

The Application of Quality Models and Techniques
in selected
SMMEs in the Eastern Cape.

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DECLARATION

"I **Andrew Murray** hereby declare that:

- the work in this dissertation is my own original work;
- all sources used or referred to have been documented and recognised; and
- this dissertation has not been previously submitted in full or partial fulfillment of the requirements for an equivalent or higher qualification at any other recognised educational institution."

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ABSTRACT

With the increase of imports from China and more pressure being put on the Small, Medium and Micro enterprises (SMME's) from their larger customers, survival has become more and more difficult, quality is no longer being a choice but a prerequisite if the companies want to survive.

This research evaluates the use of quality and productivity or the lack thereof in selected SMMEs in the Eastern Cape environment from both the SMME and Larger companies' point of view. The research has focused on the effectiveness and understanding of what has been put in place by the SMMEs, what is available for the SMMEs to use, governmental support, and the requirements of the customers. Certain shortcomings have been highlighted as to the use and benefits of the processes that have been implemented.

The researcher made use of both quantitative and qualitative data to determine the outcome of the research.

The thesis concludes that the SMME sector knows the importance of the use of quality; it is the effectiveness and management thereof that is the concern.

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TABLE OF CONTENTS

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|--------------------|-------------|
| | Declaration | i |
| | Abstract | ii |
| | Acknowledgements | iii |
| | Table of contents | iv |
| | List of Figures | xiv |
| | List of Tables | xviii |
| | List of Annexures | xx |

Chapter 1

The Problem and its Settings

| | | |
|------|-------------------------------|----|
| 1.1 | Background | 1 |
| 1.2 | Problem statement | 4 |
| 1.3 | Statement of the sub-problems | 5 |
| 1.4 | Hypothesis | 6 |
| 1.5 | Objectives | 7 |
| 1.6 | Definitions | 8 |
| 1.7 | Abbreviations | 11 |
| 1.8 | Delimitations | 12 |
| 1.9 | Assumptions | 12 |
| 1.10 | Importance of the research | 13 |
| 1.11 | Methodology | 15 |

Table of Contents (Contd.)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|-------------------------|---------------------------------------|-------------|
| 1.12 | Division of chapters | 17 |
| Chapter 2 | | |
| Literature Study | | |
| 2.1 | Introduction to quality | 18 |
| 2.1.1 | Background | 18 |
| 2.1.2 | Philosophy | 19 |
| 2.2 | Responsibility for quality | 23 |
| 2.2.1 | Areas responsible | 24 |
| 2.2.2 | Marketing | 24 |
| 2.2.3 | Design engineering | 25 |
| 2.2.4 | Procurement | 25 |
| 2.2.5 | Process design | 26 |
| 2.2.6 | Production | 26 |
| 2.2.7 | Inspection and testing | 26 |
| 2.2.8 | Packaging and storage | 27 |
| 2.2.9 | Product service | 27 |
| 2.2.10 | Quality assurance | 27 |
| 2.2.11 | Areas of responsibility within a SMME | 29 |
| 2.3 | Chief executive officer | 29 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 2.4 | Introduction to total quality management | 30 |
| 2.5 | Six Sigma defined | 44 |
| 2.5.1 | What is Six Sigma? | 44 |
| 2.5.2 | The Six Sigma philosophy | 47 |
| 2.5.3 | Six Sigma – the methodology | 52 |
| 2.5.4 | Problems with Six Sigma | 56 |
| 2.5.5 | Benefits of implementing Six Sigma | 56 |
| 2.5.6 | Six Sigma deployment | 57 |
| 2.6 | ISO 9000 | 59 |
| 2.6.1 | How does ISO 9000:2000 work? | 67 |
| 2.6.1.1 | Management responsibility | 69 |
| 2.6.1.2 | Resource management | 72 |
| 2.6.1.3 | Product/service realisation | 73 |
| 2.6.1.4 | Measure, analysis and improvement | 79 |
| 2.7 | ISO 14000 | 82 |
| 2.7.1 | What does ISO 14000 entail? | 83 |
| 2.7.2 | Benefits of ISO 14000 certification | 84 |
| 2.8 | “20 Keys” to workplace improvement | 86 |
| 2.8.1 | Aims and objectives of the 20 Key program | 87 |
| 2.8.2 | Implementation of 20 Keys | 89 |
| 2.9 | Various quality awards | 90 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---------------------------------------|-------------|
| 2.9.1 | Introduction | 90 |
| 2.9.2 | Baldrige award (MBNQA) | 91 |
| 2.9.3 | European award (EQA) | 93 |
| 2.9.4 | South African excellence model (SAEM) | 94 |
| 2.9.4.1 | Main objectives | 94 |
| 2.9.4.2 | Vision | 94 |
| 2.9.4.3 | Mission | 95 |
| 2.9.4.4 | Operating philosophy | 95 |
| 2.9.4.5 | Enablers | 97 |
| 2.9.4.6 | Results | 97 |
| 2.9.5 | Conclusion of models | 98 |
| 2.10 | Management tools | 99 |
| 2.10.1 | The Pareto concept | 100 |
| 2.10.2 | Cause and effect analysis (C&E) | 101 |
| 2.10.3 | Check sheets | 102 |
| 2.10.4 | Flowcharts | 103 |
| 2.10.5 | Histograms | 103 |
| 2.10.6 | Scatter diagrams | 104 |
| 2.10.7 | Control charts | 104 |
| 2.11 | Management | 105 |
| 2.11.1 | Introduction | 105 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 2.11.2 | Why is management the problem? | 106 |
| 2.11.3 | Management's role in the SMME sector | 108 |
| 2.11.4 | Basic management principles to be adopted | 109 |
| 2.11.5 | Summary | 111 |
| 2.12 | Conclusion | 112 |

Chapter 3

Research Design and Methodology

| | | |
|-------|---------------------------------|-----|
| 3.1 | Introduction | 116 |
| 3.2 | What is research? | 116 |
| 3.3 | The research process | 117 |
| 3.4 | Validation and reliability | 120 |
| 3.5 | Research methodology approaches | 121 |
| 3.5.1 | The positivist approach | 121 |
| 3.5.2 | The interpretative approach | 122 |
| 3.5.3 | The critical approach | 122 |
| 3.6 | Models and modeling | 123 |
| 3.7 | Quantitative and qualitative | 125 |
| 3.7.1 | Quantitative approach | 126 |
| 3.7.2 | Qualitative approach | 126 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 3.7.2.1 | Characteristics of qualitative research | 128 |
| 3.7.2.2 | Inductive versus deductive logic | 129 |
| 3.7.2.3 | How to choose the most appropriate qualitative research method | 130 |
| 3.7.3 | Triangulation | 131 |
| 3.8 | Choosing the most appropriate research method | 131 |
| 3.9 | Research goals and strategies | 133 |
| 3.9.1 | Research goals | 133 |
| 3.9.2 | Research strategies | 135 |
| 3.9.3 | The population | 135 |
| 3.9.4 | General procedure | 136 |
| 3.10 | Conclusion | 142 |

Chapter 4

The Results

| | | |
|-----|--|-----|
| 4.1 | Introduction | 143 |
| 4.2 | Section A: Biographical information (Questionnaires) | 144 |
| 4.3 | Section B: General questions | 146 |
| 4.4 | Section C: Questions addressing the sub-problems | 154 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 4.4.1 | Sub-problem 1: How and to what extent do SMMEs use quality tools to improve its processes? | 154 |
| 4.4.2 | Sub-problem 2: How and to what extent do SMMEs use quality techniques to improve its processes? | 159 |
| 4.4.3 | Sub-problem 3: How and to what extent do SMMEs use quality models or systems to improve their processes? | 162 |
| 4.4.4 | Sub-problem 4: How and to what extent does management display awareness and commitment to the change process? | 170 |
| 4.4.5 | Sub-problem 5: How and to what extent does productivity have an effect on an organisation? | 175 |
| 4.5 | General comments made by the SMMEs during the questionnaire process | 179 |
| 4.6 | Informal interviews and questionnaires with SMME companies | 181 |
| 4.6.1 | Discuss the reasons for the implementation of your QMS | 182 |
| 4.6.2 | Was new business generated because of the implementation of the QMS | 182 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|--|-------------|
| 4.6.3 | Did the company calculate the cost of implementation? | 183 |
| 4.6.4 | Explain the cost benefits resulting from the implementation of the QMS | 183 |
| 4.6.5 | Discussion of the benefits that stood out the most because of the implementation | 184 |
| 4.6.6 | How did the operators accept and use the introduced QMS? | 185 |
| 4.6.7 | Explain how the implementation increased the overall awareness regarding improvements | 186 |
| 4.6.8 | Has the exercise been a painful experience? | 186 |
| 4.6.9 | Do you envisage long term improvements for your company after implementation? | 187 |
| 4.6.10 | What was the effect on the company with regards the implementation of the QMS process? | 188 |
| 4.7 | Informal interviews and questionnaires with larger companies | 189 |
| 4.7.1 | The first question addressed the reasons why larger companies' support the SMME sector | 190 |
| 4.7.2 | This question investigated the benefits the larger companies' will get if they support the SMME sector | 191 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 4.7.3 | The researcher investigated the use of QMS in the SMME sector from a larger company's perspective | 193 |
| 4.7.4 | This question investigates the availability of support from the mother company to the SMME supplier | 194 |
| 4.7.5 | Question five investigates the knowledge that the larger companies' might have with regards to the use of tools quality and techniques by the SMME supplier | 195 |
| 4.7.6 | Question six investigates an audit and/or rating system used for the SMME suppliers | 197 |
| 4.7.7 | Question seven evaluates the skill and commitment of management in the SMMEs from a larger companies viewpoint | 198 |
| 4.7.8 | This question evaluates, from a larger company's perspective, the improvements that can be introduced | 199 |
| 4.7.9 | This question focuses on the shortcomings within the SMME sector | 200 |
| 4.7.10 | The last question looks at the choice of supporting the SMME sector | 201 |
| 4.8 | Conclusion | 202 |

Table of Contents (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---|--|-------------|
| Chapter 5 | | |
| Testing of the Hypotheses | | |
| 5.1 | Introduction | 205 |
| 5.2 | Testing the hypotheses | 207 |
| 5.2.1 | Hypothesis 1 | 207 |
| 5.2.2 | Hypothesis 2 | 210 |
| 5.2.3 | Hypothesis 3 | 213 |
| 5.2.4 | Hypothesis 4 | 217 |
| 5.2.5 | Hypothesis 5 | 220 |
| Chapter 6 | | |
| Summary, Conclusions and Recommendations | | |
| 6.1 | Summary of the most important findings | 223 |
| 6.1.1 | Leadership issues | 225 |
| 6.1.2 | Knowledge issues | 226 |
| 6.1.3 | Tools, techniques, models and systems issues | 227 |
| 6.2 | Conclusion | 227 |
| 6.3 | Recommendations | 229 |
| 6.4 | Recommendations for further research | 231 |

LIST OF FIGURES

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 1.1 | Relationship between research and sub-problems | 6 |
| 1.2 | Research outline | 16 |
| 2.1 | Areas of responsibility for quality | 28 |
| 2.2 | Scope of TQM activities | 37 |
| 2.3 | The road to business growth | 39 |
| 2.4 | Quality blueprint | 42 |
| 2.5 | The Six Sigma input – process – output approach | 48 |
| 2.6 | Juran trilogy | 49 |
| 2.7 | DMAIC improvement loop | 54 |
| 2.8 | Model of a process based quality management system | 63 |
| 2.9 | The three pillars of ISO 9000 | 64 |
| 2.10 | Alternative model of a process based Quality Management System | 66 |
| 2.11 | Model of a process based Quality Management System | 68 |
| 2.12 | 20 Keys relationship diagram showing the interrelationship between the different key areas | 88 |
| 2.13 | South African assessment model | 96 |
| 2.14 | An example of a typical Pareto diagram | 100 |
| 2.15 | General form of the cause-effect diagram | 102 |
| 2.16 | Scatter diagram for the travel time against departure time | 105 |
| 2.17 | The scope of TQM against the cost of TQM | 114 |

List of Figures (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 3.1 | Cyclical research process | 119 |
| 3.2 | Interaction between quantitative and qualitative research | 132 |
| 3.3 | A conceptual model for research design | 134 |
| 4.1 | Represents the main activities of the companies who responded | 144 |
| 4.2 | Response to number of staff employed | 145 |
| 4.3 | Appointed quality representative response | 146 |
| 4.4 | Response to the use of QMS | 147 |
| 4.5 | Response to the implementation of a QMS | 149 |
| 4.6 | Response to the use of quality models | 150 |
| 4.7 | Indicated use of check sheets | 152 |
| 4.8 | Indicated use of SPC, run and control charts | 153 |
| 4.9 | Indicated use of flow diagram | 153 |
| 4.10 | Indicated use of quality tools | 155 |
| 4.11 | Indicates the analysis of nonconformities | 155 |
| 4.12 | Indicates the positive effect of classifying nonconformities | 156 |
| 4.13 | Indicates the classification where the nonconformities occurred | 157 |
| 4.14 | Response indicates recording of quality problem | 158 |
| 4.15 | Response indication of nonconformities | 158 |

List of Figures (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|---|-------------|
| 4.16 | Response indicates the use of problem solving techniques | 160 |
| 4.17 | Response indicates the development of problem solving techniques | 160 |
| 4.18 | Response indicates the extent quality techniques could assist companies | 161 |
| 4.19 | Response indicates implementation of a QMS | 163 |
| 4.20 | Response indicates insistence from customers to implementation a QMS | 164 |
| 4.21 | Response indicates if a consultant was used for the QMS implementation | 165 |
| 4.22 | Response indicates the positive effect of a QMS | 165 |
| 4.23 | Response indicates acceptance of a QMS by employees | 166 |
| 4.24 | Response indicates management support of a QMS | 167 |
| 4.25 | Response indicates quality audits conducted by customers | 167 |
| 4.26 | Response indicates appointment of quality representatives | 169 |
| 4.27 | Response indicates a dedicated quality representative | 169 |
| 4.28 | Response indicates management support of quality initiatives | 172 |
| 4.29 | Response indicates a budget set for continuous improvement programs | 173 |
| 4.30 | Response indicates registration of successful quality proposals implemented | 174 |

List of Figures (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|--|-------------|
| 4.31 | Response indicates team based quality initiatives | 174 |
| 4.32 | Response indicates whether initiatives follow a structured approach | 175 |
| 4.33 | Response indicates team based prompted quality initiatives | 176 |
| 4.34 | Response indicates use of quality initiatives by supervision | 177 |
| 4.35 | Response indicates implementation of team based initiatives | 178 |
| 4.36 | Response indicates the acceptance of productivity initiatives by employees | 178 |
| 5.1 | Radar diagram for Table 5.1 | 208 |
| 5.2 | Radar diagram for Table 5.2 | 211 |
| 5.3 | Radar diagram for Table 5.3 | 214 |
| 5.4 | Radar diagram for Table 5.4 | 218 |
| 5.5 | Radar diagram for Table 5.5 | 221 |

LIST OF TABLES

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|--|-------------|
| 1.1 | Small business classification | 10 |
| 2.1 | The dimensions of quality | 30 |
| 2.2 | Old and new culture profiles | 34 |
| 2.3 | Basic TQM concepts practiced by various quality authors | 35 |
| 2.4 | Six Sigma tool applicability matrix defining the breakthrough steps | 55 |
| 2.5 | ISO 9000 evolution:1987 – 2000 | 61 |
| 3.1 | Difference between quantitative and qualitative research | 128 |
| 3.2 | Research method selection model | 130 |
| 3.3 | Sample population (larger companies) | 136 |
| 3.4 | Sample population (SMMEs) | 136 |
| 3.5 | Questionnaire question sections | 140 |
| 4.1 | Use of various quality tools in the SMME sector | 151 |
| 4.2 | Profile of the SMME companies interviewed | 182 |
| 4.3 | Level of the larger companies personnel interviewed | 190 |
| 5.1 | Results of the questions regarding use of quality tools | 207 |
| 5.2 | Results of the questions regarding use of quality techniques | 210 |
| 5.3 | Results of the questions pertaining to the use of quality models and systems | 214 |
| 5.4 | Results of the questions regarding the extent to which management displays commitment to change | 217 |

List of Tables (*Contd.*)

| <i>Number</i> | <i>Description</i> | <i>Page</i> |
|---------------|--|-------------|
| 5.5 | Results of the questions regarding the extent to which productivity is evaluated | 220 |

ANNEXURES

| | <i>Page</i> |
|--|-------------|
| Annexure A - Letter of reference from promoters | 239 |
| Annexure B - Letter of reference from researcher | 240 |
| Annexure C - Letter requesting assistance from ECMAC | 241 |
| Annexure D - Letter of reference from Mr. W. Oostehuziun | 242 |
| Annexure E - Questionnaire. | 243 |
| Annexure F - Questionnaires results. | 253 |
| Annexure G - Set of questions asked: larger companies | 263 |
| Annexure H - Set of questions asked: SMMEs | 268 |

CHAPTER 1

THE PROBLEM AND ITS SETTINGS

1.1. BACKGROUND

With the increased pressure being put on the local market with regards exports, a large number of manufacturing companies in the South African industry have improved quality by implementing Quality Management Systems (QMS) within the companies so as to highlight the problem with the nonconformities of products that they (the companies') are producing. Many of the smaller companies have lost market share due to poor quality, low productivity, increased competition (globalisation) and the lack of knowledge when it come to Total Quality Management (TQM) and quality principles and systems. The problem is perceived to be common with the majority of the manufacturers, but appears to be more prevalent amongst the smaller to medium sized manufacturing companies due to their limited resources.

According to the White Paper of the Department of Trade and Industry published on the National Strategy for the Development and Promotion of Small Business in South Africa (1995:6) (<http://www.policy.org.za>) and State of Small Business Review in the South Africa Annual Review (2000:52) small medium and micro-enterprises (SMMEs) represent an important vehicle to address the challenge of job creation, economic growth and equity in our country. The SMMEs play a critical role in absorbing labour, penetrating new markets and generally expanding economies in creative and innovative ways. The White Paper also

states (1995:10) that there are more than 800,000 SMMEs in the country absorbing a quarter of the labour force of 15 million.

The larger companies are now also applying much more pressure on their suppliers with regards quality requirements, reliability and delivery, especially these companies with export orders. This pressure had a major effect on the stability of these SMMEs companies, even more so if these companies are not following a predetermined methodology.

The state of the rand also had a major effect on the SMMEs, especially if they were importing, exporting or supplying to major international companies. If there was a run on the rand, resulting in the currency losing value, then this would have a domino effect on companies. The larger companies can adjust, but the SMMEs have to assess their situation, which normally means cost reductions to keep the companies afloat. These cost reduction exercises were normally targeted at the soft or non-profit adding areas in the companies. Normally quality related activities, productivity related activities and training were targeted. These areas are normally the heart of any organisation supplying critical information with regards to the operating process being performed by the company.

What must be noted is that the local manufacturing community revolves largely around the automotive industry in the Eastern Cape. The large automotive companies rely on some of the local SMMEs for the supply of critical parts.

The biannual survey done by the University of Cape Town (UCT) business school showed that companies achieving highest growth in this country do so primarily by improving product performance (Evening Post, Business Post, 10/2/1999).

According to an article written by Welsh and Welch in the Sunday Times (20/11/2005), they state that quality, cost and service are the primary aspects the SMMEs have to concentrate on if they are going to survive. They mentioned in the article that in the 80s worldwide, companies were nailed back by the Japanese, but came back in the 90s with process improvements. However, now the local SMMEs are getting undersold by China. If the SMMEs want to compete on price they are going to have to reduce by at least 30% to 40% of the cost, and if they think that they have the advantage over the Chinese with regards quality, they must realise that the Chinese quality is not perfect yet, but it is getting better every day. Winning has always been about differentiated cost, quality or service. With China's enormous competitive advantage, it has now become a game changer (Sunday Times 20/11/2005).

With quality being one of the important pillars in an SMMEs arsenal, it is very concerning to read that this particular subject is not addressed or mentioned in a number of books written for the SMME sector, for example, "The Small Business Bible" by Strauss (2005) and "The 7 Irrefutable Rules of Small Business Growth" by Little (2005) to mention a few.

1.2. PROBLEM STATEMENT

Quality and productivity have become a prerequisite for any company to maintain its competitive edge in the market place, and it is generally believed that introducing Quality Models and Quality Systems into an organisation it will enhance its quality and productivity. These models and systems then bring with them an array of techniques and tools.

With today's rapid changing and intense competitive environment it is imperative that companies make use of quality models and / or systems to maintain and improve their competitive advantage.

Taking into account the importance of using Quality Models and Systems within an organisation making information available, which should result in the ability to take important strategic decisions, the main research problem is:

An investigation into the use of quality models, systems, techniques and tools to improve quality and productivity in selected Eastern Cape SMME sector.

1.3. STATEMENT OF SUB-PROBLEMS

- Sub-problem 1

How and to what extent do SMMEs use quality tools to improve their processes?

- Sub-problem 2

How and to what extent do SMMEs use quality techniques to improve their processes?

- Sub-problem 3

How and to what extent do SMMEs use quality Models or Systems to improve their processes?

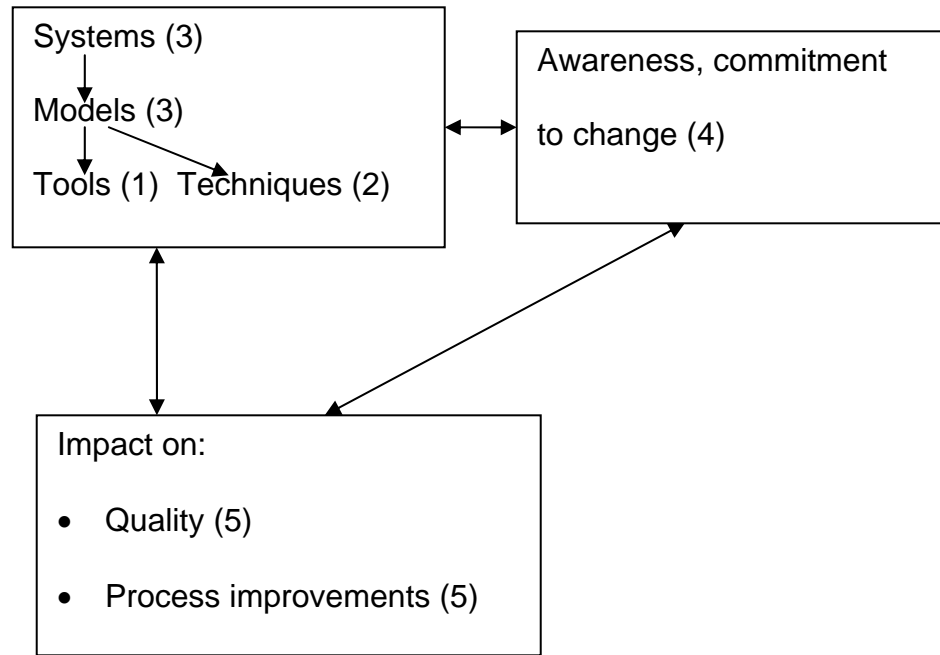
- Sub-problem 4

How and to what extent does management display awareness and commitment to process improvement?

- Sub-problem 5

How and to what extent does quality/productivity have an affect on the organisation?

Figure 1.1: Relationship between research and sub-problems



Source: (Structure of sub-problem outline developed by the researcher).

Figure 1.1 indicates the researcher's planned approach using the sub-problems (sub-problem number in brackets in the figure 1.1) identified, which will contribute to the resolve of the main problem.

1.4. HYPOTHESIS

- The first hypothesis: SMMEs use quality tools effectively to improve product quality and their processes.

- The second hypothesis: SMMEs use quality techniques effectively to improve product quality and their processes.
- The third hypothesis: SMMEs use no recognised quality Models or Systems to improve their processes.
- The fourth hypothesis: Management display no awareness and need for change.
- The fifth hypothesis: SMME management does not understand the impact of productivity/quality within the organisation.

1.5. OBJECTIVE

Larger manufacturing companies have realised the importance of implementing and maintaining quality models and systems in their organisations, and the benefit of having their first, second and third tier suppliers also using these quality models and/or systems.

The overall research goal is to analyse the utilization of quality, quality awareness, productivity and processes within the SMME sector by using various quality tools, techniques, systems and models to identify the effectiveness of these processes.

1.6. DEFINITIONS

- a) Kaizen: The Japanese term for continuous improvement activities carried out by teams in the workplace. In the West, Kaizen teams are usually referred to as 'quality circles' or 'continuous improvement groups' (Todd 1995:360).

- b) World-Class: Any organisation that makes rapid and continuous improvements in performance and is considered to be using "best practices" to achieve world-class standards (Basu & Nevan-Wright 2003:184).

- c) Critical Nonconformities: Is a nonconformity that judgment and experience indicate is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending on the product, or a nonconformity that judgment and experience indicate is likely to prevent the performance of the function of the product (Besterfield 2004:335).

- d) Major Nonconformities: Is a nonconformity, other than critical, that is likely to result in failure or in a reduction materially of usability of the product for its intended purpose (Besterfield 2004:335).

- e) Minor Nonconformities: Is a nonconformity that is not likely to reduce the usability of the product for its intended purpose. Minor nonconformities are usually associated with appearance (Besterfield 2004:335).

- f) Product Quality: The quality of a product may be defined as its fitness for use (Sandholm1997: 9).

- g) Committed leadership: Creating a culture that focuses unequivocally on the customer, requires personal, active and visible leadership on the part of all managers. The most important role of management is to formulate objectives and create the right conditions for employees (Sandholm1997: 33).

- h) Quality system: the quality system is the plan of action that should be followed in all work on quality. It includes activities and procedures (Sandholm1997: 45).

- i) Quality costs: Are defined as those costs associated with nonachievement of production or service quality (Besterfield et al 2003: 173).

- j) The criteria of small business (manufacturing only) based on the National Small Business Act No. 102.27, November 1996 is indicated in **Table 1.1**.

Table 1.1: Small business classification (manufacturing sector only). Adapted from the White Paper for development and promotion of small business in South Africa (1995) (<http://www.policy.org.za>). Published in

the

Government Gazette on 27 March 2003.

| Size | Paid employees (less than) | Total annual turnover (less than) | Total gross asset value (less than) |
|-------------|-----------------------------------|--|--|
| Medium | 200 | R51.00 m | R19.00 m |
| Small | 50 | R 13.00 m | R 5.00 m |
| Very Small | 10 | R 5.00 m | R2.00 m |
| Micro | 5 | R 0.20 m | R 0.10 m |

k) A process: A sequence of activities that is intended to achieve some result (Evans and Lindsay 2005: 20).

l) Quality Control: The process relating to gathering data and analysing the data to determine whether the process exhibits nonrandom variation (Thomas-Foster 2004: 511).

m) Quality Assurance: Those activities associated with assuring the quality of a product or service (Thomas-Foster 2004: 511).

n) Prevention Cost: Cost of preventing defects from occurring (Stevenson 2005: 391).

- o) Process Improvement: Process analysis and process improvement includes the cost and time reduction, productivity improvement, process yield improvement, and quality improvement and increasing customer satisfaction. (Stevenson 2005: 27).

1.7. ABBREVIATIONS

- BBP- Best Business Practices
- EMS – Environmental Management System
- FMEA – Failure Mode Effect Analysis
- IMS – Integrated Management System
- ISO – International Standards Organisation
- ISO 9000:2000 - Quality Management System - Fundamentals and vocabulary
- ISO 9001:2000 – Quality Management System - Requirements
- ISO 9004:2000 - Quality Management System - Guidelines for performance improvements
- ISO 14000 – Environmental Management System
- ISO/TS16949 – Technical Specifications for Automotive suppliers
- ISO 19011:2003 – Guidelines for quality and/or environmental management systems auditing
- OEM – Original Equipment Manufacturers

- PPAP – Production Part Approval Process
- PPM – Parts Per Million
- QMS – Quality Management System
- SAEF – South African Excellence Foundation
- SMME – Small, Medium, and Micro Enterprises
- TQM – Total Quality Management
- VOC – Voice of the customer.

1.8. DELIMITATIONS

The Research will be directed towards a selection of SMMEs operating in the Nelson Mandela Metropole in the Eastern Cape. The delimitations are as follows:

- The primary focus will be on the SMMEs in the supply chain that supply various manufacturers and OEMs
- The secondary focus will be on the manufacturers and OEMs
- The research will focus on both automotive and non-automotive companies.

1.9. ASSUMPTIONS

The following assumptions were made with respect to the problem statement and sub-problems:

- A need exists to address the fundamental issue of quality principles from a supply chain perspective
- The lack of use of proper quality models, systems, techniques and tools that influence management's degree of commitment towards quality
- The findings of this research project (done in the Eastern Cape) will be representative of the quality initiatives in the SMME sector countrywide.

1.10. IMPORTANCE OF THE RESEARCH

According to Besterfield (2004:52) 40% of production costs (on average) are due to purchased material. Hence it is expected that a substantial portion of the quality problem will result from substandard material issued from the supplier, which will have a direct affect on the product quality, and subsequent manufacturing processes. This could well result in customers deciding to purchase a competitor's product.

If companies want to survive and continually grow in the changing South African conditions and compete effectively against any foreign and local competitors constant improvements to the processes will to have to be made. As mentioned previously the SMMEs are now faced with a new threat, that of cheap Chinese imports (Sunday Times 20/11/2005). This previously untapped source (China) is going to have a major impact on the local market with regards possible job losses and the price of goods.

Ever increasing requirements and standards are being put in place by the larger “customer” companies and for the local SMMEs to be competitive and effective, the use of quality as a strategy in the SMMEs will have to be constantly evaluated and addressed if they (the SMMEs) want to carry on supplying the larger companies.

The research will consider the following:

- The current quality situation of selected SMMEs that are considered to be typical of the target sector (as per Table 1.1).
- Selected quality systems and techniques that are available in literature, which could assist with the improvement of quality within the SMME sector.
- Quality management systems, which should enhance the effectiveness of quality tools used, which in turn should assist the SMMEs with their quality requirements.
- Implementation and effectiveness of quality improvement programmes introduced into the SMME sector.

The importance of the research is to evaluate the current situation the SMME sector is faced with, in respect of quality initiatives. This information could lead to further research, for example, the development of a “user friendly” quality model that the SMME sector could use, understand and implement.

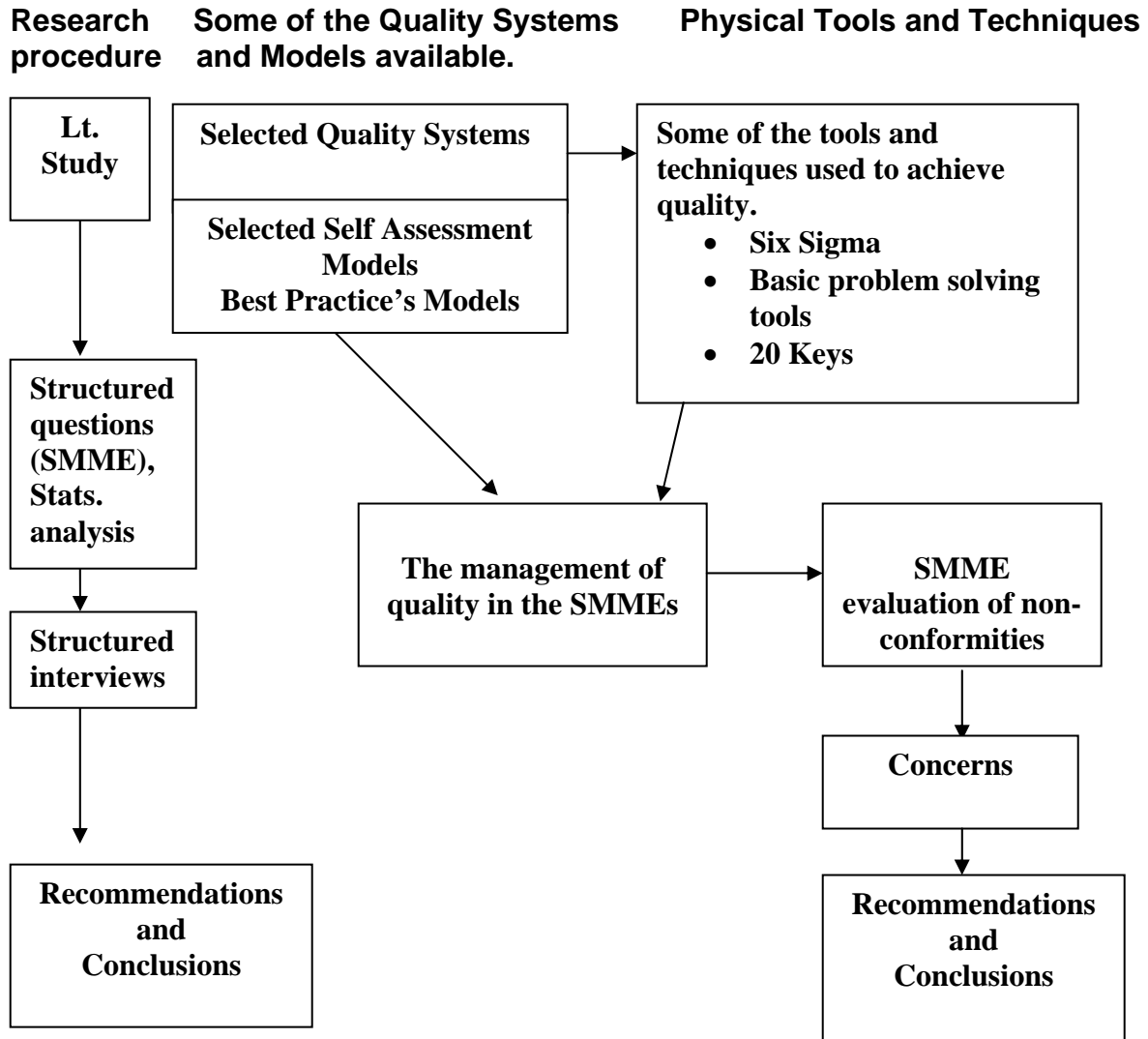
1.11. METHODOLOGY

This section describes the methodology to be followed by the researcher. The following procedures will be adopted during the research project in order to solve the main and sub-problems:

- To identify suitable research methodologies for the collection of the data required. According to Leedy (1993:121), methodology is an operational framework within which the facts are placed so that their meaning may be seen more clearly.
- An in-depth literature study will be conducted focusing on the key factors regarding the main problem and sub-problems. Information will be gathered from libraries, the Internet, newspaper articles, accredited journals and magazines, and experts in the field who are involved with the process. The sub-problem and research outline models (**Figure 1.1 and Figure 1.2**) have been developed by the researcher to assist with the literature survey. The models will serve as a guideline with regards the literature to be researched.
- An empirical survey will be conducted. The empirical study will include a structured questionnaire to be sent out to the selected SMME companies, and structured interviews which will be conducted by the researcher with a selected sample of SMMEs and larger companies.

On completion of the empirical study the data from the questionnaire will be statistically analysed and interpreted. The analysis will be done in consultation with a statistician at the Nelson Mandela Metropolitan University.

Figure 1.2: Research outline



Source: (Structure of literature model and theoretical model developed by the researcher).

1.12. DIVISION OF CHAPTERS

The study will be divided into six chapters as follows:

- Chapter 1 will be the research proposal, which will indicate the scope of the study, including the introduction, problem statement and study objectives.
- Chapter 2 will explore relevant literature.
- Chapter 3 outlines on the research methodology and methods that will be used.
- Chapter 4 will focus on the results.
- Chapter 5 will test the hypotheses.
- Chapter 6 will present a summary of the most important findings of the study.

CHAPTER 2

LITERATURE REVIEW

The bitterness of low quality is not forgotten. Nor can it be sweetened with a low price.

Marquis De Lavant (1734)

2.1. INTRODUCTION TO QUALITY

2.1.1. Background

An increasing number of companies regardless of size are starting to understand or experience the threat and problems associated with the introduction of Chinese products to the local South African market. One of the ways to compete with these imported products is to understand how quality could be used to assist the manufacturing or service processes currently being performed.

Another major problem facing the SMMEs is the understanding and knowledge required with regards the quality requirement set out by their major customers or competitors. Even though books have been written to help and support the SMMEs to sustain and possibly improve their growth, a large percentage of these books do not cover the quality issues, which has now become a major stumbling block to some SMMEs. What the researcher has done is to analyse some of the different quality models, systems, techniques and tools applicable to the SMME sector, selecting and summarising their requirements.

The management of the SMME sector can now study and understand how these quality systems operate and see if these quality systems or parts thereof can be used to assist them if required by a customer or if they want to introduce and implement quality improvement initiatives into their company. What must be understood is that if any quality initiatives are introduced into a company by parties that are not associated or employed by the company, these quality initiatives that have been introduced will not be effective if the management does not understand and support what has to be done.

2.1.2. Philosophy

When the expression “quality” is used, we usually think in terms of an excellent product or service that fulfills or exceeds our expectations. According to Besterfield, Besterfield-Michra, Besterfield and Besterfield-Sacre (2003), and Besterfield (2004) these expectations are based on the intended use and the selling price. For example, a customer expects a different performance from one type of product as opposed to another similar type of product because they are a different grade. When a product surpasses our expectations we consider that quality. Thus, quality is somewhat of an intangible based on perception. Besterfield et al (2003) and Besterfield (2004) gives the following overview regarding quality, expressing and quantifying it as follows:

$$Q = P/E$$

Where Q = quality

P = performance

E = expectations

The required performance and expectations for a particular product or service must be understood and agreed to by all relevant parties; the process can then be controlled by the introduction of Quality Control or Total Quality Management (TQM) which is discussed later.

An SMME company can evaluate (with the help of their customers, consultants or their own management) what approach would best suit their process, if considering introducing quality into the company. The SMME could introduce certain tools (that will be discussed later in this chapter) to assist them with their envisaged approach they want to take. Whatever approach is chosen, it must be understood that it will take a lot of time, money and dedication from the entire workforce for the process to be successful. If the full commitment and dedication is not there, it will be a waste of time, effort and money for any company with regards to its quality initiatives.

Quality control is the use of techniques and activities to achieve, sustain, and improve the quality of a product or service. According to Besterfield (2004) it involves integrating the following related techniques and activities:

- *Specifications* of what is needed
- *Design* of the product or service to meet the specifications
- *Production or installation* to meet the full intent of the specifications
- *Inspection* to determine conformance to specifications
- *Review of usage* to provide information for the revision of specifications if needed.

Besterfield (2004) further explains the following concepts, *Statistical quality control (SQC)* as a branch of Total Quality Management, which is defined below. It is the collection, analysis, and interpretation of data for use in quality control activities. *Statistical process control (SPC)* and *acceptance sampling* are the two major parts of SQC.

All the planned or systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality is called *quality assurance*. It involves making sure that quality is what it should be. This includes a continuing evaluation of adequacy and effectiveness with a view to having timeously corrective measures and initiated feedback where necessary.

TQM is defined as both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organisation. It is the application of quantitative methods and human resources to improve all the processes within an organisation and exceed customer needs now and in the future.

A *process* is a set of interrelated activities that use specific inputs to produce specific outputs as illustrated in **Figure 2.5**. The output of one process is usually the input to another. Process refers to both business and production activities. *Customer* refers to both internal and external customers, and *supplier* refers to both internal and external suppliers.

It is important that the fundamentals of TQM must be covered in order to make an impact on the areas being studied. What needs to be highlighted is that not only will some of the principles and practices be covered but also the tools and techniques that are to be used.

According to Besterfield et al (2003:494), Statistical Process Control (SPC) tools are excellent problem solving tools, but there are many situations where they are not appropriate, therefore additional tools that can be very effective for teams and some individual cases need to be investigated. These tools do not use hard data but rely on subjective information as illustrated in **Figure 2.3**. Application of these tools has been proven useful in process improvement, cost reduction, policy development, and new product development.

According to Besterfield et al, (2003:1), and Besterfield (2004) TQM is an enhancement to the traditional way of doing business. It is a proven technique to guarantee survival in world-class competition. Only by changing the actions of management will the culture and actions of the entire organisation be transformed. TQM is, for the most part, common sense, but is defined both as a philosophy and a set of guiding principles that integrate fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach.

A self-assessment model such as the American Baldrige Award or the South African Excellence Foundation Award provides a non-prescriptive framework for

management education and continuous improvement for all organisations and can be used as a diagnostic tool to improve performance and help achieve higher levels of competitiveness (<http://www.saef.co.za>).

