, etc.) to make it easier to understand the evaluation results

### 3.4.4 Determining the priority number for specific parts

The prioritisation of the parts is exclusively performed by the customer before the start of the Qualification Programme for New Parts, based on fixed evaluation criteria that are only described here for information purposes.

#### **Parts with Priority 1: Important parts that require special monitoring**

The project is jointly evaluated at the production site of the supplier in all QPNP phases after coordination with the parts manager of the QA department of the customer plant.

### **Parts with Priority 2: Parts that require general monitoring**

The supplier evaluates all QPNP phases as his own responsibility, at the latest by the deadlines provided by the customer. The evaluation documents are presented to the parts manager of the QA department of the customer plant during an appointment.

### **Parts with Priority 3: Parts where monitoring is not required**

The supplier evaluates all QPNP phases at his own responsibility, at the latest by the project deadline specified by the customer. The evaluation documents are sent to the parts manager of the QA department of the customer plant.

## **3.5 THE QUALITY FRAMEWORK AGREEMENT FOR COMMISSIONING SUPPLIERS OF MODULE AND SYSTEM ASSEMBLIES**

The quality framework agreement for commissioning suppliers of module and system assemblies at Volkswagen AG establishes who is responsible for the individual components in a module or system (henceforth the module), according to the "formel-Q-konkret" quality management agreement. According to Volkswagen, the assembly of systems or modules involves the supply of complex and varied components, which are supplied, normally in sequence with production according to customer requirements.

The supplier's added value is therefore located purely in the assembly function. In the case of system suppliers, it also covers responsibility for individual parts or assemblies. The module suppliers who deliver to Volkswagen are responsible for the quality of all commissioned added-value in the complete module. This means: the module supplier accepts responsibility for the assembly and delivery quality of all the products and designated parts they supply.

Self-procured module parts must be sampled for the reasons given above. For technical or aesthetic reasons, Volkswagen samples individual parts or assemblies itself. When this is done the module supplier must repeat the installation test. The module supplier then makes first sample submission parts available to Volkswagen.

Volkswagen is responsible for sampling designated parts. Designated parts which, contrary to this, are to be sampled by the module supplier, is defined by Volkswagen quality assurance at the factory where the parts are to be assembled prior to commissioning of the order. The findings for all parts sampled by the module supplier are made available in the form of technical data.

Once contracted, the module supplier takes over Volkswagen external change management, including schedule monitoring for self-procured parts and designated parts, as well as the (complete) module. Any parts in the module requiring supporting documentation are documented according to VDA volume one Volkswagen must provide confirmation that the module can be fitted.

Warranty claims for designated parts within an assembly, which cannot be supplied as individual or replacement parts, are, if necessary, passed on by the module supplier to a subcontractor after having received the claim from Volkswagen, according to the principal of responsibility. Warranty claims concerning designated parts within an assembly, which are available as individual or replacement parts will be processed directly by the service division.

Incoming goods identity checks, as well as tests defined prior to the awarding of the contract; detect obvious faults in functions, tolerances and surfaces, allowing the module supplier to ensure that only parts with a known release status are produced. The prerequisite for this is that Volkswagen or designated part suppliers inform the module suppliers in good time of any design modifications to designated parts and their use in production.

A quality assurance and warranty agreement shall be concluded between the module supplier and the designated parts suppliers. The module or designated parts supplier quality assurance agreement covers the basic implementation of all Volkswagen quality guidelines, such as "formel-Q-konkret". Sub-contractors supplying self-procured parts are subject, without restrictions, to the terms of "formel-Q-konkret".



The module or designated parts supplier warranty agreement requires the adherence to the terms and conditions defined in Volkswagen's purchasing conditions, as well as the regulation of cost allocation between the module supplier and the instigator of the costs.

The module supplier is responsible for the implementation of conditions determined by colour management if the module is subject to colour specifications. Should there be complaints in the assembly halls or in the field, the module supplier, together with factory quality assurance, shall analyse causes and ensure that the required measures are implemented as quickly as possible.

Finally, a representative from the module supplier must be present during Volkswagen's inspection of the 2-day production run for designated parts.

### **3.6 CONCLUDING REMARKS**

The purpose of this chapter was to discuss the tools currently in place at VWSA to encourage and enforce supplier development. Various aspects of quality and supplier management were discussed. A discussion of the various quality management systems highlighted the importance of supplier capabilities required before orders can be placed and the agreements required between customer and supplier.

From the aspects discussed in this chapter, Volkswagen's view on supplier development was established. This will form the basis for the development of the research questionnaire which is discussed in chapter four.

The following chapter outlines the research methodology and analyses the design of the empirical study.

## **CHAPTER 4**

### **THE EMPIRICAL STUDY**

#### **4.1 INTRODUCTION**

In chapter three the existing methods of supplier development at Volkswagen were analysed. Chapter three was used to establish the answer to sub-problem two: What modes of interaction are currently in existence between VWSA and its suppliers?

Allison, O' Sullivan, Owen, Rice, Rothwell, and Saunders, (1996: 4) state that research is a systematic enquiry that is reported in a form that allows the method of research results to be known to others. This technique will enable the researcher to resolve the main and some or all the sub-problems.

The main problem being addressed in this research project is the assessment of the nature of the supplier training at VWSA. To achieve this, it is necessary to test the actual situation. The purpose of this chapter is to describe the research methodology pursued in this study.

#### **4.2 RESEARCH METHODOLOGY**

Dominowski (1980: 2); Leedy (2005: 2) and Smith and Dainty (1991: 68) describe research as a systematic examination to discover new information to expand or verify existing knowledge in an attempt to resolve a problem.

Surveys are usually conducted via a questionnaire by post (postal surveys) (Emory and Cooper, 1991: 332-333).

It was decided to make use of the personal interview and descriptive survey method. Each will be briefly discussed below.

(a) Personal interview

Kerlinger (1973: 481) describes the personal interview as a face-to-face interpersonal situation in which the researcher asks the respondent questions designed to obtain answers which are related to the research topic. A personal interview can therefore be regarded as a very powerful method of obtaining the required information in a research survey. Kerlinger (1973: 479) confirms this when he says that the personal interview is the most widespread method of obtaining information. Smith and Dainty (1991: 101) emphasize the importance of the personal interview survey method when they state that the interview has a fundamental role in management research. Leedy and Ormrod (2005: 184) further reinforce this by explaining that face-to-face interviews have the distinct advantage of enabling the researcher to establish rapport with potential participants and therefore gain their cooperation, and thus yield the highest response rates.

Kerlinger (1993: 481) and Mitchell and Jolley (1992: 466-467) distinguish between the following two formats of interviews: A structured format, where the questions, their sequence and wording are fixed. The questions have been carefully designed to obtain information in terms of the research subject.

An unstructured format allows the researcher to ask any type of question and the respondent can answer as he or she wishes. This interview method is an open situation as opposed to the structured format which is a closed situation. Without a standard question construction, this method is open to researcher bias and is usually too disorganised for analysis.

Some of the advantages of the personal interview survey method are: It can be used when no other survey method is possible or adequate. It is subject to the same criteria of reliability, validity and objectivity as any other survey method.

The researcher can, to a great extent, arouse initial interest and thereby increase the rate of participation. The researcher can, because of the interaction with the respondent, clarify questions the respondent does not understand. The researcher can follow up on an ambiguous response.

(Kerlinger, 1973: 480-483; Aaker and Day, 1986:151 and Mitchell and Jolley, 1992: 458).