Non-TQM companies by definition have not taken action to implement a quality management system and therefore, are more likely to rate lack of time and motivation as the more severe obstacles to implement quality initiatives into a company (Salegna and Fazel 2000:53-57).

2.2. RESPONSIBILITY FOR QUALITY

According to Besterfield (2004), Thomas-Foster (2004) and Oakland (2003) it is extremely important to get all the areas within an organisation to work towards the agreed to and common goal. The understanding, responsibilities and interrelationship of the various areas when striving to achieve and adapt different cultures could be a major stumbling block when trying to implement a new quality culture into the organisation. Besterfield's (2004) views are further summarised below. What must be noted is that it should not just be a forward flow of information, but a feedback process must also be made available. **Figure 2.1** can be used by the SMME sector to help assign various responsibilities to personnel within the organisation. Due to the number of people employed within an SMME company (see **Table 1.1**) the assignment and controlling of these responsibilities could improve the management of the company. Management of the smaller companies tend to be "jack of all trades"

when it comes to responsibilities, compared to the larger companies who assign personnel into certain positions.

2.2.1. Areas Responsible

Quality is not the responsibility of any one person or functional area; it is everyone's responsibility. It includes everyone within the company, from the janitor to the chief executive officer (CEO). The CEO within the company should start the initiative, thereafter the responsibility should be delegated to the various departments within the organisation with a common goal in place. The responsibility for quality begins when the marketing department determines the customer's quality requirements and continues until a satisfied customer receives the product. The responsibility for quality is delegated to the various areas with the authority to make quality decisions. According to Besterfield (2004) in addition, methods of accountability, such as cost, error rate, or non-conforming units, are included with the responsibility and authority. Areas of responsibility include marketing, design engineering, procurement, process design, production, inspection and test, packaging and storage, product service, and the customer. The information in this section pertains to a manufactured item; however, the concepts can also be adapted to a service organisation.

2.2.2. Marketing

Marketing helps to evaluate the level of product quality that the customer wants, needs, and is willing to pay for (Stevenson 2005). In addition, marketing provides the product-quality data and helps to determine the quality requirements. Marketing evaluates all the data, and determines the agreed to quality requirements for the

product. An information monitoring and feedback system should be put in place to continually collect new information and analyse it in an effective manner on an ongoing basis. Marketing provides the company with the product brief, which translates customer requirements into a preliminary set of agreed to specifications. Marketing is the liaison with the customer and as such is a vital link to the development of a product that surpasses customer expectations.

2.2.3. Design Engineering

Design engineering translates the customer's quality requirements into operating characteristics, exact specifications, and appropriate tolerances for a new product or a revision of an established product (Evans and Lindsay 2005). The simplest and least costly design that will meet the customer's requirements is the best design. As the complexity of the product increases, the quality and reliability decrease. Early involvement of marketing, production, quality, procurement, and the customer is essential to prevent problems before they occur. This type of involvement is called concurrent engineering.

2.2.4. Procurement

Using the quality requirements established by design engineering, procurement has the responsibility of procuring quality materials, components or services. (Evans and Lindsay 2005).

2.2.5. Process design

The scope of process design is developing processes and procedures that will produce a quality product. This responsibility according to Besterfield (2005) is achieved by specific activities, which include process selection and development, production planning, and support activities.

2.2.6. Production

The aim of production is to produce quality products. Quality cannot be inspected into a product; it must be built into the product. According to Deming, only 15% of the quality problems can be attributed to operating personnel – the balance is due to the rest of the system (Besterfield 2004). Statistical process control effectively controls quality and is an invaluable tool for quality improvement. Operating personnel should be trained to perform their own statistical process control.

2.2.7. Inspection and Testing

The object of inspection and testing is to appraise the quality of purchased and manufactured items and to report the results. The various departments must take corrective action when needed using the reports (Evans and Lindsay 2005). Inspection or testing may be in an area by themselves or be part of production, or part of quality assurance. They might also be located in both production and quality assurance.

2.2.8. Packaging and Storage

The aim of packaging and storage is to preserve and protect the quality of the product (Stevenson 2005). Control of the product quality must extend beyond production to the distribution, installation, and use of the product. A dissatisfied customer is not concerned with where the non-conforming condition occurred.

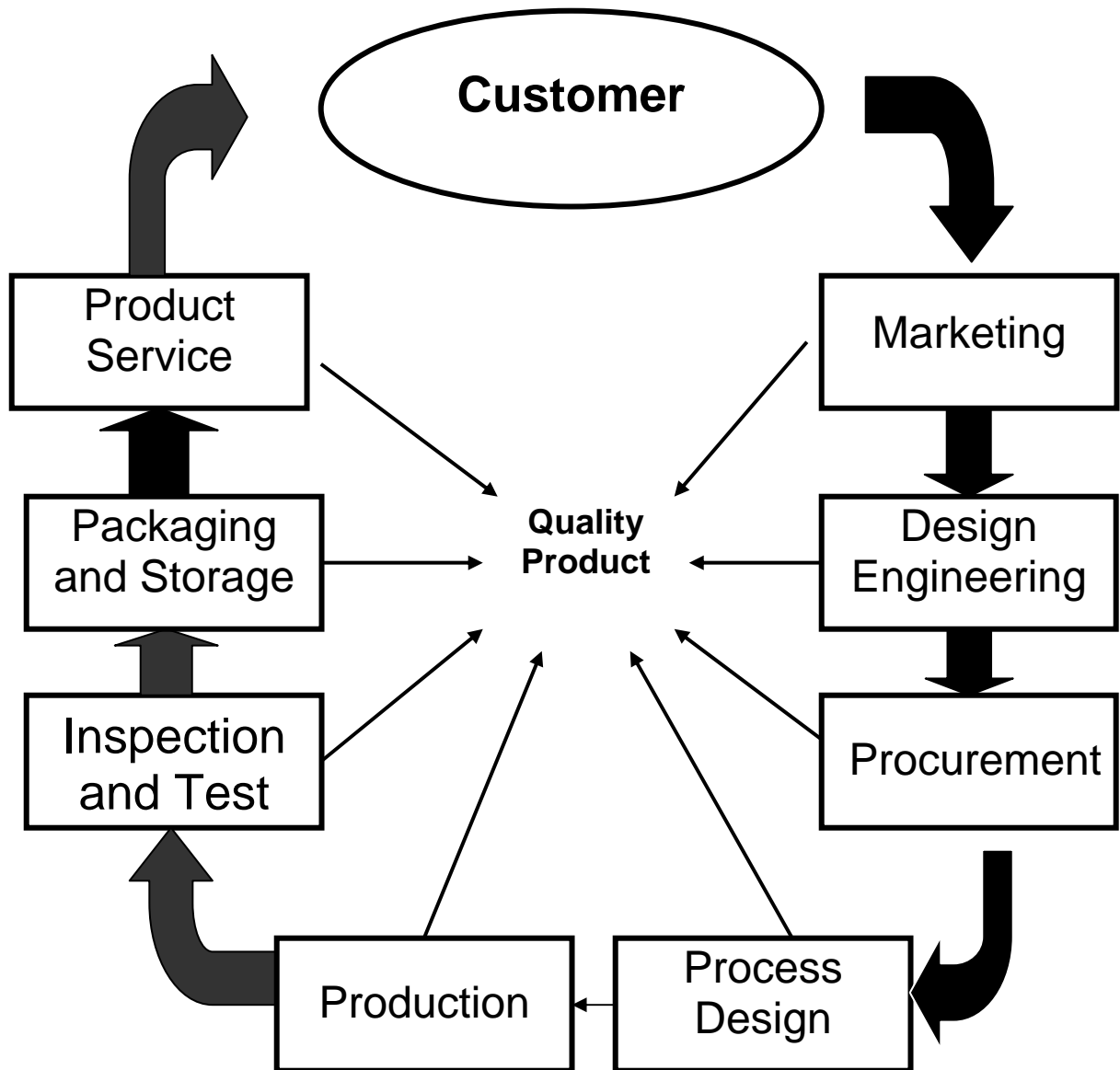
2.2.9. Product Service

According to Besterfield (2004) product service provides the customer with the means for fully realising the intended function of the product during its expected life. This responsibility includes sales and distribution, installation, technical assistance, maintenance, and disposal after use. Products should be serviced quickly whenever they are improperly installed or fail during the warranty period. Prompt service can change a dissatisfied customer into a satisfied one. Product service and marketing, work closely together to determine the quality the customer wants, needs, and obtains.

2.2.10. Quality Assurance

The quality assurance or quality control department (the name is not important) *does not* have direct responsibility for quality. It assists or supports the other areas as they carry out their quality control responsibilities. Quality assurance *does* have the direct responsibility to continually evaluate the effectiveness of the quality system (Besterfield 2004).

Figure 2.1: Areas of responsibility for Quality.



Source: (adapted from Besterfield 2004).

It determines the effectiveness of the system, appraises the current quality, identifies quality problem areas or potential areas, and assists in the correction or minimisation of these problem areas.

The overall objective is the improvement of the product quality in co-operation with the responsible departments.

2.2.11. Areas of responsibility within an SMME

There is no hard and fast rule as to the responsibility for quality assigned within the SMME sector, each company has to evaluate its own situation and assign responsibility according to its needs, depending on the nature of the business. Longenecker et al (2003) states that the management team will consist of supervisory and nonsupervisory personnel. The individuals chosen will play a key role in the success of the business. Not all members of a management team need competence in all areas – the key is balance.

2.3. CHIEF EXECUTIVE OFFICER

The CEO of a company is ultimately responsible for the quality in each of the functional areas. The CEO must be involved directly in the quality effort. The activity requires knowledge of quality and direct involvement with the quality improvement programme. Merely stating that quality is important is not sufficient. The CEO can use the dimensions stated in **Table 2.1** to effectively assist and guide the company's quality focus requirements in specific categories or areas.

Table 2.1: The dimensions of quality.

| DIMENSION | MEANING AND EXAMPLE |
|------------------|---|
| Performance | Primary product characteristics, such as the brightness of the picture |
| Features | Secondary characteristics, added features, such as remote control |
| Conformance | Meeting specifications or industry standards, workmanship |
| Reliability | Consistency of performance over time, average time for the unit to fail |
| Durability | Useful life, includes repair |
| Service | Resolution of problems and complaints, ease of repair |
| Response | Human-to-human interface, such as the courtesy of the dealer |
| Aesthetics | Sensory characteristics, such as exterior finish |
| Reputation | Past performance, and other tangibles, such as being ranked first |

Source: (adapted from, Managing Quality: the strategic and competitive edge by Garvin 1988 and Thomas-Foster 2004).

2.4. INTRODUCTION TO TOTAL QUALITY MANAGEMENT

TQM is an enhancement of the traditional way of doing business. It is a proven technique to guarantee survival in world-class competition. Besterfield (2004) summarises TQM as follows: only by changing the actions of management will the culture and actions of an entire organisation be transformed. TQM is, for the most part, common sense.

Analysing the three words, we have

Total = made up of the whole

Quality = degree of excellence a product or service provides

Management = act, art, or manner of handling, controlling, directing, etc.

Therefore, TQM is the art of managing the whole to achieve excellence. What the goal or the focus of the organisation should be to “do unto others as you would have them do unto you”.

The purpose of TQM is to provide a quality product or service to customers, which will, in turn, increase productivity and lower cost. With a higher quality product and lower price, the more competitive your position in the market place will be. This series of events will allow the organisation to achieve the business objectives of profit and growth with greater ease. In addition, the work force will have job security, which will have an effect on the motivation of the employees and create a satisfying place to work. Small companies will be able to make the transformation time much faster than large companies, one of the main reasons being the swiftness that they can adjust to new processes.

A company will not begin the transformation to TQM until it is aware that the quality of the product or service must be improved. Having an accredited quality management system (QMS) does not mean that it is conforming to TQM requirements, what it means is that the company is following and adhering to a set of guidelines set out by

the QMS, this is shown in **Figure 2.4**. Awareness occurs when a company loses market share or realises that quality and productivity go hand-in-hand. It also occurs when the customer mandates TQM, or when management realises that TQM is a better way to run a business and compete in domestic and world markets (Dale and Bunney 1999). It is also important to highlight quality shortcomings referring primarily to the loss of profit or cost losses resulting from the lack of quality. Management tends not to be too interested in quality until the whole cost aspect or quality losses are calculated and shown to management. That usually gets management's attention a lot faster, resulting in more focus being placed on the quality issues at hand.

Automation and other productivity enhancements will not help a corporation if it is unable to market its product or service because the quality is poor. The Japanese learned this fact from practical experience. Prior to World War II, the Japanese could sell their products only at ridiculously low prices, and found it was difficult to secure repeat sales (compared to some of their overseas competitors) due to the poor quality of their products. The product quality was improved with little extra cost to the operation resulting in Japan now being more competitive, and the competition now having to re-analyse their own situation or face a reduction in market share. China, having learnt from what the Japanese did, now seem to be following the same route the Japanese did in the sixties, and are focusing on the quality of the product produced (which is improving daily). Until recently, corporations and countries have not recognised the importance of quality and are now realising quality is first among equals in cost and service.

As Dale and Bunney (1999:20) state that cost, productivity and quality improvements are complementary and not alternative objectives. Improvements in quality lead directly to increased productivity and other benefits. The improvement in quality resulted in a 5.6% improvement in productivity, capacity, and profit according to Besterfield (2004). Dale and Bunney (1999) state improvements could range between 5% and 25% of an organisation's annual sales turnover. Many quality-improvement projects are achieved with the same work force, same overheads, and no investment in new equipment.

Implementing TQM is not something that will occur overnight. There are no quick fixes or remedies. It takes a long time to build the appropriate emphasis and techniques into the culture. Over emphasis on short-term results and profits must be set aside so that long term planning and consistency of purpose will prevail. **Table 2.2** highlights some of the major differences that occur between the old and the new quality philosophies.

When focusing on, and looking at implementing a TQM system, it is advisable to have a structured approach. This approach should be followed and continually analysed during the implementation processes.

The basic approach is just the framework, which will later form the cogs to be followed to help you achieve "Total Quality".

The TQM implementation process should be a basic approach, and senior management of the company should be comfortable with the agreed approach which the company wants to follow and should be discussed prior to the implementation stage. Besterfield (2004) has based the TQM process on a two-pronged attack, namely principles and practices, and tools and techniques as illustrated in **Figure 2.2**. One without the other will result in failure.

Table 2.2: Old and New Culture Profiles.

| Quality Element | Previous State (Old Culture) | T Q M (New Culture) |
|------------------------|-------------------------------------|---|
| Definition | Product-oriented | Customer-oriented |
| Priorities | Second to service and cost | First among equals of service and cost |
| Decision | Short-term | Long-term |
| Emphasis | Detection | Prevention |
| Errors | Operations | Systems |
| Responsibility | Quality control | Everyone |
| Problem Solving | Managers | Teams |
| Procurement | Price | Life-cycle costs |
| Manager's role | Plan, assign, control, and enforce | Delegate, coach, facilitate, and mentor |

Source: (adapted from Besterfield 2004 and Besterfield et al 2003).

There are various approaches that can be used as guidelines, which have been developed over the years. According to certain academics and quality practitioners who might differ in certain aspects of TQM but have had success with different routes see **Table 2.3**.

Table 2.3: Basic TQM concepts practiced by various quality authors.

| Key Element | Sandholm (1997) | Besterfield (2004) | Goetsch & Davis (2000) | Thomas- Foster (2004) | Dale & Bunney (1999) |
|---|----------------------------|-------------------------------|---|--------------------------------------|---|
| Indicate the aim of what is to be achieved | • | | • | • | • |
| Focus on the customer | • | • | • | • | • |
| Continuous improve | • | • | • | | |
| Committed management | | • | • | • | • |
| Involved workforce | | • | • | • | • |
| Suppliers as partners | | • | | | • |
| Performance measures | | • | | | • |
| Scientific approach | | | • | • | |
| Training and education | | | • | | |

Source: (Table developed by researcher).

A number of quality philosophers (authors) have been researched and a matrix set up indicating the different author's perceptions on how to achieve TQM. The key elements have been summarised, showing which quality authors think is more important to focus on if you want to implement TQM into your company.

These are just a few TQM concepts that have been promoted by quality professionals, which they further analyse and explain in their books. What can be deduced from **Table 2.3** is the importance of focusing on the customer when trying to implement TQM.

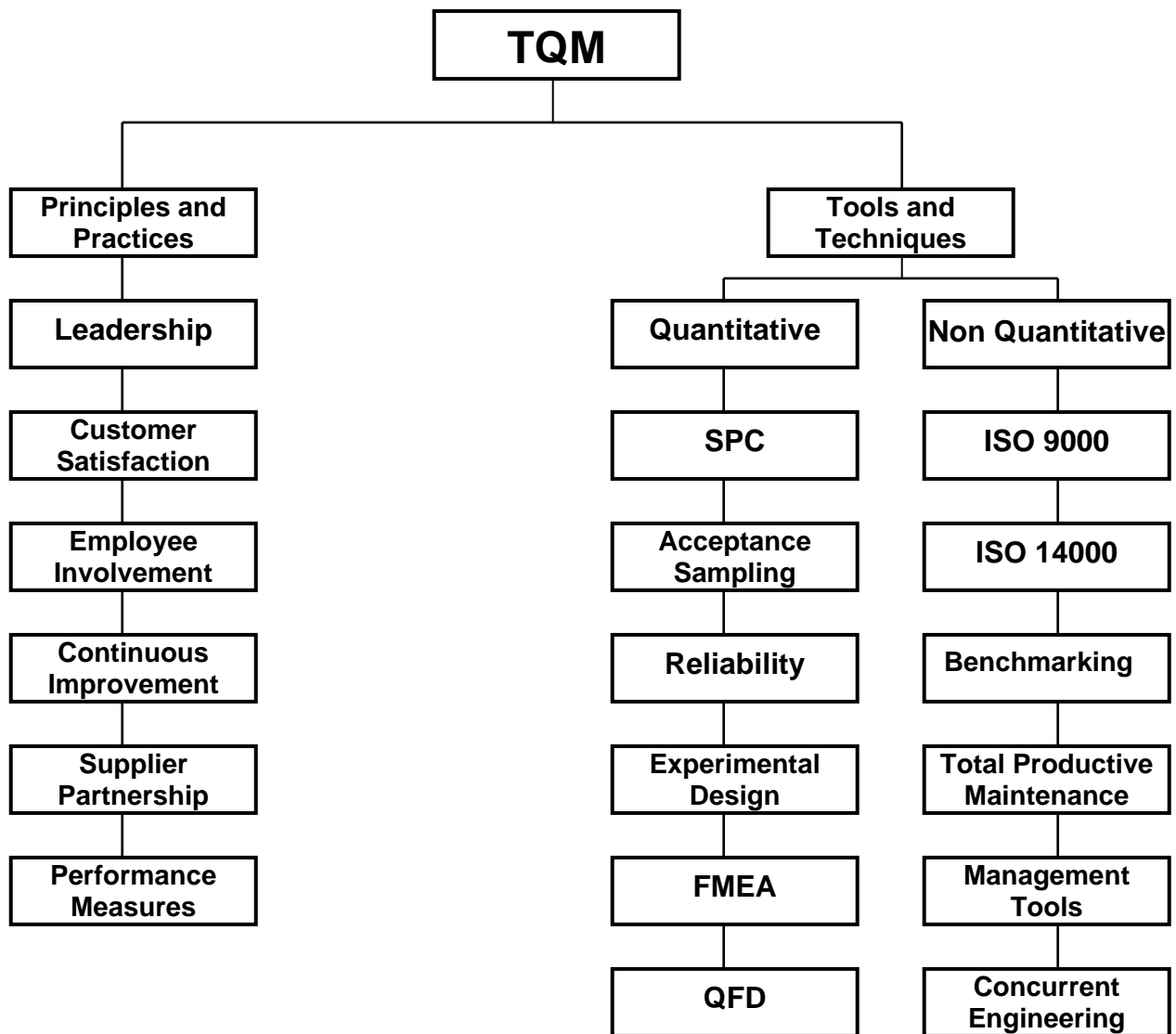
After analysing some of the various TQM concepts that have been used and implemented successfully it should be possible to look at and implement a generic approach that could be followed for the SMME sector in the Eastern Cape, which could be developed and evaluated later in further research.

When analysing the various TQM concepts it can be seen that they have been initiated by some of the earlier Quality Gurus, namely: Deming, Juran, Crosby, Feigenbaum, Ishikawa, Taguchi and Shewhart to mention a few, who had laid the cornerstone of the quality approach to be followed. The pioneers developed specific approaches and trends to be followed which have formed the basis for TQM. Presently we focus on more scientific approaches, with the aid of what the Gurus developed.

A structured, continuous improvement model must be developed for specific company needs. This can be done by analysing the key elements that would be most appropriate, and then introducing the tools and techniques that will help achieve the goal. This will not be achieved overnight; it is a long slow process. The more a developed structured approach is followed, the easier the journey to achieve TQM.

This approach must not be set in stone; it must be pliable and achievable. **Figure 2.2** shows the scope of possible TQM concepts that can be used.

Figure 2.2: Scope of TQM activities



Source: (Adapted from Besterfield 2004).

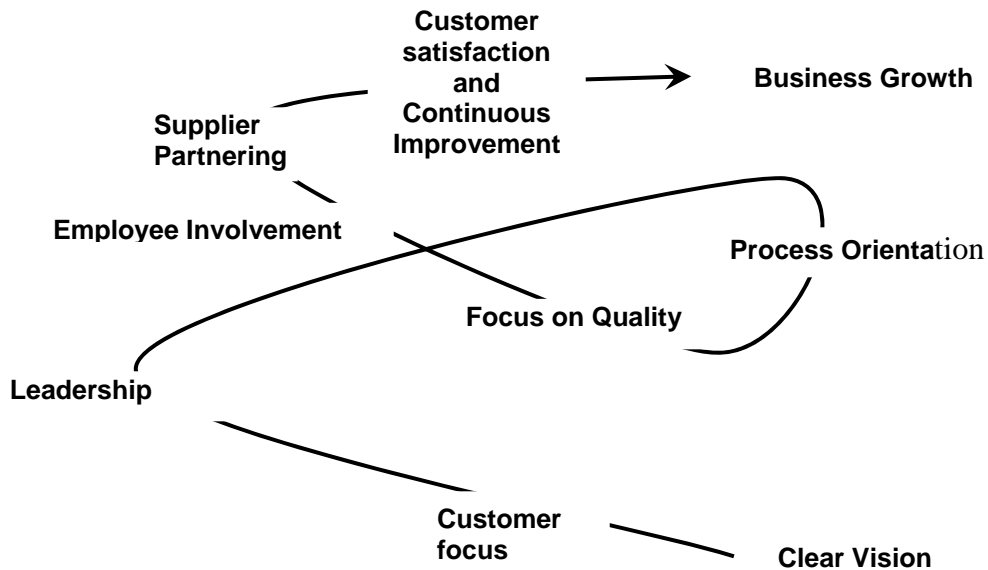
What must be noted for any TQM initiative introduced into a company, or whatever approach to be taken, the success of the approach will depend on the commitment, understanding, knowledge, and motivation of senior management and the buy-in of the entire workforce. For this to be achieved there must be complete faith and support on the agreed TQM approach by management and workforce combined. It is management's responsibility to start the ball rolling.

The TQM plan that is initiated in the company must go hand in hand with productivity which automatically leads to increased profits, and what must be understood by management is that this cannot be achieved overnight, and the process must have the full support of top management if it is to succeed.

A process proposed by Juran and adapted by Besterfield (2004) shows "The road to business growth" **Figure 2.3**. This will create a focusing point to work on, which if followed will lead to business growth. Analysing the various approaches to TQM, the success and failure of the program can be laid fairly and squarely at the door of senior management. Besterfield et al (2003), adds that the focus on leadership is one of the most important issues that must be addressed.

The SMMEs can use this **Figure 2.3**. to help the company focus on what strategy it should take. The management of these companies must realize that the one point leads to the next, and if any of the points are left out or not addressed it could lead to a loss in profitability and productivity.

Figure 2.3: The road to business growth.



Source: (Adapted from Besterfield 2004).

An extensive literature research done by Masters, "Overcoming the Barriers of TQM Success", Quality Progress (May 1996: 53-55), determined that the most common reasons resulting in the unsuccessful implementation of a TQM program is due to the lack of focus on the following:

- Customer driven quality
- Leadership
- Continuous improvement and learning
- Valuing employees
- Fast response
- Design quality and prevention

- Long range view of the future
- Management by fact
- Partnership development
- Corporate responsibility and citizenship
- Results focus.

According to Masters (1996) when analysing the basic steps and approaches to TQM the following tend to be the more prominent points:

- Management commitment and total support and involvement
- Focusing on our customers' requirements (internally and externally)
- Structured approach using the required tools and techniques
- Total support and involvement from all corners of the company
- Setting of long term, achievable and measurable goals
- Training and education.

These points concur with **Table 2.3**, which shows what are possibly the more important key elements that have to be addressed first for TQM to be successful.

Management could use this particular approach as a springboard to get the TQM process moving.

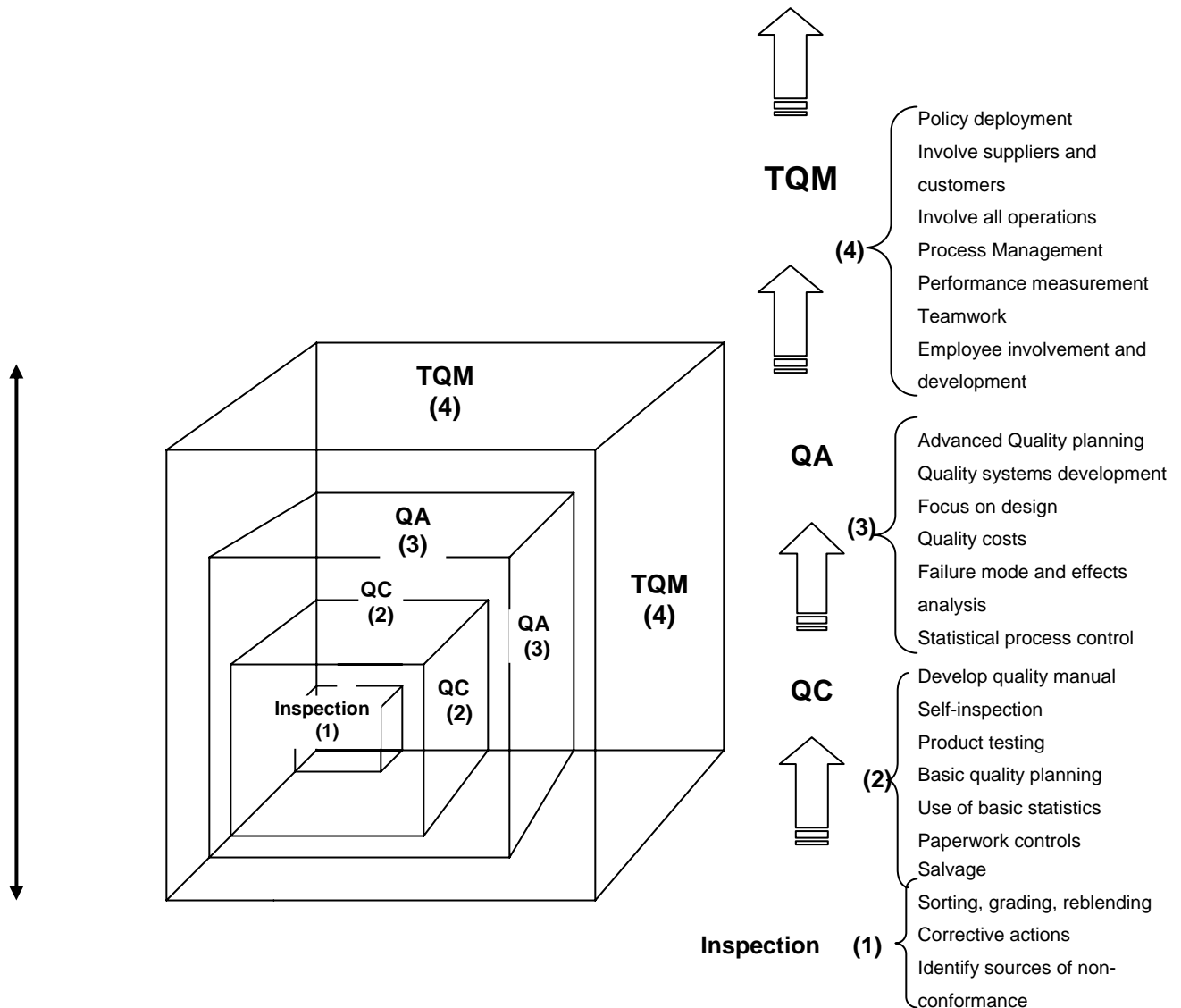
Gauging from the success of the TQM process put in place, management can now assess its weak and strong points, both in the company and the systems so as to see what course of action is required next.

After the implementation of the TQM process, the decision from the company could be to take the process to the next level. This could possibly be the implementation of a QMS.

Figure 2.4 indicates some of the strategies available to management when thinking of the possibility of implementing a quality process within a company. Management must realize that the one strategy can lead to the next, and all the strategies can be interrelated, companies do not have to reinvent the wheel when progressing from a lower strategy to a higher one. What the SMME sector must understand is the more intense the strategy the more money it will cost.

If the “Inspection Strategy” in **Figure 2.4.** is introduced into an SMME, and the entire workforce should understand and accept the process for it to be effective, management can then introduce selected quality tools as a start to assist on the road towards business growth.

Figure 2.4: Quality blueprint.



Source: (Adapted from Dale and Bunney 1999).

From a management view point, the implementation of the “Inspection Strategy” in **Figure 2.4.** means that the management style must change from “allocating blame” to “people involvement, compliance to specifications, caring for people, empowering people”. This will eventually lead to “continuous improvement” which is considered as the “Total Quality Management Strategy”. **Figure 2.4.** shows what management

should concentrate on when progressing from the inspection strategy to the TQM strategy, indicating on the right hand side of the diagram what checks and balances could be introduced for the various phases of improvement. Therefore, when wanting to introduce the higher level strategies into the company, these strategies will now be easier to implement because of the acceptance and understanding the workforce has of the quality concepts that were previously implemented.

It is advisable that before an organisation attempts to implement a QMS or methodology, that the company has some knowledge of QMS principles and the requirements. If a TQM process has been successful in the company, it can be used as a springboard making it easier for the company to achieve a QMS. The pillars or columns of a successful TQM process can be developed and realigned from the current procedures put in place in accordance with the guidelines of a QMS. This will result in little or no cultural change within the company.

What must be reiterated is that the implementation of any QMS is an expensive process. If an SMME management wants to implement a QMS into its business, it would be advisable to analyse the impact it will have on the SMME first. An SMME company could develop and use a generic QMS until it deems it necessary to further customise their QMS.

2.5. SIX SIGMA DEFINED

2.5.1. What is Six Sigma?

The concept of the Six Sigma methodology as an improvement programme for manufacturing was developed and implemented at Motorola in the mid-1980s (Henderson and Evans 2000). Many of the tools used by Six Sigma have been available since the Second World War, with the Balanced Scorecard being the only relatively new addition to these management practices.

The term Six Sigma refers to a particular way of reducing defects to near zero. Sigma is the Greek letter statisticians use to represent the “standard deviation of a population”. The Sigma tells us how much variation there is within a group of items (the “population”). The more the variations the bigger will be the standard deviation.

In statistical terms, the purpose of Six Sigma is to reduce process variations to achieve very small standard deviations so that most of the products or services meet or exceed customer specifications (Pande, Neuman and Cavanagh 2002). For General Electric, the Six Sigma approach invited the use of statistical and non-statistical tools for the creation of knowledge that leads to quality improvement of products/processes in less time than the competition (Breyfogle 2003).

On the “isixsigma.com” website Six Sigma is defined as: “a rigorous and disciplined methodology that uses data and statistical analysis to measure and improve a company’s operational performance by identifying and eliminating ‘defects’ in

manufacturing and service-related processes. Commonly defined as 3.4 defects per million opportunities, Six Sigma can be defined and understood at three distinct levels: “metric, methodology and philosophy”.

According to Pande et al (2002) there are six critical factors that are needed to achieve Six Sigma capability within an organisation. The factors are as follows:

- Genuine focus on the customer
- Data and fact driven management
- Process focus, management and improvement
- Proactive management
- Boundaryless collaboration
- Driven for perfection.

Although not many authors highlight these specific factors for Six Sigma, these factors could be used as a vision of a Six Sigma organisation. These factors not only support the listed key elements of Six Sigma, but are covered quite extensively in ‘Total Quality Management’ and ISO 9000:2000 requirements and Pande et al (2002) as discussed below.

- High focus on customer – within the TQM philosophy and ISO 9001:2000, customer focus and satisfaction are one of key quality principles to be recognized and developed. For Six Sigma, customer focus and satisfaction are the main drivers (both internal and external customers). Six Sigma performances begin with the customer, and the improvements are defined by their impact on the customer;

customer focus being the top priority of Six Sigma. Performance measurement begins and ends with the Voice of the Customer (VOC).

- Data- and fact-driven management (statistical techniques – this is also a key quality principle within TQM and ISO 9001:2000). The Six Sigma approach addresses questions on what data/information is required and what is the best way to use this data, providing answers to important questions asking management and the improvement teams:
 - How are we really doing?
 - How does it compare to the targeted projections?
 - What other data/information needs to be collected to answer other questions?
- Process focus, management and improvement – another key quality principle from TQM and ISO 9001:2000 is the focus on process/systems management. Six Sigma positions the process as the key vehicle of success using a well structured methodology and highly trained individuals to drive the improvement processes. This has been very successful in convincing leading managers to master and improve processes used to develop competitive advantage by delivering real value to the customer.
- Proactive management – based on processes under control with the necessary monitoring and control tools, will allow a proactive approach to management (which means to be ahead of events). This is a good starting point for creativity. Six Sigma provides the tools and practices to replace reactive with proactive management.

- Boundaryless collaboration – the focus on internal and external customers and the processes required to deliver the required quality levels break down barriers within an organisation to ensure that all focus on the common goal of customer satisfaction. The Six Sigma approach supports and promotes teamwork company wide and can include suppliers as well as customers.
- Drive for perfection – the metric of 3.4 Defects per Million Opportunities (DPMO) is a rigorous drive to achieve near perfection quality for customer satisfaction. This metric highlights the need to focus on processes, more specifically, what is critical to the customer and how to manage variation within these processes – from there the statistical approach to process improvement. The biggest risk teams can take is to be afraid to try new methods. Spending time on data collection may seem risky at first, but the result could lead to better and more effective decisions.

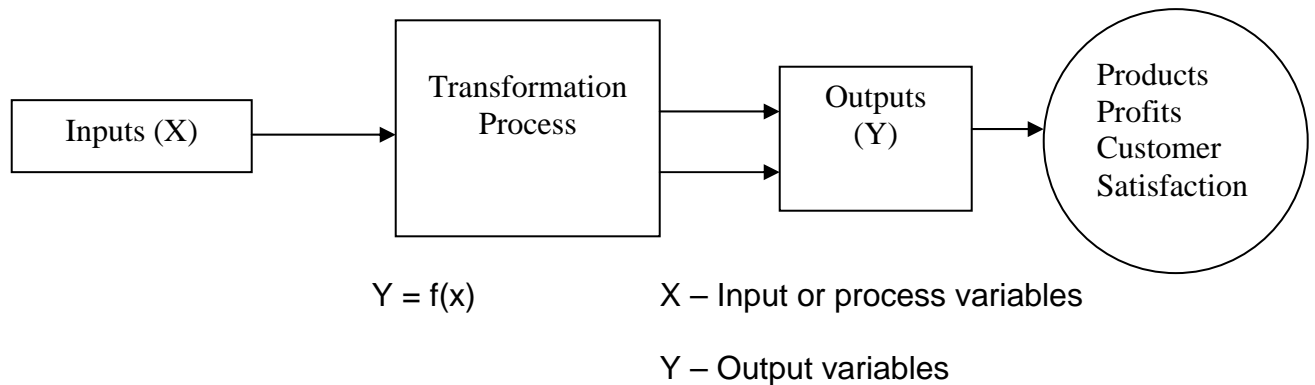
2.5.2. The Six Sigma philosophy

According to the Juran Institute the steps of Six Sigma breakthrough improvement are as follows:

- Define: Improve project-by-project, beginning with the most significant output
- Measure/Analyse: Uncover root cause or causes
- Improve: Create an improvement
- Control: Implement procedure and hold the gains
- Replicate: Help organisations with similar problems and what was learnt.

The basic principle of Six Sigma is that the outputs (Y) of a process are dependant on the inputs (X). Six Sigma must discover the Xs (inputs or causes) of serious quality problems (a “bad” Y), remove the Xs and put into place new control Xs and the Y cannot return.

Figure 2.5: The Sigma input – process – output approach



Source: (Adapted from Basu & Nevan-Wright 2003:34).

As can be seen in **Figure 2.5**, the process requires inputs (depicted by Xs, input variables). Ys depict the process outputs, which is a measure of business performance. The result of Ys in the mathematical formula $Y= f(X)$ is a way of saying changes or variables in the inputs and the process will largely determine Y’s outcome.

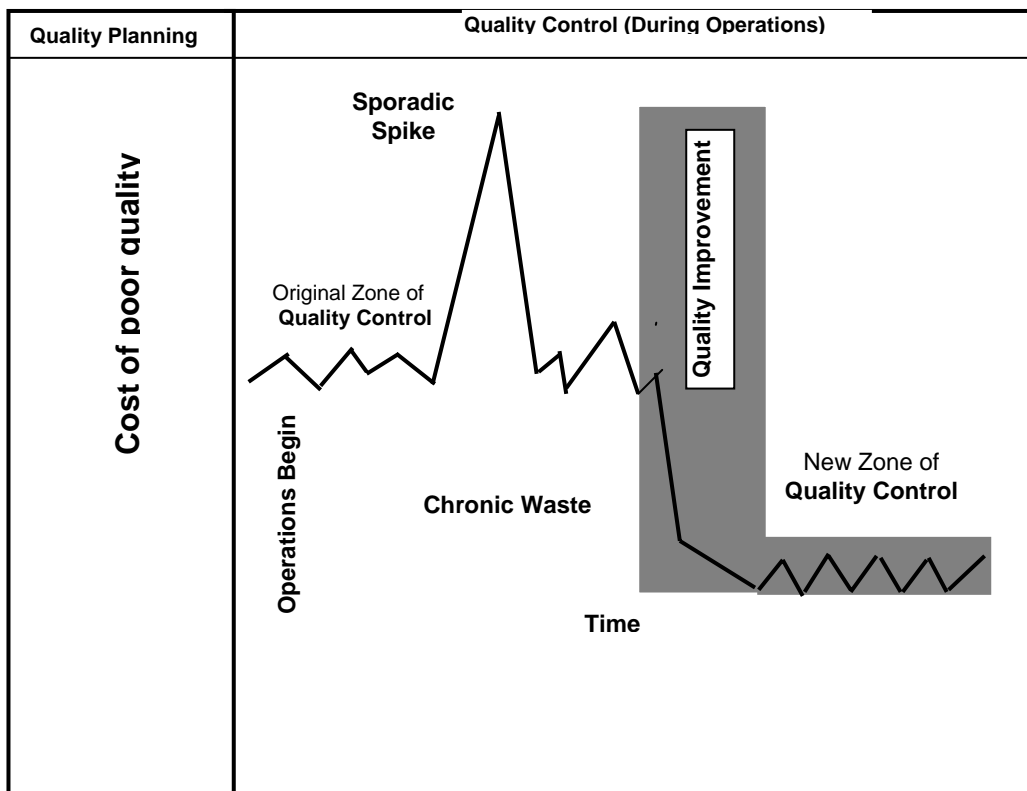
Key aspects to consider for the Six Sigma improvement process is as follows:

1. To determine which Xs or variables in the business process or inputs have the biggest influence on the Ys or results.

- To use the changes in the overall performance of the process (the Y's) to adjust the business for profitability (align with business strategy to support market/customer requirements).

The key is to understand the relationship between the Xs and Ys. By using Six Sigma methods to understand the system and the variables an organisation can learn to monitor and respond to these variables more effectively and efficiently.