The personal interview survey method, however, also has disadvantages. Kerlinger (1973: 480) and Mitchell and Jolley (1992: 458-459) list some of these disadvantages:

- Interviews can be very time consuming, hence expensive.
- Interviewer bias. The interviewer may influence the respondent by verbally or non-verbally encouraging preferred responses.

#### (b) Descriptive surveys

Descriptive surveys are concerned with discovering answers to the questions who, what, where, when or how much in terms of the research topic. In certain circumstances such as these the questionnaire is a useful instrument available to a researcher. The information gathered should be:

- Presented in a simple and structured manner.
- The questioning style should be clear and concise, removing opportunity for bias.

The principal means of data collection will be via the monitoring of organizational practices, and the capturing thereof. The population of the study should be carefully selected and delimited.

Emory and Cooper (1991: 13) identify the following advantages of this method:

- It is popular in business research because of its versatility across disciplines.
- It has a broad appeal to the administrator and policy analyst for the planning, monitoring and evaluating functions.

The descriptive survey method has, however, also disadvantages according to Leedy (1989: 168):

- It is an involved research method and demands more activity from the researcher than other methodologies.

- It is also complex in terms of choosing a technique for sampling it, that is, should you send out a questionnaire or conduct an interview.

Leedy (1989: 151) concludes by stating that it is vital to design descriptive surveys with the necessary care, precision and consideration. The population also needs to be carefully selected.

Based on the findings of Kerlinger (1973: 479-483); Aarker and Day (1986: 151); Emory and Cooper (1991: 13) and Mitchell and Jolley (1992: 458), the personal interview in combination with the descriptive survey method, was used for the following reasons:

- It was the most suitable, considering the nature of the research being conducted.
- This method is reliable as it is subject to the same criteria of reliability, validity and objectivity as any of the other survey methods.
- The interaction between the researcher and respondent ensures that any queries can be resolved instantly.

The production manager at the listed suppliers was identified as the key individuals with whom the interview would be conducted as lean manufacturing principles forms part of his portfolio. The characteristics of the descriptive survey have now been highlighted. The questionnaire will now be discussed.

### **4.3 QUESTIONNAIRE CONSTRUCTION**

Easterby-Smith, Thorpe and Lowe (1991: 119) say that although questionnaires seem simple to use and analyse, their design is not simple as the main decisions to be made in terms of their design, centre around the type of questions to be included and the overall format of the questionnaire. Based on this fact, questionnaires need to be constructed according to certain principles.

#### **4.3.1 Question Construction**

Some of the most important factors to consider when constructing questions are: content, format, type and wording of the questions, and the sequence.

For the purposes of this study the researcher used two questionnaires, one to the selected suppliers mentioned earlier and the other directed at the Supplier Development manager of VWSA. The questions in the questionnaire used for this research were checked with various experts to ensure that they fulfilled the necessary requirements of question construction.

#### **4.3.1.1 Question Content**

The question content varies according to the type of information that is required. Hague and Jackson (1987: 104-107) and Easterby-Smith, Thorpe and Lowe (1991: 119) identify three types of questions:

- Factual questions which obtain biographical details such as age and length of service. Factual questions also address demographic details such as in which division the respondent is employed.
- Questions addressing opinions. Questions on opinion attempt to determine the respondent's thoughts and beliefs in respect of a particular subject at a specific point in time.
- Questions concerning behaviour. These questions determine awareness of a particular subject and attempt to assess the current situation.

#### **4.3.1.2 Use of language**

The following basic principles will be followed when constructing the questionnaire. According to Bell, (1993: 77),

- The more structured the question, the easier it will be to analyse.
- Question wording should be clear and concise to avoid ambiguity and imprecision and assumption should be avoided.
- Simplicity in sentence construction and meaning is vital.

The use of language has now been discussed. The following aspect of the survey to be discussed is the questioning technique.

#### **4.3.1.3 Questioning technique**

Thomas, (1996: 121) states that the researcher should not design questions that lead the respondent. The questions should focus on general problems versus personal matters. The questions should be simple and concise. There should be a consistent style of questioning technique.

The researcher will mostly use closed questions. This type of questioning technique ensures that the respondent replies in as concise and focused a manner as possible. The way in which the survey is presented to the respondents is of great importance. This leads to the next point.

#### **4.3.1.4 Covering letter**

The letter should be concise and focus on a brief explanation of the fact that the researcher is completing a thesis towards an MBA, and what the aim of the questionnaire is.

The respondents should be reassured that the time taken to complete the questionnaire would be a maximum of 15 minutes. A final date of return mail should be communicated and the respondent should be thanked in advance for his or her time and assistance. The manner and rate of the response is an important aspect of a survey. Should the response rate and validity of the responses be high and accurate respectively, the accuracy and credibility of the researcher's survey will be enhanced. Research response will now be discussed.

#### **4.3.2 Pilot Study**

The importance of conducting a pilot study to identify and rectify problems and weaknesses related to the questionnaire prior to the actual collection of data, is emphasized by various authors (Leedy and Ormrod, 2005: 192; Emory and Cooper, 1991: 382 and Mitchell and Jolley, 1992: 470). This pilot study can consist of two steps:

Informal testing. The draft questionnaire is scrutinised by people familiar with the research topic and/or the construction of questionnaires. Refinements are made to the questionnaire, based on the input received.

Formal testing. The draft questionnaire is tested on a small population that is representative of the target group. Again, in this instance, refinements are made, based on the recommendations received.

The questionnaire was subjected to informal testing in that it was examined by the Supplier Development Manager in an attempt to get language usage and meaning of certain terms clarified so as to approach the suppliers with correct terminology. His feedback was used to refine questions.

#### **4.4 RESEARCH RESPONSE**

The researcher attempted to have all questionnaires answered in his presence to enable him to maximize the research response. Unfortunately the researcher was only able to secure five personal interviews, four telephonic interviews, two respondents completed questionnaires without an interview and one none response. The lead-time from physically handing out the questionnaire to the tabulation of the results in chapter five was kept to a minimum. This ensured that the results were not stale, optimizing the accuracy of the outcomes. Any doubt as to the interpretation of the questionnaire was dealt with immediately and this too expedited the process.

The general response to the questionnaire was that the questions were unambiguous and the respondents were able to supply the necessary information required. Many of the respondents remarked that their organizations did not get the desired support with many of the aspects of the training support asked in the questionnaire. These aspects will become apparent in the following chapter.



#### **4.4.1 Delivery and return of the survey**

For the purposes of this document the questionnaires were e-mailed and the respondents interrogated in a personal or telephonic interview by the researcher. The type and number of respondents to whom the questionnaire was handed is important. The results of such factors will be tabulated in the following chapter.

#### **4.4.2 Selection of the research sample**

According to Welman, and Kruger (1999: 49), "...the populations in which human behavioural scientists are interested are so large that from a practical point of view it is simply impossible to conduct research on all of them." The researcher has selected a sample of firms that are relevant to the scope of the problem. A sample of ten firms supposedly operating according to lean manufacture principles as supplied by the Supplier Development Manager was selected. A total of 12 questionnaires were completed.

Knowing who the respondents were in each questionnaire is of great importance in establishing who in each firm's organisational structure was reached by the survey. It is important to obtain a sample of candidates within each firm that is knowledgeable of the contact with VWSA and its quality requirements. This is important, as all questions pertain to the quality, sequence and support structures to OEMs. This leads to the next point.

#### **4.4.3 Biographical detail**

In order for the questionnaire to cover the correct spectrum of respondents, the production, procurement and general managers were included in the mailing program. This was done to provide a realistic representation of organizations. In the following chapter these representative ratios will be quantified in tables. The way the survey was measured in terms of the outcomes will be described in the following point.

#### **4.4.4 Measuring statistical data**

According to Stevens (1993: 52), measurement involves the assignment of numbers, in terms of fixed rules, to individuals (or objects) to reflect differences between them in some or other attribute or characteristic. When measuring constructs such as opinions or attitudes, it is more difficult to quantify the outcome. The respondents' outcomes will be categorized in most instances as a percentage of respondents replying correctly as when compared to the ideal or optimal response.

#### **4.5 Conclusion**

This chapter explained the derivation of the survey and the various techniques to be included in the questionnaire in order to further expand the database already derived from secondary studies and analysis of successful supplier training initiatives. The salient characteristics of the descriptive survey method were described and it was explained how this method would be applied in this study.

The information gained from the questionnaire will be considered in the following chapter and ultimately aid the researcher by giving the necessary feedback required to solve the main problem. This leads to the next chapter which considers the results of the research.

## CHAPTER 5

### THE RESULTS OF THE EMPIRICAL STUDY

#### 5.1 INTRODUCTION

In this chapter the results of the empirical study described in chapter four will be presented and discussed in detail. Presenting the results of the empirical study will solve the third sub-problem, namely, how the literature research conducted in chapter two and the modes of interaction currently in place at VWSA presented in chapter three can be integrated into a model for future reference on which business can be built?

The research was divided into two questionnaires:

- The first questionnaire is targeted at the suppliers. This questionnaire has two sections namely section A, the biographical data and section B attempts to determine the quality systems and manufacturing requirements. It further attempts to gauge training support and needs as compared to other OEMs.
- The second questionnaire is aimed at the Supplier Development Manager. The aim of this questionnaire is to establish what the current training offerings are, the source of what VWSA teaches and the awareness of the Toyota Training College.

Leedy and Ormrod (2005: 22) state that measurement is ultimately a comparison: “a thing or concept measured against a point of limitation.” The results obtained will be discussed, and recommendations and conclusion will be offered at the end. This practical survey will be related back to theory where applicable.

Each section of the questionnaire will be quantified by assigning values to the responses to questions in that section. The greater part of the questionnaire is given with the rating scale of one to five, one being poor and five excellent.

Responses will be converted to a mean average score where positive and negative aspects of each question will be discussed.

Once this has been done, the main problem, “to assess the extent and effectiveness of the supplier training at VWSA” will be successfully resolved.

## **5.2 COLLECTION OF DATA**

The collection of data took place through first distributing the questionnaires via e-mail to all possible respondents having received contact details of the suppliers from the respective buyers at VWSA. The researcher then conducted personal interviews with those respondents who willingly availed themselves. The rest of the questionnaires were collected by conducting telephonic interviews with respondents and having them e-mail the questionnaires back. One of the respondents failed to reply to e-mail and telephonic requests to complete the questionnaire.

## **5.3 AN ASSESSMENT OF THE SUPPLIER FEEDBACK**

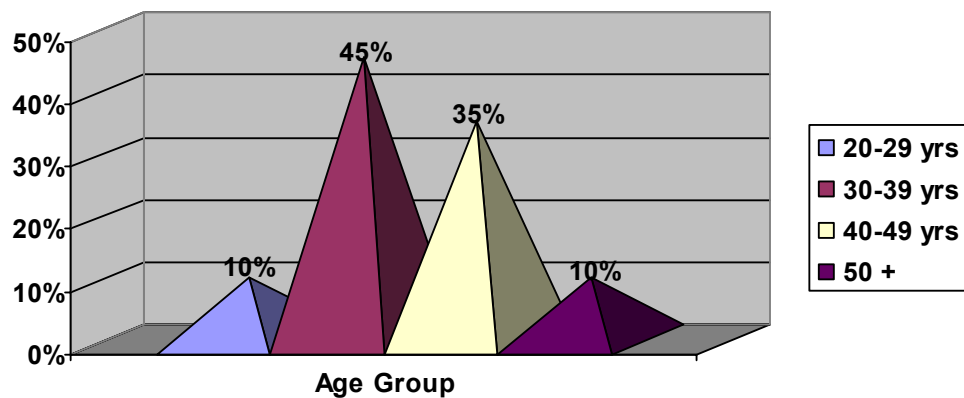
The findings of the selected suppliers will now be analysed and discussed. Each question from the questionnaire which was used in the interview will be provided to save the reader the inconvenience of having to refer to the questionnaire included as annexure A.

### **5.3.1 Biographical profiles of the respondents**

Section A required the respondents to furnish personal details. This information may further assist the researcher in assessing the profile of supplier development training needs should the requirement arise.

### 5.3.1.1 Age group of respondents

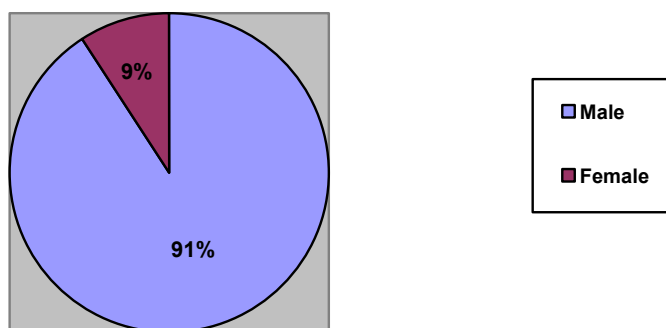
Figure 5.1: Age Group



This graph shows that the majority of the sample of respondents were in the age group thirty to forty nine years of age. Only one of the respondents were below thirty years old and one older than fifty years old.

### 5.3.1.2 Gender

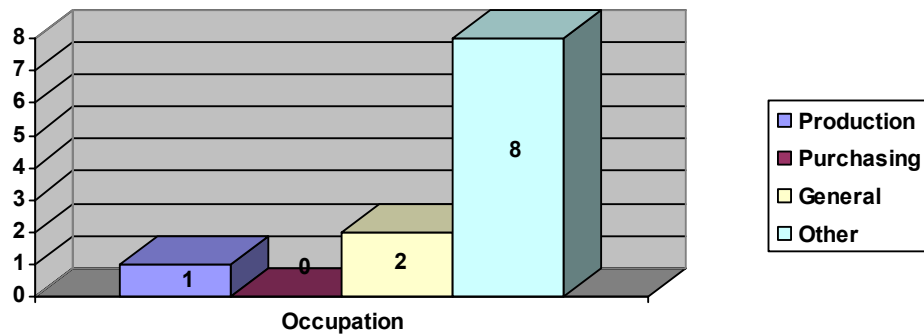
Figure 5.2: Gender



As indicated above the majority of the respondents were male. Only one of the respondents was a female.

### 5.3.1.3 Occupation

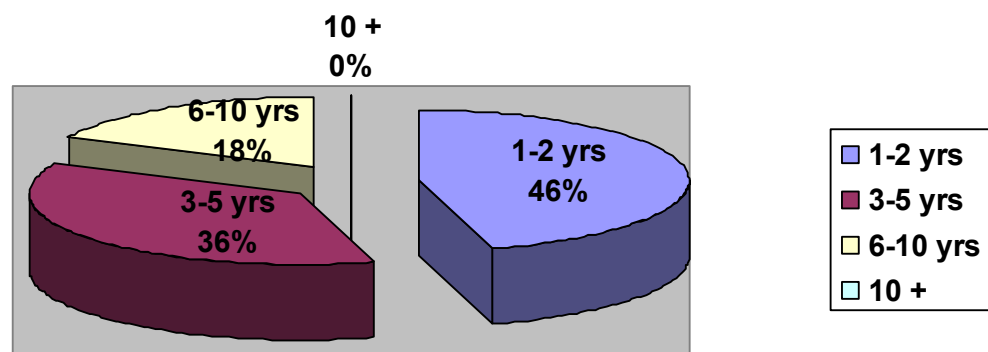
**Figure 5.3: Occupation**



The majority of the respondents came out of the other category. From these the following titles emerged, Program Manager, Engineering Manager, OE Product Manager, Sales Manager, Commercial Manager and Quality Manager. All of the respondents were found to have direct dealings with the OEMs and were familiar with the requirements of their customers.