Figure 2.6: Juran Trilogy



Source: (Adopted from Juran's Six Sigma Training Kit 2002).

The focus of Six Sigma is improvements, which is equated with cost saving to the company. Once the improvements have been created, the focus is also on what lessons can be learnt from the improvement. **Figure 2.6.** shows the benefits of implementing Six Sigma over a period of time, where the improvement process attacks the various forms of waste.

The Juran Trilogy (**Figure 2.6.**) focuses on three main processes, the “**Quality Planning Process**”, the “**Quality Control Process**” and then only on the “**Quality Improvement Process**”. If these processes are followed systematically, it will only be a matter of time before the “New Zone of **Quality Control**” is achieved

Some of the tools used in Six Sigma will be explored in more depth later in the research, but these are the basic tools used according to The Six Sigma Basic Training Kit (Juran Institute 2002:8):

- Flow diagrams
- Fundamental Deployment Matrices (FDM)
- Pareto Analysis
- Brainstorming
- Cause and effect diagram
- Failure mode effect analysis (FMEA)
- Data sheets
- Histograms
- Scatter diagrams.

These tools are also used effectively in TQM, but in Six Sigma the use of the tools are structured so as to follow a specific structured improvement process (step by step).

The difference between TQM and Six Sigma is that TQM is an improvement-focused programme and according to Pande and Holpp (2002:3-4) three key characteristics that separate Six Sigma from past quality programmes are:

- Six Sigma is customer focused.
- Six Sigma projects produce major returns on investment.
- Six Sigma changes the way management operates.

The researcher's view point with regards to Pande and Holpp (2002:3-4) comments on the key characteristics of Six Sigma indicated above, is that all TQM strategy's **must** also have these characteristics as their key processes. Pande and Holpp might feel that Six Sigma focuses more on the key factors than compared to other quality programmes.

Pande and Holpp (2002:3-4) continue to say that the Six Sigma efforts target three main areas, namely improving customer satisfaction, reducing cycle time and reducing defects.

Six Sigma is a management process that focuses on a philosophy of excellence, customer focus, process improvement and rule of measurement rather than gut feeling. For Six Sigma to be effective it requires resources for effective implementation

with the required organisational structure, roles, responsibilities and training. This could be one of the major reasons why it is going to be more difficult for the SMME sector to implement Six Sigma.

To summarize – the Six Sigma metric system is threefold as outlined by Pande et al (2002):

1. Start with the customer:- clearly define what is critical to the customer (CTQ) or the Ys (specification limits). Consider the cost of poor quality (COPQ) for process selection.
2. Provide a consistent metric:- determine the defect rate and convert to a yield (from standard sigma conversion table). Yield can be converted to defects per million opportunities (DPMO) or sigma level (this will assist with common measuring language, e.g. between manufacturing and service departments).
3. Link to an ambitious goal of achieving near perfection:- a process yield of 99.99967% or 3.4 DPMOs.

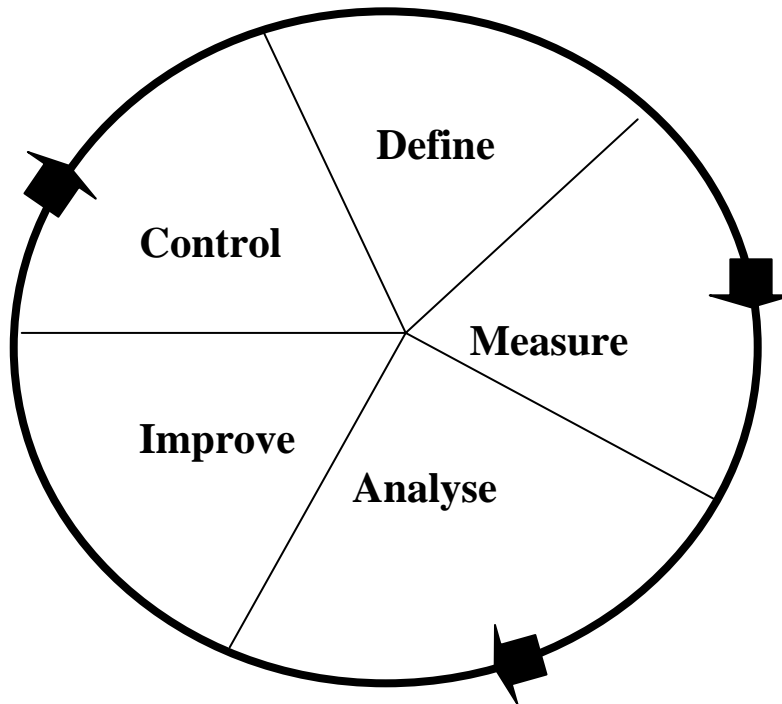
2.5.3. Six Sigma – the methodology

The Six Sigma approach is primarily based on the “PLAN-DO-CHECK-ACT or the P-D-C-A cycle which was developed by Deming for the continuous improvement of processes. Six Sigma uses a five phase improvement cycle called the DMAIC (Design, Measure, Analyse, Improve and Control) process. This is referred to as the road map to problem solving which is expanded into a set of twelve steps commonly known as the “Six Sigma Breakthrough Steps”. A brief description of the DMAIC process according to Brue (2002) and Henderson & Evans (2000) is as follows:

1. **Define** the projects, the goals and the deliverables to customers (internal and external), identification of those attributes called CTQs (critical to quality) and what the customer considers to have the most impact.
2. **Measure** the current performance of the process (how is the process measured and how is it performing) – determine the key internal processes that influence CTQs.
3. **Analyse** and determine the root cause(s) of the defect(s) (what are the most important causes of defect) – why are defects generated by identifying the key variables that have the most likely effect on process variation.
4. **Improve** the process to eliminate defects (how do we remove the causes of defects).
5. **Control** the performance of the process (how can the improvements be maintained – systems are put in place to ensure that updated processes remain within new specification limits.

If we now take an in depth look at the methodology and analyse each of the twelve steps (**Table 2.4**) and how they interrelate with the DMAIC process (**Figure 2.7**), it shows how the process should be followed and helps with the understanding of what should be covered at each step.

Figure 2.7: DMAIC improvement loop.



Source: (Adapted from Basu & Nevan-Wright 2003:48)

In addressing each of the above steps certain objectives have to be achieved. For each of the steps, certain tools are used which are linked to an ultimate objective. To reach the objective certain parameters have to be set and a question asked as to what is expected to be achieved with each step.

Table 2.4: Six Sigma Tool Applicability Matrix defining the breakthrough steps.

| | |
|---------|--|
| DEFINE | 1. Select output characteristics 2. Identify process input/output variables |
| MEASURE | 3. Define performance standards 4. Validate measurement systems 5. Establish initial process capability 6. Define performance objectives |
| ANALYSE | 7. Identify variation sources 8. Screen potential causes |
| IMPROVE | 9. Discover variable relationships 10. Establish operating tolerances 11. Validate measurement systems 12. Determine improvement process capability |
| CONTROL | 13. Implement process controls |

Source: (adapted from Adams, Gupta & Wilson 2003)

In paraphrasing the Chinese philosopher Loo-tzu: “Six Sigma is a journey of a thousand miles. Creating a roadmap that links customer satisfaction, quality and costs is the first step.”

2.5.4. Problems with Six Sigma

According to Besterfield et al (2003) Six Sigma could be a very costly exercise for a smaller business, as it will have to develop the required infrastructure to operate the process. The high cost of training can also be a major stumbling block, and the possibility of the infrastructure becoming a bureaucracy. According to Stamatis (2000), “Six Sigma presents absolutely nothing new to the quality field of defect prevention. It’s little more than an old appraisal methodology that focuses on problems after they have already occurred.”

2.5.5. Benefits of implementing Six Sigma

Pande et al (2002) define the following as the key benefits/results when implementing Six Sigma in an organisation:

- Generates sustained success – Six Sigma creates the skills and culture for constant improvement.
- Sets performance goals – Six Sigma allows everyone in a company, on all levels, to work towards the same goal. Six Sigma utilizes the common business framework of the process and customer towards the Six Sigma goal of performance excellence (close to perfect).
- Enhances value to customers – the focus on customers is the heart of Six Sigma – this implies defining, understanding and developing your systems to support what ‘value’ means to customers.

- Accelerates the rate of improvement – Six Sigma tools assist the company to improve on performance as well as the rate of improvement.
- Promotes learning and cross pollination – Six Sigma can increase and accelerate the sharing of knowledge through projects within the organisation.
- Executes strategic change – better understanding of processes and procedures will result in the improved ability to implement continual and breakthrough improvements.

2.5.6. Six Sigma deployment

Kaufmann (2000) who examined the “Implementation of Six Sigma” states that the difficulty lies in implanting Six Sigma into an organisation’s culture and most companies implementing Six Sigma must go through four phases of implementation.

In phase one when the company’s leadership decides to implement Six Sigma it is usually caught between the increasing of net income with huge savings (while increasing customer satisfaction and loyalty) and the doubts whether this concept actually works. Six Sigma implementation normally begins with leadership awareness training and a few projects. The first chosen projects will demonstrate Six Sigma competence by following the Six Sigma methodology by the leadership team, or demonstrate the old fashioned quality way by delegating the tasks to a quality team. If the company also only focuses on manufacturing, it will limit itself to traditional quality improvement initiatives, instead of focusing and improving of all business processes.

The beginning of phase two is critical for the leadership to track the results of the first project. Successful Six Sigma companies set up steering committees to make decisions about projects, tying their selection to business strategy and customer needs, implementing improvements, rewards and recognition. It is important at this stage to communicate the results to the entire company, which will help convince the sceptics.

Measures must be implemented in phase three to track results from the initial projects and ensure that the improvements last. Successful companies measure these results against the initial projected results, sharing these results with customers, which builds trust. Customer satisfaction is the key to project selection. These figures are unfortunately not always available or used. Scoreboards should be implemented to tie Six Sigma implementation to the reward-and-recognition system to drive the process improvement, customer satisfaction, employee satisfaction and net income.

According to Kaufmann (2000) by building Six Sigma into the 'business as usual' approach in all departments will facilitate phase four. Six Sigma includes a powerful tool set that can be used to improve all key business processes throughout the company.

Once the four phases are entrenched into a company project, selection will no longer be driven by quality or business leaders but the individual process owners, and the

owners will know that Six Sigma is finally part of the organisation's culture when you no longer talk about it and it has become second nature.

Six Sigma is often implemented without much interest expressed in the approach by management. Pyzdek (2001) states that the leadership must be persuaded to get involved and do it right first time, but these companies, not wanting long term results, can take shortcuts which will result in short term results. Hopefully these short-term results will encourage management to implement Six Sigma with full commitment.

2.6. ISO 9000

ISO stands for the Organisation for International Standards and is based in Geneva, Switzerland. ISO has been developing voluntary technical standards all over the world over most sectors of business, industry and technology since 1947.

ISO has a much more significant impact than any of the other quality standards or recognition because of the number of companies that have implemented the approach.

The focus of ISO 9000:2000 is for companies to document their quality systems in a series of manuals to facilitate trade through supplier conformance. Once the quality system is documented, ISO 9000:2000 registration states that there is a quality system in place and that the quality system is being adhered to (Thomas-Foster 2004:86).

In 1987 ISO 9000 was introduced and in 1994 the original ISO 9000 was implemented internationally (Thomas-Foster 2004:87) after the Organisation for Standardization (ISO) Technical Committee (TC) 176 worked for eight years developing the standards. The ISO 9000:1994 standard closely mirrored the previous British Standard 5750 in form and substance. By 1997 the ISO 9000 family of documents had become quite cumbersome with 20 required elements addressing the service, manufacturing and design process.

The vast majority of ISO standards are highly specific to a particular product, material or process. However, both ISO 9000 (quality management system) and ISO 14000 (environmental management system) are known as generic management systems.

According to http://www.iso.org/iso/en/iso9000-14000/basics/general_3.html the term 'generic' means that the same standard can be applied in any organisation, large or small, whatever its products are – including whether the product is an actual service – in any sector of activity, and whether it is a business, enterprise, a public administration, or a government department, and the term 'management system' refers to what an organisation does to manage its processes or activities in order that the product or service that it produces, meets the objectives it has set itself such as the following:

- satisfying the customer's quality requirements;
- complying with the regulations; or

- meeting environmental objectives.

Table 2.5: ISO 9000 Evolution: 1987 – 2000.

| 1987 Release | 1994 Release | 2000 Release | Purpose |
|---|--|---------------------|---|
| ISO 9000:1987 None None None | ISO9000:1:1994 ISO9000:2:1993 ISO9000:3:1991 ISO9004:4:1993 | ISO9000:2000 | Guidelines for Selection and Use Guidelines for Application of the Standards Guidelines for Application of ISO 9001 to Software Producers Guide to “Dependability” Program Management Fundamentals and Vocabulary |
| ISO 9001:1987 ISO 9002:1987 ISO 9003:1987 | ISO 9001:1994 ISO 9002:1994 ISO 9003:1994 | ISO9001:2000 | Standard – Model for “Full House” Producers Standard – Model for Production Standard – Model for Final Inspection and Test Only Quality Management Systems – Requirements* |
| | ISO9004:1:1994 ISO9004:2:1991 ISO9004:3:1993 ISO9004:4:1993 | ISO9004:2000 | Guidelines for Quality System Elements and Management Guidelines for Services Guidelines for Processed Materials Guidelines for Quality improvement Guidelines for Organisational Performance Improvements |

Source: (Thomas-Foster 2004) ***Certifications are to ISO 9001:2000 only.**

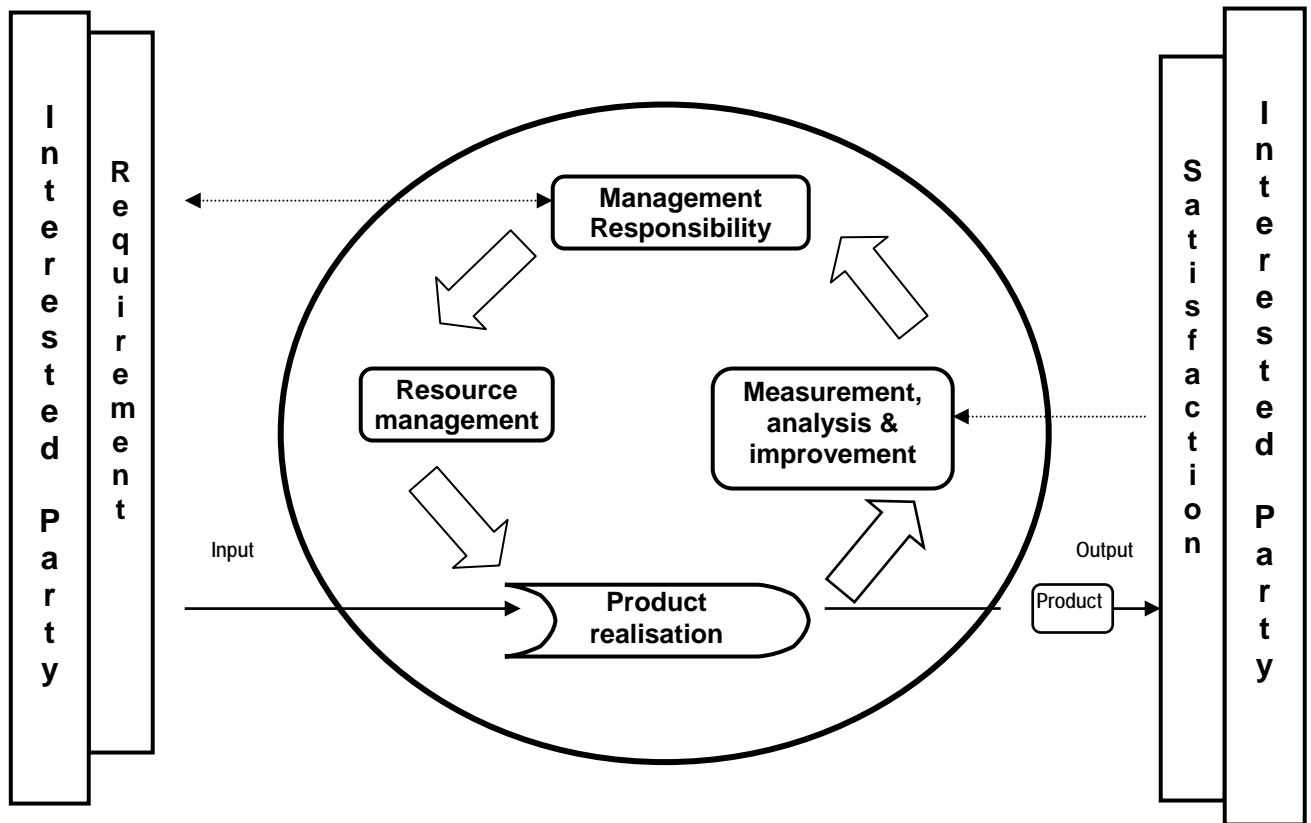
In implementing and getting accredited with ISO 9000:2000, organisations have found that it gives them a licence to compete on the international scene, making their

products and/or services acceptable world wide as ISO 9000 is an internationally accepted quality management system.

This later revision of ISO 9000:2000 has aligned itself more closely with the TQM philosophy, especially in the area of continual improvement as shown in **Figure 2.8, 2.10 and 2.11**. This edition incorporated eight quality management principles that come directly from TQM which are as follows:

- Customer focus – understanding their needs and expectations
- Leadership – establishing direction, purpose and a supporting working environment
- Involvement of people – ensure all employees at all levels benefit
- Process approach – reorganise so that all work is done through processes
- Systems approach to management – using a system to achieve company's objectives
- Continual improvement – a permanent company objective
- Factual approach to decision making – sound decisions must be based on factual data and information
- Mutually beneficial supplier relationships – treat your suppliers as partners.

Figure 2.8: Model of a Process Based Quality Management System

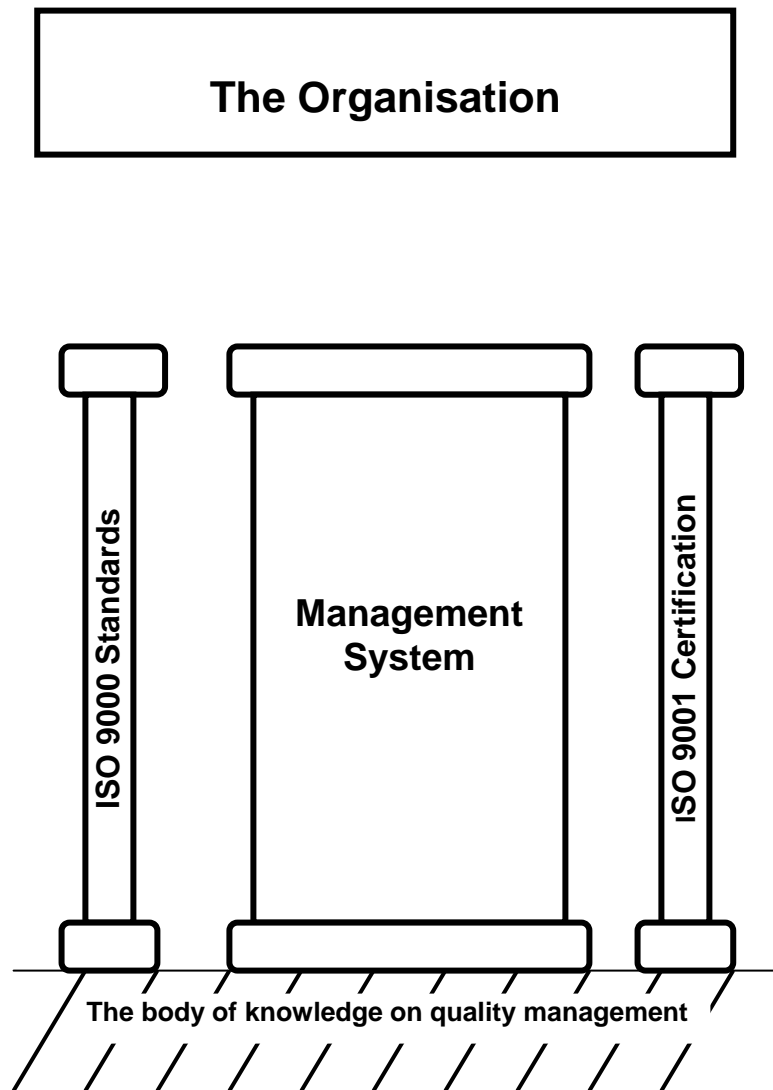


Source: (Source: Hoyle 2003).

ISO also evaluated other Quality Management Systems before introducing the revised ISO: 2000, and introduced major changes in the following areas:

- Increased focus on top management commitment
- Customer satisfaction
- Emphasis on processes
- Continual improvement.

Figure 2.9: The three pillars of ISO 9000.



Source: (Hoyle 2003).

According to Goetsch and Davis (2000:448) most organisations implement ISO 9000 for one of the following reasons:

- To improve product or service quality and consistency
- To improve organisational performance

- To have a QMS that will be recognised worldwide
- To conform to the requirements of one or more major customers.

ISO 9000 internationally is revised every five years to evaluate its current shortcomings and to evaluate future opportunities, thus making this QMS a live document. It adapts its changes according to the improvements developed in technology in industry. The latest edition was introduced in 2000, effective implementation in 2004 (giving companies listed with outdated version of ISO 9000 a chance to upgrade). The latest update is currently being developed.

A synopsis of new requirements were introduced in the 2000 version, these requirements fell into nine distinct categories as indicated below:

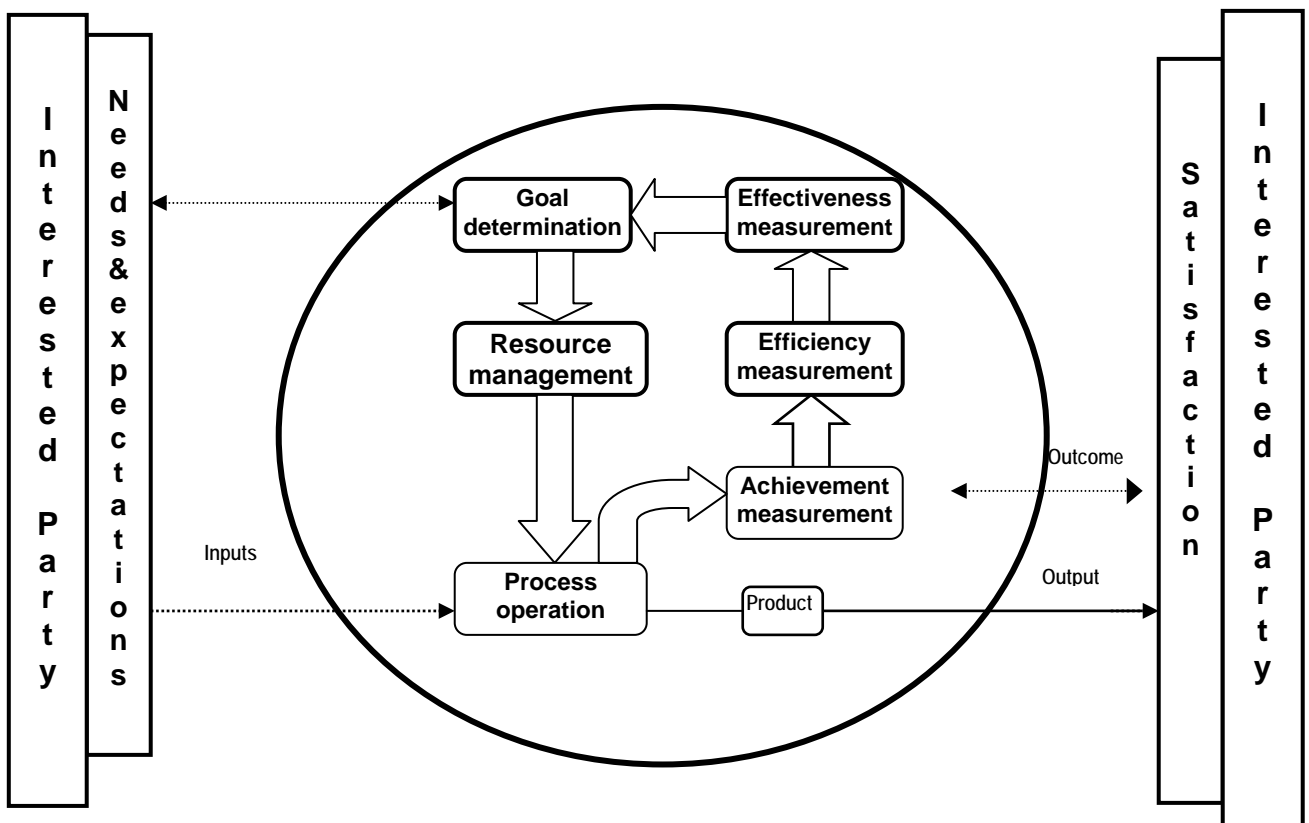
- Continual improvement
- Increased emphasis on the role of top management
- Consideration of legal and regulatory requirements
- Establishment of measurable objectives company wide
- Monitoring customer satisfaction/dissatisfaction
- Increased attention to resource availability
- Determination of training effectiveness
- Measurements extended to systems, processes and product

- Analysis of collection of data on performance of the QMS.

What must be noted is that the ISO 9000 family is primarily concerned with quality management. This means that the organisation chooses to fulfill –

- Customer quality requirements
- Application regulatory requirements, while aiming to
 - Enhance customer satisfaction
 - Achieve continual improvement of the performance in pursuit of these objectives.

Figure 2.10: Alternative model of a process based management system.



Source: (Hoyle 2003).

Figures 2.8, 2.10 and 2.11 show various approaches that can be followed when trying to implement a Process Based Quality Model. The approach differs slightly from model to model, and any SMME wanting to implement ISO 9000 can evaluate the various approaches and choose whichever one seems to suit the company best.

2.6.1. How does ISO 9000:2000 work?

The ISO 9000:2000 is a standardized QMS that has been approved by more than 160 countries and implemented by some 610 000 organisations

(<http://www.iso.org/isoen/iso9000-14000/index.html>) and consists of three standards:

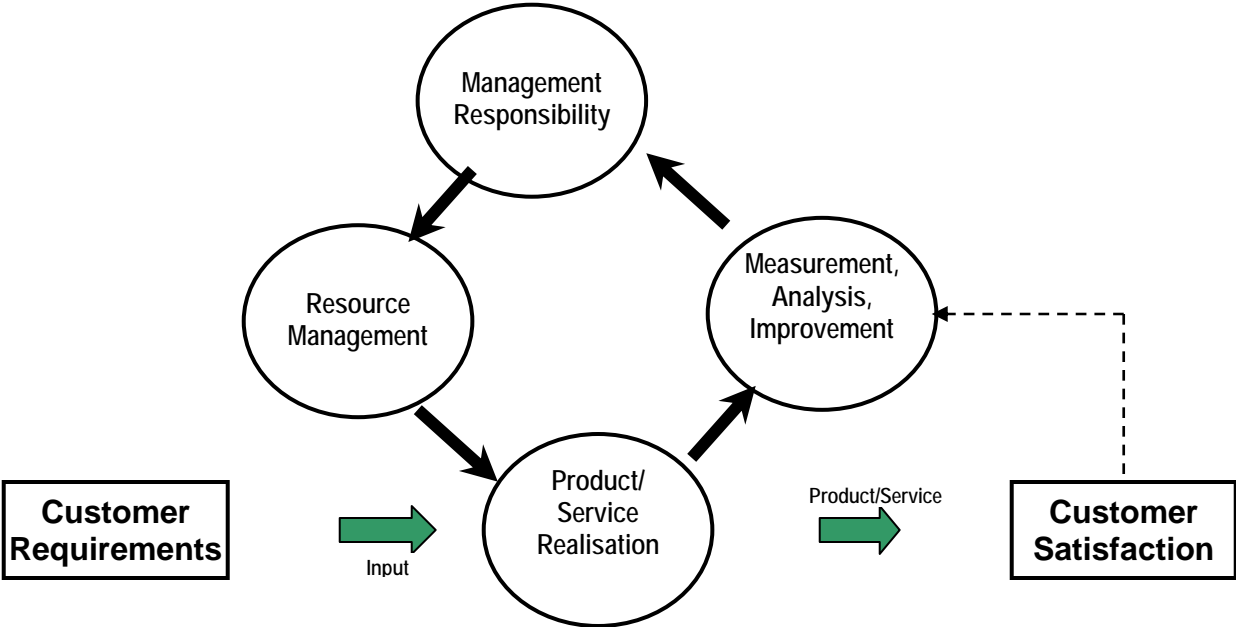
- ISO 9000, which covers fundamentals and vocabulary
- ISO 9001, which covers the requirements; and
- ISO 9004, which provides guidance for performance improvement

The ISO 9000:2000 is made up of eight single-digit clauses, which are as follows:

- Clause 1 – Scope
- Clause 2 – Normative Reference
- Clause 3 – Terms and Definitions
- Clause 4 – Quality Management System
- Clause 5 – Management Responsibility
- Clause 6 – Resource Management
- Clause 7 – Product Realizations
- Clause 8 – Measurement, Analysis and Improvement.

The requirements define the criteria for an acceptable QMS. **Figures 2.8, 2.10 and 2.11** show the four major clauses of the system and their relationship to customer requirements and customer satisfaction. The four major clauses are management responsibility; resource management; product/service realisation and measurement, analysis and improvement.

Figure 2.11: Model of a process based quality management system.



Source: (adapted from Hill, Self and Roche 2003:13).

According to Besterfield (2004) in Quality Management these four clauses (as indicated in **figures 2.8, 2.10 and 2.11**) can best be broken down and summarized as follows:

2.6.1.1. Management Responsibility

This clause is composed of the sub clauses of customer requirements, legal requirements, quality policy, planning, system requirements and management review.

Top management ensures that customer *requirements*, in the form of needs and expectations are determined and converted into requirements. They also create and maintain awareness of the importance of understanding and fulfilling these requirements.

A *quality policy* is established to meet the needs of the organisation and its customers as well as meeting requirements and continual improvement. It also provides a method to establish and review quality objectives; is communicated, understood, and implemented throughout the organisation and is continually reviewed.

Planning begins with the development of quality objectives at each relevant function and level within the organisation in order to meet the product/service requirements. Next, the activities and resources are identified to achieve the objectives. The planning process includes identification of the quality characteristics at all stages, verification activities, acceptability criteria, and needed quality records.

System requirements are needed as a means of meeting the quality policy, quality objectives, and conformance to customer requirements. This sub clause includes the sub-sub clauses of:

- Responsibility and authority
- Management representative
- Internal communications.
- Quality manual
- Control of documents
- Quality records.

Responsibility and authority must be defined and communicated to all personnel affecting quality. They must be given the freedom and authority to facilitate effective quality management such as the prevention of further processing of non-conforming product/service until the process has been corrected.

A *management representative(s)* is appointed and given the authority to implement and maintain the quality system, report system performance and improvement needs to top management, and ensure customer awareness throughout the organisation.

Internal communications among the various levels and functions are established and maintained to ensure an effective QMS.

A *quality manual* is prepared and includes a description of the elements of the organisation's QMS and any sub clauses or sub-sub clauses that are excluded.

Control of documents requires that procedures and a master list be established and maintained to control all documents and data that affect the quality of a product/service. Examples of documents requiring control are blue prints, inspection instructions, work instructions, test procedures, and, of course, the quality manual. Methods must be in place to provide for the review and approval of documents for adequacy before they are issued. Likewise, changes to documents must be reviewed and approved by the same entity that performed the original review and approval unless specifically stated otherwise. The purpose of document control is to ensure that current issues of documents are in place at all required locations. Controls should also provide for the prompt removal of obsolete documents.

Quality records are used to demonstrate conformance to requirements and verify the effective and economical operation of the quality system. Records are maintained for the established retention period or as prescribed by contractual requirements. They must be stored in a protected environment from which they can be easily retrieved for review.

Management review is required to ensure that the system remains effective. Reviews should make use of information from customer feedback, internal audits, process and product performance, preventative and corrective actions, earlier reviews, and changing circumstances. From the results of this review, management can determine

if a change is required in the organisational structure or the operations of the organisation to improve the quality system. The frequency of reviews is not specified in the standard, only that they are carried out at appropriate intervals. However, to ensure the continuing effectiveness of the system, reviews should be conducted at least annually. The standard does require that a record of the reviews be maintained.

2.6.1.2. Resource Management

The organisation must determine and provide in a timely manner, the resources needed to establish and maintain the QMS. This clause consists of the sub clauses of human resources, information, infrastructure, and work environment.

Human resources consists of the sub-sub clauses of:

- Assignment of personnel
- Competence, training, qualifications, and awareness.

Assignment of personnel who have responsibilities defined in the QMS must be competent based on education, training, skills, or experience.

This standard defines activities associated with employee *competence, training, qualifications, and awareness*. System level procedures are established and maintained to determine competency and training needs; provide training for those needs; periodically evaluate the effectiveness of the training; and maintain appropriate records. In addition, each relevant function and level will establish and maintain procedures to make employees aware of various quality aspects such as

quality policy, QMS requirements, and impact of quality on their work activities, benefits of improved performance, and consequences of not following procedures.

Information necessary for control of processes and to ensure conformity of product/service must be determined. System level procedures for managing information are required to ensure access and security such as confidential customer and supplier information.

The *infrastructure* needed to achieve product/service conformity must be defined, established, and maintained. It includes work space and facilities; equipment, hardware and software; suitable maintenance and supporting services. Those human and physical factors of the *work environment* needed to be achieving product/service conformity are defined and implemented. They include: health and safety conditions; work methods; work ethics and ambient t/ environmental working conditions.

2.6.1.3. Product/Service Realisation

Processes necessary to achieve the required product/service must be determined, planned and implemented. The organisation ensures that these processes are operated under controlled conditions and produce outputs that meet customer requirements. This clause is composed of the sub clauses of customer related processes, design and development, purchasing, production and service operations, and control of measuring equipment.

Customer-related processes consist of:

- Identification of customer requirements

- Review of customer requirements
- Customer communication.

A process for the *identification of customer requirements* must be established. This process includes the completeness of customer requirements, fitness for use criteria and regulatory and legal requirements.

Prior to accepting the customer's order, there must be a *review of customer's requirements*. This review will determine that the requirements are clear (no ambiguity), the same as previously expressed, capable of being met, and confirmed to the customer.

Satisfactory arrangements for *communication* with the customer in order to meet customer requirements shall be implemented. Arrangements shall include product/service information, order handling, complaint resolution, and product/service performance.

The organisation must plan and control *design and development* of the product/service. Plans include: stages of the design/development process; required review, verification, and validation activities and responsibilities and authorities for the design/development activities. Sub clauses are:

- Inputs
- Outputs
- Review

- Verification
- Validation
- Changes.

The *inputs* to the process must be defined and recorded. They include performance requirements from customer or market; regulatory and legal requirements; environmental requirements; previous design requirements and any other requirements. Provision must be made for review to eliminate any incomplete, ambiguous, or conflicting requirements.

The *outputs* to the process must be recorded in a format that allows verification against the inputs. Output must meet the input requirements, refer to acceptance criteria, and define the characteristics of safe and proper use. Documents must be approved before release.

Systematic *reviews* at suitable stages of the design/development process are conducted to evaluate the ability to meet quality requirements and identify any quality problems. Participants in the review should be representatives from affected functional areas.

Verification is planned and performed to ensure that the output requirements meet the input requirements. The results of verification and all design/development activities are recorded.

Validation is performed to confirm that a product/service is capable of meeting end use requirements. Where possible, validation is defined, planned, and completed. Prior to delivery; where impossible, partial validation of the outputs is undertaken to the extent possible.

Changes or modifications must be approved by authorized personnel and recorded before implementation. The organisation shall determine the effect of changes on the design/development process; interaction of component parts of the resultant product/service; existing product/service and the need to repeat the verification or validation activities.

The organisation controls its *purchasing* process to ensure that purchased product/service conforms to its requirements. This control is dependent on the effect on the final product/service. Suppliers are evaluated and selected based on criteria that ensure their ability to meet the organisation's requirements. This sub clause consists of the sub-sub clauses of:

- Purchasing information
- Verification.

Purchasing information clearly describes the product/service ordered including information on requirements for approval or qualification.

Verification arrangements shall be determined and implemented for purchased product/service whether this verification occurs at the organisation or the supplier's facilities.

The organisation must plan and control *production and service operations*, including those undertaken after initial delivery by means of product/service specifications, work instructions, use and maintenance of equipment, suitable work and environment, measuring and monitoring equipment, and verification activities. This sub clause consists of the sub-sub clauses of:

- Identification and traceability
- Customer property
- Handling, packaging, storage, preservation and delivery
- Validation of process.

Identification and traceability requires the organisation to make provision for identifying the status of the product/service with respect to the required measurements and verification activities and where applicable, all processes. It includes component parts where they affect conformity to requirements. Where traceability is a requirement such as with canned food, the organisation shall control and record the unique identification.

This standard further requires the organisation to exercise care while using and caring for *customer property*. It includes the identification, storage, and maintenance

of the property. Where property is lost, damaged, or found unusable, it shall be recorded and reported to the customer. Note that customer property includes intellectual property.

During internal processing and final delivery of the product/service to its destination, the organisation ensures that the *handling, packaging, storage, preservation, and delivery* do not affect the performance of the final product/service.

Where output cannot be readily or economically verified by subsequent monitoring, inspection or testing until after the product/service is in use, then *validation of processes* is required to demonstrate their effectiveness and acceptability. Arrangements for validation of processes are defined and cover the processes to be validated, qualification of people and equipment, use of specific procedures and/or records, and provision for re-validation.

The *control of measuring and monitoring devices* is necessary to demonstrate conformance of product/service to requirements. Methods of handling, preservation, and storage are required to protect measuring and monitoring devices from damage and deterioration. These devices should be used in a manner that ensures attributes such as accuracy and precision are consistent with the measurement capability. Software should be validated before use. The organisation must calibrate, measure and monitor at regular intervals, traceable to national or international standards where available; identify measuring and monitoring devices as to calibration status; determine the calibration method; record the results; ensure environmental conditions

do not adversely affect the results; safeguard measuring and monitoring devices from adjustments that would invalidate results and assess the validity of previous inspection and test results when a device is found to be out of calibration.

2.6.1.4. Measurement, Analysis and Improvement

The organisation must define, plan, and implement measurement, analysis, and improvement processes to ensure that the system, processes, and product/service conform to requirements. Included in this clause is the type, location, timing, frequency, and recording of measurements; periodic evaluation of measurement effectiveness; use of appropriate statistical tools; and feedback of results to the management review process. Sub clauses are measuring and monitoring, non-conforming product/service control, analysis of data for improvement.

Measurement and monitoring contains the sub-sub clauses of:

- System performance
- Customer satisfaction
- Internal audit
- Processes
- Product/service.

The organisation must determine and establish processes for the measurement of the *system performance*.

The methods and measures to obtain and utilize information and data on *customer satisfaction/dissatisfaction* must be determined.

Objective *internal audits* will be conducted to determine if the QMS is effectively maintained and to identify opportunities for improvements. The audit process includes: the schedule based on the importance of the activities; the scope, frequency, responsibilities and reporting of results and the standing aside when a person's area is being audited.

Suitable methods for measuring and monitoring of *processes* to meet customer requirements are employed. Results are used to maintain and/or improve those processes.

Suitable methods for measuring and monitoring of the characteristics of the *product/service* are employed to verify that requirements are met.

Non-conforming product/service control is required to prevent unintended use or delivery and is defined in a system level procedure which identifies, records, and reviews the nature and extent of the non-conformity encountered. The non-conformity is rectified, accepted with concession, re-assigned for an alternate use, or rejected. When required by contract, the customer is notified and appropriate actions recorded.

A system level procedure for the *analysis of data for improvement* is established to determine the effectiveness of the QMS and identifying opportunities for improvement. Applicable data are analysed to provide information on the suitability, effectiveness and adequacy of the QMS; process operation needs; customer satisfaction/dissatisfaction; conformance to customer requirements and characteristics of processes and products/services.

Continual improvement of the QMS is required. A system level procedure is established to describe the use of quality policy, objectives, internal audit results, analysis of data, corrective and preventative action and management review to facilitate continual improvement. This sub clause is composed of:

- Corrective action
- Preventative action.

Corrective action is a process for reducing or eliminating the causes of non-conformity in order to prevent recurrence. A system level procedure is required to identify the non-conformities; determine the causes; evaluate the need for corrective action; implement action; record the results and review the effectiveness of the corrective action.

Preventative action is a process for eliminating the causes of potential non-conformities to prevent occurrence. QMS records and results from the analysis of data are used as inputs for preventative action. A system level procedure is required to: identify potential non-conformities; determine the causes; determine the

preventative action; implement the required action and review the effectiveness of the action.

2.7. ISO 14000

ISO 14000 like ISO 9000 is also known as a generic management system standard. ISO 14000 was introduced into industry almost ten years after ISO 9000. ISO 9000 is commonly known as a quality management system (QMS) where ISO 14000, which is aligned with the QMS is known as an Environment Management System (EMS).

According to Whitelaw (2004) ISO 14000 was born out of the widespread international concern about the effects of business on the environment, and in particular the effect on international trade. The standard seems set to become a strong trade barrier for companies that misbehave environmentally. What the ISO 9000 has done which supports ISO 14000, is to provide organisations with the EMS elements, which can be integrated with other management systems to help achieve environmental and economic goals.

The ISO 14000 uses the same basic approach as ISO 9000:2000 covering many of the same elements, but in addition to these controls, ISO 14000 includes quantified targets, established objectives, emergency and disaster preparedness and disclosure of environmental policy.

This means that the organisation must:

- Minimise harmful effects on the environment caused by its activities, and

- Achieve continual improvement of its environmental performance (www.iso.org/iso/en/iso9000-14000/index.html).

2.7.1. What does ISO 14000 entail?

ISO 14000 must be integrated into a QMS already entrenched in the organisation. The more committed the company is towards the QMS, the easier the EMS will be accepted in the company, making it part of the overall management system. The ISO 14000 standard defines an EMS as being: “The part of the overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resource developing, implementing, achieving, reviewing and maintaining the environmental policy” (Milard 1998:109).

According to Jackson (1997), Whitelaw (2004) and Besterfield et al (2003) an EMS is intended to specifically help the enterprise by:

- Identifying and controlling the specific environmental aspect, impacts and risk relevant to the organisation
- Achieving its environmental policy, objectives and targets, including compliance and environmental legislation
- Defining the basic set of principles that guide the organisation’s approach to its environmental responsibilities in the future
- Establishment of short, medium and long-term goals for environmental performance, making sure to balance costs

- Determining what resources are required to achieve the goals, assigning responsibilities and committing the required resources
- Defining and documenting specific tasks, responsibilities, authorities and procedures ensuring that every employee acts in the course of their daily work to help eliminate the enterprise's negative impact on the environment
- Communicating and training employees to effectively fulfill their responsibilities with the organisation, and
- To measure performance against pre-agreed standards and goals.

2.7.2. Benefits of ISO 14000 certification

The most important benefit of ISO 14000 is the protection of the environment and according to Kuhre (1995:11-18) ISO 14000 certification can be summarized as follows:

Protection of the environment - the reduction of hazardous waste, minimization of all other waste and conservation of natural resources.

Equal competitive basis – to equalize environmental costs will never be possible between companies, but it will reduce discrepancies between competitors, giving the environmentally conscious organisation more of a chance.

Demonstrated compliance with regulations – the company's written documentation will demonstrate compliance with the present regulations and show successful integration with other QMSs that the organisation is using.

Establishment of effective management system – the QMS and now the EMS will force management to be more effective to achieve the standards that have been put in place.

Reduced costs – after the initial incurred cost of implementation, there should be long term savings, especially in the area of control and clean-up because the organisation is now following standards that have been put in place.

Reduced injuries – because of the control mechanisms put in place by the system, there will be a reduction of chemicals and hazardous waste on site and an increased awareness with regard to the chemicals, which will make employees more aware of them.

Improved community relations – being one of the key components of ISO certification, organisations can now show what numerous environmental actions have been taken.

Improved customer's trust and satisfaction – this can clearly be related to improvement of community relations, but it also shows that the organisation is assuring the customer that they do care about the environment.

Improved upper management attention – the whole ISO 14000 approach is to get upper management more involved with the process, giving senior management an increased and more positive appreciation towards environmental management.

According to Jackson, (1997:257) if existing systems already in the organisation are ignored, it will result in parallel or duplicative systems that will create inefficiencies and place an excessive burden on the organisation, which will add little value.

Whitelaw (2004) states that the SMME sector react quicker to downturns in economies and may well place environmental management lower in the priorities when survival of business is at stake, but they have shown a higher willingness to implement environmental management into the companies.

2.8. “20 KEYS” TO WORKPLACE IMPROVEMENT

Kobayashi developed the 20 keys approach over a period of four decades where he guided and changed numerous companies to adopt the ‘Practical Program of Revolutions in Factories’ (PPORF) approach to improve the efforts of the companies.

According to Kobayashi (1995:2) the basic principles of PPORF implementation appears in the 20 Keys Relations Diagram (**Figure 2.12**). The primary features of PPORF are a scoring system for evaluating, manufacturing strength known as the 20 Key - Five Point Evaluation System.

The objective of 20 keys is to bring world manufacturing improvements together and at the same time integrating these separate methods as they interrelate with one another. Kobayashi looked at the 20 keys as 20 supporting pillars within a company, if some of the weaker keys collapse; the stronger ones will still support the company if the support by management is evenly balanced among all 20 pillars. As mentioned before the keys work on a scoring system rated from 1 to 5. Five being what every organisation should be striving for.

Kobayashi (1995:44) states that the highest-ranking companies throughout the world are rated in terms of quality, cost and delivery (QCD). But even some of these companies are obstructed by clear vision of what it takes to satisfy customers. The 20 keys system combines a QCD approach (making products better, cheaper and faster) with a customer-focused approach. The 20 keys system takes a hard look at customer satisfaction to create world class manufacturing quality.

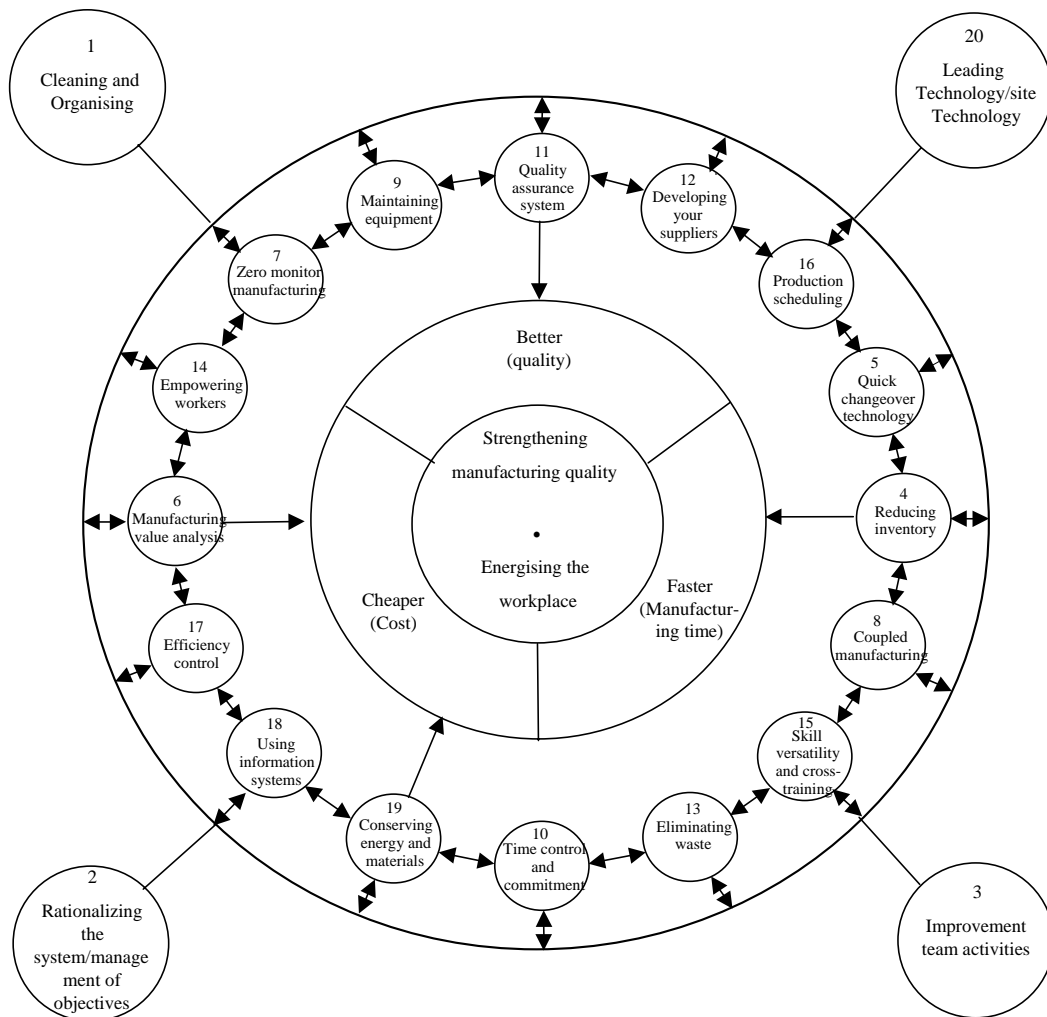
2.8.1. Aims and objectives of the 20 keys program

According to Organisation Development International (Pty) Ltd (2003) (<http://www.odisa.co.za>) 20 keys was created to:

- Achieve the strategic goal of the business
- Improve the speed of learning and innovation
- Eliminate all forms of waste (non value adding activities)

- Improve customer satisfaction and market share by making products and services better, faster and cheaper
- Improve the flexibility of organisations to more readily adapting to market changing requirements

Figure 2.12: 20 Keys Relations Diagram showing the interrelation between the different key improvement areas.



Source: (Kobayashi 1995).

- Energise and motivate employees to work towards achieving the goals of the business; improve competitiveness, profitability and long term sustainable business success.

The 20 Keys program changes the culture of the way things are done in organisations. What it focuses on is getting the entire workforce involved through education thus making it easier to introduce and compare units, develop stretch goals and benchmark against the best practices in the world. 20 Keys also makes use of visual descriptions and check sheets, which help the organisation to focus on improvements.

2.8.2. Implementation of 20 Keys

Implementation of 20 Keys is the same as the implementation of any other program, initial training and education of employees. The front line employees must then attempt to discover their relevant strengths and weaknesses for the various keys. This tends to pique their interest in making improvements. The 20 Keys cover the factors every manufacturing company must consider and according to Kobayashi (1995:6) and <http://www.odi-sa.co.za> (2003) depending on particular conditions and characteristics, companies will differ from each other when giving priority to certain keys over others. Combinations of priorities and implementation sequence are almost limitless. The combination becomes apparent as you understand the keys better. Companies that have implemented 20 Keys completed the process over three years

taking seven keys per year. The Keys that are addressed first are agreed to before the process is started.

Some of the South African companies are successfully using the 20 Keys in South Africa are Cadbury, Columbus Steel, Parmalat and Woolworths to mention a few. Due to the intensity of the process it is stated in <http://www.20keys.net/eng/results.htm>., this process can enhance productivity by 25%, reduce work in process by 86% and reduce lead time to less than a week to mention a few.

This process might not be feasible for SMMEs, but the methodology used can be effectively downscaled and adapted to a SMME environment thus doubling up as a TQM process.

2.9. VARIOUS QUALITY AWARDS

2.9.1. Introduction

One of the most useful trends in the past decade has been the self assessment activities of many organisations according to Wadsworth et al (2002:102). The organisations using the criteria of various national quality awards assess their current performance against a set of guidelines for total quality.

The quality awards have been established to generate awareness and interest in quality. Awards have been developed for different countries based on the Malcolm Baldrige Award (MBNQA), which is used in the USA.

The success of the Baldrige Award in the USA resulted in Europe introducing the European Quality Award (EQA) and in South Africa the South African Excellence Award to mention a few.

These awards will be explained in the next sections.

2.9.2. Baldrige Award

President Reagan signed the Malcolm Baldrige National Quality Improvement Act on 20 August 1987 (Dale & Bunney: 1999:207). The purpose of the award program was to help improve quality and productivity of companies in the USA. A clear design strategy for the award had to be developed and Dr C. Riemann, the first director of the award with his team developed the elements of the strategy as follows:

- To create a national value system for quality
- To provide diagnosis and information transfer
- To create a vehicle for cooperation across organisations
- To provide for a dynamic award system that would evolve through consensus and be continually improved.

The criteria also had three important purposes:

- To help raise quality performance standards and expectations
- To facilitate communication and sharing among and within organisations of all types based on a common understanding of key quality and operational performance measures

- To serve as a working tool for planning, training, assessment and other uses (Wadsworth, Stephens and Godfery: 2002:103-104).

The core values and concepts are embodied in seven categories as follows (Stevenson, 2005:395):

- Leadership (125 points)
- Strategic Planning (85 points)
- Customer and Market (85 points)
- Information and Analysis (85 points)
- Human Resources factor (85 points)
- Process Management (85 points)
- Business Results (450 points)

According to Stevenson (2005:395) the benefits of the Baldrige competition include:

- Winners achieve financial success
- Winners share their knowledge
- The process motivates employees
- The process provides a well-designed quality system
- The process requires obtaining data
- The process provides feedback.

2.9.3. European Award

The European Award was launched in October 1991 (Dale & Bunney, 1999:211) and awarded for the first time in 1992. The framework for quality improvement was based on the framework of the Baldrige Model and the Deming's Prize (www.efqm.org). The mission of the award is "To be the driving force for sustainable excellence in organisations in Europe", and the vision, "A world in which organisations in Europe excel" (www.efqm.org). The model is structured on the following nine criteria which companies can use to assess and measure their own performance:

- Leadership (100 points)
- People Management (90 points)
- Policy and Strategy (80 points)
- Resources (90 points)
- Processes (140 points)
- People's Satisfaction (90 points)
- Customer's Satisfaction (200 points)
- Impact on Society (60 points)
- Business Results (150 points)

The criteria is split into two groups; Enablers and Results and illustrated in

Figure 2.13 and the nine elements of the model are divided into a further 32 criteria points. Each of the nine elements are used to assess the organisation's progress to business excellence.

The Enablers (i.e. the hows) are scored in terms of approach and deployment and the Results (i.e. the whats) are evaluated in terms of degree of excellence and the scope or breadth of the results presented.

2.9.4. South African Excellence Model (SAEM)

The South African Excellence Foundation (SAEF) introduced the awards system in 1998. The European Foundation for Quality Management (EFQM) played a key role in providing the SAEF with assistance and expertise in developing the South African Model (www.saef.co.za/asp/about) using the Baldrige Model (USA) as a base.

2.9.4.1. Main objectives

The main objectives of the South African Excellence Foundation (SAEF), as captured in the SAEF Memorandum of Association, read as follows:

- SAEF provides a process framework and direction to create a culture of organisational excellence throughout South Africa to enhance overall competitiveness and promote the well being (quality of life) of all its citizens
- SAEF could provide support to the rest of Africa to promote a culture of organisational performance excellence.

2.9.4.2. Vision

To be recognised as the primary guiding force in the achievement of organisational excellence in Southern Africa by 2008.

2.9.4.3. Mission

SAEF will pursue its vision by means of:

- Developing sound relations with public and private sector stakeholders
- Inspiring and stimulating a culture of organisational excellence
- Providing guidance on prioritising and integrating appropriate improvement initiatives and standards within the holistic framework of organisational excellence
- Facilitating the structured use of a repertoire of value-adding products and services
- Continuously innovating products and services
- Creating the capacity to realise the mission
- Recognising organisational excellence through a National Awards Programme.

2.9.4.4. Operating philosophy

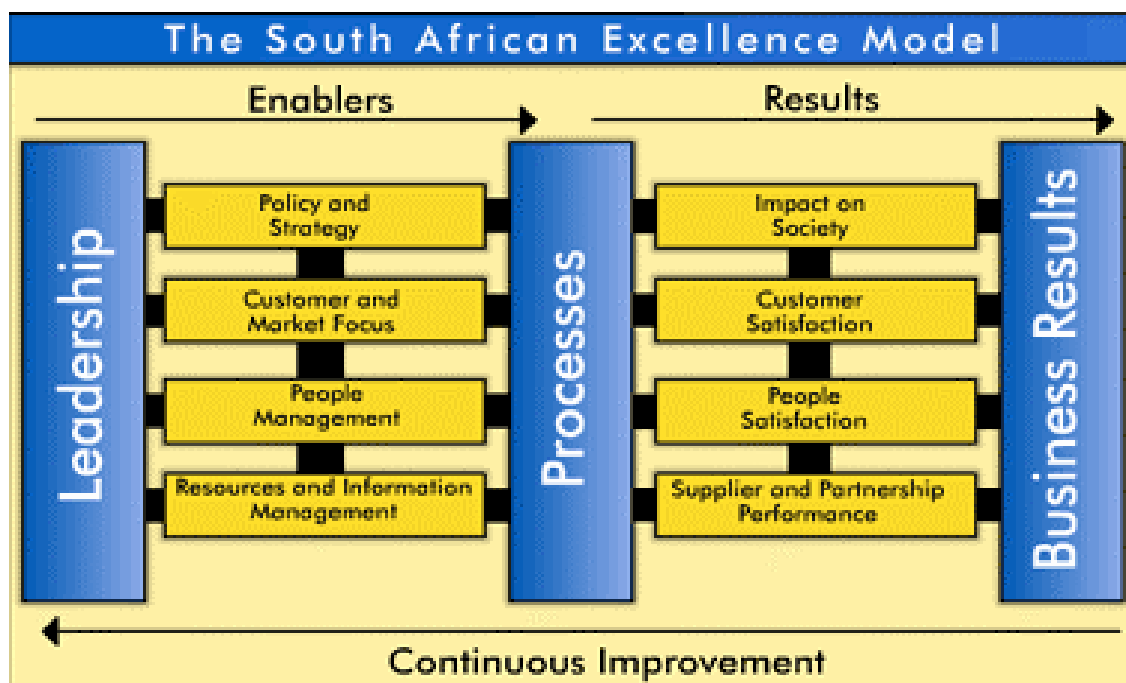
The people at SAEF have internalised an operating philosophy, which visibly reflects the following values:

- A passion for excellence
- Integrity
- Pursuing strength in diversity
- “Ubuntu” as embodied in the concepts of supportiveness, co-operation and solidarity (see King Report on Corporate Governance for South Africa 2002, (www.ecgi.org))
- Adding value

- Willingness to improve
- Transparency.

The SAEM similar to the EQFM also uses the Enablers and Results approach but has eleven criteria, which it evaluates is shown in **Figure 2.13**.

Figure 2.13: The South African Self Assessment Model.



Source: (www.saef.co.za/asp/about).

2.9.4.5. Enablers

1. Leadership (100 points / 10%)

How the behaviour and the actions of the executive team and all other leaders inspire, support and promote a culture of Performance Excellence.

2. Policy and Strategy (70 points / 7 %)

How the organisation formulates, deploys, reviews and turns policy and strategy into plans and actions.

3. Customer and Market Focus (60 points / 6%)

How the organisation determines the needs, requirements and expectations; enhances relationships and determines satisfaction of customers and markets.

4. People Management (90 points / 9%)

How the organisation develops and releases the full potential of its people.

5. Resources and Information Management (60 points / 6%)

How the organisation manages and uses resources and information effectively and efficiently.

6. Processes (120 points / 12%)

How the organisation identifies, manages, reviews and improves its processes.

2.9.4.6. Results

7. Impact on Society (60 Points / 6%)

What the organisation is achieving in satisfying the needs and the expectations of the local, national and international community at large (as appropriate).

8. Customer Satisfaction (170 points / 17%)

What the organisation is achieving in relation to the satisfaction of its external customers.

9. People Satisfaction (90 points / 9%)

What the organisation is achieving in relation to the satisfaction of its people.

10. Supplier and Partnership Performance (30 points / 3 %)

What the organisation is achieving in relation to the management of supplier and partnering processes.

11. Business Results (150 points / 15%)

What the organisation is achieving in relation to its planned business objectives and in satisfying the needs and expectations of everyone with a financial interest or other stakeholders in the organisation.

2.9.5. Conclusion of models

If one looks at the rating of the various criteria by the different models it is noticeable that the MBNQA focuses more on leadership (125 points) and business results (450 points), whereas the EQA focuses on customer satisfaction (200 points), business results (150 points) and process (140 points).

The SAEM is more evenly spread when it comes to the allocation of points and also focuses on more areas. The MBQA focuses very heavily on the management process and to a lesser extent on the customer, where the EQA tends to focus more on the customer than the leadership. SAEM had an even spread of both the Enablers and

Results, thus possibly making it the better of the three models because of the spread of the points, **but unfortunately this (the SAEF) self assessment model is currently not operational and does not exist anymore.**

2.10. MANAGEMENT TOOLS

For a QMS to be effective, a successful continuous improvement process must be operational within the organisation. In **Figure 2.2** Besterfield breaks down the principles and practices, showing both the quantitative and the non-quantitative systems, techniques and tools. Some of the non-qualitative techniques have already been covered in the literature study.

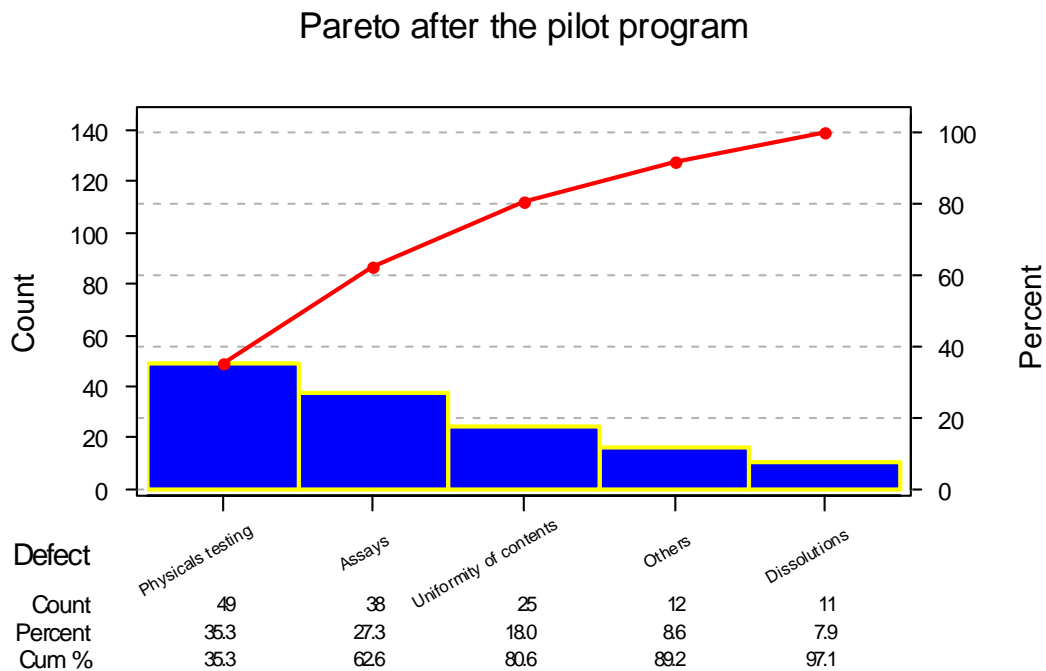
If any SMME wants to implement its own QMS, it is important that the management of that company need to have a basic understanding of some of the tools available.

The interpretations of these basic management tools are also very important. These tools can be used effectively in the highlighting and analysing of any shortcomings or problems identified in specific areas. According to Stevenson (2005:407) the first seven tools are often referred to as the seven basic quality tools, and have been identified by Besterfield (2004:75) as statistical process control (SPC) and comprise the following: Pareto diagram, cause and effect diagram, check sheets, process flow diagram, scatter diagram, histogram and control charts. Juran in the Six Sigma Training Kit (2002) also highlights the importance of these basic tools which were covered in the Six Sigma overview. These diagrams will now be discussed further.

2.10.1. The Pareto Concept

An Italian economist Alfredo Pareto developed the Pareto concept in the nineteenth century. Juran identified this concept as a universal one that could be applied to many different fields when trying to identify root causes for problems.

Figure 2.14: An example of a typical Pareto diagram



Source: (Adapted from Pycraft , Singh, Pihlela, Chambers, Harland, Harrison & Johnson 1997).

The concept uses the 80% / 20% rule, or as Juran puts it, identifying the vital few and useful many Besterfield (2004:76). **Figure 2.14** shows a typical diagram of the Pareto analysis identify the vital few causing the greater problems.

The effective use of the Pareto process will assist any organisation in highlighting its problem areas scientifically, rather than with the gut feel process, which is more common and usually incorrect. This is a very easy, user friendly and unbiased tool that could be used in critical areas, which will successfully analyse and prioritise the problem situation.

2.10.2. Cause and Effect Analysis (C& E)

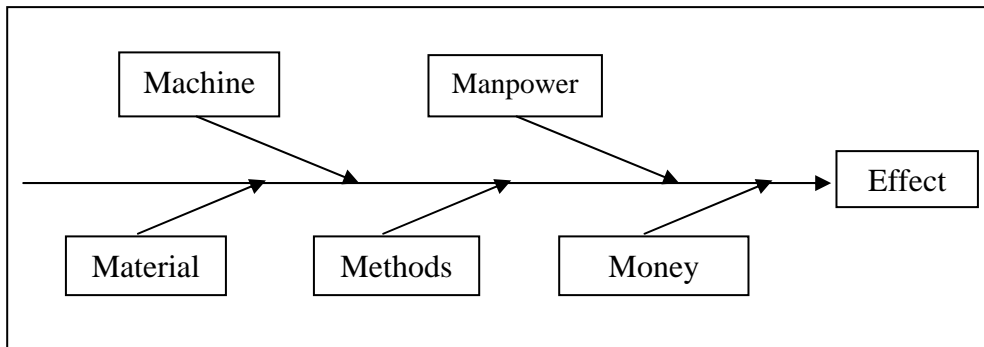
Developed by Ishikawa in 1943 which is also referred to as the Fishbone diagram or Ishikawa diagram and is extensively used in industry to help investigate “bad” effect and take action, or to identify the “good” effects and build on them.

One of the quantitative tools as indicated in Besterfield’s diagram (**Figure 2.2**) is “Failure Mode Effect Analysis” (FMEA). This particular tool uses the C&E process to good effect. The C&E diagram highlights and analyses the situation being investigated, giving the participants a good overview of the situation, helping the FMEA in its structured approach to further progress, and solve the opportunity or problem.

The C&E diagram is broken down into a left and right process as indicated in **Figure 2.15**. For every effect, which is indicated on the right there must be certain situations or causes, which will be indicated on the left. To determine these causes the organisation requires a brainstorming session, which identifies and usually breaks

down the causes into the following categories: work methods, materials, people, environment, equipment and measurement.

Figure 2.15: General form of the cause-effect diagram



Source: (Adapted from Pycraft et al 1997).

The causes could vary depending on the situation. Each major cause is then evaluated by the brainstorming group and further sub-divided into minor causes. Once completed this tool gives the group a very good picture of what is happening, resulting in action to be taken. One of the positives from this particular tool is that it shares a huge amount of knowledge with employees throughout the organisation.

2.10.3. Check Sheet

This tool is very effective in collecting and or maintaining quality levels that have already been achieved. According to Stevenson (2005:407), the check sheets are designed on the basis of what the users are attempting to learn by the data collection process. Besterfield (2004:81) notes that the data used should be presented in such a format that it can be quickly and easily used and analysed. Checks are made on an hourly, daily, weekly or monthly basis depending on the company's requirements or

the situation or the process being studied. This tool can therefore be used as a gauge to indicate what is happening in the process. A good and basic example of a check sheet is your monthly shopping list. One special form of check sheet, used by Toyota, addresses the seven wastes, and contains a sheet listing as many as 50 questions that ask the operators if certain events are taking place according to Bicheno (1994:32). The seven wastes being classified as overproduction, waiting, transporting, inappropriate processing, unnecessary inventory, unnecessary motions and defects.

2.10.4. Flowcharts

A flowchart is a visual or schematic diagram that shows the flow of a product or service within a specific organisation. The process chart has long been used by work-study practitioners to good effect using symbols for transport, delay, storage, operation and inspection. The process flowchart can help identify wasteful actions, thus improving the process.

The flowchart has been highlighted by ISO 9000 as a good tool to help improve communication, and summarise the process or procedure to be followed. The diagram developed can be an effective and valuable visible tool. The use of a flow diagram can be seen in the research methodology chapter (chapter 3).

2.10.5. Histograms

A histogram is a diagram used to summarise the data from a process that has been collected over a period of time. This data is graphically presented, and can show the

process capability in relation to the specification and the nominal. If used correctly the tool as discussed by Brassard and Ritter (1994:65) allows easier interpretation of large amounts of data in tabular format, and can be useful in providing information to predict the future performance of the process being analysed.

2.10.6. Scatter Diagrams

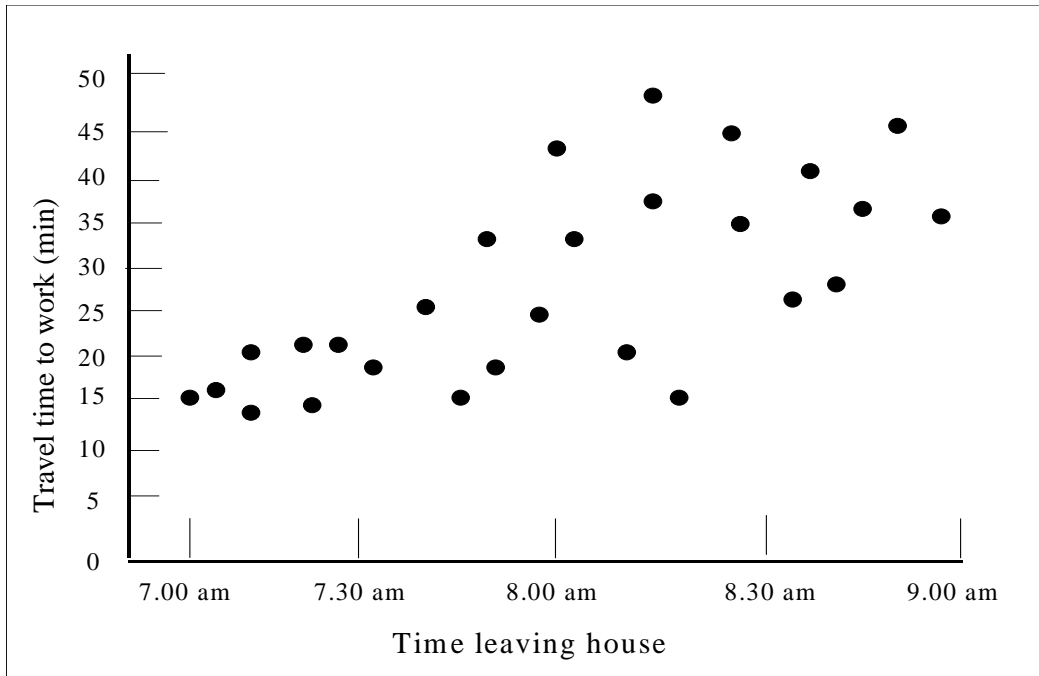
According to Brassard and Ritter, Stevenson, Besterfield, and Bicheno it is one of the easiest ways to determine, and study the cause and effect relationship, as well as the correlation that exists between two different but common variables plotted on a graph.

Figure 2.16 illustrates the correlation between two sets of common data, allowing a decision to be reached which would best benefit the person using it.

2.10.7. Control Charts

A control chart is an excellent way of illustrating, monitoring, controlling improving process performance and improvement over a time stipulated at the source of the investigation. According to Besterfield (2004:89) the charts are an outstanding technique for problem solving and the resulting quality improvement. Brassard and Ritter (1994) discuss the function of the charts as, focusing, detecting and monitoring processes over time, distinguish special from common causes of variation, serve as a tool for ongoing process control as well as providing a common language for discussing process performance with the goal being higher productivity and quality while lowering the cost and improving effective capacity.

Figure 2.16: Scatter diagram for travel time against departure time.



Source: (Adapted from Pycraft et al 1997).

2.11. MANAGEMENT

2.11.1. Introduction

With any new process, procedure or system introduced into a company, management should have initiated it. It is therefore their responsibility to support and back any new initiatives. According to Harrington (1999: 5 – 7) too many managers expect their employees to correct the problems that are created by management. The employees cannot, management must be accountable for 80% of the problems that they created within the organisation.

2.11.2. Why is management the problem?

Juran has long stated that management causes 80 – 85% of all problems. It is a common situation for management to be responsible for the problems (Besterfield 2004:39).

Management has to execute many responsibilities in a superior manner if the process is to succeed and only when management executes their responsibilities correctly will it release the enthusiasm and creativity that exists in employees.

If management is analysed for areas of responsibility we can come up with a very long list, but managers are ultimately responsible for the following according to Harrington (1999) and Strauss (2005):

- Allocating resources
- Establishing the organisational structures
- Selecting leaders
- Developing processes
- Setting standard performance
- Making job assignments
- Preparing job descriptions
- Providing measurement and reward systems
- Setting priorities
- Selecting and training employees.

These are just a few, but the more important responsibilities which management has to attend to. If management lacks the skill or understanding of the responsibilities, the commitment regarding those responsibilities will be questionable.

In the case where major problems within the organisation have been highlighted, management is responsible for modifying and controlling the process. Employees cannot correct problems that management has created. Only management's personal involvement in the improved process will bring about the required change.

According to Wright and Phillips (1990:48) the most common pitfalls in South African Small Business are as follows:

- Failure to develop essential management skills
- Poor record keeping
- Bad money management
- Neglect of marketing and advertising planning
- Poor planning
- Inaccurate job costing and estimating and hence pricing
- Poor management of workers
- An inability of the owner to change his role as the business grows.

These limitations/pitfalls are also a concern when conducting business internationally according to Longenecker et al (2003:106 –108).

2.11.3. Management's role in the SMME sector

For an SMME to be successful now, management has to focus on three areas: quality, cost and scheduling (Longenecker et al 2003). This could quite easily be known as the golden triangle. Management must ensure that all three are met at the same time. It is easy for management to get two and sacrifice one, or get one and sacrifice two. Today's customers demand all three at the same time. If the golden triangle is met, managers, as well as the company will grow, and prosper.

Due to the nature of management's involvement in the SMME sector, compared to management in the bigger companies, management's role is more of a "jack of all trades" compared to the different approach management take in the larger companies which is more focused on an individual area or department. According to Rhuy and Gryna (2001:31) quality methods can be reduced in scope and complexity, enabling management to be more focused. It is common for smaller organisations to not have the resources, time or skills required to alert management to any shortcomings. It is therefore imperative for the SMME sector to focus on the customer when planning for quality, integrating the customer into the requirements or outcomes, which are to be achieved.

In combination with whatever tools, methods or models are used with regard to quality in the SMME sector, the company must also develop a positive quality culture, if the success is to be ongoing.

According to Juran and Godfery (1999) a company must foster the following five key behaviours:

- The company must create and maintain an awareness of quality with all levels of personnel. It must also create and disseminate information on all current quality results
- It must provide evidence of management leadership. Real evidence is required like serving on quality councils, doing strategic planning for quality, provide resources for quality and performing other tasks to plan and develop quality goals
- The company must encourage self-development and empowerment. Management must design jobs for self-control, select and train employees, use self-directed work teams and encourage personal commitment towards quality
- The company must provide opportunities for employees' participation to inspire action, such as serving on quality councils, process ownership, or making presentations on quality
- The company must provide recognition and rewards. These expressions play an essential role in inspiring people to deliver on quality.

2.11.4. Basic management principles to be adopted

The management of any company has a difficult task, but according to an article written by Harrington (1999: 5–7), on “Performance measures and the twenty-first

century manager” management has become a lot more sophisticated with new methods and principles. According to Longenecker et al (2003:485) performance based principles must be designed carefully if they are to be successful. Managers that have not mastered these principles will be vulnerable when the company looks at restructuring. Harrington (1999) has listed the basic principles as follows:

- Delegation: to accomplish assignments, management must delegate responsibility. This frees up management to manage and focus on other issues
- Appraisal: management must develop individual performance goals in cooperation with employees, providing honest, continuous feedback with regard to the goals
- Disagreement: disagreement between management and employees can be healthy. Management must make the best decision regarding the situations. This can only be done if all the information has been evaluated and discussed
- Be decisive: reluctance to make a decision is not an option; often “gut feeling” is an important part of management within an organisation
- Positive attitude: if management conveys a feeling of failure, the department is doomed to defeat. Employees normally show and take the same attitude as the management
- Five-way communication system: management must establish excellent upward, downward, sideways, supplier and customer communication systems. This will enable them to focus on the more pressing requirements and opportunities
- Invest: management should invest heavily in their employees, providing them with training and helping and supporting the growth and maturity of the employees.

2.11.5. Summary

No management can be successful without a great deal of hard work, training and sacrifice. The management profession is constantly changing, with the bar continually being lifted. If the current management cannot adapt with regard to improvements, it might be beneficial for the company to introduce new blood.

The key to successful management is basically to work positively with employees, following the basic principles, developing and supporting employees at the same time portraying a sense of urgency and importance regarding the work that has to be performed.

Stevenson (2003), Evans and Lindsay (2005), Longenecker (2003) and Thomas-Foster (2004) to mention a few, emphasizes the importance of the relationship between quality and productivity, and indicated that the elimination of waste should be the major focus of any quality initiative which will simplify any process resulting in higher productivity. The earlier a problem is identified in a process, the cheaper it is to fix it; thus having a direct influence on cost and profitability in any company.

2.12. CONCLUSION

Any company wanting to improve its profitability and productivity must introduce a quality process into the company. With the introduction of this quality process, it is going to have a major effect on the way the company is currently doing business. This quality process will not only result in the change of the culture of doing business, but also the change process that will happen with management, which will directly affect the work process (for the better) if introduced correctly.

What must not be forgotten is that with the introduction of any quality initiative it is going to cost money. Management must not be short sighted with regards the introduction of the quality process. Yes, it does cost money, but if properly introduced, understood, supported and controlled, not only by management but also by the workforce, the results and improvements could be endless.

It is imperative for the management to not only understand, but get involved with the introduction and running of any quality improvement processes irrespective if they are ISO 9000, the SAEF Model or basic quality tools that are being introduced.

If an SMME is going to go down this road for the first time, it is advisable to test the waters first, before jumping headlong into something that has not been researched and supported properly, and thus could result in a waste of time, effort and money.

Management must have a common goal, indicating what they want to get out of the process, how much money is going to be spent on the process, the training of the

workforce, the implementation and project management of the process just to mention a few pointers. Management at the end of the day must take ownership of the quality process if it is to be effective.

As mentioned by Whitelaw (2004) when survival of a business is at stake, the management is more concerned about the business than quality management. What must be realised by management is that if there is any quality initiative in place, these quality initiatives must form the basis of the investigation of the problem.