### 5.3.1.4 Length of Service

**Figure 5.4: Time current position**



As indicated above most of the respondents were employed for one to two years in their current position. This is followed by those employed between three and five years. None of the respondents were employed for more than ten years in their current positions.

### 5.3.1.5 Summary of biographical information

- Eighty percent of the respondents were in the age group thirty to forty-nine years of age.
- An overwhelming majority were male.
- The questionnaire reached a broad spectrum of job portfolios as indicated by the occupation survey.
- Eighty-two percent of all respondents are employed for less than five years in the current position.

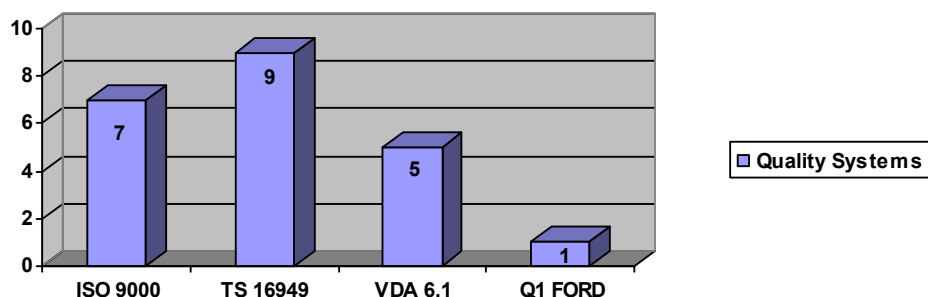
The information above indicates the profile of the sample. However, depending on the total result of the questionnaire, it may point to certain facts about what attitude the supplier base has to development. The relevance of this information will be referred to in statements made in the conclusion of this chapter. This leads to the next section of the questionnaire.

## 5.4 ANALYSIS OF QUALITY SYSTEMS

In this section of the questionnaire the respondents identify the quality systems in place at their respective organisations.

The question asked was: *What quality systems do you currently have in place?*

**Figure 5.5: Quality systems**



As mentioned in chapter three the quality management system requirements of the VW group are based on agreements between car manufacturers and suppliers, to which a QM system according to VDA 6 Part 1 or ISO/TS 16949 must be effective. The requirements for the QM elements correspond with DIN EN ISO 9001/9004-1 with specific additional requirements for the automotive

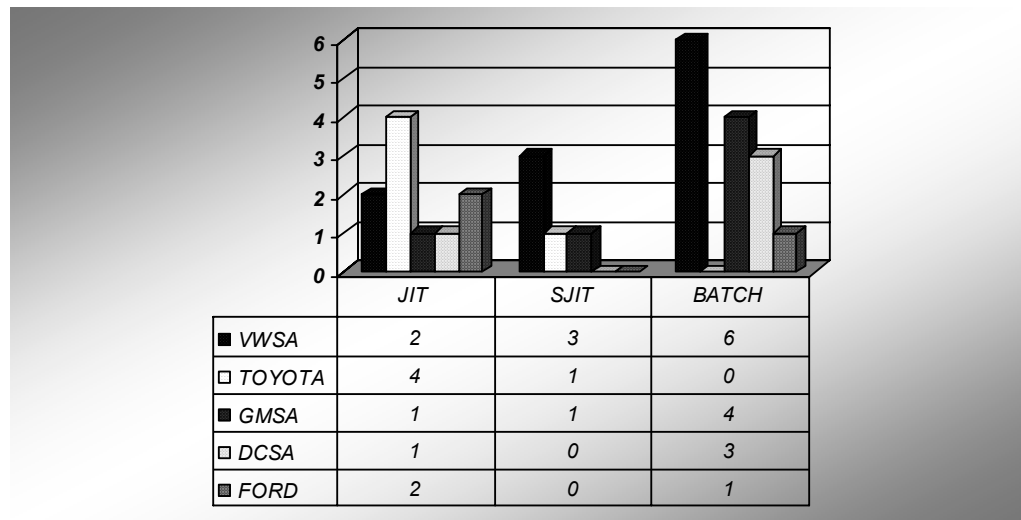
industry and refer to the basic definitions and requirements for the quality management system and the respective practical application.

In figure 5.5 above it is evident that the majority of the sample suppliers adhere to the VW group requirement of having the required quality systems in place. One of the respondents indicated that they currently do not have any quality system in place and are currently under review by the OEMs it supplies. They also indicated that they are undergoing an organisational change and are planning on getting their quality systems in place before any business is lost.

## 5.5 ANALYSIS OF MANUFACTURING AND DELIVERY REQUIREMENTS

*What are your current manufacturing and supply delivery requirements and What sequence is required from OEMs?*

**Figure 5.6 Manufacturing and delivery requirements**



Liker (2004: 28) lists the eight wastes that lean manufacturing can eliminate. These wastes are as follows: over-production, waiting time, unnecessary transport, over processing, excess inventory on hand, unnecessary movement, production of defects and the eighth waste being unused employee creativity. By eliminating these wastes, the organisation will benefit financially. In the present global market, organisations need to achieve these financial gains to offer their



customers better service, product prices and to even keep their customers from transferring their business to the opposition.

The first factor to consider when creating a pull system from the customer would be the kanban (card signal) system, which works the same way, as a signal to replace what has been used. If the kanban authorization is present, one can act. If it is not, one does not act. In lean manufacturing it is important to control inventory and the kanban system does just that. It again promotes one-piece flow rather than large batch production. The customer will signal to the supplier when to manufacture the next parts. It will allow for fewer inventories on the line and this will help the reduction of scrap parts (Liker, 2004: 23).

In figure 5.6 above it is evident that the majority of VWSA suppliers still supply on a batch order system. The batch orders are delivered on daily and weekly bases as revealed by the research. The average quantity was difficult to establish. Majority of the respondents failed to submit a figure to this question, but indicated that because they supply various parts for various platforms it is too complex to establish a quantity. Worth noting is the fact that all the respondents who supply to Toyota supply on the just-in-time or sequential just-in-time method. The effect of this will be highlighted in the training support received by suppliers in the following section.

## **5.6 COMPARISON OF TRAINING SUPPORT RECEIVED FROM OEMS**

This part of the study compares how VWSA perform against other OEMs. The respondents were requested to rate each OEM on a scale from one to five where one is poor, two is fair, three is good, four is very good and five is excellent.

The question asked was: *How does VWSA training support to you compare with that of other OEMs?*

The aim of this question is to establish whether any assistance was received from VWSA or any of the other OEMs. The result of this study is tabled and a mean average score assigned to each OEM. This score is then graphed to illustrate the comparative support. There were seven aspects of support

investigated. These include quality systems, process audits, lean manufacturer compliance, project management, inspection, production process and customer care. Each of these aspects will be separately tabled, graphed and discussed.

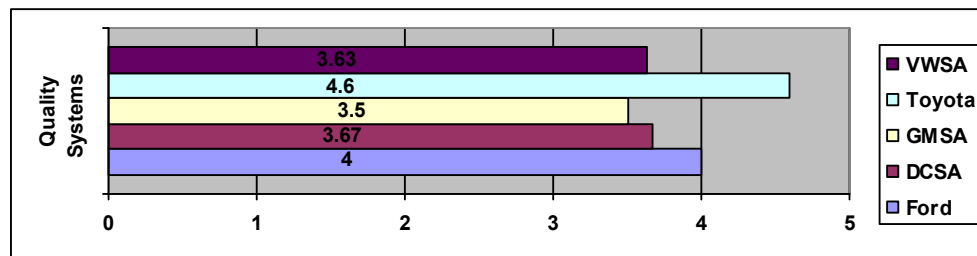
### 5.6.1 Quality systems

The quality management (QM) system requirements of the VW group are based on agreements between car manufacturers and suppliers, to which a QM system according to VDA 6 Part 1 or ISO/TS 16949 must be effective.

**Table 5.1: Training on quality systems**

		Sample size	1 %	2 %	3 %	4 %	5 %	Mean (Avg.) score
<b>Quality Systems</b>	VWSA	11	18	0	18	28	36	3.6
	Toyota	5	0	0	0	60	40	4.6
	GMSA	6	0	17	33	33	17	3.5
	DCSA	3	0	0	33	67	0	3.7
	Ford	3	0	0	33	33	33	4

**Figure 5.7: Training on quality systems**



From table 5.1 it can be seen that 36 percent of the respondents rated VWSA as poor to good. This equates to a mean average score of 3.6. Toyota receives a 100 percent rating of very good to excellent and a mean average score 4.6. It is evident from figure 5.7 above that the respondents feel that Toyota more than any of the other OEMs are most helpful when it comes to ensuring that they as suppliers have the required quality management systems in place.

### 5.6.2 Process audits

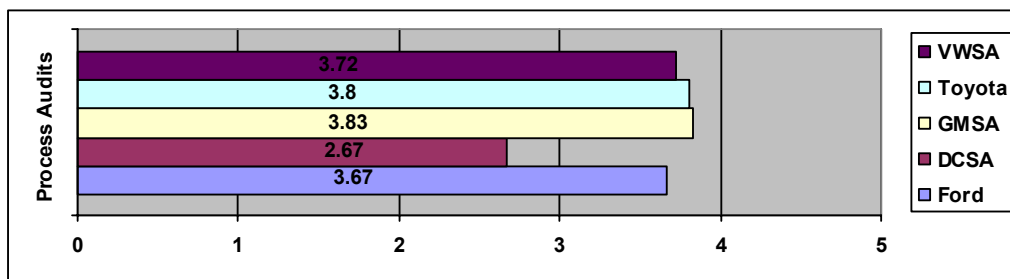
Here the aim was to establish what quality management process audit support is being offered by the OEMs. An audit of the process and procedure steps is very time-consuming and ties up a host of personnel and represents a high cost factor to both the audited company and the company performing the audit.

In the audit, the presence and effectiveness of installed quality management systems at the individual production site are determined and compared with the requirements of the products produced at the supplier.

**Table 5.2: Training on process audits**

		Sample size	1 %	2 %	3 %	4 %	5 %	Mean (Avg.) score
<b>Process Audits</b>	VWSA	11	9	0	18	55	18	3.72
	Toyota	5	0	20	20	20	40	3.8
	GMSA	6	0	0	33	50	17	3.83
	DCSA	3	0	33	67	0	0	2.67
	Ford	3	0	33	0	33	33	3.67

**Figure 5.8: Training on process audits**



From the illustration above the OEMs seem to score quite similarly among the sample suppliers on support received for conducting process audits. The interviews revealed that suppliers are happy with the fact that process audits are being conducted.

### 5.6.3 Lean manufacture compliance

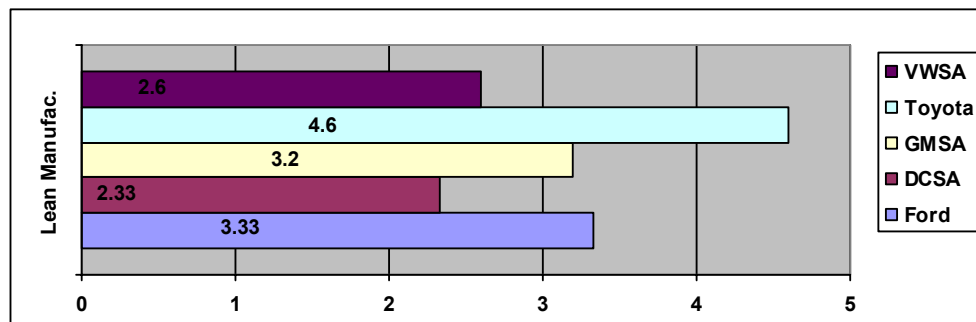
Here the aim of the question is to establish whether OEMs provide training to their suppliers to ensure they are compliant to lean manufacturing principles.

Lean manufacturing is a company philosophy that looks at continually improving and not being complacent. For this reason alone, it is important to implement the lean principles and not to become listed as one of those organisations which are dethroned once reaching the top position.

**Table 5.3: Training on lean manufacture compliance**

		Sample size	1 %	2 %	3 %	4 %	5 %	Mean (Avg.) score
<b>Lean manufacture Compliance</b>	VWSA	10	30	20	30	0	20	2.6
	Toyota	5	0	0	0	40	60	4.6
	GMSA	5	0	40	20	20	20	3.2
	DCSA	3	33	33	0	33	0	2.33
	Ford	3	0	33	33	0	33	3.33

**Figure 5.9: Training on lean manufacture compliance**



From table 5.3 it can be seen that 80 percent of the respondents rated VWSA as poor to good. This equates to a mean average score of 2.6. Toyota receives a 100 percent rating of very good to excellent and a mean average score 4.6. It is evident from figure 5.9 above that the respondents feel that Toyota more than any of the other OEMs are most helpful when it comes to assisting them as suppliers to be lean manufacture compliant.

This is proven in the literature study conducted in chapter two whereby studying the lean manufacturing concept that Toyota coined as the Toyota Production System (TPS), there are specific continuous improvement tools that complement the implementation of lean manufacturing in organisations. These tools are one-piece flow - pull vs. push, cellular manufacturing, TPM, TQM and create uniform production - Kanban and just-in-time.

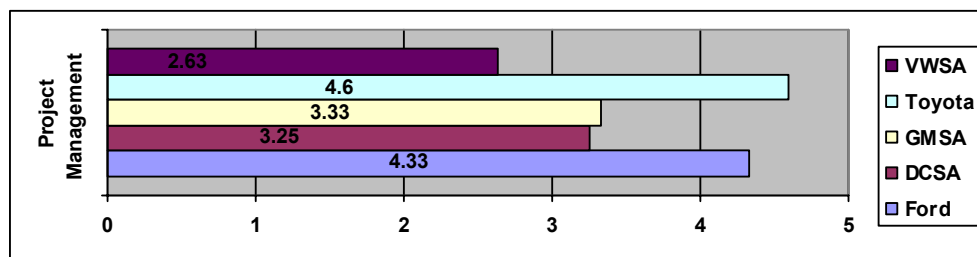
#### 5.6.4 Project management

Here the aim was to establish to what degree the supplier feels they are trained or supported when it comes to project management of new parts or components. The focus of the question was to establish whether they were furnished with what was required from them in terms of responsibilities, the specified timeframes, the development capacity and the requirements for series release.