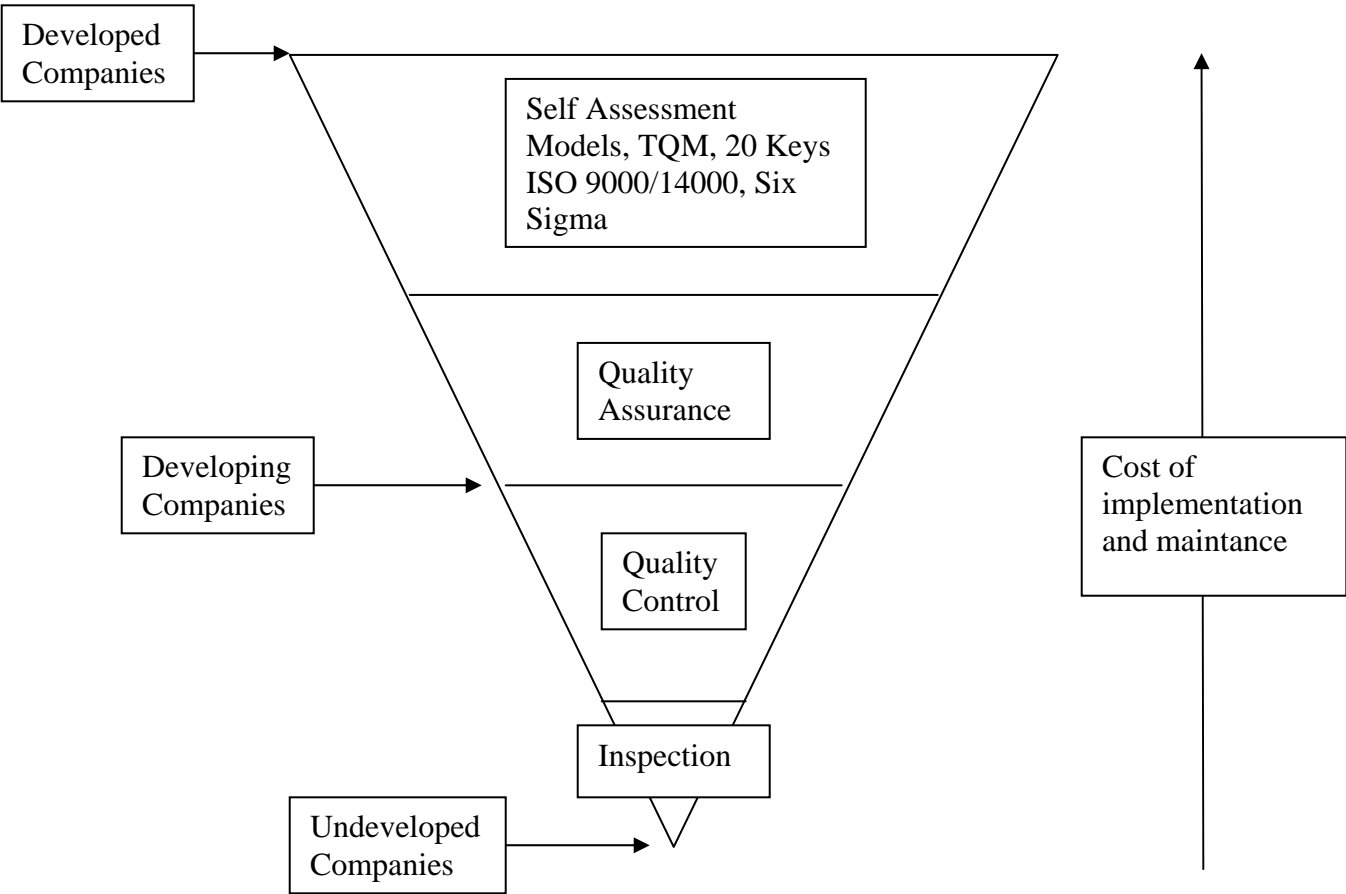
A SMME might be reluctant to spend money, or possibly spend too much money on a quality process when not knowing the implications or benefits; **Figure 2.17** has been developed to show the scope of TQM against the cost and maintenance of TQM.

The SMME management must have a good idea of what they expect to achieve if they implement a specific quality improvement process. What has been previously discussed in the research is that the management must understand and know how the quality process that is to be introduced into the company operates for it to be successful. **Figure 2.17** is an indicator of how the different quality improvement processes can affect the company. The more involved the quality process, the higher the cost and maintenance. **Figure 2.4** indicates how the quality processes intensify with regards understanding, commitment, manpower requirements, teamwork, development, costs and involvement to mention a few.

It is the prerogative of a customer to ask its supplier (irrespective of size) to implement quality models, systems techniques or tools as required. This could be

because of a number of reasons, but mainly to improve the product or service delivered and reduce the amount of time the customer has to waste on rechecking what was supplied. It could also be the requirement of the customer's QMS, but at the end of the day the quality supplied must be laid at the front door of the supplier.

Figure: 2.17. The scope of TQM against the cost of TQM



Source: (Developed by researcher)

According to Hill et al (2003) customer satisfaction is the most common form of market research in business-to-business markets, and is often connected to quality and production measurement. It is therefore important that an organisation embark on

a customer satisfaction exercise before making any changes. And as mentioned by Jackson, (1997) if existing quality systems in the organisation are ignored, this will create inefficiencies and place an excessive burden on the organisation.

It is therefore important for the management of any SMME company to investigate what quality improvement process would benefit the company. After deciding what route to follow it is very important for the management to understand how the quality improvement process works, its general requirements and to train the employees who are going to be utilizing it the most. It will then be the commitment and drive from the management that will determine the success of the improvement initiative put in place.

What management must realise is that “Rome was not built in one day”, and any quality improvement process introduced into a company will take time before it is working effectively, and the company can then reap the rewards.

CHAPTER 3 RESEARCH DESIGN AND METHODOLOGY

All is change, nothing is permanent. (Heracleistus 513 BC)

3.1. INTRODUCTION

A great deal has been said and written about research methodology; some authors take the philosophical approach, whilst others follow a pragmatic approach.

The importance of including both schools of thought in the study of social science research is increasingly emphasized by social scientists (Leedy 1993:143; Neuman 1994:65; Jackson 1995:18; Leedy and Ormrod 2001:90).

Depending on the research problem, it is appropriate to establish a research strategy which will help focus on the objectives. The primary research should focus on quantitative research, whilst the secondary research should be focused on qualitative research. The final objective of the research is the triangulation of both the primary and secondary research methodology.

3.2. WHAT IS RESEARCH?

According to Leedy and Ormrod (2001:4) research is a systematic process of collecting and analyzing information (data) in order to increase the understanding of the phenomenon, which is being investigated.

What the researcher should understand is that at the end of the research certain objectives should be met. Research is not an information gathering exercise. Neuman (2000) mentions that scientists (researchers) tend to adhere to certain norms. Scientists, who make the knowledge available to everyone, must be honest when reporting their findings and should be neutral, impartial and open.

There should be three primary strategies for conducting research according to Olivier (2004:2):

1. Compile some information on some topic where bits and pieces have already been discovered and yet integrated into a single coherent body of knowledge.
2. Solve the problem for which no known (or apparent) solution exists.
3. Look with new eyes at existing knowledge. In other words, find better solutions for a problem that has previously been solved.

3.3. THE RESEARCH PROCESS

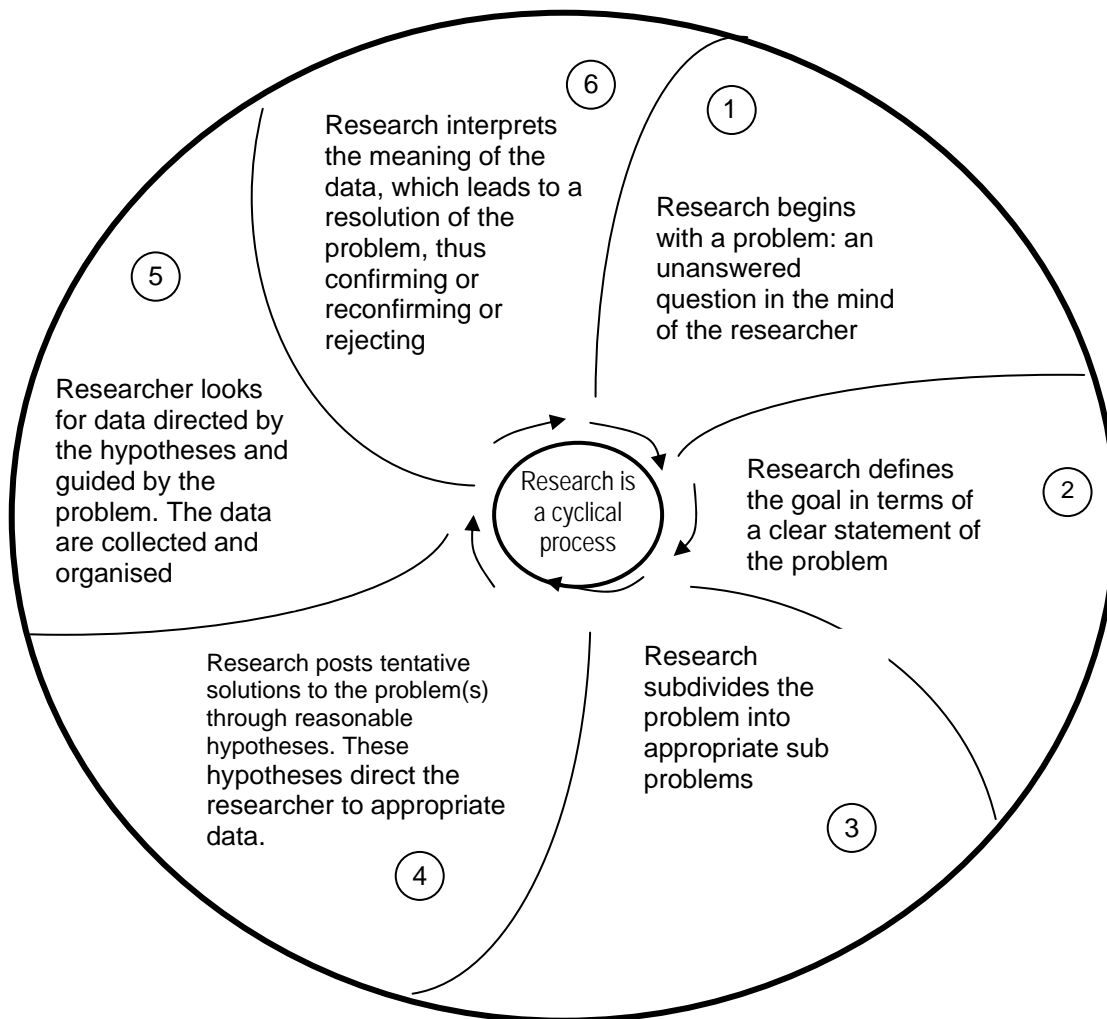
According to Leedy and Ormrod (2001:4) research has eight distinct characteristics, even though research projects vary in complexity and duration. These characteristics are as follows:

- Research originates with a question or a problem. What must be noted here is that the problem and its statement are important because they point to the origin of formal research

- Research requires a clear articulation of a goal. The success of the research is based on a clear, unambiguous statement of the problem
- Research follows a specific plan or procedure. It is critical to have a carefully planned attack, prior to the start of the research for it to be successful
- Research usually divides the main problem into more manageable sub problems. It makes the research more manageable and focused. It also dictates the parameters that should be covered in the sub problems
- Research is guided by the specific research problem, question or hypothesis. Once the problem or sub problems have been developed, the researcher forms one or more than one hypothesis (a proposition or a statement). These hypotheses are never proved or disproved. They are either supported or not supported by the data
- Research accepts certain critical assumptions. An assumption is a condition taken for granted, without which the research would be pointless
- Research requires the collection and interpretation of data in an attempt to resolve the problem that initiated the research. The significance of data depends on how the researcher extracts meaning from them. In research, data uninterpreted by the human mind is not only a waste of time but also worthless
- Research is, by its nature, cyclical. The complete research cyclical process is shown in **Figure 3.1**. What the research leads to at the end of the day is an expansion of knowledge. Thus research has two primary functions:

- To control and dictate the acquisition of data
- To control the data after their acquisition and extract meaning from them (interpretation of the data).

Figure 3.1: Cyclical Research process



Source: (Leedy and Ormrod 2001:9)

3.4. VALIDATION AND RELIABILITY

With any type of measurement, two considerations are extremely important. These are validation and reliability. Validation is concerned with the soundness, the effectiveness of the measuring equipment.

There are several types of validity. The more common types according to Struwig and Stead (2001:139) and Leedy and Ormrod (2001:103) are:

- Face validity – relies basically on the subjective judgement of the researcher
- Criterion related validity – employs two measures of validity, the second as a criterion check against the accuracy of the first measure
- Content validity – is the accuracy with which an instrument measures the factors or situations under study
- Construct validity – is any concept such as honesty that cannot be directly observed or isolated
- Internal validity – is the freedom from bias in forming conclusions in view of the data
- External validity – is concerned with the generalisability of the conclusions reached from a sample to other cases.

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

The focus of research design is to maximize the validity and reliability of the research findings. According to Leedy (1993:128), the use of human subjects in research raises the question of ethical standards and should not go without careful scrutiny.

3.5. RESEARCH METHODOLOGICAL APPROACHES

There are three important contemporary methodological research approaches, namely: the positivist, interpretative and the critical approaches. Researchers usually adopt one of these approaches and then formulate a strategy that is consistent with the approach selected by them.

3.5.1 The positivist approach

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

likely to implement quantitative research and use experiments, surveys and statistics (Gummesson 1991:152).

3.5.2 The interpretative approach

According to the interpretative approach, doubt is expressed over the question of whether it is always possible to establish cause and effect between variables in the social sciences. An example: can the effect of poor quality decision-making on a project always be linked to a specific objective cause? The interpretative approach represents a reaction against unqualified application of positivism in the social sciences. Instead of trying to explain causal relationships by means of objective truth and statistical analysis, hermeneutics provide a process to interpret, understand or reconstruct reality. Language, pictures, sound, text and symbols play a central role in qualitative projects and replace quantitative data such as facts and figures as the primary sources of information (Neuman 1994:61; Jackson 1995:9).

3.5.3 The critical approach

The critical approach is based on the argument that the researchers cannot distance themselves from people in their research. They have to empower people through their research in order to bring about social justice (Jackson 1995:11). The relative success of research in South Africa may in the future be measured against its ability to conform to the requirements of the critical approach. It is important to state that there is no specific method or technique associated with this research approach and this method or technique does not seem to be that important. According to Jackson

(1995:11, 13), researchers using this approach show a preference for the historical method of research.

3.6. MODELS AND MODELLING

This research proposes to attempt to analyze the understanding and use of quality and productivity in selected SMMEs in the Eastern Cape region. This research could lead to further investigation with the possibility of a model being developed for this sector. Mouton and Marais (1994:138) describe the term “model” as one of the most ambiguous in the vocabulary of the social scientist (or researcher). The terms “model” and “theory” are frequently used as synonyms. The view of Mouton and Marais (1994:138) is that a model performs a heuristic function as opposed to a theory that performs an explanatory function.

Dooley (1995:348) defines a model as “one set of causal paths that can be compared with observed data”. Fellows and Liu (1997:61) view modelling as the process of constructing a model representing a designed, actual object, process or system or a representation of a reality.

Gains and Shaw (2004) state that a model is the theoretical image of the object of the study. Furthermore, Kemp (1997:6) states that a model is a tool used by social scientists to explain a phenomenon.

Emory and Cooper (1991:64) point out that there are three types of models, viz. descriptive models, that seek to describe the behavior of the elements in a system;

explicit models, that seek to extend the application of the current theories; and finally simulation models, that replicate current phenomena.

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

According to Gains and Shaw (2004), the goal of research is to create a theoretical picture of the object of study, which resides in the empirical world. All the theoretical knowledge, concerning empirical things, makes up a more or less complete picture of the empirical world. The researcher's task is to try and evaluate whether this project could lead to the construction of a model relating its theory in further research.

According to Audet and d'Amboise (2001), understanding a phenomenon that has barely been researched requires a qualitative approach that is both adaptive and innovative to give insight to this phenomenon. Strategic scanning must be done to

gain an in-depth knowledge of the organisation's environment. Audet and d'Amboise (2001) define strategic scanning as the collection, dissemination and interpretation of information related to a company's environment. Further, scanning is directed towards those sectors that are the most strategically uncertain. To conclude, it is sometimes difficult to define what is relevant in advance. It only becomes apparent through research and analysis.

3.7. QUANTITATIVE VERSUS QUALITATIVE RESEARCH

Quantitative research is usually associated with positivism and qualitative research with interpretativism. It is best to visualise the distinction between quantitative and qualitative research as a continuum. All research methods could be placed somewhere between the extremes of pure quantitative and pure qualitative research (Jackson 1995:13). It is, however, plausible to indicate whether research projects have a more qualitative or more quantitative nature. This in turn would play an important role in decisions on what process to follow and what measuring instruments to select (van Biljon 1999:37). A summary of the main differences between qualitative and quantitative research is given in **Table 3.1** An important choice that researchers face is the research method to be used. Leedy (1993:145) believes that the answer to this question can be found in the nature of the data, the problem of the research, the location of the data, obtaining of data and the intention with the data. If the data is verbal, the methodology is qualitative, if it is numerical; the methodology is quantitative (van Biljon 1999:37).

3.7.1. Quantitative research

Mouton and Marais (1994:159) define quantitative research as more highly formalised as well as more explicitly controlled, with a range that is more exactly defined, and which, in terms of the methods used, is relatively close to the physical sciences. This definition once again shows a preference for the positivist approach.

Quantitative research seeks to quantify, through numbers, observations about human behavior. The emphasis is on precise measurement, the testing of hypotheses based on a sample of observations, and a statistical analysis of the data. Relationships among variables are described mathematically and the subject matter is, as in the physical sciences, treated as an object (van Biljon 1999:40). Variables play key roles in quantitative research. Variables take on two or more values. Attributes, on the other hand are the values of categories of a variable and people sometimes confuse variables with attributes.

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

3.7.2. Qualitative research

Qualitative research relies on interpretative and critical approaches to social sciences. The aim of qualitative research is to study individuals and phenomena in

their natural settings in order to gain a better understanding of them. It is also evident that qualitative research does not follow a fixed set of procedures. The researcher will, however, need to develop a set of strategies and tactics in order to organise, manage and evaluate the research (Neuman 1994:317; Dooley 1995:258). Scientists who wish to describe everyday life from the point of view of the phenomenological perspective prefer qualitative research. Quantitative researchers manipulate figures and statistics, the data of the qualitative researcher is in the form of words, sentences, and paragraphs. Qualitative research is more at risk in terms of validity and reliability (Miles & Huberman 1994:2).

Mouton and Marais (1994:155) define qualitative research projects as those in which the procedures are not strictly formalised, while the scope is more likely to be under-defined, and a more philosophical mode of operation is adopted.

Table 3.1: Differences between qualitative and quantitative research.

| Quantitative | Qualitative |
|---|---|
| <p>Test hypothesis that researcher begins with. Hypotheses are stated explicitly and are formulated beforehand.</p> <p>Concepts are in the form of distinct variables. Concepts have an ambiguous meaning.</p> <p>Measures are systematically created before data collection is standardised. The researcher remains largely aloof.</p> <p>Data are in the form of numbers from precise measurement.</p> <p>Theory is largely causal and is deductive.</p> <p>Procedures are standard, and replication is assumed.</p> <p>Analysis proceeds by using statistics, tables or charts and discussing how /what they show relates to the hypotheses.</p> | <p>Capture and discover meaning once the researcher becomes immersed in data. Hypotheses are frequently undeclared or stated in the form of a research goal.</p> <p>Concepts are in the form of themes, motifs, generalisations, and taxonomies. Concepts can be interpreted in a number of ways.</p> <p>Measures are created in an ad hoc manner and are often specific to the individual or researcher. The researcher is involved with the events / phenomena.</p> <p>Data are in the form of words from documents, observations and transcripts.</p> <p>Theory can be causal or non-causal and is often inductive.</p> <p>Research procedures are particular, and replication is very rare.</p> <p>Analysis proceeds by extracting themes or generalisations from evidence and organising data to present a coherent, consistent picture.</p> |

Source: Neuman (1994:317); Mouton and Marais (1994:159).

3.7.2.1. Characteristics of qualitative research:

- It is not always easy to describe the meaning of qualitative research

- It is not always possible to classify methods in terms of the level of qualitiveness.

According to Miles and Huberman (1994:7), these features can be referred to as core and recurring features for naturalistic studies, configured and used differently in any particular research tradition.

3.7.2.2. Inductive versus deductive logic

According to Patton (1987:15), qualitative research methods are particularly orientated towards exploration, discovery and inductive logic.

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

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

3.7.2.2. How to choose the most appropriate qualitative research method

Considering the model shown in **Table 3.2** can solve the problems of a qualitative method.

Table 3.2:Research method selection model

| | Form of research question | Requires control over behavioral events? | Focuses on contemporary events? |
|-------------------|--------------------------------------|---|--|
| Experiment | How, why | Yes | Yes |
| Survey | Who, what, where, how many, how much | No | Yes |
| Archival analysis | Who, what, where, how many, how much | No | Yes/No |
| History | How, why | No | No |
| Case study | How, why | No | Yes |

Source: Adapted from Yin (1994:6).

The most appropriate research method or strategy to use depends on three conditions:

- The type of research question posed
- The extent of control an investigator has over actual behavioral events
- The degree of focus on contemporary as opposed to historical events.

3.7.3. Triangulation

Leedy (1993:143) describes the situation where it is possible to combine qualitative research methods with quantitative research methods in the same project. This process is called triangulation and many research projects could be enhanced considerably if a triangulation approach was applied. According to Struwig and Stead (2001:19), the triangulation method could include various methods such as interviews, Likert type questions and focus groups. The interactions between quantitative and qualitative research are illustrated in **Figure 3.2**.

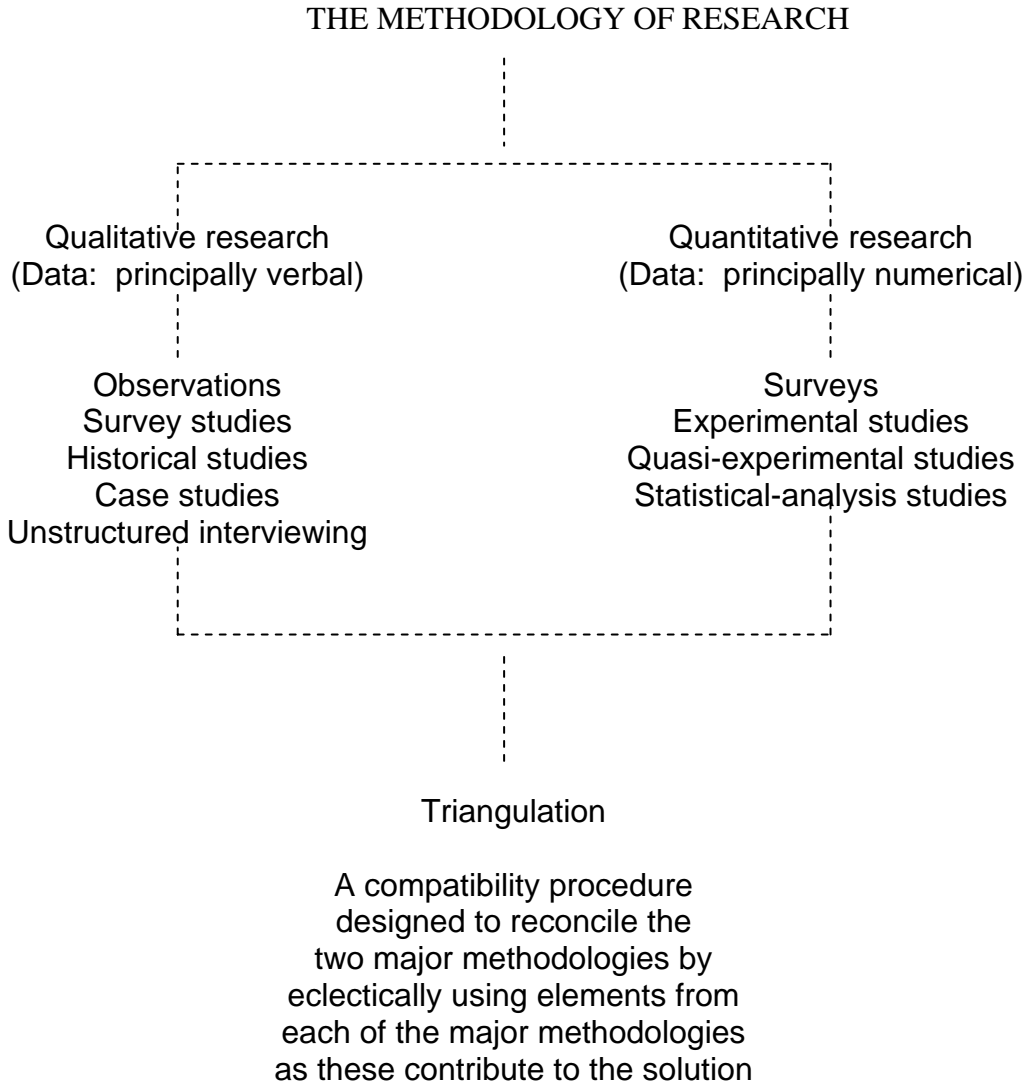
3.8. CHOOSING THE MOST APPROPRIATE RESEARCH METHOD

From the problem setting it can be concluded that the research project firstly adheres to quantitative research methods as it supports deductive reasoning and analysis. Secondly, this research project adheres to defined themes to solve stated research problems through a well-defined methodical process of investigation, analysis and reconstruction.

A deductive design starts with an explicit conceptual framework developed from existing theory and models. The project requires the formulation of a specific research problem leading to a theory building exercise. A questionnaire is used to collect data; the answers to the problems are determined and causal relationships between variables established.

Focusing on the problems and sub-problems of the study, how, what, where type questions are asked. A contemporary study of quality, productivity and continuous improvement was undertaken with no control over behavioral events. This concludes and configures the introduction of quantitative research in the form of interviews; observations and surveys to further enhance this project.

Figure 3.2: Interaction between quantitative and qualitative research



Source: Adapted from Leedy (1993:145).

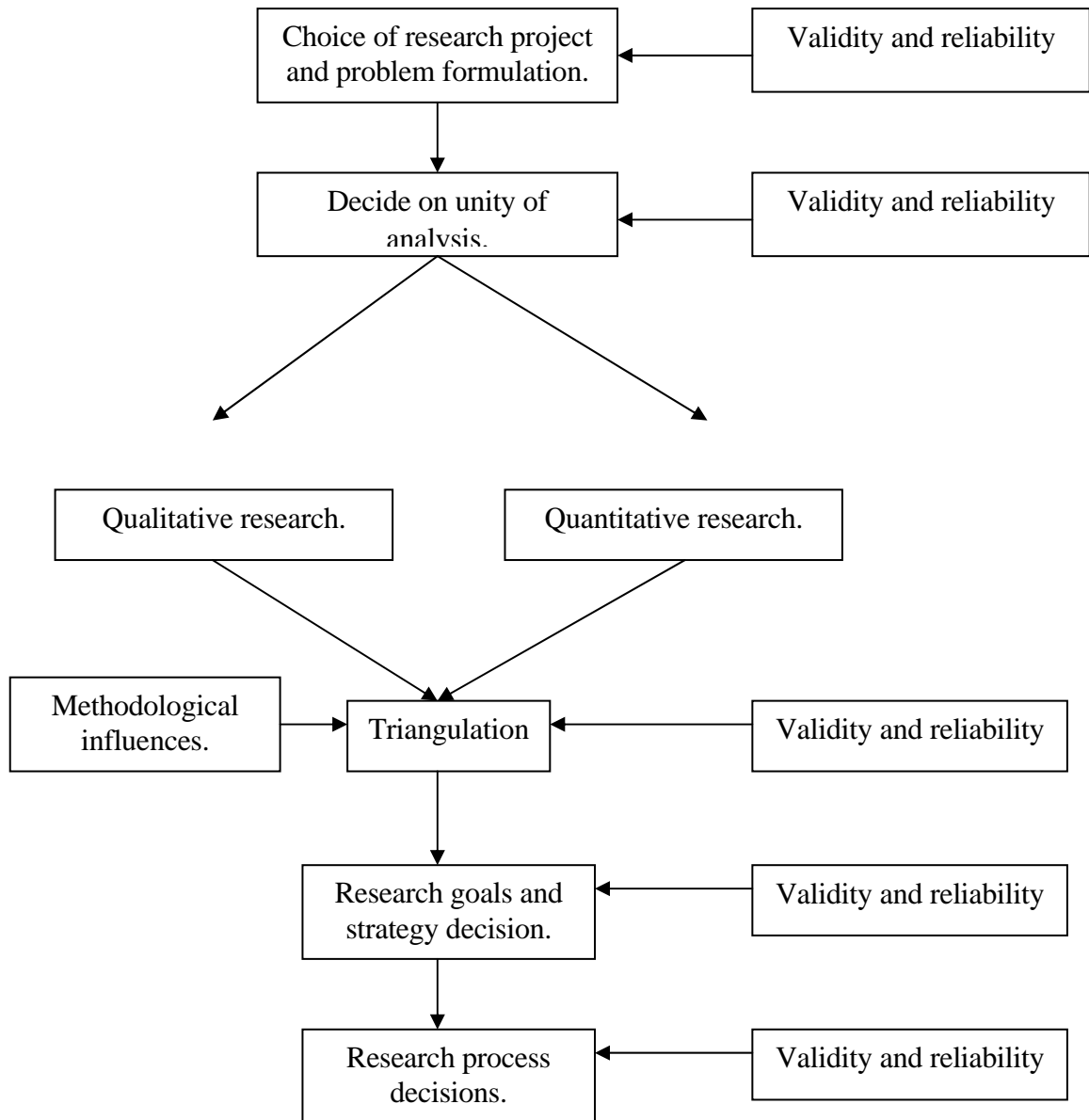
3.9. RESEARCH GOALS AND STRATEGIES

3.9.1. Research goals

The research goal provides a broad indication of what a researcher wishes to accomplish with research. The primary aim of this research project is to portray accurately the characteristics of a particular group, situation, interaction or object (Mouton & Marais 1994:43). The outcome of a descriptive project is a detailed picture of the subject. According to Neuman (1994:43) the aims of descriptive projects may be to:

- Provide an accurate profile of a group
- Describe a process, mechanism or relationship
- Give a verbal or numerical picture
- Find information to stimulate new explanations
- Present basic background information or a context
- Create a set of categories or classify types
- Clarify a sequence, set of stages or steps
- Document information that contributes prior beliefs about a subject.

Figure 3.3: A conceptual model for research design.



Source: (Structure of literature study and theoretical model developed by the researcher)

3.9.2. Research strategy

According to Mouton & Marais (1994:49) the two research strategies are contextual research strategies that deal with projects such as historical sciences, languages, arts, jurisprudence and theology, and secondly, general research strategy that deals with experimental studies, comparative research and various types of surveys.

3.9.3. The population

The research project will be conducted according to actual surveys (interviews and questionnaires). The actual survey's population comprised a variety of SMME manufacturing companies, as well as a few larger manufacturing companies that rely on the support of the SMME sector.

The possibility of the sample being biased cannot be excluded, even though the sample will be randomly chosen. The population of the study is indicated in **Table 3.3** and **Table 3.4**. Both the questionnaire and interview method will be used to get a better perspective of, and insight into the problem statement. All the companies involved with the research will be chosen on a random basis.

The various people/companies selected will be requested to complete the questionnaire (in the SMME sector), where after a structured interview process will be conducted with a sample of these companies to strengthen the findings. The researcher will aim to carry out all interviews with either the owner, managing director, quality manager or the purchasing manager of the larger companies and a sample of

the smaller companies, so as to evaluate senior management's understanding of the research problem, and analyse problems and benefits encountered from the bigger companies perspective when dealing with SMMEs. Only a small sample of the larger companies will be done, as the research will be focusing mainly on the SMME sector.

Table 3.3: Sample Population (**Larger companies**)

| Type | Number approached | Number completed | % |
|-------------|--------------------------|-------------------------|----------|
| Interviews | 7 | 5 | 72 |

Table 3.4: Sample Population (**SMMEs**)

| Type | Number sent / approached | Number completed | % |
|----------------|---------------------------------|-------------------------|----------|
| Questionnaires | 87 | 31 | 36 |
| Interviews | 8 | 6 | 75 |

3.9.4. General procedure

The methodology adopted in this research project was discussed earlier in this chapter. The body of data collected consisted of questionnaires and interviews primarily with the SMME sector to solve stated research problems. The secondary data used in this research project was obtained from various local and international sources in various forms, such as articles, books, internet articles, reports, the most predominant being international books originating in America, Japan and Europe as discussed in the literature review chapter.

The primary data used in this research project was acquired from questionnaires and interviews.

From the 7 larger companies that were approached to participate in the interviews, only 5 accepted. The 2 larger companies that declined to participate stating that they did not deal with the SMME sector.

Questionnaires were sent to 87 SMMEs. Only 31 completed the survey. The actual study in the form of an electronic survey was done using a standard questionnaire that was developed. This was forwarded under covering letters to try and get a better than average response (with regards questionnaires) from the target group (see Annexure A, B, C, D and E). Although there were only 31 (36%) that responded out of a possible 87 participants, a lot more of the initial 87 indicated telephonically their willingness to assist with the survey.

During the follow-up on outstanding questionnaires the following problems and excuses were given as to why questionnaires had not been completed and returned:

- Too busy right now – will look at questionnaire after budget
- Questionnaires too long and complex – do not have time to complete
- Far too academic for our company
- Don't use or measure productivity or quality

- Have e-mailed the questionnaire
- Sudden increase in workload has made it impossible to complete the questionnaire
- This can't help me, and
- Not interested, a waste of time.

What was interesting about some of the information that came out of the questionnaires that were returned by some of the SMMEs, was how the survey could possibly improve their quality, service and productivity, coupled to what could be done to help them in their quest to improve, and how to get local government to focus, assist and support the SMME sector more.

This is directly linked to what the researcher is investigating in the research. Further research will be investigated with certain governmental bodies to analyse what support can be developed for the smaller companies.

After the questionnaires were analysed, the researcher structured a set of interview questions targeting the SMME sector to extract more information with regards the implementation and acceptance of quality within the SMME sector. A sample of eight companies were selected out of the 31 companies that returned the questionnaire, six of the eight agreed to participate with the interview session.

Another interview process was set up and conducted among some of the larger companies, this process yielded a more favourable outcome with some interesting observations and facts that would not have surfaced from any survey questionnaires, these results are covered in Chapter 4. A set of questions were drawn up so as to focus on the highlighted sub-problems. These interviews were unstructured to gain a better understanding and the focus was on concepts, themes, generalisations and actual versus make-believe (as perceived in the SMME sector). These interviews were done specifically with the focus on the SMME sector to compare specific concepts, yielding interesting information for comparison purposes, each interview lasted approximately an hour.

The design of the questionnaire and interview process used for the SMME sector was drawn up in such a way that the questions were formulated to solve stated problem and sub-problems. The questions were also structured in such a way to cover all the categorised sections according to the five respective hypotheses. This is depicted in **Table 3.5.**

After an acceptable questionnaire was developed (Annexure D), incorporating 9 general information questions and 46 specified questions with regards the major and sub-problems, it was circulated with covering letters (Annexure A, B and C) requesting that the completed questionnaires be returned by 26 September 2005 (only eight were returned). This date was extended to mid-October because of the response (a further two returned). The researcher had to finally telephonically, randomly select set appointments with certain SMMEs and physically deliver and pick

up the questionnaires (thus the remaining 21 questionnaires [49% return rate] were collected). Problems experienced with the communication and collection of the questionnaires from the 43 randomly selected companies have been discussed.

Correlating the information from the questionnaires resulted in further research having to be conducted in the SMME sector. Interview sessions were set up with certain SMMEs to extract further information regarding the success of the use of quality within this sector (Annexure G).

Table 3.5: Questionnaire question sections:

| Section | No. of questions |
|---|-------------------------|
| Section A: | |
| Biographical information | 9 |
| Section B: | |
| General questions | 9 |
| Section C: | |
| Questions addressing the sub-problems | |
| Sub-problem 1: The use of quality tools | 6 |
| Sub-problem 2: The use of quality techniques | 4 |
| Sub-problem 3: The use of quality Models or Systems | 14 |
| Sub-problem 4: Management commitment | 8 |
| Sub-problem 5: Affect on quality/productivity. | 5 |
| Total | 55 |

The interviews with the larger companies were conducted with 5 respondents based in the Nelson Mandela Metropole. On average each interview conducted lasted one hour. These interviews were done to evaluate the different perceptions or understanding of quality delivered by the SMMEs and what the larger companies are expecting and receiving from the SMME sector.

One major fact that the researcher did observe during the collection of the information was that the recipients would much rather discuss their problems, than put them down on a questionnaire. It is also the researcher's perception and from the interviews conducted that more constructive information is generated from interviews than questionnaires and the recipients would much rather spend an hour talking to someone than putting the information down on paper.

This can be deducted by the information collected as indicated in **Table 3.3 and Table 3.4**, and as to why (the excuses, which are mainly time based) the recipients did not want to fill out questionnaires (indicated on page 124), as against the time set aside by senior management of SMME and larger companies to sit and be interviewed. The percentage interviewed far outweighs the percentage of questionnaires returned.

The questionnaires that were returned from the survey were recorded on disk; the data was processed and presented in tabular form by Dr J Pietersen from the

Department of Mathematical Sciences at the Nelson Mandela Metropolitan University.
These results are presented in Chapter 4.

3.10. CONCLUSION

A formal systematic approach to research design is crucial to ensure that a research project conforms to the principles of validity and reliability. The research design decisions guide the researcher in effectively addressing the research problem. A quantitative approach is the most appropriate research strategy for this research project. Questionnaires, interviews and observations are the main methods of data collection.

CHAPTER 4

THE RESULTS

Vision without action is a daydream; action without vision is a nightmare.
(Japanese proverb)

4.1. INTRODUCTION

The results shown in this chapter are the core part of the research project, generated from the response obtained from the questionnaires and interviews conducted. Observations and comments made by the various parties whilst collecting the data will assist and contribute to the identification of those topics that form part of the hypotheses.

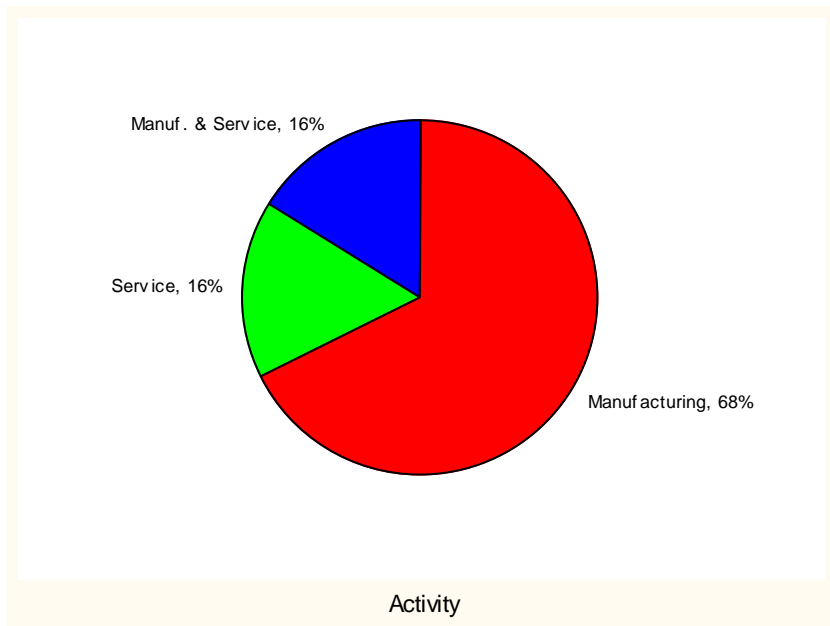
All the respondents from the SMME sector were selected on a random basis. What must be noted about the respondents is that they are either working towards their QMS accreditation, have completed the process or some have got accreditation but have failed to maintain the accreditation of the QMS. The companies that have previously got accreditation and failed to maintain it could be because of a number of reasons, some of the reasons could be because of the finance, the required understanding, commitment, involvement or manpower constraints to maintain a QMS as indicated in **Figure 2.17**. SMMEs not involved with the quality process or that had no knowledge base of quality systems, models, tools or techniques were not considered in the research.

4.2. SECTION A: BIOGRAPHICAL INFORMATION (QUESTIONNAIRES)

This section was broken down into two distinct areas, the first part which comprised five questions in section A (refer to Annexure D page 1 of the questionnaire) were not included in the results of the study as they covered the contact details of the respondents. The relevant data is covered from the 6th question onwards.

This question covered the main activity of the organisation, which was subdivided into either manufacturing or service.

Figure 4.1: Represents main activities of companies who responded

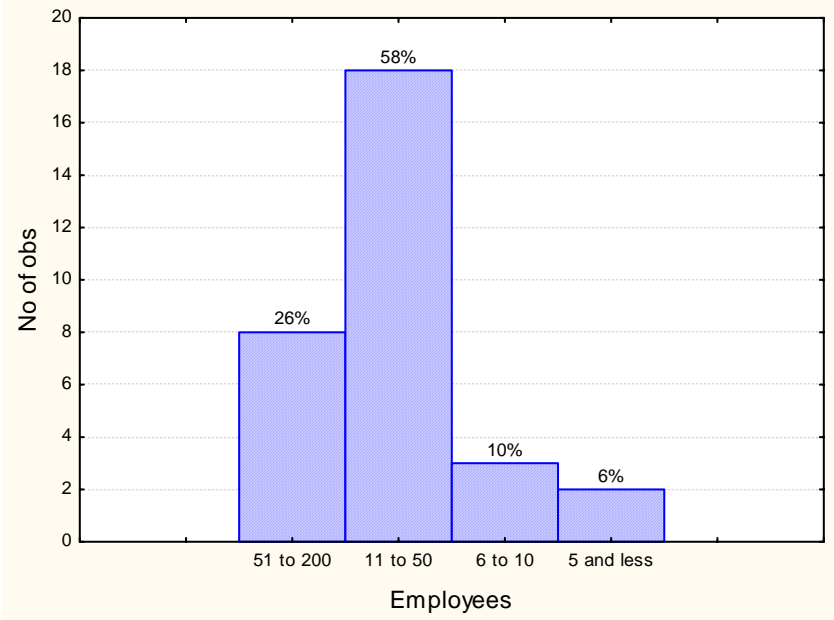


The interesting information generated from this question is the number of SMMEs involved in both Manufacturing and Service, which indicates that a fair percentage of SMMEs are not solely focused on manufacturing or service, which could indicate that

they have their preferred larger customer base, but at the same time could deal directly with the public (they are not a sole supplier to one of the larger companies).

The question regarding the number of employees was asked to evaluate and classify the size of the companies the researcher was dealing with. One of the prerequisites required to classify a company as an SMME, is that the number of employees employed at a particular company may not exceed 200 (this is indicated with **Table 1** shown in Annexure D). **Figure 4.2**, indicates that 58% of the recipients are classified as small companies, with 6% classified as micro (less than five employees).

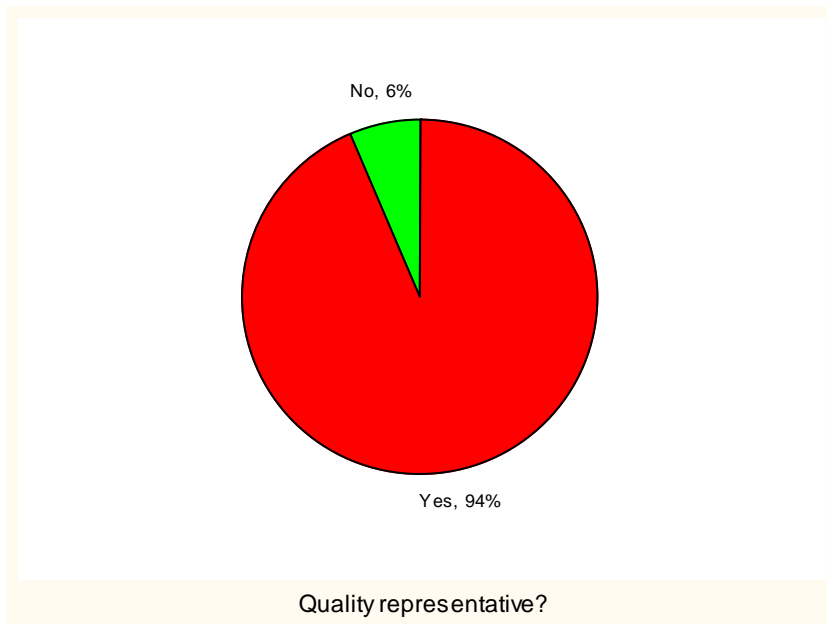
Figure 4.2: Response to the number of staff employed.



The aim of the next two questions in this section was to determine whether the company had a quality function, and if the company had an appointed quality

representative, respectively. Every recipient indicated that they followed some type of quality function, with only two (6%) indicating that they did not have an appointed quality representative, which possibly indicates that the micro companies do not have the manpower, capacity or financial expertise to justify the permanent employment of a quality representative (refer to **Figure 4.3**).

Figure 4.3: Appointed quality representative response.



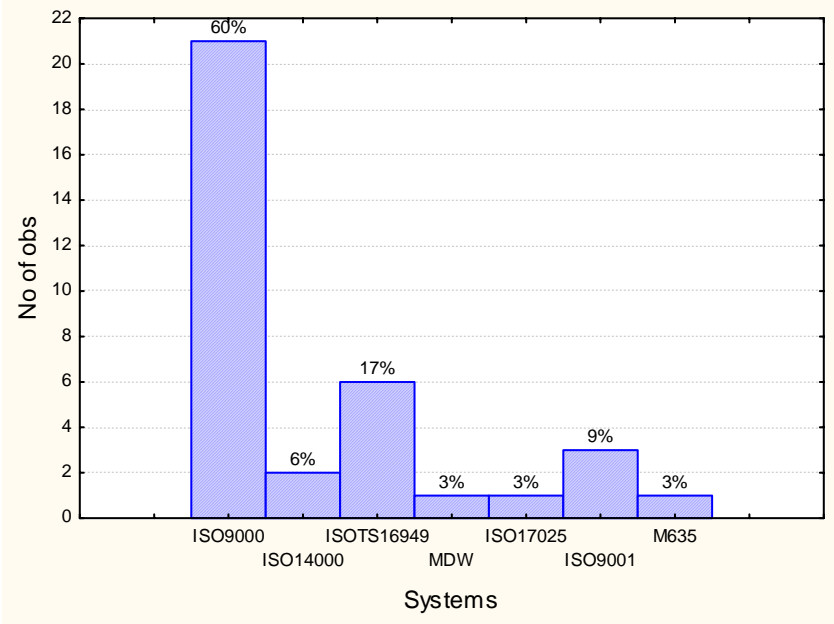
4.3. SECTION B: GENERAL QUESTIONS

This section was included in the second part of the questionnaire, (refer to section B in Annexure D, pages 5, 6 and 7) which covered information concerning quality management systems, tools and techniques which are or possibly could be used in the SMME sector to support possible goals set by management to reduce scrap, increase productivity and to set initiatives in place to introduce problem solving tools.

This section also focused on the commitment of management and re-addresses certain questions, which are addressed in section A of the questionnaire. By re-addressing certain questions the validity of certain information recorded in the returned questionnaires can be cross-checked.

Of all the companies that returned the questionnaire only two of the companies indicated that they were not accredited with a recognized quality management system (QMS).

Figure 4.4: Response to the use of QMS.



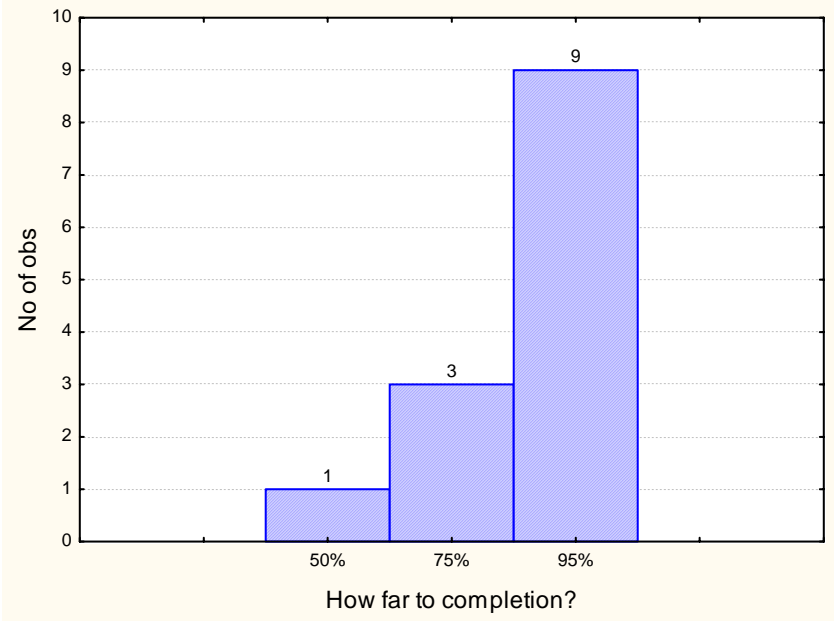
From question B3 (**Figure 4.4**), 69% of the SMMEs that returned the questionnaire listed that they use ISO 9000 or ISO 9001 (all respondents should have indicated the use of ISO 9001, which could possibly indicate the lack of knowledge or involvement

of certain SMMEs management with this QMS). Nevertheless, **Figure 4.4** indicates that ISO 9001 is the preferred QMS and with the Eastern Cape linked to the motor-industry and the study being done in the Eastern Cape, it was not a surprise to see ISO TS 16949 with 17% indicated use from the returned questionnaires (this being one of the required QMS any company must have in place if they want to supply parts to the automotive manufacturers). What can be noted from question B2 and B3 is that about 20% of the recipients have two QMSs in place. This could indicate that certain companies have benefited because of implementing a QMS and want to try and improve their processes, or they might supply the motor industry and have to have both ISO 9001 and ISO TS 16949 or might export and require both ISO 9001 and ISO 14000.

The environmental management system (EMS) or ISO 14000 has only been accredited to two companies (6%). With ISO 14001 starting to become a prerequisite for companies wanting to export, this will mean that the SMMEs that supply larger companies that export, are going to have to become accredited if they want to keep their supply contract. Mission Directed Work teams (MDW) are also indicated in **Figure 4.4**. This system also seems to be becoming more popular with certain companies, because of the direct involvement of the employees with regards to problem solving and productivity improvement at the work place. Question B4 indicates that only two of the respondents are currently working towards their first QMS, whilst another two have possibly relinquished the effort or don't have accreditation. Question B5 (**Figure 4.5**) indicates that 13 of 31 companies that

returned the questionnaire are working towards another QMS; whilst the other 18 companies are already accredited with either one or two recognized QMSs.

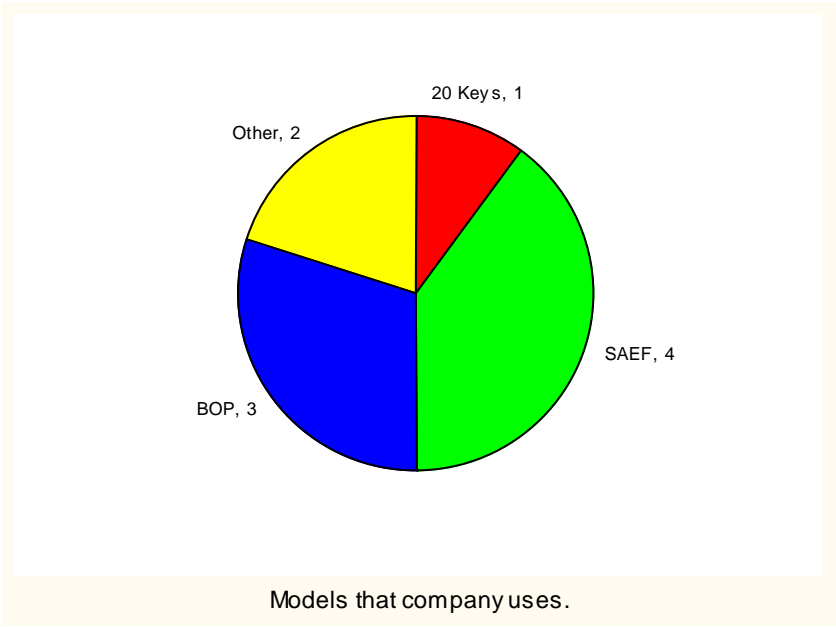
Figure 4.5: Response to the implementation of a QMS.



It was a positive indication in the returned questionnaires to observe that certain of the SMMEs were introducing quality models (question B5) to help improve quality and productivity. Even though only about 32% (10 companies) are already using models (question B6): it shows the commitment of some of the SMME’s management toward improving quality. 52% of the SMMEs that have quality initiatives (QMS accreditation) say they were requested by their customers to implement it and 45% of the recipients indicated that the customer requested them to implement techniques or tools (question B7 and question B8) to help control quality.

Question B9 asked the question pertaining to the use of quality tools in the SMME sector. **Table 4.1** indicates the use of various tools in the SMME sector as per the returned questionnaires. If the respondent did not fill in this information the researcher assumed that the company does not use the tool at all.

Figure 4.6: Response to the use of quality models.



The three most widely used tools from the research in the SMME sector are the Check Sheets, Flow Diagrams and then the Control Charts (information generated from the questionnaire).

This indicates that a vast majority of the SMMEs do not use basic quality tools to assist with the day to day running of the plant or for the analysis of problems.

Some of the basic quality tools need to be entrenched onto the shop floor if the SMMEs want to improve their quality, productivity and profitability and ultimately want

to survive. The quality tools used by the SMMEs might vary from company to company depending on the company's needs. It is also important to evaluate and introduce the correct tool, to achieve the required results. It is therefore important that both the employers and employees understand the tools used.

Table 4.1: Use of various quality tools in the SMME sector.

| <u>TOOL</u> | <u>Entrenched</u> | <u>A lot</u> | <u>A little</u> | <u>Not at all</u> | <u>Not answered</u> | <u>Total</u> |
|--------------------------|-------------------|--------------|-----------------|-------------------|---------------------|--------------|
| Pareto Chart | 3 | 2 | 6 | 7 | 13 | 31 |
| Fishbone Diagram | 3 | 0 | 7 | 7 | 14 | 31 |
| Check Sheets | 13 | 7 | 1 | 3 | 7 | 31 |
| Histograms | 0 | 0 | 6 | 12 | 13 | 31 |
| Scatter Diagrams | 1 | 0 | 5 | 11 | 14 | 31 |
| Run/Control Charts (SPC) | 6 | 5 | 5 | 6 | 9 | 31 |
| Stratification | 0 | 0 | 0 | 15 | 16 | 31 |
| Flow Diagrams | 9 | 7 | 6 | 2 | 7 | 31 |
| Design of experiments | 3 | 3 | 1 | 10 | 14 | 31 |
| Other | 1 | 0 | 2 | 5 | 23 | 31 |

The lack of use of these quality tools might be as a result of a lack of knowledge, training or the employees are afraid to use the tools (this is indicated in **Table 4.1**, in the columns that show little or no use at all). The biggest concern (shown in **Table 4.1**) is the number of recipients that did not answer the question on the use of the tools. This could be because the SMME management does not understand basic

quality tools, which could lead to the assumption that the majority of the SMME management does not understand the use and benefits of the basic quality tools or they (the companies) did not answer this question because the companies do not use the tools at all.

Certain of the QMS and models ask the question regarding the use of tools and statistical techniques once accredited or implemented. **Figures 4.7, 4.8 and 4.9** indicate the use of three of the most important tools available to be used for analysis (from information generated in the questionnaires and shown in Annexure E).

Figure 4.7: Indicated use of a Check sheet.

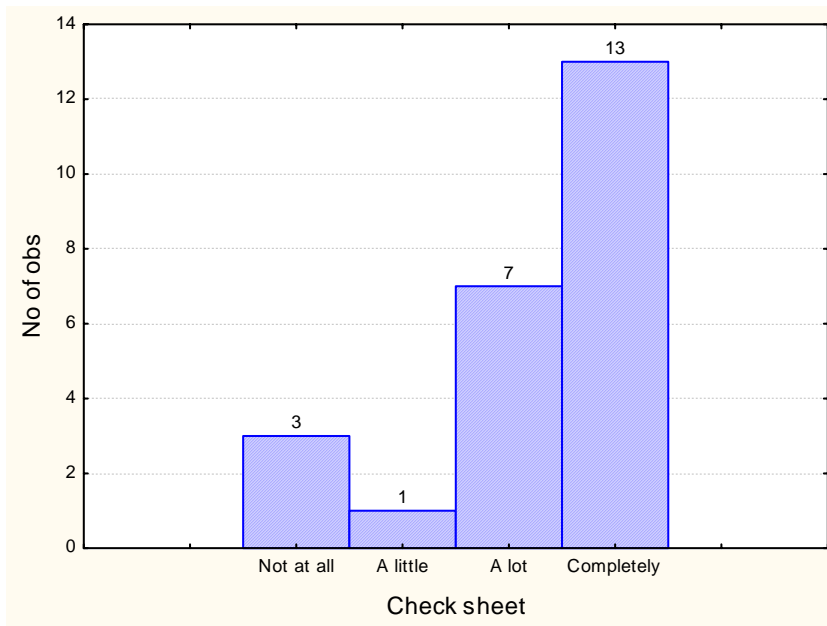


Figure 4.8: Indicated use of SPC, Run and Control charts.

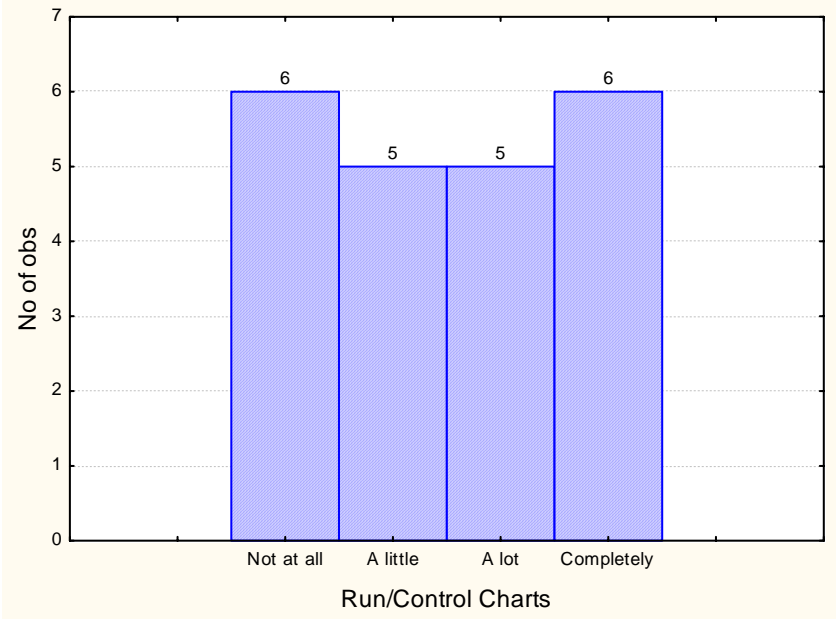
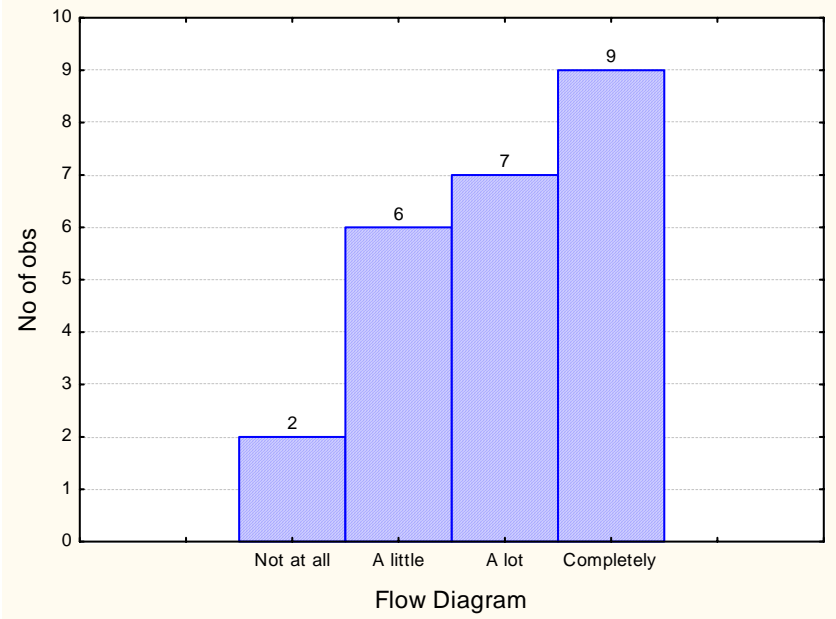


Figure 4.9: Indicated use of a Flow Diagram.



If these quality tools are introduced into a company, used, controlled and analysed correctly, they could assist any company to improve productivity, quality and ultimately profitability.

4.4. SECTION C: QUESTIONS ADDRESSING THE SUB-PROBLEMS

The rest of the questionnaire (pages 7 to 12 in Annexure D) addressed the sub-problems generated in the proposal. These sub problems are going to be addressed individually in the rest of this chapter, structured around the questions asked in the questionnaire.

4.4.1. Sub-problem 1: How and to what extent do SMMEs use quality tools to improve its processes?

This sub-problem analyses the use of quality tools in greater depth, and is also cross checked with regards validity as per the question asked in section B where the complete use or part use of quality tools worked out to approximately 31% (102 of a possible 310 use quality tools as per **Table 4.1**). **Figure 4.10** indicates that 71% of all the recipients use quality tools to analyse nonconformities as per question 1.1 in section C, but only 26% completely. This is the first possible indicator as an area of concern with regard to the management and use or understanding of quality tools.

Figure 4.10: Indicated use of quality tools.

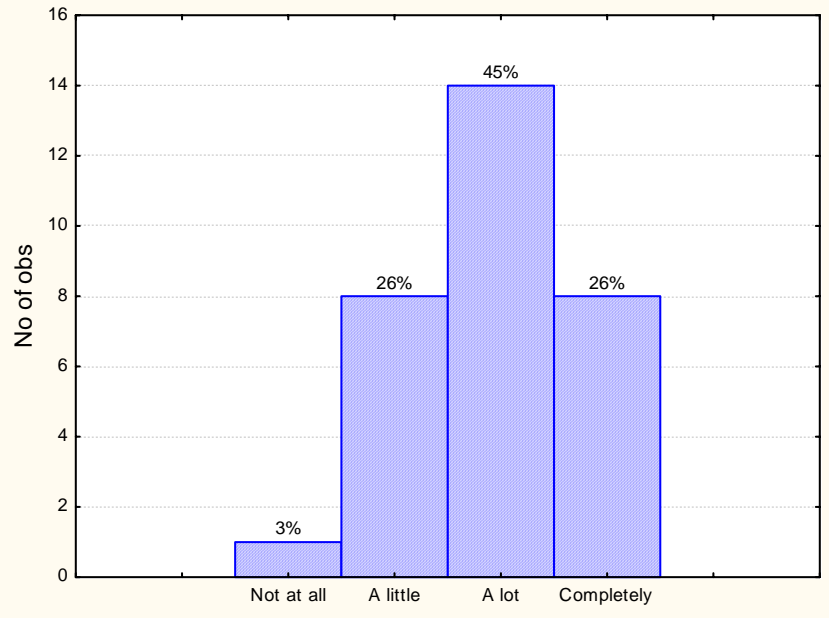


Figure 4.11: Indicates the analysis of nonconformities.

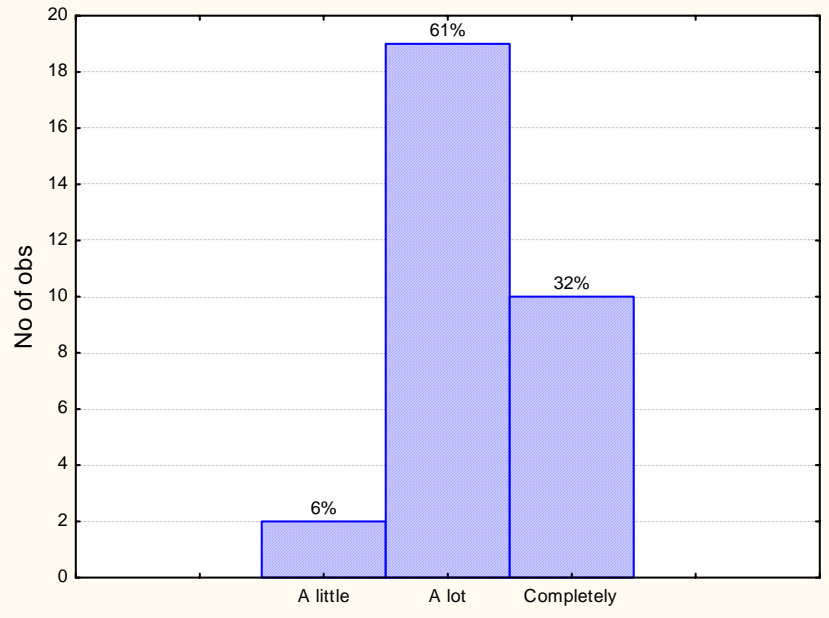
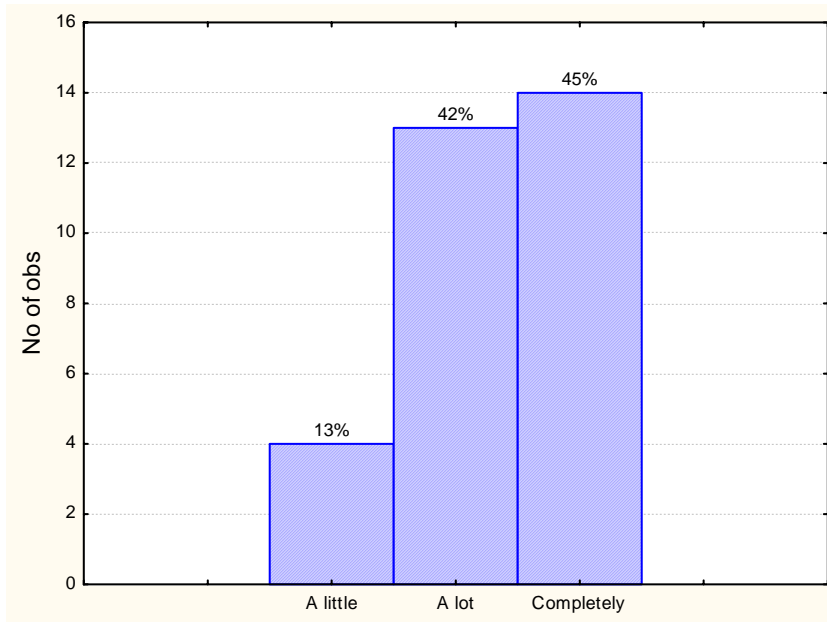


Figure 4.12: Indicates the positive effect of classifying nonconformities.



As can be seen with the response to question C1.3, a high percentage (45%) of the SMMEs think that by classifying nonconformities, this could have a positive affect on the company as indicated in **Figure 4.12**. In the next question, C1.4, that focuses on highlighting the area where the nonconformity occurred, 61% (**Figure 4.13**) of the recipients feel it will have a positive affect on the company, yet when you look at question C1.6 only 55% of the recipients think that it is critical to classify the nonconformity (**Figure 4.15**) and only 32% analyse all quality problems recorded (**Figure 4.14**) question C1.5, with only 32% of the recipients indicating where the nonconformities originate (**Figure 4.11**).

If you analyse the critical information that can be generated with the use of quality tools, and what has been highlighted with the response to this sub problem (questions C1.1 to C 1.6 in Annexure D), the following question can be asked: Are the

management of the SMMEs not focusing enough on the quality tools and possibly focusing too much on the QMS itself that is a requirement, because of the lack of knowledge and insight into the subject?

This can have far reaching effects on the company because of the incorrect focus by management on the system rather than the process being used.

Figure 4.13: Indicates the classification where the nonconformance occurred.

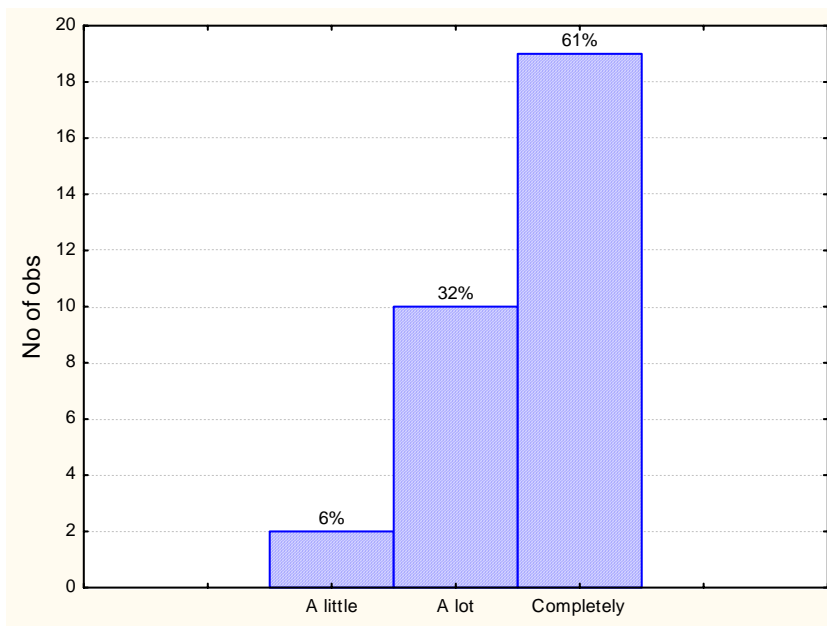


Figure 4.14: Response indicates the recording of quality problems.

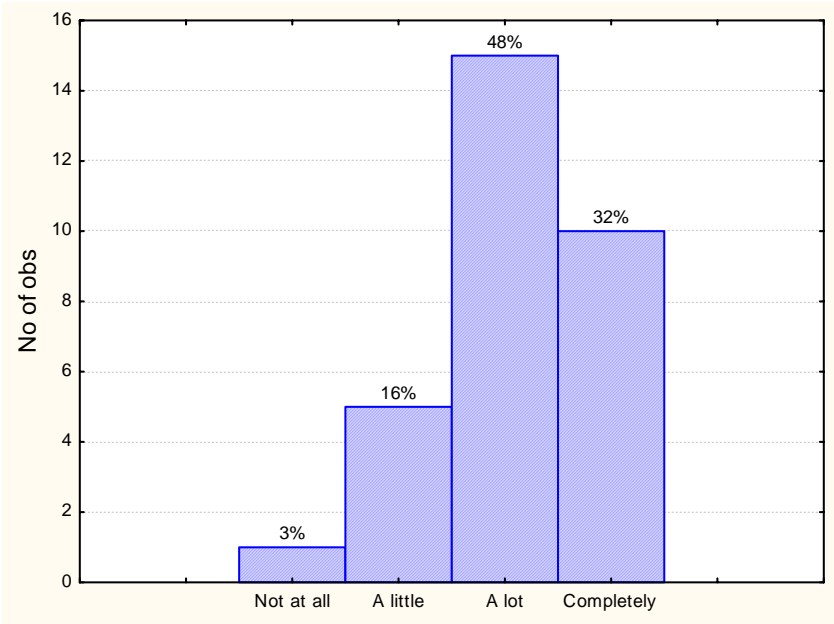
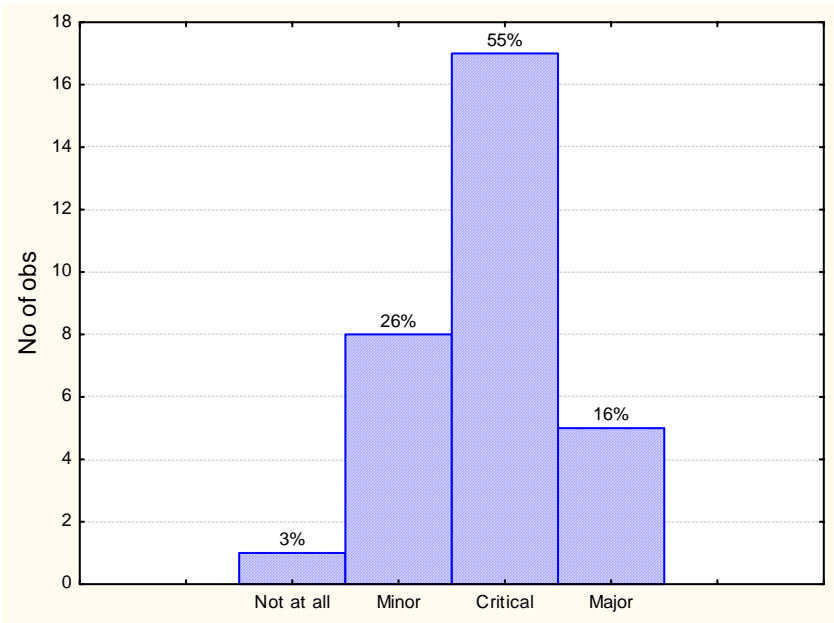


Figure 4.15: Response indication of nonconformities.



4.4.2. Sub-problem 2: How and to what extent do SMMEs use quality techniques to improve its processes?

Because the use of quality techniques are more prevalent in the larger companies as a result of the financial backing and/or available manpower, the results that the questionnaire generated confirmed that not many of the SMMEs use techniques to solve problems.

According to the Chambers Concise Dictionary (1988), “the difference between a tool and technique is that the tool is a working instrument and a technique is a method of performance, manipulation”. This means a lot more time, understanding and effort is required with the use of techniques as opposed to tools.

The analysis of this sub problem highlighted the fact that some of the SMMEs use quality techniques, which shows that they are committed to quality. 6% have shown that they are committed to the use of techniques, yet a further 80% use techniques **(Figure 4.16)**. **Figure 4.17** also shows that 6% have developed their own problem solving technique, and 83% solve problems with a proven problem solving technique or parts thereof which have been altered by the company to suit their requirements and the remainder don't make use of any problem solving techniques at all. The information used in **Figure 4.16 and 4.15** developed from the information in questions C2.1 and C2.2. Question C2.3 indicates 90% of all the companies that participated in

the questionnaire feel that quality techniques could assist companies if implemented (Figure 4.18).

Figure 4.16: Response indicates the use of problem solving techniques.

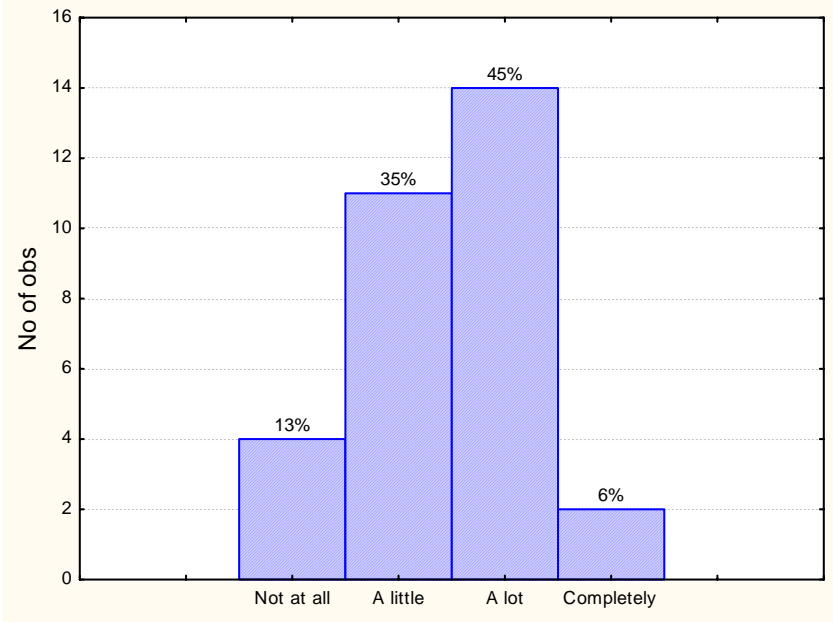


Figure 4.17: Response indicates the development of problem solving techniques.

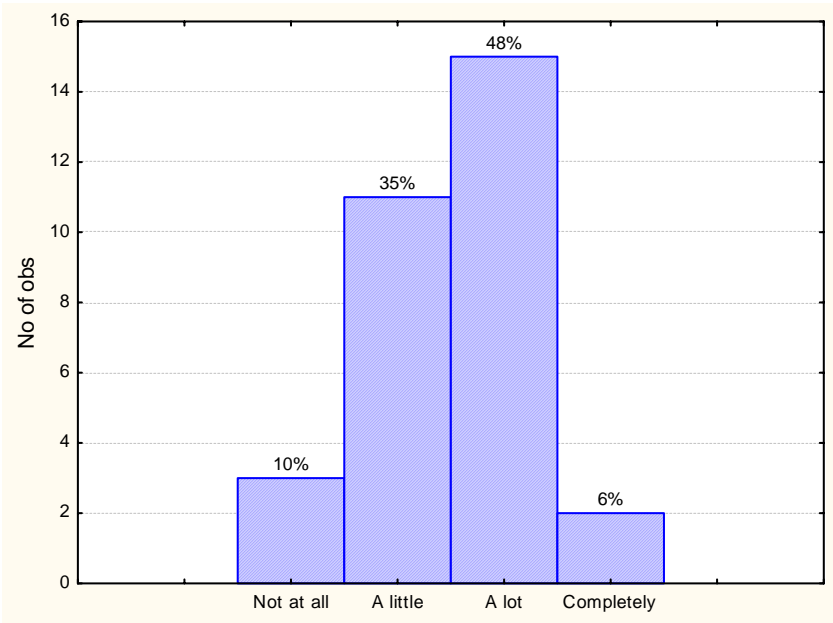
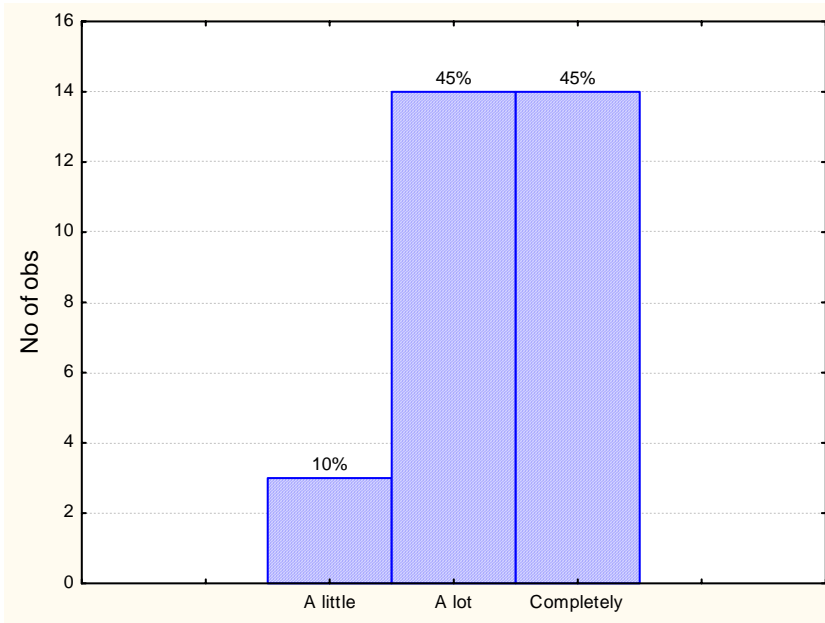


Figure 4.18: Response indicates the extent that quality techniques could assist companies.



The last question asked with regards to this sub problem analysed the introduction of quality techniques in the various companies. Almost 90% of the participants responded positively to this question.

This positive indication could lead to further research in the development of easy, basic and user-friendly quality techniques incorporating tools that could be used and implemented in the SMME sector.

4.4.3. Sub-problem 3: How and to what extent do SMMEs use quality models or systems to improve their processes?

This sub-problem focuses on the use of QMS and Quality Models in the SMME environment. The validity of some of the questions covered in this section will again be cross checked against some of the questions which address the same subject in sections A and B of the questionnaire (Annexure D).

As deduced in question B3 almost 70% of the recipients use the QMS ISO 9000. This is one of the more widely used and preferred QMS. **Figure 4.19** indicates that 60% of the recipients use a QMS; with a further 23% indicating that they use the system a lot (this could indicate that the companies only use it when required for example for window-dressing purposes, or the lack of knowledge from a management perspective regarding the use and understanding a QMS). This information corresponds with the information generated in question B3. Only one recipient has not implemented a QMS.

One of the prerequisites set by the larger companies is that if you supply critical parts or service to them, the “supply company” must be ISO 9001 accredited. This prerequisite is also indicated in the ISO 9000 guidelines, so as to ensure that your suppliers conform to certain agreed to set of requirements that can be monitored, evaluated and audited on a regular basis. As can be seen by **Figure 4.20**, 42% of the recipients were required to conform to a QMS, as this was a requirement set in place

by their customer base, and a further 19% indicated that their customers feel very strongly that the SMME puts a QMS in place.

It is therefore assumed that the other 39% had little or no pressure placed on them to implement the QMS, but possibly implemented it because of the checks and balances the QMS puts in place to improve productivity and quality.

As indicated by the question 3 in section A, all recipients have a quality function in place in the companies, which shows that the focus on quality is a very important and integrated part of any industry.

Figure 4.19: Response indicates the implementation of a QMS.