**Table 5.4: Training on project management**

		Sample size	1 %	2 %	3 %	4 %	5 %	Mean (Avg.) score
<b>Project Management</b>	VWSA	11	9	36	45	0	9	2.63
	Toyota	5	0	0	20	0	80	4.6
	GMSA	6	0	17	50	17	17	3.33
	DCSA	4	0	25	50	0	25	3.25
	Ford	3	0	0	33	0	67	4.33

**Figure 5.10: Training on project management**



From table 5.4 it can be seen that 90 percent of the respondents rated VWSA as poor to good, but clearly the lowest of the OEMs mentioned. This equates to

a mean average score of 2.63. Toyota receives an 80 percent rating of excellent when it comes to project management, and score a mean average of 4.6. It is evident from figure 5.10 above that the respondents feel that Toyota more than any of the other OEMs are most helpful when it comes to assisting them as suppliers on project management. Ford also scores quite well with 4.33.

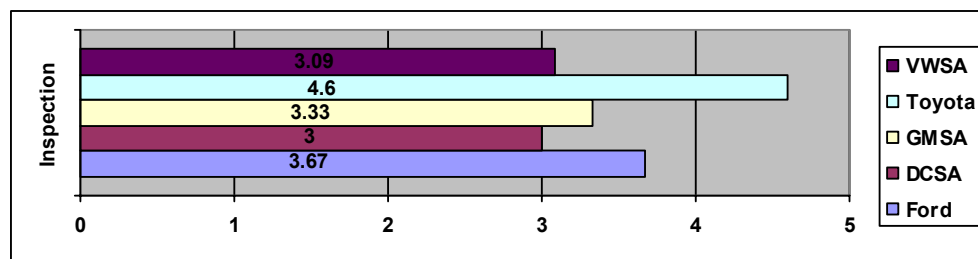
### 5.6.5 Inspection

The aim of this aspect is to establish whether any assistance was received from VWSA or any of the other OEMs with regard to inspection. Inspection entails the constant improvement of product quality according to the expectations of the customer, analysis and test devices.

**Table 5.5: Training on inspection**

		Sample size	1 %	2 %	3 %	4 %	5 %	Mean (Avg.) score
<b>Inspection</b>	VWSA	11	18	0	45	27	9	3.09
	Toyota	5	0	0	0	40	60	4.6
	GMSA	6	0	17	33	50	0	3.33
	DCSA	3	0	33	33	33	0	3
	Ford	3	0	33	0	33	33	3.67

**Figure 5.11: Training on inspection**



In figure 5.11 above it can be seen that when it comes to inspection, Toyota receives a 100 percent rating of very good to excellent, and score a mean average of 4.6. The respondents rated VWSA as poor to good with a mean average score of 3.09. It is evident from figure 5.11 above that the respondents

feel that Toyota more than any of the other OEMs are most helpful when it comes to assisting them as suppliers on inspection.

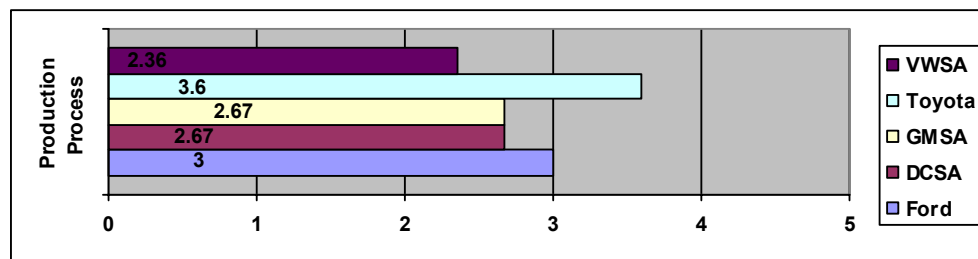
### 5.6.6 Production process

The aim of this aspect is to establish whether any assistance was received from VWSA or any of the other OEMs with regard to the production process. The production process entails installation, technical capabilities, part specification and material flow. The quality management plan must contain components, modules, sub assemblies, parts and materials and include the production processes for the respective product.

**Table 5.6: Training on production process**

		Sample size	1 %	2 %	3 %	4 %	5 %	Mean (Avg.) score
<b>Production Process</b>	VWSA	11	18	45	18	18	0	2.36
	Toyota	5	0	0	0	60	40	3.6
	GMSA	6	0	17	33	33	17	2.67
	DCSA	3	0	0	33	67	0	2.67
	Ford	3	0	0	33	33	33	3

**Figure 5.12: Training on production process**



From table 5.6 it can be seen that over 80 percent of the respondents rated VWSA as poor to good. This equates to a mean average score of 2.36. Toyota receives a 100 percent rating of very good to excellent and a mean average score 3.6. It is evident from figure 5.12 above that the respondents feel that Toyota, more than any of the other OEMs, is most helpful when it comes to assisting them as suppliers in their production process.

It must be noted that most of the respondents felt that they would not like further assistance in their production process. Many commented that they were specialists in their field of supply and did not feel that the OEMs were equipped to improve their process.

### 5.6.7 Customer care

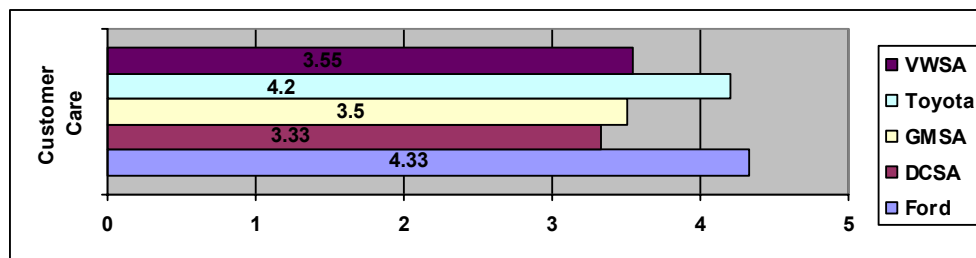
Suitable instruments must be used to secure the as-delivered quality.

These instruments include, for instance, monitoring of problem resolution and of initiated corrective action, securing customer supply through defined emergency and failure strategies, monitoring of the delivery quality and of logistical requirements through product inspections and shipping audits.

**Table 5.7: Training on customer care**

		Sample size	1 %	2 %	3 %	4 %	5 %	Mean (Avg.) score
<b>Customer Care</b>	VWSA	11	0	18	18	55	9	3.55
	Toyota	5	0	0	20	40	40	4.2
	GMSA	6	0	0	50	50	0	3.5
	DCSA	3	0	33	33	0	33	3.33
	Ford	3	0	0	33	0	67	4.33

**Figure 5.13: Training on customer care**



From table 5.7 it can be seen that the respondents were quite evenly spread in their rating of VWSA. VWSA achieved a mean average score of 3.6. Toyota receives an 80 percent rating of very good to excellent and a mean average score of 4.2. It is evident from figure 5.13 above that the respondents feel that



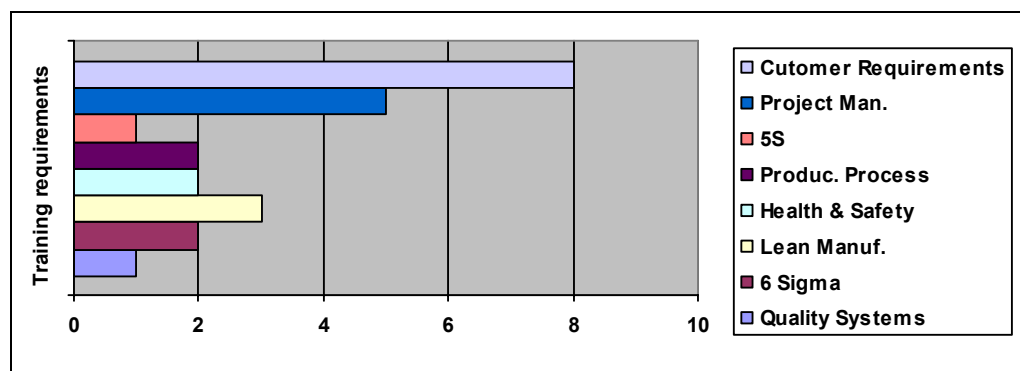
Ford and Toyota are most helpful when it comes to ensuring that they as suppliers have the required customer care support.

## 5.7 DESIRED TRAINING REQUIREMENTS.

This part of the study aims to establish what the desired training requirements are from the supplier base. The aim of this question is to establish if a shortfall exists and to recommend corrective action.

The question asked was: *As a supplier to VWSA what more do you believe is needed in the form of training from VW?*

**Figure 5.14: Training needs**



From figure 5.14 above eight of the respondents indicated the need for training on customer requirements. It is clear that there is a need for customer requirements training or information sharing. Although, when looking at the comparison in figure 5.13, VWSA score a mean average of 3.55 which indicates that VWSA is not deprived in this regard. Ford and Toyota fare the best when it comes to customer care. The other training requirements that stand out are project management and lean manufacturing.

## 5.8 FEEDBACK ON CURRENT TRAINING OFFERINGS AT VWSA

As mentioned earlier a second questionnaire was aimed at the Supplier Development Manager at VWSA. The aim of this questionnaire was to establish what the current training offerings are, the source of what VWSA teaches and the awareness of the Toyota Training College.

To provide a clear understanding of why certain questions were included in the questionnaire, the discussion set out below will explain the rationale for the structure of each question.

### **Question 1:** *What is currently being offered in the form of training to suppliers?*

The aim of this question is to establish what training Volkswagen is currently offering. To establish in what form the training is presented and to establish once the feedback has been compiled whether there is any correlation between what the suppliers say and what Volkswagen says.

The following response was received:

- ETI (Education and Training Institute)
- Supplier workshops e.g. one held in every province during 2005.
- Strategic workshop held for strategic suppliers on annual bases.

### **Question 2:** *Where do you obtain the content on what to teach?*

The aim of this question is to establish the source of the training material offered by Volkswagen. The reasons for this question it to find out whether the training material is relevant to the requirements of the suppliers and whether the needs are being fulfilled. Reference is made to specifications, delivery and packaging requirements.

The following response was received:

- The quality capability handbook which is a group requirement.
- The supplier handbook which suppliers are able to access via the VW website.
- Weaknesses which are picked up during supplier visits.

**Question 3:** *Are you aware of the activities and the role of the Toyota Training College for suppliers?*

The aim of this question is to establish whether Volkswagen is aware of what Toyota is currently engaged in to develop their suppliers.

The following response was received:

- Yes, the organisation is aware of its existence.
- Not aware of its activities and roles.
- Know that Toyota opened a new centre in Gauteng.

## **5.9 CONCLUSION**

In this chapter the results of the questionnaires administered to the respondents were discussed. This chapter started off with the analysis of the biographical profile of the questionnaire which aimed to assess what the development requirements may be based on the age and experience of the respondents. It was discovered that the respondents were in the active age group 30 to 49 years of age. Also revealed was that most of the respondents had less than five years experience in their current positions meaning that they would be open to further development and training.

It was further revealed that most of the suppliers adhered to the minimum quality and manufacturing requirements as stipulated by VWSA. The comparative training support and desired needs from the suppliers were found wanting and will be dealt with in more detail in the next chapter. Also mentioned in this chapter are the current training offerings at VWSA. This leads to the next chapter which considers the conclusion and recommendations of the research.

## **CHAPTER 6**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1 INTRODUCTION**

Supplier development was shown to be an increasingly important organisational concern and proper management of supplier relationships constitutes one essential element of supply chain success. OEMs faced with problems of deficient supplier performance can implement a wide range of supplier development practices such as supplier evaluation and feedback, supplier recognition, and supplier training. The relationship between supplier development practices, customer satisfaction, supplier satisfaction, and supplier quality performance can be investigated. The control of quality management and supplier development programs are crucial factors that lead to mutual satisfaction among OEMs and suppliers. Krause et al. (2000) found that direct supplier involvement activities, such as buyer site visits to supplier factories and training and education of supplier personnel, play a critical role in supplier performance improvement.

This chapter will summarise the extent and effectiveness of supplier training at VWSA. The importance of categorising supplier development activities based on the level of involvement and implementation complexity stems from its potential to help better understand the implementation of supplier development activities and their impact on performance. The results of the prior chapters of the study will be revisited. Conclusions and recommendations will be made based on the information gathered from the study. This leads to the next section.

#### **6.2 RECOMMENDATIONS AND CONCLUSION**

The study performed in the latter chapters will be concluded and suggest some recommendations in the following point.

### 6.2.1 Conclusion

The primary purpose of this study was to assess the extent and effectiveness of supplier development at Volkswagen of South Africa to investigate the relationships between supplier development practices and gain the views from both suppliers and Volkswagen to identify the direct effects of supplier development practices.

Considering the latter the following conclusions can be drawn as evidenced in the empirical study in chapter five. Suppliers are of the view that there is a need for training especially when it comes to customer care and project management. Volkswagen on the other hand is of the view that all the tools are in place to ensure that suppliers are adequately informed of the organisations requirements. They do not encourage the idea that suppliers be spoon-fed or hand held to get them to the required level of competence.

Volkswagen operates on the view of supplier development through motivation rather than on one of training. Volkswagen's Education and Training Institute is one of the services on offer to suppliers for the development of their staff. The extent to which ETI is used by suppliers and its effectiveness to supplier development requires further investigation. An analogy of the importance that quality systems play at suppliers to Volkswagen is encompassed in the following statement made by the Supplier Development Manager, "when compared to driving ISO 9000 is seen as a learners licence, TS 16949 the drivers licence and the suppliers process audit the advanced drivers licence."

Organisations use a variety of approaches and practices to remain competitive. Identifying practices that positively impact performance allows an organisation to more effectively manage scarce resources. This study focused on supplier development practices and revealed how involving suppliers in supplier development activities is important and may help suppliers improve performance. Supplier development practices can be initiated by top management, and in some instances, by functional managers who recognise the need for supplier development implementation to respond to competitive challenges.

### 6.2.2 Recommendations

The benefits of supply chain management, supplier development and lean manufacturing are evident throughout the primary and secondary studies conducted in this document. It is thus recommended that:

- OEMs focus on their core activities as the automotive manufacturer industry today is under greater pressure than ever before. Adopting lean manufacturing techniques and supply chain management has become a key issue in recent years.
- OEMs improve supplier development. According to the research, this generates year-over-year improvements in supplier quality and performance, and identifies opportunities to remove non-value-added costs from the supply chain; and develop and improve capacity, throughput, and other capabilities of key suppliers.
- A programme to evaluate supplier development, not only at VWWSA, but to all OEMs should be established to ensure that the main activities used by buying firms to improve supplier performance are thereby creating competition amongst suppliers; and working directly with suppliers through training and education.
- Supplier incentives are looked at as it motivates suppliers to improve by sending a message that improved performance is rewarded with increased business and preferred status for future business. Supplier assessment allows buying firms to evaluate a supplier's performance, compare it with the performance of other suppliers, and provide suppliers with direction to drive improvement objectives.