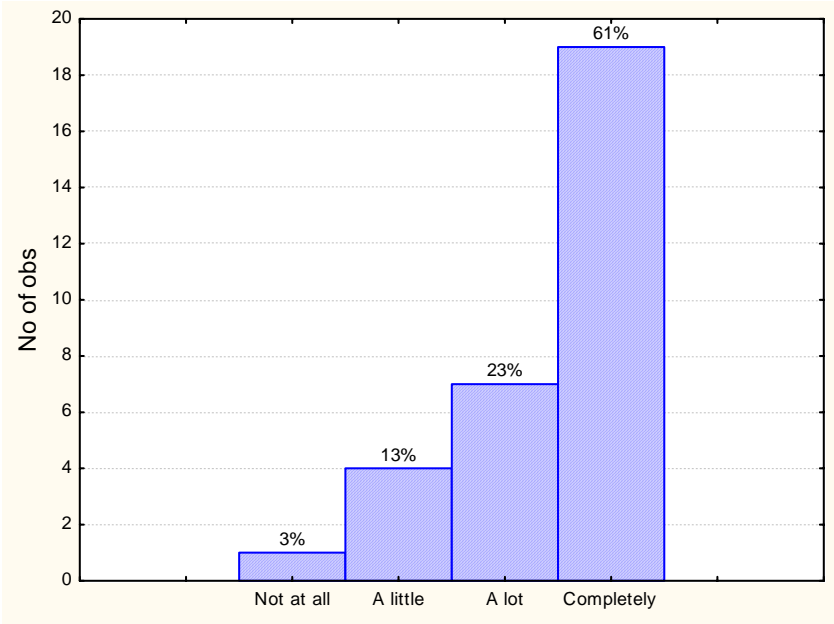
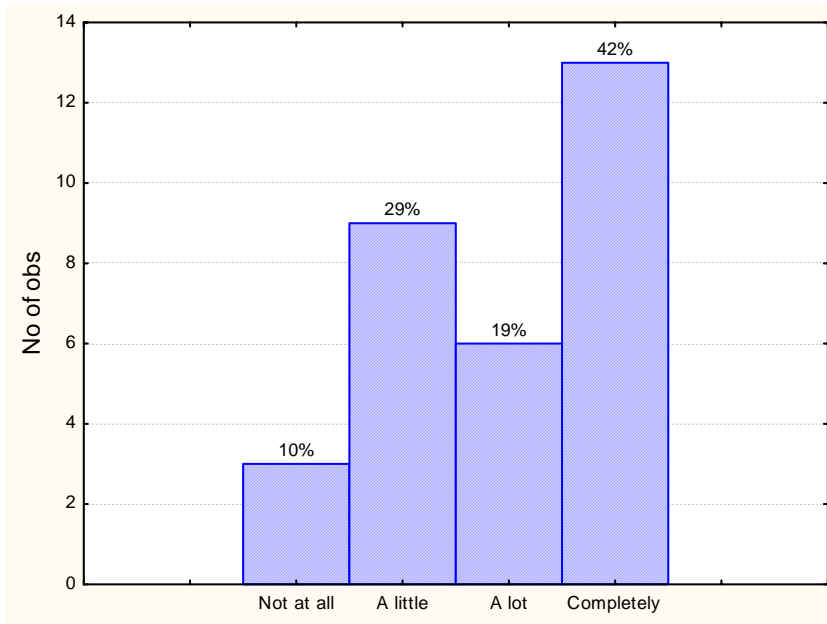


Figure 4.20: Response indicates insurances from customers to implement a QMS.



The research also shows that only 10% of all the recipients require their suppliers to conform to a formal QMS (Annexure E, question C3). This shows that most of the SMMEs are probably at the start of the QMS requirement process, as set out by ISO 9000 (requiring certain suppliers to have a QMS accreditation to supply the company).

One of the reasons that could lead to the fact that a lot of SMMEs do not use quality tools could possibly be because of the high percentage (91%) of the SMMEs that used consultants to implement the QMS (as indicated in Figure 4.21). This is definitely an indicator that the management does either not have the time, knowledge or resources to implement a QMS.

Figure 4.21: Response indicates if a consultant was used for the QMS implementation.

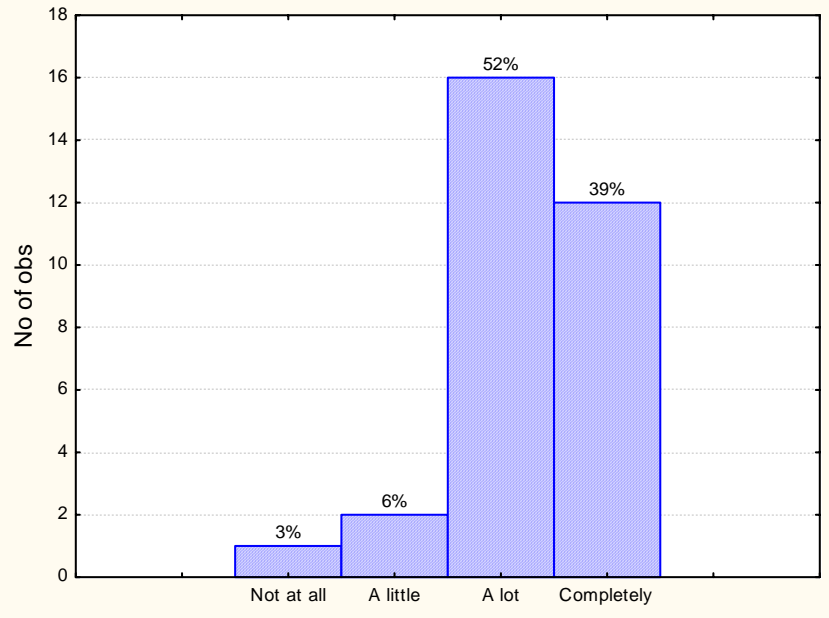
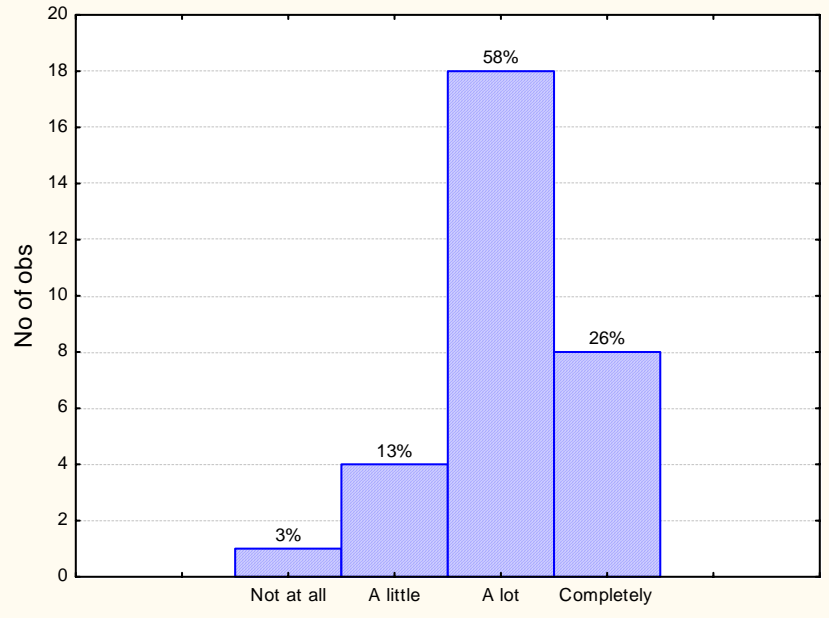


Figure 4.22: Response indicates the positive effect of a QMS.



So the question then arises, what can be done to assist the SMME sector to implement quality tools or to a lesser extent quality techniques?

What is a positive indicator is that, as shown in **Figure 4.22**, 81% of the recipients have indicated that the implementation of a QMS in the company has had a positive effect on the company and that about 75% of the recipients have indicated that the employees have accepted and support the change (**Figure 4.23**) and 91% of the management supporting the QMS as indicated in **Figure 4.24**. For the SMME sector, the researcher feels that this is a good indicator because of the limited or lack of exposure to QMS this sector has had as opposed to the larger organisations.

Figure 4.23: Response indicates QMS acceptance by employees.

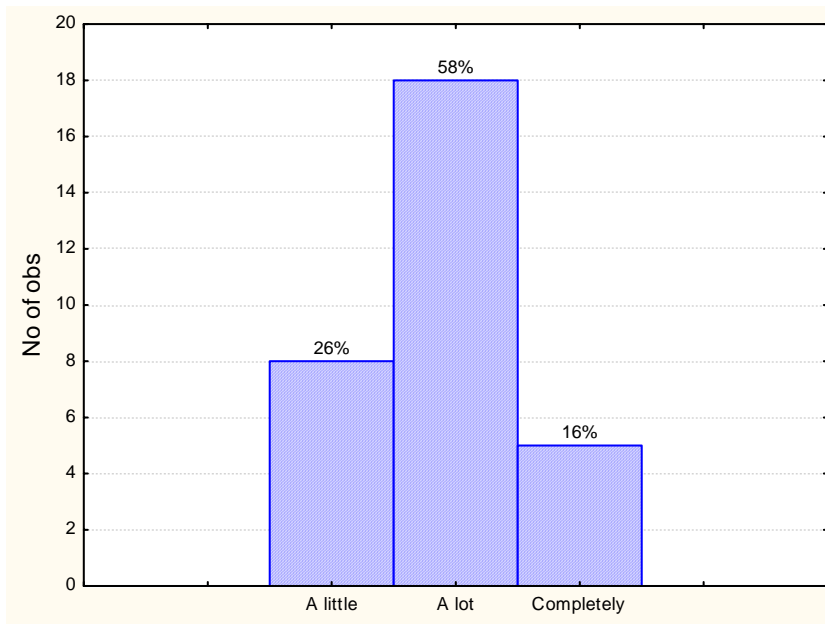


Figure 4.24: Response indicates management support of QMS.

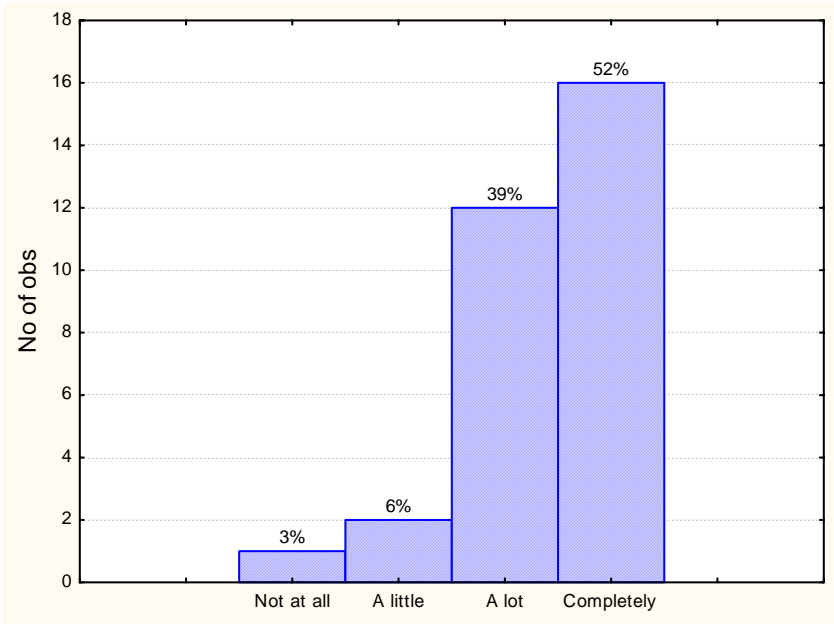


Figure 4.25: Response indicates quality audits conducted by customers.

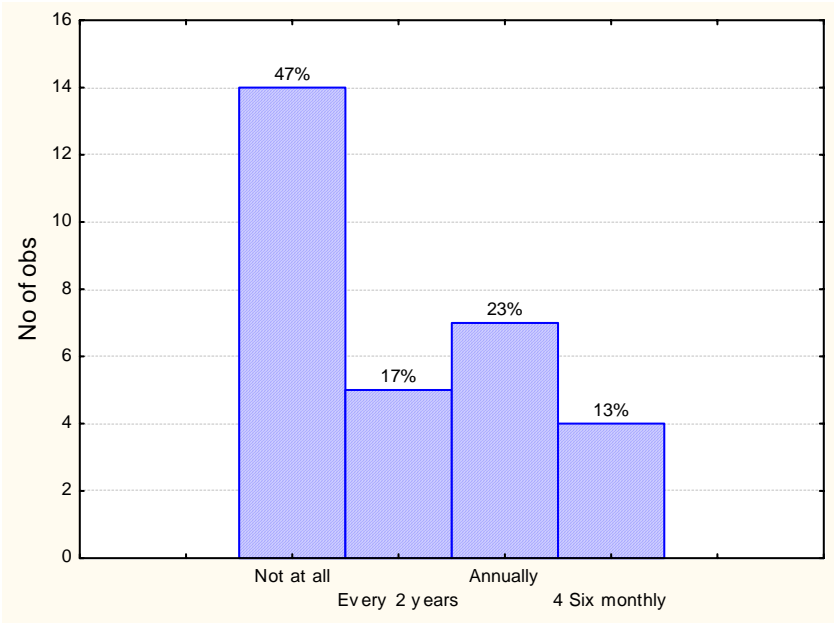


Figure 4.25 indicates that almost 50% of the companies the SMME supplies do not audit them. This could also be an indicator why the SMME sector does not use quality tools. The response to question 3.13 (Annexure E) indicates that almost 50% of the SMMEs that have a formal QMS, perform an internal quality audit on a monthly basis, with a further 35% doing it annually.

The response to question 3.14 regarding the visibility of the QMS in the company indicates that 80% of the SMMEs that returned the questionnaire say that they display that the company is accredited. This, the researcher feels is also a good thing as it give both the customers and employees confidence.

Question C3.11 cross checks the validity of the question which asked whether the company has a dedicated quality representative against the same question asked in section A (**Figure 4.26 and Figure 4.27**). This percentage drops from 94% to 71%, it could be assumed that the difference in responses to the two questions could be that they were interpreted differently.

Figure 4.26: Response indicates an appointed quality representative.

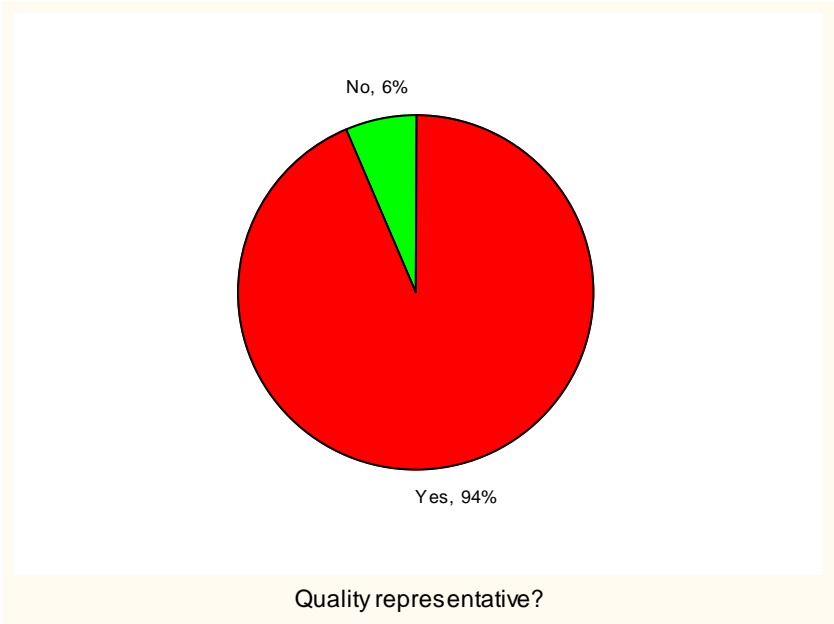
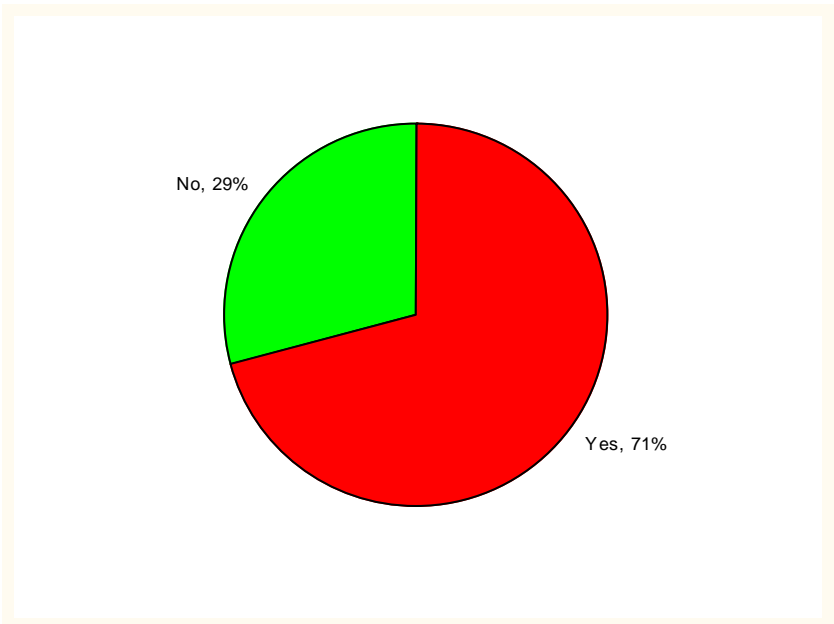


Figure 4.27: Response indicates a dedicated quality representative.



4.4.4. Sub-problem 4: How and to what extent does management display awareness and commitment to the change process?

This sub-problem focuses on the management of the SMME sector, investigating how pro-active it is with regards current tools and techniques, new tools or techniques introduced to them or specified quality initiatives required by the customers.

During the researcher's interview and discussion process with the larger companies, one point that most of the representatives of the larger companies made was that the larger companies had initiated the start-up and assisted with the development of certain SMMEs that supply them. These large companies now have to play nursemaid to these SMMEs as some of the owners of these SMMEs do not have the expertise or knowledge of how to run a company, but this statement does not apply to all the SMMEs.

Discussions with the larger companies also showed that a lot of the SMMEs that were started, were started by people who were technical experts in the field of what they now supply or manufacture and according to the interviews held with the larger companies, they feel that some of these SMMEs lack in management skills and knowledge when it comes to the actual running of these companies, but again this comment does not pertain to the entire spectrum of the SMME sector.

Most of the responses to this sub-problem from the questions that were set out in the questionnaire (Annexure D) indicate that the graphs are skewed to the left side (see

Table 5.4 in chapter 5). This is also indicated in the figures generated for this sub-problem, which show that the respondents do very little or nothing at all with regards the specific questions set for this problem.

Figure 4.28 indicates a positive response to the support of quality initiatives (87%), with none of the recipients having no interest with this question. It is therefore assumed that the management of all SMMEs know what effect quality initiative can have on the growth of the organisation.

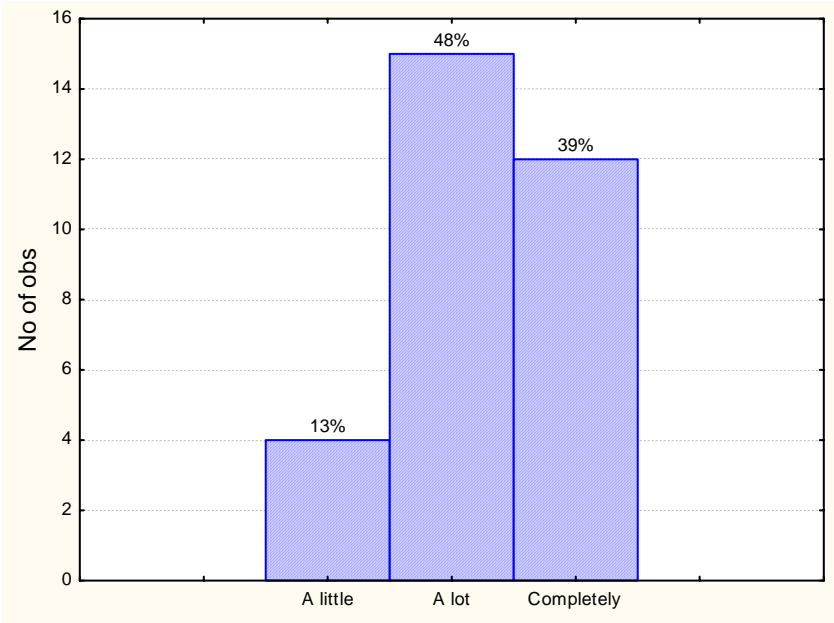
The next question (C4.2) is concerning, with only 16% of the recipients indicating that the budgeting for a continual improvement processes is a priority, with a further 29% indicating they do some budgeting (**Figure 4.29**). When it comes to budgeting for continuous improvement programs it is a very contentious issue as certain senior management look at this as an area where the company could save money rather than spend it.

The benefits of any improvement program do not happen overnight, but if a program is introduced and nurtured correctly, the future benefits to the company could be positive, with the companies' possibility starting to reap the rewards within one to two years. In small companies the rewards could be a lot sooner.

Questions 4.3, 4.4 and 4.5 focuses on suggestion schemes and rewards connected with these schemes. As can be seen by the results (Annexure E) not many companies have a formal suggestion scheme, with only two of the recipients

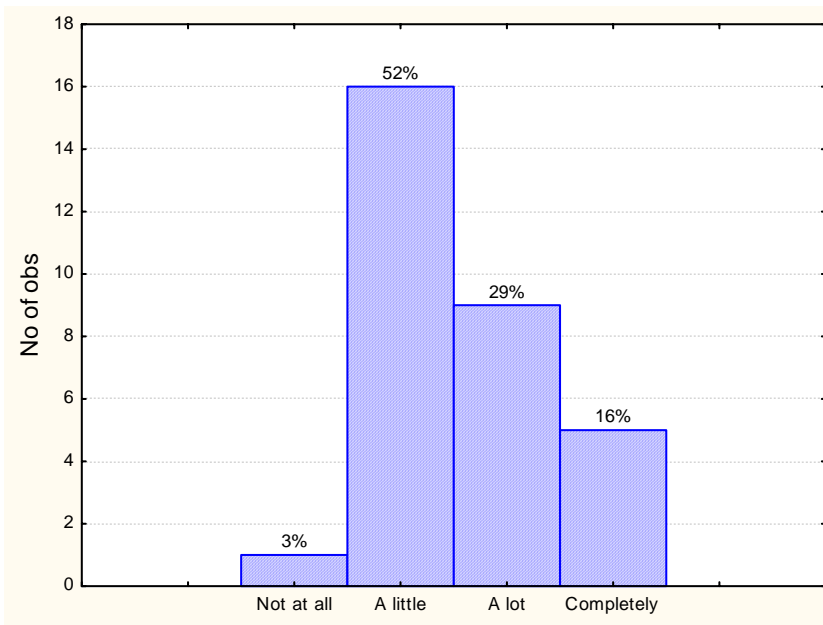
indicating that they have a reward program linked to the system. This possibly does not give the employees a chance to use their creative imagination with regards to the introduction of new or improved ideas.

Figure 4.28: Response indicates management support of quality initiatives.



It is the researcher's assumption (based on the researcher's experience in industry) that there is a very broad knowledge base available on any production floor waiting to be untapped (the operators know how to improve their own jobs), but the employees possibly feel that they are not given the opportunity, are too scared to suggest new

Figure 4.29: Response indicates a budget for continuous improvement programs.



ways of doing things or could also possibly feel that they (the operators) do not get the support or recognition from management. This is shown in **Figure 4.30** (number of suggestions successfully implemented) and **Figure 4.31** (use of team based initiatives). This could indicate that there is no systematic way of managing quality and productivity. Rather an ad hoc approach is used, or firefighting as it is referred to in industry.

Figure 4.30: Response indicates a register of successful quality proposals implemented.

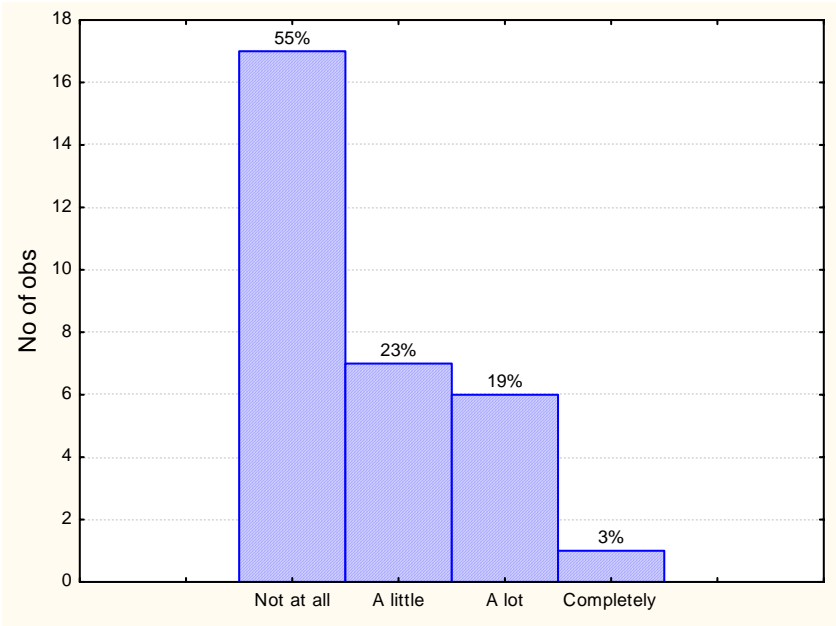


Figure 4.31: Response indicates team based quality initiatives.

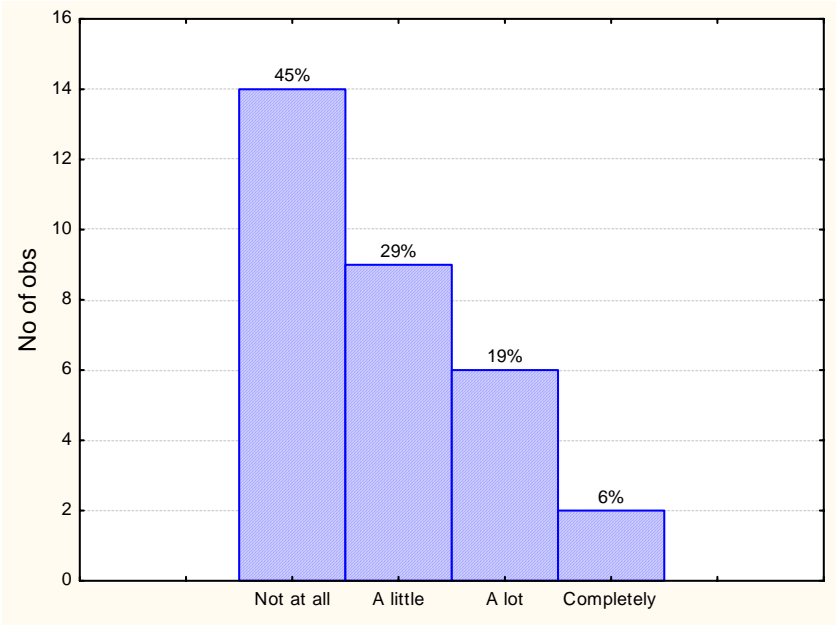
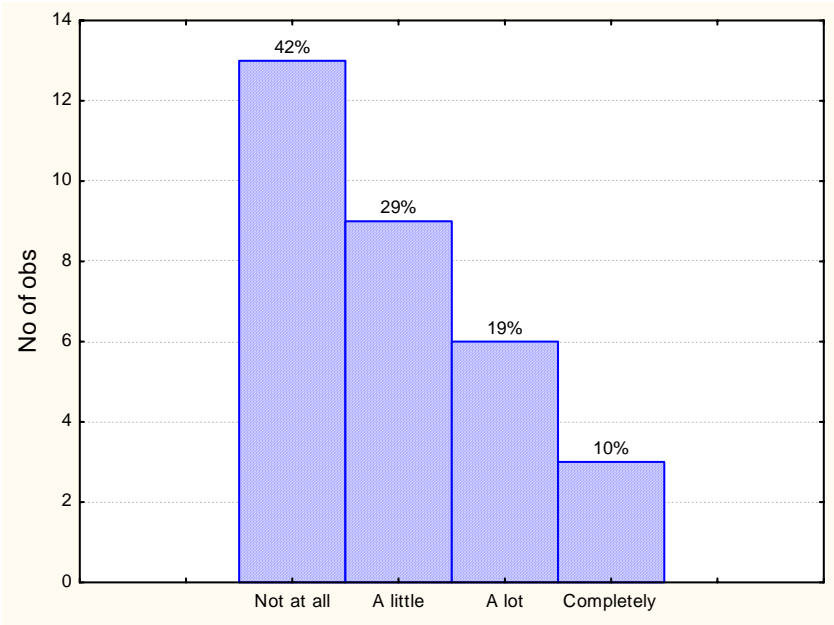


Figure 4.32 supports the above comment, indicating that “little or no” suggestions or initiatives following a structured approach for successful implementation. This means that there is no “road map” put in place to follow to assure a positive outcome of any suggestion or initiatives highlighted by employees.

Figure 4.32: Responses indicate whether initiatives follow a structured approach.



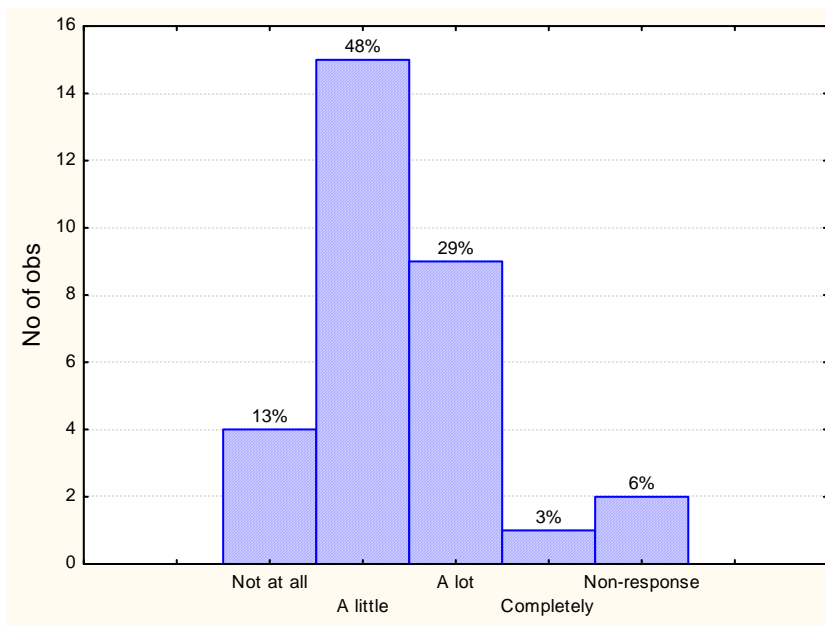
4.4.5. Sub-problem 5: How and to what extent does productivity have an effect on the organisation?

This sub-problem is linked closely to the previous one. Therefore some of the comments made regarding the previous sub problem are also pertinent to this one. The researcher assumes that the results of this sub problem are directly linked to the fact that management either has no knowledge, training, finances, capacity or a

combination of a number of these factors to focus on this area (this is again shown by the skewed result attained from the questionnaire **Table 5.5** in Chapter Five).

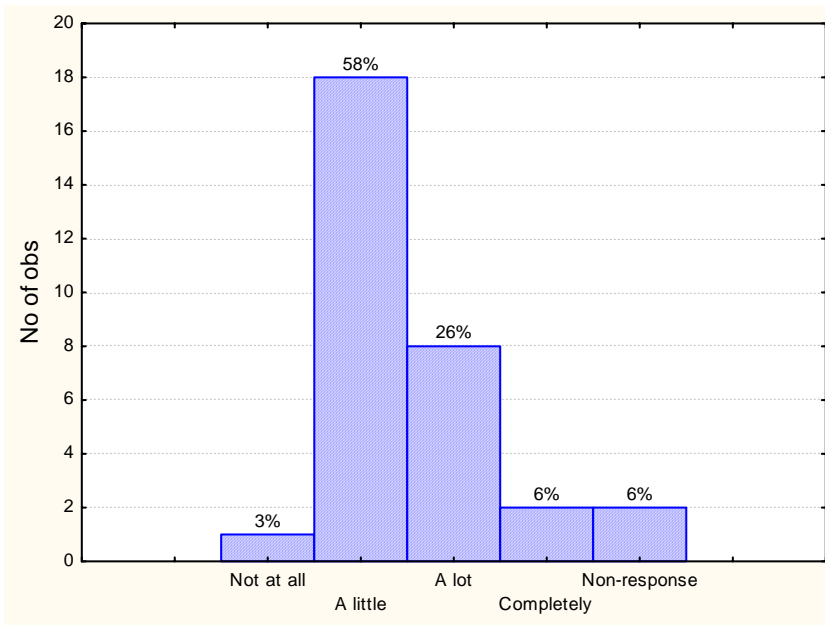
With regards the employees, again as per comments made in the previous sub problem, the researcher feels the same comments can be made to address this sub problem. It could also be because there is a lack of vision from management or that the employees possibly do not want to “rock the boat”.

Figure 4.33: Response indicates team based promoted quality initiatives.



Question 5.2 (**Figure 4.33**) indicates 61% of the recipients feel team based initiatives have little or no effect promoting quality and productivity. During the interview sessions with the larger companies, the management indicates that the team based initiatives for the basis of quality and productivity improvements is imperative for the survival of any company.

Figure 4.34: Response indicates use of quality initiatives by supervision.



Question 5.3 (**Figure 4.34**) again indicates that approximately 60% of the recipients felt that the supervision do not support quality initiatives as they do not get the required support from management in return, again, going back to sub problem four regarding the comment made by the researcher addressing possible management shortcomings.

Figure 4.35: Responses indicate implementation of team based quality initiatives.

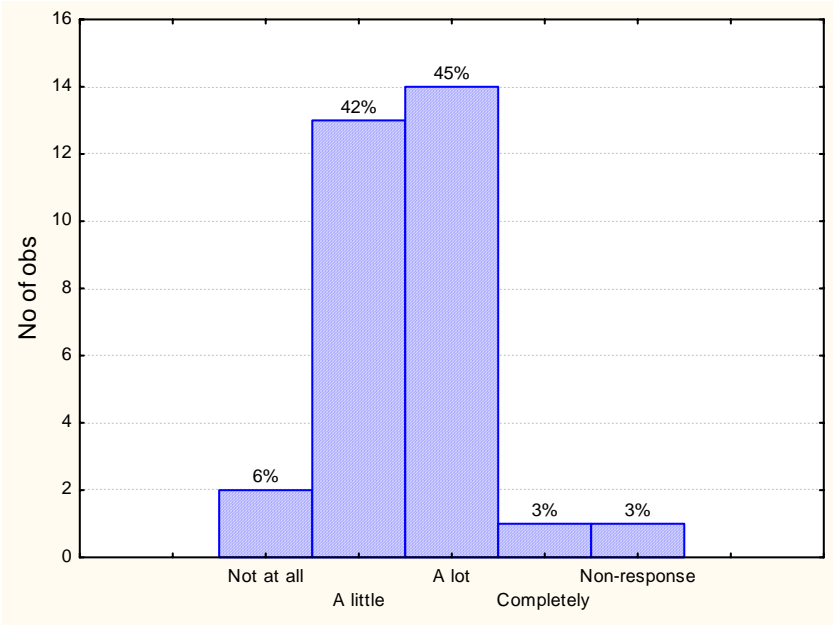
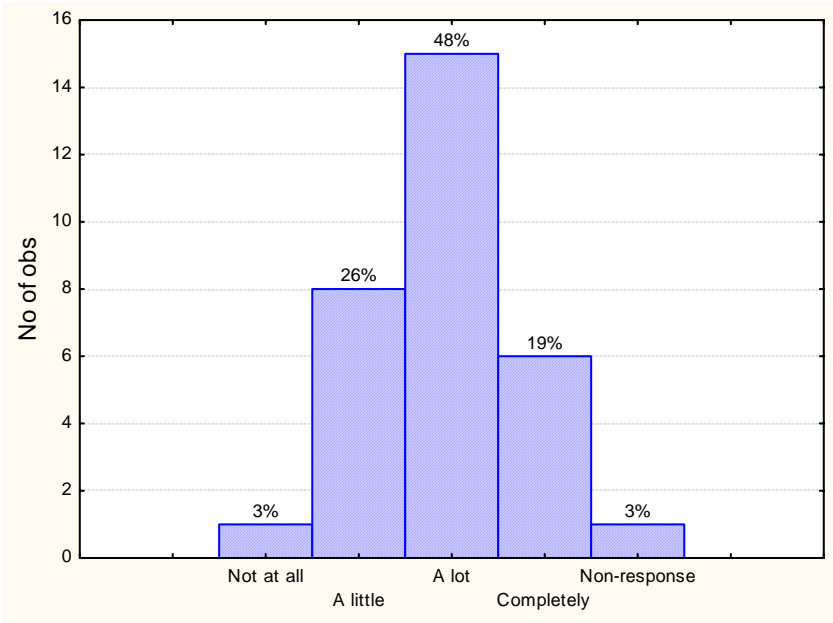


Figure 4.36: Responses indicate the acceptance of productivity improvement initiatives by employees.



The last question shows that the employees of any organisation are very flexible with regards new initiatives introduced. Almost 70% of the respondents showed that the employees are willing to try new tools, techniques, systems or models (shown in **Figure 4.36**), which again questions certain of the SMME management's ability to manage (knowledge, education, training and support).

4.5. GENERAL COMMENTS MADE BY SMMEs DURING THE QUESTIONNAIRE PROCESS

Allowance was made in the questionnaire (see Annexure D) for the recipients to make comments. This opportunity was not used by the majority of the respondents, yet certain of the SMMEs had some important information to share.

One of the companies indicated that they implemented the QMS themselves, stating that because they (the company) implemented the QMS, the QMS was more successful than if someone else implemented the QMS. This was due to the fact that the company could understand the mechanics of the QMS a lot better, resulting in a better understanding of the process and which has lead to improved outcomes. A general comment made was the importance of a QMS and the necessity to control the QMS correctly for it to be a success which will benefit the company in the long run.

One company had successfully implemented ISO 9000, but due to staff and financial constraints had lost its accreditation status. This company however is carrying on using certain of the critical elements set out by the QMS in its day-to-day activities as a controlling mechanism to assist the company with its quality and productivity initiatives.

Some of the companies stated that they use certain tools which they have customized specifically for their company as a measure to evaluate and help with some of the processes and scrap control.

80% of the companies that completed the questionnaire (questions 3.5 and 3.9 in the questionnaire) stated that they have seen the benefits of the introduction of a QMS in their respective companies, resulting in a continual improvement culture being introduced into their specific company. One company stated that it is trying to link the QMS with an accounting and a resource management planning system (similar to the SAP system used in larger companies).

The following are direct interpretation/comments made by the recipients:

“Since our organisation being small, suggestions are discussed daily at start-up meetings, in order for each and every individual to voice his opinion pertaining to the subject for the benefit of everybody” and, “the concept of “quality” is good. However as a supplier to automotive manufacturers we feel that we are at the rough end of the stick. Our customers apply the “stick” to make us conform with little or no support. Their middle management is busy and top management conveniently, the researcher

believes; do not know what's happening. Communication is not really there and as a supplier, the researcher feels that has a battle on (with systems that our customers do not adhere to) regardless, and it creates negative feelings”.

4.6. INFORMAL INTERVIEWS AND QUESTIONNAIRES WITH THE SMME COMPANIES

After evaluating the results of the questionnaires returned by the SMME sector, the researcher felt that a clearer and better picture would be able to be concluded if an interview session was developed and conducted with a small sample of SMME companies that submitted the questionnaires. A sample of eight companies were approached, from the original 31 companies that completed the questionnaire, of which six companies agreed to the interview.

A set of standard discussion questions were set up (**see Annexure G**) so that the researcher could develop a better picture and understanding from the SMMEs' perspective (over and above the questionnaires that were sent out) regarding the use and utilization of a QMS in an SMME environment.

From the researcher's experience and as mentioned in Chapter Three, people are much more willing to open up at a discussion session than complete a questionnaire. The profile of the sample of SMMEs interviewed is indicated in **Table 4.2**.

Table 4.2: Profile of the SMME companies interviewed.

| Number of employees | Type of process | QMS implemented | Year implemented | Accreditation Body |
|----------------------------|------------------------|------------------------|-------------------------|---------------------------|
| 130 | Machining | ISO 9001 | 1995 | SABS |
| 30 | Machining | TS 16949 | 2000 | TUV |
| 69 | Printing | ISO 9001 | 2004 | SABS |
| 16 | Plastics | ISO 9001 | 2004 | DQS |
| 45 | Furniture | ISO 9001 | 2001 | DEKRA |
| 28 | Adhesives | ISO 9001 | 1999 | DGQ |

The questions pertaining to the informal interviews conducted with the SMME sector will now be addressed individually.