As evidenced in the biographical profile of the respondents the research reveals that the key positions at suppliers are dominant among the active age group thirty to forty-nine and work experience in their current positions are under five years. The perception among suppliers, revealed in the research, is shown in the fact that Toyota far outperforms any of the other OEMs when it comes to

training support. What is also noteworthy is the fact that not one of the suppliers sampled supply to Toyota in batch form. The effect of lean manufacturing is evidenced in the positive response to Toyota. It is thus recommended to VWSA and the other OEMs to note the benefits of lean manufacturing and to implement lean principles through supplier development.

One of the most important effects to supplier satisfaction is sharing more information, whether forecasts, schedules, or other data. More buyers use it as a means to keep the suppliers in the loop and up-to-date. This is illustrated in figure 5.14 of chapter five where suppliers stress the need for training on customer requirements and project management. Sharing the production schedule ensures that the suppliers can better anticipate needs and use blanket agreements that commit to take certain volumes. That helps to ensure that midsize and small suppliers are keeping enough raw materials on order and are confident that they will not be overstocked.

### **6.3 SUMMARY**

In chapter one it was discovered that the automotive industry is the leading manufacturing sector in the South African economy. It incorporates the manufacture, distribution, servicing and maintenance of motor vehicles and plays a vital role in South Africa's economy. The sector made up 7 percent of the GDP of South Africa in 2005.

The problem OEMs in South Africa face, and possibly all manufactures around the world, is the constant striving towards lower costs through improved productivity, better floor space utilization, reductions in scrap and rework, increased employee participation, and simplified administrative routines. One of the major factors to this problem is the inability of suppliers to meet the required needs. This led to the main problem of the study: To assess the nature of the supplier training at VWSA.

In chapter two, research revealed the importance of SCM, supplier development and lean manufacturing. This chapter primarily looked at the what, why and how of SCM and supplier development. Covering the meaning of lean

manufacturing, its importance for today's manufacturers and the types of tools required to create a lean manufacturing environment.

Chapter three described the tools currently in place at VWSA to encourage and enforce supplier development. Various aspects of quality and supplier management were discussed. The various quality management systems highlighted the importance of supplier capabilities required before orders can be placed and the agreements required between customer and supplier.

The planning of the empirical study was described in chapter four; it further explained the derivation of the survey, the various techniques included in the questionnaire and analysis of successful supplier training initiatives.

The findings of the empirical study were illustrated in chapter five and the aim of each question quantified. Results were graphed and tabulated allowing for recommendations and conclusions to be made. This study, however, still exposes a number of opportunities and areas for future research.



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**QUESTIONNAIRE COVERING LETTER**

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10/11/2006

Dear Respondent

**AN ASSESSMENT OF THE SUPPLIER DEVELOPMENT PRACTICES AT  
VOLKSWAGEN OF SOUTH AFRICA.**

Please look at the attached questionnaire. With your kind permission, we can complete it when I visit you personally. It should take only a few minutes of your time.

This information is needed for the completion of my Masters in Business Administration (MBA) studies that I have enrolled for at the Nelson Mandela Metropolitan University.

It would be appreciated if you could set aside some time for me to come and interview you to complete the questionnaire by the 17<sup>th</sup> November 2006.

Yours sincerely

Bradley Erasmus  
Researcher

**\* SEE ATTACHED QUESTIONNAIRE FOR YOUR PERUSAL AND  
PREPARATION FOR INTERVIEW.**

## SECTION A

### BIOGRAPHICAL DATA

(Indicate your choice by means of an X)

#### A. Age Group

<b>20 - 29 years</b>	
<b>30 - 39 years</b>	
<b>40 - 49 years</b>	
<b>50 and older</b>	

#### B. Gender

<b>Male</b>	
<b>Female</b>	

#### C. Occupation

<b>Production Manager</b>	
<b>Procurement Manager</b>	
<b>General Manager</b>	
<b>Other</b>	

If other, please specify

---

#### D. Time in current position

<b>1 - 2 years</b>	
<b>3 - 5 years</b>	
<b>6 - 10 years</b>	
<b>10 or more years</b>	



## SECTION B

What quality systems do you currently have in place?


What are your current manufacturing and supply delivery requirements, what sequence is required from OEM's?

	<u>VWSA</u>	<u>Toyota</u>	<u>GMSA</u>	<u>DCSA</u>	<u>Ford</u>
1. Just in Time					
2. Sequential just in time					
3. Batch orders					
3.1. Frequency					
3.2. Average Quantity					

How does VWSA training support to you compare with that of other OEM's?

Please grade between 1 and 5 the level of support received (1 = poor; 5 = excellent)

	<u>VWSA</u>	<u>Toyota</u>	<u>GMSA</u>	<u>DCSA</u>	<u>Ford</u>
<b>Quality Systems</b>					
<b>Process Audits</b>					
<b>Lean Manufacture Compliance</b> i.e. JIT concept, 6Sigma, 5S, etc.					
<b>Project Management,</b> i.e. responsibilities, specified time frame, development capacity, series release					

	<u>VWSA</u>	<u>Toyota</u>	<u>GMSA</u>	<u>DCSA</u>	<u>Ford</u>
<b>Inspection</b> i.e. analysis, test devices, continuous improvement practices					
<b>Production process</b> installation, technical capabilities, part specification, material flow					
<b>Customer care</b> i.e. product audit, failure analysis, corrective action, customer contacts.					

As a supplier to VWSA what more do you believe is needed in the form of training from VW?

Quality Systems	
6 Sigma	
Lean manufacturing	
Health & Safety, Environment	
Production process	
5 S	
Project Management	
Customer requirements	
Other: please specify eg. TPM, TQM,	

**QUESTIONNAIRE COVERING LETTER**

10/11/2006

Dear Respondent

**AN ASSESSMENT OF THE SUPPLIER DEVELOPMENT PRACTICES AT  
VOLKSWAGEN OF SOUTH AFRICA.**

Your assistance in completing and returning the attached questionnaire (via personal interview) relating to the above will be greatly appreciated. It should take only a few minutes of your time.

This information is needed for the completion of my Masters in Business Administration (MBA) studies that I have enrolled for at the Nelson Mandela Metropolitan University.

It would be appreciated if you could set aside some time for me to come and interview you to complete the questionnaire by the 17<sup>th</sup> November 2006.

Yours sincerely

Bradley Erasmus  
Researcher

- **SEE ATTACHED QUESTIONNAIRE FOR YOUR PERUSAL AND  
PREPARATION FOR INTERVIEW.**

**What is currently being offered in the form of training to suppliers?**


**Where do you obtain the content on what to teach?**

**E.g. Specifications, delivery requirements, etc...**


**Are you aware of the activities and role of the Toyota Training College for suppliers?**


Annexure C: Data Collection synopsis

<b>Date and whom interviewed</b>	<b>Number of questionnaires handed out</b>	<b>The number of questionnaires received back.</b>	<b>Response percentage.</b>
Date: 11.11.2006 Supplier Development Manager, (Volkswagen of South Africa)	1	1	1 100%
Date: 11.11.2006  (Johnson Controls)	2	1	2 50%
Date: 11.11.2006 (Kromberg & Schubert)	1	2	3 200%
Date: 11.11.2006 (Alucast)	1	1	4 100%
Date: 11.11.2006 (Faurecia)	2	0	5 0%
Date: 11.11.2006 (Inergy)	1	1	6 100%
Date: 11.11.2006 (Feltex)	1	2	7 200%
Date: 11.11.2006  (Sentech)	1	1	8 100%
Date: 11.11.2006 (Bel Essex)	1	1	9 100%
Date: 11.11.2006  (Shatterprufe)	1	1	10 100%
Date: 11.11.2006 (Venture)	2	1.	11 50%