4.6.1. Discuss the reasons for the implementation of your QMS

This question was asked because the researcher wanted to establish if the implementation was as a result of a requirement set out by a customer, or if it was initiated in by the management of the company. Of the six companies interviewed, three stated that it was a requirement from their customer. One of the recipients commented that he knew that it was going to be a requirement, so he was being proactive. The last two companies stated that they introduced the QMS as a self improvement process.

4.6.2. Was new business generated because of the implementation of the QMS?

This question was attempting to establish if the implementation of the QMS had acted as a catalyst to generate new business.

Only two of the companies' interview monitored if new business was generated. Both these companies broke into the export market because of the implementation of the QMS. Two companies stated that no new business was generated, but one of these companies commented that the QMS had secured its current business. One company stated that the QMS had generated very little extra business but it was used as a marketing tool, with the last company stating that they thought it was, but it was not monitored.

4.6.3. Did the company calculate the cost of the implementation?

All the companies apart from one had the approximate costing information, stating that the implementation cost varies from R 35 000 to R 70 000.

The ongoing QMS running costs (excluding staffing) ranged from between R18 000 and R 30 000 per annum depending on the number of external audits conducted by the accreditation company. Only one audit was conducted per annum if the SMME was accredited by an international accreditation body and two if it was a local body.

4.6.4. Explain the cost benefits resulting from the implementation of the QMS

This question got a variety of responses, predominately positive. The researcher generated interesting information with this question. The responses are as follows:

- The company did benefit, because it grew about 60% and got export orders

- The QMS slowed things down, more checks and surveillance required on work produced. This is not practical for a company with a job shop environment
- The QMS has paid for itself over and over
- Generated more business than the QMS cost the company. The company cannot operate without it now
- The QMS has made the company more aware of the waste situation. This has resulted in a reduction of waste and created more of an awareness on the shop floor to rework waste
- The company has become more critical with regards waste analysis and the process has helped with cost reduction projects. A QMS is a must for any organisation as the advantages outweigh the disadvantages.

4.6.5. Discussion of the benefits that stood out the most because of the implementation

All the companies' interview noticed that vast improvements in the process occurred after the implementation of the QMS. The most noticeable are as follows:

- A major reduction in customer complaints, new business generated and the new QMS standards. The company worked to certain standards before ISO 9001 was introduced which was acceptable, but the QMS improved those standards dramatically
- One permanent long term customer

- Total mind set change, staff more quality concise and more proactive when it comes to service delivery now
- The turnover is growing about 50% per annum and the required training has resulted in more skilled operators now
- The improvement in waste reduction was the most noticeable. Other noticeable factors were the credibility of the company, improved marketing, quality awareness of staff and the introduction of training.

4.6.6. How did the operators accept and use the introduced QMS?

The general response from all the companies was that the operators mostly accepted the changes and understood what the management was trying to achieve. The various responses to this question are as follows:

- Operators do understand, and trained operators got opportunities of going on quality courses and improving their quality qualifications. Six of these operators are now qualified internal auditors
- Yes and no, operators have to know how to fill in inspection sheets. This is therefore marginalizing operators with standard 4 (grade 6) or a lesser education
- Yes, operators understand the QMS, operators were not forced but went along because of the benefits
- Operators not forced to use it, operators accepted it as it comes with the process.
- It does affect operators with limited education, therefore, subsequent training needs to be covered with those operators, but allowance is made for this training

- Operators understand and are trained, and supervisors are trained as operators.
Staff bought into the process.

4.6.7. Explain how the implementation increased the overall awareness regarding Improvements

There was a unanimous agreement from all the recipients that the process did definitely improve awareness towards not only quality but productivity as well. Staff are now willing to get involved with improvement processes.

One company stated that the processes created more visual aids within the company and operators are more aware of cost related incidents. It resulted in the implementation of SPC (statistical process control) and MSA (measuring systems analysis). Certain of the operators had the opportunity of training up as quality auditors and are now conducting system and process audits.

Another company stated that the housekeeping, neatness and presentation of the final product improved.

4.6.7. Has the exercise been a painful experience?

Again the answer from most of the recipients was positive the comments were recorded as follows:

- Yes, a new experience and a lot of paperwork, the company is currently-upgrading to a paperless system
- Yes and still is
- Yes, a mind set change, not difficult but a cumbersome process
- Yes it has been and hurt the wallet, but did increase turnover
- Not really, a lot of processes already in place prior to the implementation of ISO 9001. Therefore the existing processes were taken and fitted into ISO 9001 requirements, formalising the process
- Yes, initially, a mindset change and has resulted in additional work, but has improved.

4.6.9. Do you envisage long term improvements for your company after implementation?

All the companies interviewed had used the QMS as a stepping stone to institute improvements into their organisations. The implementation of a QMS seemed to be a catalyst for the companies to succeed in other areas. These are the comments on this question:

- Have got ISO9001, TS16949 and VDA6, am now striving for ISO 14001
- The company has benefited, but hoping it is going to be an ongoing process
- One of the goals set was a reduction in scrap which the company achieved. The company is also positive that it will receive further international business
- With the mind set change achieved, the company can only grow

- The company wants to cut down further on waste and achieve an improved turnover
- Continual improvements are ongoing; quality focus is now being built into the process.

4.6.10. What was the effect on the company with regards the implementation of the QMS process?

All the recipients that took part in the interview session only had positive comments to make with regards the implementation of a QMS. These are listed as follows:

- Operators are more proactive, team leaders have gone on advanced quality training courses, without ISO 9001 this would not have happened
- More organised, a place for everything, paperwork is a problem as it increases the paper trail, there are benefits but the thing is overbearing and expensive possibly the bigger manufacturers get a slice of the cake, therefore the larger manufacturers make sure this process stays
- Overall very positive, but continual training processes are required to keep the quality and service of a top standard
- Improved housekeeping, things in their place are now easier to find
- Did not affect the bottom line or loss of clients, but is currently being used as a marketing tool to create quality awareness and improve optimization

- Positive, costing initially a big problem, but the system as mentioned previously has paid for itself, has lead to new business and other add-ons. Has lead to the enhancement of the QMS and has highlighted the need for further training.

4.7. INFORMAL INTERVIEWS AND QUESTIONNAIRES WITH LARGER COMPANIES'

A sample of five larger companies were selected on a random basis to evaluate the confidence level of the larger companies with regards their SMME suppliers.

Table 3.3 indicates the number of larger companies approached for the sample. Chapter Three explained the reasons why some of the companies did not want to participate in the exercise.

Table 4.3 indicates the level of personnel that the interviews were conducted with, which addressed ten questions (see **Annexure F**). These questions were covered on an informal basis and the results for each of the questions are listed. One company had two senior management employees at the interview session to make sure all the questions were addressed correctly.

As can be seen from the variety of questions asked (**Annexure F**), the researcher tried to view the SMME sector from a different perspective. The senior management of the larger companies were more than willing to make time available to discuss success stories, problem areas, set-backs, disappointments and any other areas of concern regarding the SMME sector.

The researcher found this information extremely important and interesting, coupled with the different views taken by the larger companies (Mother Company) management on their SMME supplier sector.

Table 4.3: Level of the larger companies personnel interviewed.

| ORGANISATIONAL LEVEL | NUMBER INTERVIEWED |
|--|---------------------------|
| Managing Director | 1 |
| Quality Manager | 2 |
| Supplier Quality and Development Manager | 1 |
| Purchasing Manager | 1 |

One of the biggest concerns of the larger companies is the “Chinese Imports” or “China Problem”, with the supply of cheaper products imported from China. The larger companies do not believe the SMME sector is aware of this problem, or that they (the SMME sector) are ignoring the problem and hoping it will disappear.

The questions pertaining to the informal interviews will now be addressed individually.

4.7.1. The first question addressed the reason why larger companies’ support the SMME sector

This question focused on the reasons why the mother company should support the SMME sector. A number of the larger companies have got no option now but to support this sector because of the availability and the relationship built up. Some of

the larger companies have also put a lot of time and effort into the development of some of these SMMEs, which has resulted in these SMMEs now becoming a necessity.

The comments made during the interviews pertaining to this question are as follows:

- Availability of local component requirements
- Have developed some, the SMME will fail if support is retracted
- Outsourcing is part of the commercial operation
- Space restrictions, therefore work is outsourced
- Necessity, the company does not have sufficient capacity to cope with the workload
- Politically motivated and
- If accredited with the larger company's requirements, the larger company will use that company as a supplier regardless of size.

4.7.2. This question investigated the benefits the larger companies' get if the support the SMME sector

One of the larger companies stated that they were very concerned about what the government is doing with the introduction of new laws being passed where the "scorecard" for government tenders has been changed with regards the reduced support of the SMME or local sector.

This might force the larger companies to go the China Route (importing) rather than using the local or SMME sector because of price. Larger companies are looking at retrenchment or other options of price reduction because their competition can import the same products they are making much cheaper.

These are the responses to this question from the larger companies:

- Adds to required scorecard
- Close and local
- Developed on site
- In the long run will save money
- Points allocated for SMME development
- Previously beneficial to larger companies, those benefits have now been removed by government
- No rebates or government contracts for the use of local or development SMMEs
- Quicker response than larger companies
- “Mother company” is allowed to interfere with the day-to-day running of some SMMEs
- Accommodating
- No major benefits, apart from helping develop SMME
- Government contracts and
- SMMEs are used more on the indirect procurement side, less quality control required.

4.7.3. The researcher investigated the use of QMS in the SMME sector from a larger company's perspective

Most of the larger companies indicated that they had agreed to certain specified requirements that have to be met before any other company can start supplying them. If the SMME does not have a QMS in place, but could possibly turn out to be a major supplier, that SMME is given a time period to get the required accreditation, or lose the contract.

These are the views with regards this question:

- Yes, some have their own QMS which is acceptable to larger company's requirements, otherwise the SMME has to adhere to the larger company's requirements
- "Quality is controlled by mother company"
- Depends on the importance of material supplier and the effect it could have on the larger company's product and
- Larger companies do get involved where critical parts are supplied.

4.7.4. This question investigates the availability of support from the mother company for the SMME supplier

According to **all** the interviewees, the quality of critical items is not negotiable, if any company irrespective who, large or small, is having a quality problem, which it cannot solve, the larger company will assist.

The larger companies have more resources and sometimes more expertise in specialized areas and stressed that they would assist their suppliers who had problems with the product to be supplied to the larger companies, as the problem would later become their problem.

A support system between the various automotive manufacturers (OEMs) has been set up, that if one specific supplier (who might supply the broad spectrum of the motor industry) is having quality problems, an agreed OEM will assist to solve the quality problem because it could have a knock on effect and affect all the other OEMs. This saves the motor industry money and time as they are supporting each other with regards quality.

Listed are the responses from the interviewees (of how they promote quality in their suppliers):

- Regular audits
- Available any time at all times to assist the SMME sector

- Train supplier SMMEs operators
- Supplier specialized staff to assist in problem areas
- Back-up support for maintenance or breakdowns
- Advise on critical machine purchases
- Support with the development and testing of new or improved processes, which the SMME will eventually take over
- Assist with problem solving and with critical information or testing
- As set out by customer requirements, teams are sent out to SMMEs to assist not only with quality, but also productivity improvements as this will have an impact on the cost of the supply, and
- Agreement set up by the motor manufacturers to assist one another's common suppliers to achieve agreed to quality specifications.

4.7.5. Question five investigates the knowledge that the larger companies' might have regarding the use of quality tools and techniques by the SMME supplier

As mentioned previously, the larger companies focus on the critical parts that are supplied to them. They accept that if an SMME is accredited, then it must follow the set out requirements as stipulated in that particular QMS. As per the question investigated in the questionnaire addressing this issue, this seems to be a very contentious area. This can also be seen in **Table 4.1** as per the use of tools.

It cannot be stressed enough that this is one of the most critical areas to monitor and to assess the manufacturing and supply process. The correct tool must be highlighted for the task and applied. If monitored and controlled by a correctly trained operator, tools can be very beneficial to any organisation.

Here are the comments made by the interviewees regarding this question:

- If a QMS is not in place for critical parts supplied by an SMME, no stock will be accepted from that company, as per tools used by the SMME sector that supply them, don't know what tools they use to evaluate quality
- Yes to the supply of products, but also monitor productivity induces (standard time), customer will only pay for products supplied according the standard time calculation
- Yes, it is a requirement to have a monitoring system in place
- Certain SMMEs do not monitor their scrap rate. If done correctly this could have an affect on the cost and profits and
- If a tool is used to monitor a critical process by the SMME, it is acceptable by the customer as long as it controls the quality and proof can be shown with regards effectiveness.

4.7.6. Question six investigates an audit and/or rating system used for the SMME supplier

The majority of the larger manufactures interviewed do not rate, but do audit their supply companies. All of the interviewees stated that no preferential treatment was given to the SMME sector. They were handled the same as any other supplier. Some of the larger companies stated that they do rate on supply (reliability), quality, price and technology.

This was the response to this question:

- Not rated, but audited as per QMS audit procedure
- Not rated or audited, 100% quality checks done on incoming products from SMMEs. If quality irregularities found, payment not forwarded
- Audited every second year. Every other year SMME required to perform a self assessment
- All SMMEs rated on quality, price, delivery and sometimes development and
- All critical suppliers rated and audited on a yearly basis as per QMS requirements. If the SMME fails the audit, it could be audited more than once a year.

4.7.7. Question seven evaluates the skills and commitment of the management in the SMMEs from a larger company's viewpoint

A general comment from the majority of the interviewees was that some of the SMMEs have very good technical ability, but the research has highlighted that the standard of quality management of some of the SMMEs varies from company to company.

This was the response from the interviewees:

- Technical ability good, but the management skills vary from company to company
- Commitment there, but major gap in management skills
- Certain managers do not have the ability to focus on problem areas
- Management not willing at times to take advice from larger companies
- If larger company are not there to assist, the SMME suppliers could fail
- Skills generally good
- Technically skilled for the job, but doubts about management skill level
- In problem SMMEs it is sometimes the employees that are the problem, thus causing further problems.

4.7.8. This question evaluates, from a larger company's perspective, the improvements that can be introduced

This point has partly been covered by some of the other questions, where the larger companies have stated that they have support mechanisms in place to assist the SMMEs if they require them and due to the fact that developed specialized skills to support certain critical areas, the wheel does not have to be reinvented.

One company has a 16-step process in place to assist any critical suppliers. This process is accessible on the internet. The larger companies have highlighted shortcomings within the SMME sector, but this does not pertain to the entire SMME sector, and one must understand that the SMME sector might not have the financial backing or manpower to implement certain improvements.

The following was raised by the interviewees regarding the question of how to improve:

- Greater understanding of what the larger company requires
- Interaction business understanding
- Possible kan-ban delivery set-up
- Improved production runs
- Mentoring program to address specific and critical outcomes
- Better understanding and controlling of the financial process and

- To understand and be able to generate an “action plan” on open issues or problem areas.

4.7.9. This question focuses on the shortcomings within the SMME sector

This question again is being addressed from the larger company’s perspective and is not applicable to all the SMMEs. One area highlighted by most of the interviewees was the control and understanding of the financial application.

These are the comment made with regards this question:

- Lack independence
- Lack of costing ability and analysis
- Not versatile
- No problems encountered in this area
- Control of finances
- Planning ability
- Availability of technical back-up and
- Management knowledge and commitment with regards reinvesting in the company.

4.7.10. The last question looks at the choice of supporting the SMME sector

To this question all the larger companies indicated positively to the support of the SMME sector. As mentioned previously some of the larger companies created some of the SMMEs or have developed a good relationship and understanding over a certain period, resulting in the support becoming a necessity with the focus on the supplier as a partner rather than a supplier.

One major issue that can and will have an effect is the “China Problem”, (imports). What was noted here is that the Chinese imports are not only cheaper and available, but there is a dramatic improvement in the quality of these imported products. As mentioned by one of the larger companies, if the government does not focus more intensely on the support of these SMMEs (legislation), they are going to be eroded away. This is already evident in the clothing industry.

These were the comments made to this question:

- All stated they would definitely carry on with support, as clear relationships had been developed
- No special treatment for SMMEs. All companies treated the same
- Chinese problem
- Morally correct to do so and
- A toolbox has been developed by one of the companies to perform a risk assessment on any supply company, analysing the productivity and sustainability

of that specific company, because, as the larger company stated, if it wants to get into bed with a specific company, it wants to make sure it is going to stick around.

4.8. CONCLUSION

This Chapter has analysed the SMME sector from information generated not only from larger companies but also from the SMMEs themselves. Using the literature survey, the researcher has tried to link the findings of the empirical study with the literature researched, and has shown some contrasts between the results obtained from the interviews when compared to the questionnaires. From the information obtained the following questions can be asked:

- Does the management of the SMME sector have time for quality?
- Is the SMME management fully aware of the commitment that is required to successfully implement a QMS?
- Do the companies understand the problem (quality or productivity) before they jump to solutions?
- Are the problems defined clearly?
- Are the SMMEs using the right people for the job?
- Do the SMMEs financially analyse problems?
- Does the management of the SMME companies know how to correctly monitor highlighted problem areas?

A further question must be raised with the collection of the empirical data using questionnaires. Questionnaires leave the researcher in a catch 22 situation. If the questionnaires are too short, respondents do not respond to them. The same might be said if the questionnaires are too long. The following can be considered regarding the questionnaires:

- With a low response rate, what is the real value and reliability of the data collected?
- Do the correct people complete the questionnaires?
- Do people complete the questionnaires indicating what they actually do or what they would like to do?
- Why do the answers from the questionnaires and interviews differ so drastically?

It can be argued that the research design and procedures should provide for some of the above difficulties to be overcome, and it is the duty of the researcher to see that they are avoided or overcome. However, research is a process of discovery, of learning and identifying new knowledge and the research should produce results that are of societal benefit. Data collected in a real life situation cannot always be accurately accounted for, resulting in the researcher having to adapt to changing and unanticipated circumstances and produce credible results with imperfect inputs. The results of the complete survey will be discussed in detail in Chapter Five.

During the research a lot of pertinent information was collected, and certain of the points raised do not apply to all the SMMEs, but what did come out as a major point of concern was the fact that some of the SMMEs do not realize and understand the

implications of the Chinese threat and the devastating effect it is going to have on the SMME sector.

This factor is not totally understood by the SMME sector, and what is not understood is often rejected, but once understood it will be accepted. But when the SMME sector understands that the imports from China are going to have a major affect on the local market, the SMME management will then realize the importance of proactive management, productivity, quality tools and techniques, if they (the SMME sector) are to show a positive growth.

Another major point was the support from government with regards legislation. This legislation could lead to the increased erosion of the SMME sector that is linked to products than are imported from China.

Interim measures must be put in place to support the sustenance and growth of the SMME sector if the country wants to reduce unemployment.

Finally, what must be noted as a major concern was the fact that of all the companies interviewed, who had a QMS in place, not one of those companies had implemented it themselves; every SMME had made use of a quality consultant, which poses a question of, who is the custodian of the QMS implemented; the company or the consultant?

CHAPTER 5

TESTING THE HYPOTHESIS

The real voyage to discovery is not seeking new lands. But seeking new ideas.

(Proust)

5.1. INTRODUCTION

The testing of the hypothesis has been approached using a number of criteria:

- A written survey was returned by a number of committed SMMEs, answering 37 questions addressing the 5 sub-problems (section C of the questionnaire), and a further 11 questions (section A and B in the questionnaire) which validate certain of the questions asked in section C of the questionnaire
- A set of interviews set up with a sample of the SMME companies to address certain questions regarding the SMME sector
- A set of interviews set up with a sample of the larger customer companies to address certain questions regarding the SMME sector, and
- A summary of the results for each of the hypotheses represented on a radar diagram compiled from the questions set up in the questionnaire addressing each of the sub-problems.

The triangulation process (radar diagram) is set up for each of the hypotheses, where the positive results are superimposed over the negative results from the data collected in the questionnaires. The radar diagrams have been computed using the following process:

- Computing the data for each question representing that particular sub problem on the radar diagram, where each question represents a position on the diagram
- Most of the questions in the questionnaire are based on the Likert scale
- To establish the positive position on the radar diagram, the values from the questionnaire were computed as follows, **Positive = (3+4) x 100 = %**, or the **yes** in the yes or no questions. This is done for each point on the radar diagram (3 and 4 on the questionnaire indicates “a lot” or “completely”)
- To establish the negative position on the radar diagram, the values from the questionnaire were computed as follows, **Negative = (1+2) x 100 = %**, or the **no** in the yes or no questions. This is done for each point on the radar diagram (1 and 2 on the questionnaire indicates “not at all” or “a little”)
- Drawing both diagrams, superimposing the positive set of results over the negative set and interpreting the results, and
- The conclusion for the particular sub problem is based on the results generated from the questionnaire pertaining to that particular sub-problem.

5.2. TESTING THE HYPOTHESES

5.2.1. **Hypothesis 1:** SMMEs use quality tools effectively to improve quality and their processes.

Written survey

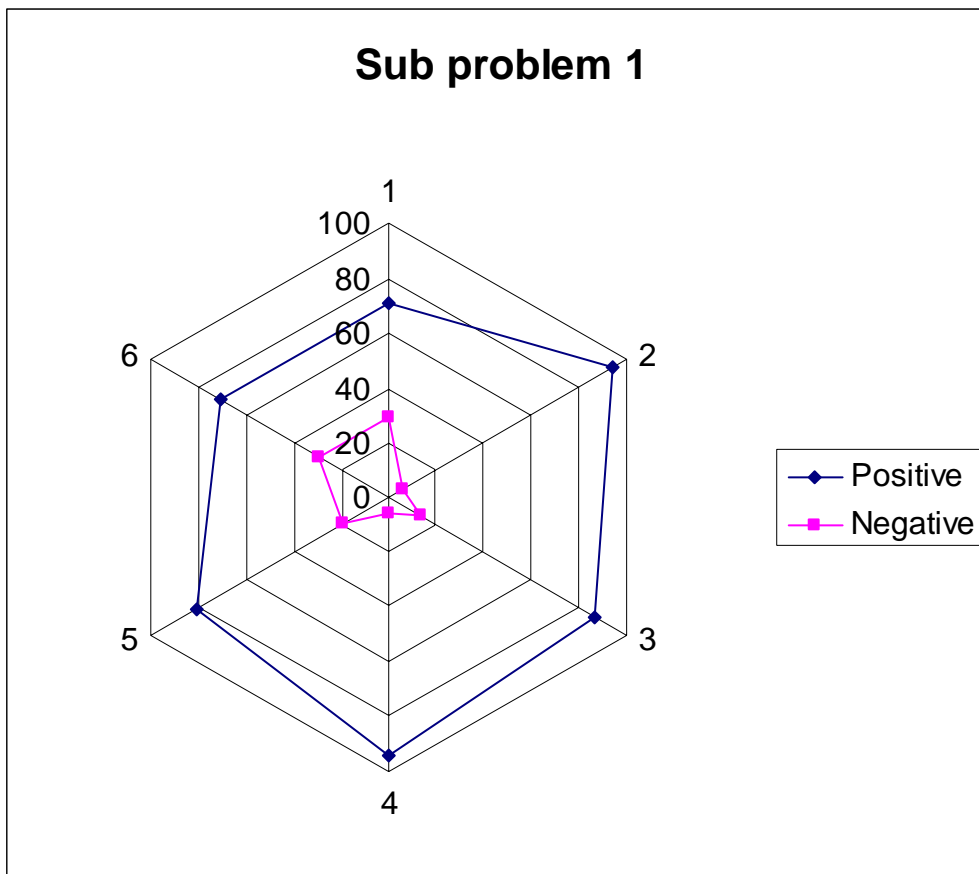
From the written survey the following information was generated:

- SMMEs do use quality tools to analyse and classify problem areas
- SMMEs do think the classification of nonconformities are important
- Highlighting and recording problem areas also came out strongly, but
- The lack of tools used came out as a negative (**Table 4.1**).

Table 5.1: Results of the questions regarding use of quality tools.

| Question | Positive % | Negative % |
|-----------------|-------------------|-------------------|
| 1.1 | 71 | 29 |
| 1.2 | 94 | 6 |
| 1.3 | 87 | 13 |
| 1.4 | 94 | 6 |
| 1.5 | 81 | 19 |
| 1.6 | 71 | 29 |

Figure 5.1: Radar diagram for Table 5.1



Interviews: Outcomes from the SMMEs interviewed:

- Due to education levels, certain operators could not fill out inspection sheets
- Allowances have to be made for training needs because of operators' limited education
- Operators were not forced to use new processes, but accepted them.

Interviews: Outcomes from the larger companies interviewed:

- Some felt that the scrap rate is not monitored enough or correctly, or SMME's don't even focus on tools being used
- Some accept what the SMME sector is doing with regards quality tools, even if the tools are not used correctly or the incorrect tools are used. They just want proof that it is being monitored
- If monitored correctly some feel it will definitely improve the profitability of the SMMEs.

Test

The findings of the written survey as indicated in **Table 5.1 and Figure 5.1** supports hypothesis 1: "SMMEs use quality tools effectively to improve quality and productivity". The interviews conducted, as shown in **Table 4.1** does not support this hypothesis fully, and it is the researcher's assumption that more in-depth investigation has to be done in this area in a future research project.

However, based on the overall findings, **the hypothesis is partially supported** as more and more SMMEs are seeing the benefits of using quality tools, even though they might not be the correct tools, or the tools being used are not being used to their full potential.

5.2.2. **Hypothesis 2:** SMMEs use quality techniques effectively to improve quality and their processes.

Written survey

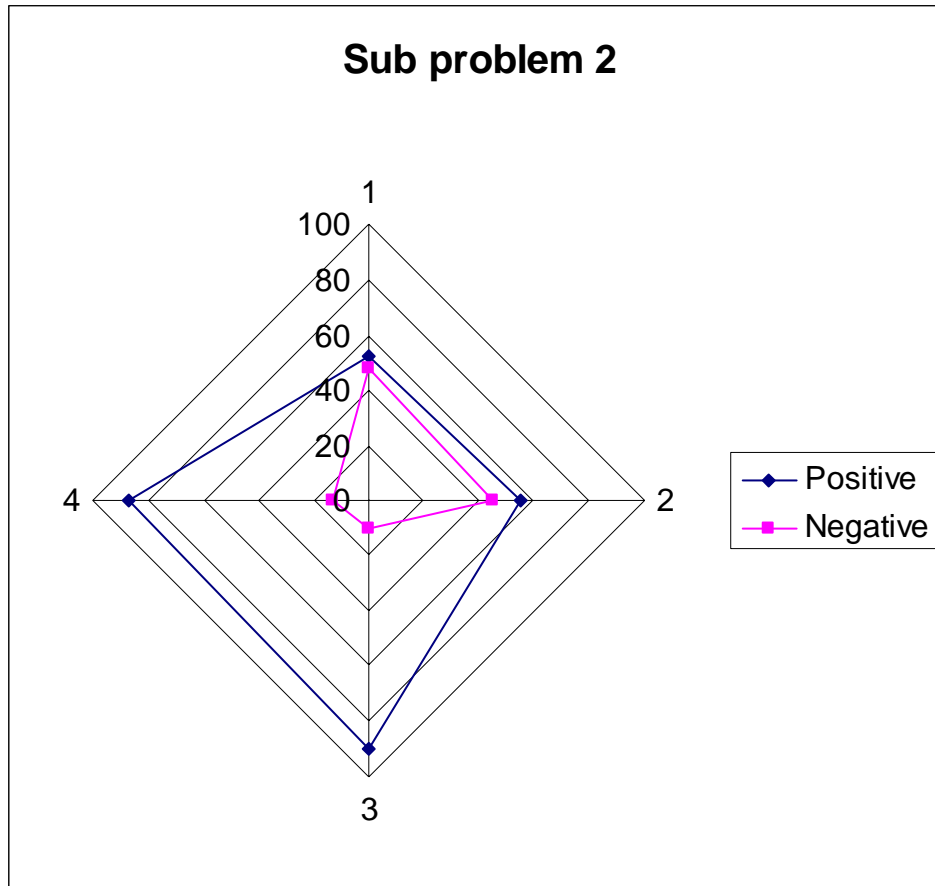
From the written survey the following information was generated:

- Certain SMMEs show they are committed to the use of quality techniques
- Some SMMEs have developed their own problem solving techniques
- Some SMMEs possibly do not use quality techniques because of budget or manpower constraints, and
- Almost all the recipients indicated that quality techniques could assist their company.

Table 5.2: Results of the questions regarding use of quality techniques.

| <u>Question</u> | <u>Positive %</u> | <u>Negative %</u> |
|------------------------|--------------------------|--------------------------|
| 2.1 | 52 | 48 |
| 2.2 | 55 | 45 |
| 2.3 | 90 | 10 |
| 4.4 | 87 | 13 |

Figure 5.2: Radar diagram for Table 5.2



Interviews: Outcomes from the SMMEs interviewed:

- Due to the training put in place certain operators have been promoted
- Level of education of some of the operators a problem when introducing new processes
- As mentioned before, operators not forced to use the process

- Operators know any techniques introduced can only benefit the process, and is accepted as a help mechanism (even if it is not understood)
- Staff are brought into the process as well.

Interviews: Outcomes from the larger companies interviewed:

- Some felt that the scrap rate is not monitored enough or correctly, or SMMEs don't even focus on techniques being used
- Quality techniques are generally not used because of the lack of manpower, knowledge or finances
- If monitored and used correctly, some feel it will definitely improve the profitability of the SMMEs.

Test

The findings of the written survey as indicated in **Table 5.2 and Figure 5.2**, support hypothesis 2: "SMMEs use quality techniques effectively to improve quality and productivity", but again, as in the previous sub problem, the interviews conducted at the SMMEs and larger companies do not fully support the hypothesis. It is also the researcher's assumption that many of the SMMEs do not know the difference between tools and techniques. Further research needs to be done to investigate the possible development of an easy to use and understandable process for the SMME sector.

However, based on the overall findings, **the hypothesis is partially supported** based on the fact that certain of the SMMEs are developing basic user-friendly techniques to support their process.

5.2.3. **Hypothesis 3:** SMMEs use no quality systems or models to improve quality and processes.

Written survey

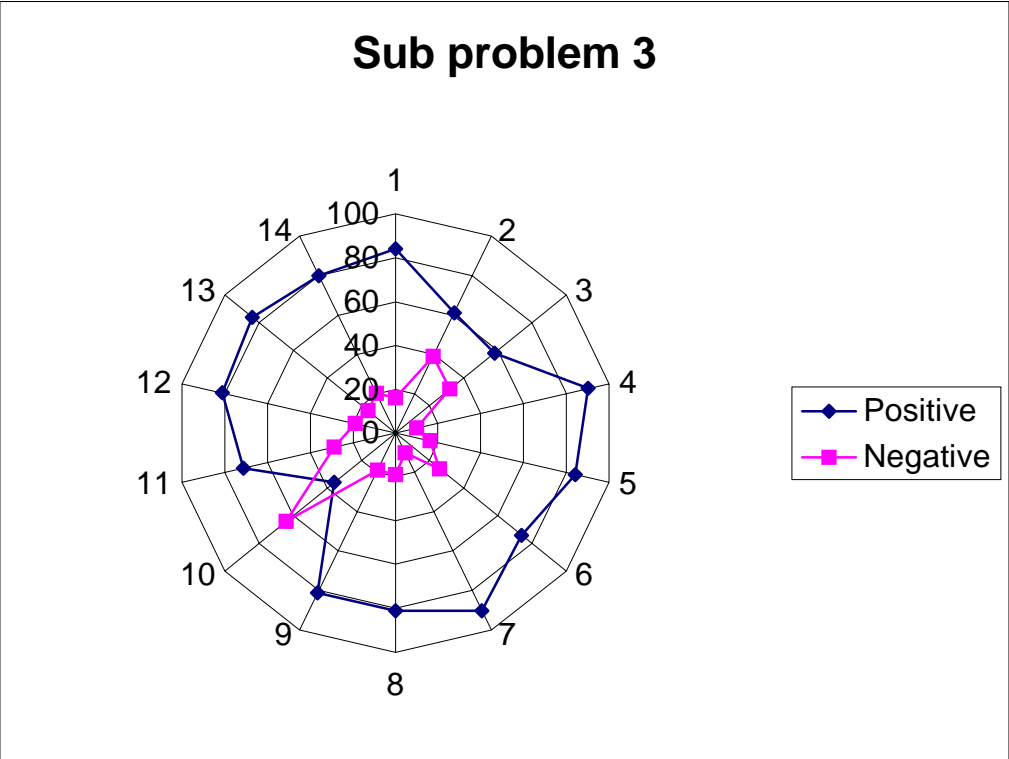
From the written survey the following information was generated:

- Mostly all the SMME recipients have a quality management system in place
- Certain SMMEs have more than one QMS in place
- Certain SMME managements have realized the benefit of a QMS, especially when supplying the automotive manufacturing sector
- Most of the SMMEs used a consultant to implement the QMS and
- Most of the SMMEs are proud of the fact that they have a QMS accreditation.

Table 5.3: Results of the questions regarding use of quality models and systems.

| <u>Question</u> | <u>Positive %</u> | <u>Negative%</u> |
|-----------------|-------------------|------------------|
| 3.1 | 84 | 16 |
| 3.2 | 61 | 39 |
| 3.3 | 58 | 42 |
| 3.4 | 90 | 10 |
| 3.5 | 84 | 16 |
| 3.6 | 74 | 26 |
| 3.7 | 90 | 10 |
| 3.8 | 81 | 19 |
| 3.9 | 81 | 19 |
| 3.10 | 36 | 64 |
| 3.11 | 71 | 29 |
| 3.12 | 81 | 19 |
| 3.13 | 84 | 16 |
| 3.14 | 80 | 20 |

Figure 5.3: Radar diagram for Table 5.3



Interviews: Outcomes of the SMMEs interviewed:

- Most of the companies interviewed indicated that it was a difficult process to implement
- All companies indicated that the QMS was accepted by all the staff
- All the companies indicated that there were benefits once a QMS had been implemented
- Once a QMS was implemented, all companies unanimously agreed that awareness of quality and productivity improved
- All companies interviewed used the QMS process as a guided and improved catalyst
- Because of the QMS implementation, it forced the companies to look at the way they were doing business through another set of eyes, and forced the companies to analyse the processes according to the guidelines set out in the procedures
- Continual training
- Improved housekeeping.

Interviews: Outcomes of the larger companies interviewed:

- If SMMEs supply critical parts, they preferably must have a QMS in place
- SMMEs like any other supplier, are audited on a regular basis by some of the larger companies
- No preferential treatment is given to the SMME sector

- Productivity and costing linked to the QMS are also monitored on a regular basis
and
- Ready to help with specialized expertise from the mother company.

Test

The findings of the written survey as indicated in **Table 5.3 and Figure 5.3, reject hypothesis 3: "SMMEs use no Models or Systems to improve quality or productivity"**

The recipients that returned the questionnaire indicated that a few companies in the SMME sector have more than 1 model or system in the company. A positive indicator is that the SMMEs use and can see the benefit of a QMS. As can be deduced from the findings is that one possible shortcoming is that a consultant was used for this process. A negative indicator is question 3.10 where 64% of the recipients say that the larger companies do not conduct quality audits in their companies, yet in the interviews with the larger companies, they indicated that they do audit on a regular basis.

What must also be noted is that there are a large number of SMME companies that do not use QMS, because of a variety of reasons, but they know that there are QMS available.

5.2.4. **Hypothesis 4:** Management display no awareness and commitment to process improvement.

Written survey

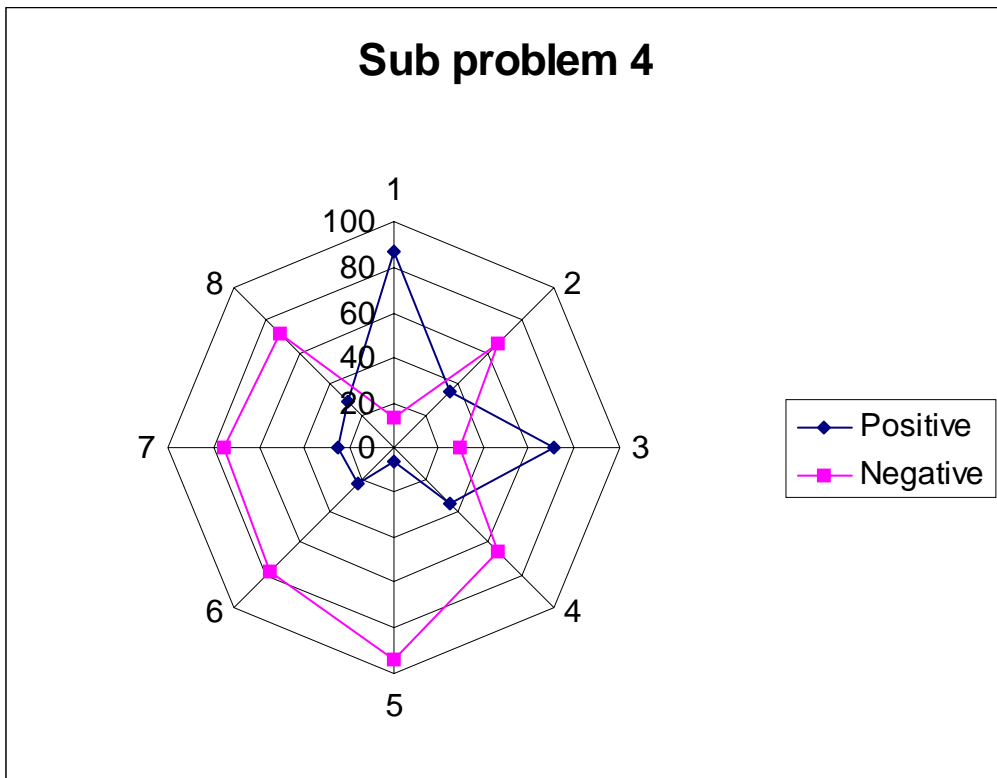
From the written survey the following information was generated:

- SMMEs do indicate support for quality initiatives
- Budgeting for quality initiatives not a priority and
- Suggestion schemes and team based quality initiatives also not a high priority.

Table 5.4: Results of the questions regarding the extent to which management displays to change.

| <u>Question</u> | <u>Positive %</u> | <u>Negative%</u> |
|------------------------|--------------------------|-------------------------|
| 4.1 | 84 | 16 |
| 4.2 | 61 | 39 |
| 4.3 | 58 | 42 |
| 4.4 | 90 | 10 |
| 4.5 | 84 | 16 |
| 4.6 | 74 | 26 |
| 4.7 | 90 | 10 |
| 4.8 | 81 | 19 |

Figure 5.4: Radar diagram for Table 5.4



Interviews: Outcomes of the SMMEs interviewed:

- Certain SMMEs implemented a QMS to use it as a marketing tool
- Introduction of a QMS caused a mind set change
- Certain SMMEs were now striving to introduce extra QMS into the companies, eg:
ISO14001
- Continual improvement is a requirement of a QMS
- With the introduction of a QMS will result in an increase in training.

Interviews: Outcomes from the larger companies interviewed:

- The comment was made here that many of the companies were developed by people with technical and not management expertise
- Positive commitment, but again lack of management skills
- SMME management not able to focus on the problem areas
- Certain SMMEs do not know how to handle their employees correctly
- SMME management sometimes not willing to approach its mother company for advice and
- Unable to see the entire picture, long term results and focus on day to day running of the business and fire fighting.

Test

The findings of the written survey as indicated in **Table 5.4 and Figure 5.4**, reject hypothesis 4: "Management display no awareness of and commitment to change", even though the larger companies have indicated shortcomings with regards the SMME sector in this area. Some of the SMMEs that supply the automotive industry have been developed from necessity and therefore the researcher assumes that people have been placed in situations with little or no management skills and think they are going to develop management skills overnight. Again based on the findings, **this hypothesis is rejected**. However the need for certain management training and education with regards the bigger picture has been highlighted.

It must be remembered that a manager is only a good manager if someone is prepared to follow that person.

5.2.5. **Hypothesis 5:** SMME management does not understand the affect that productivity has on the organisation.

Written survey

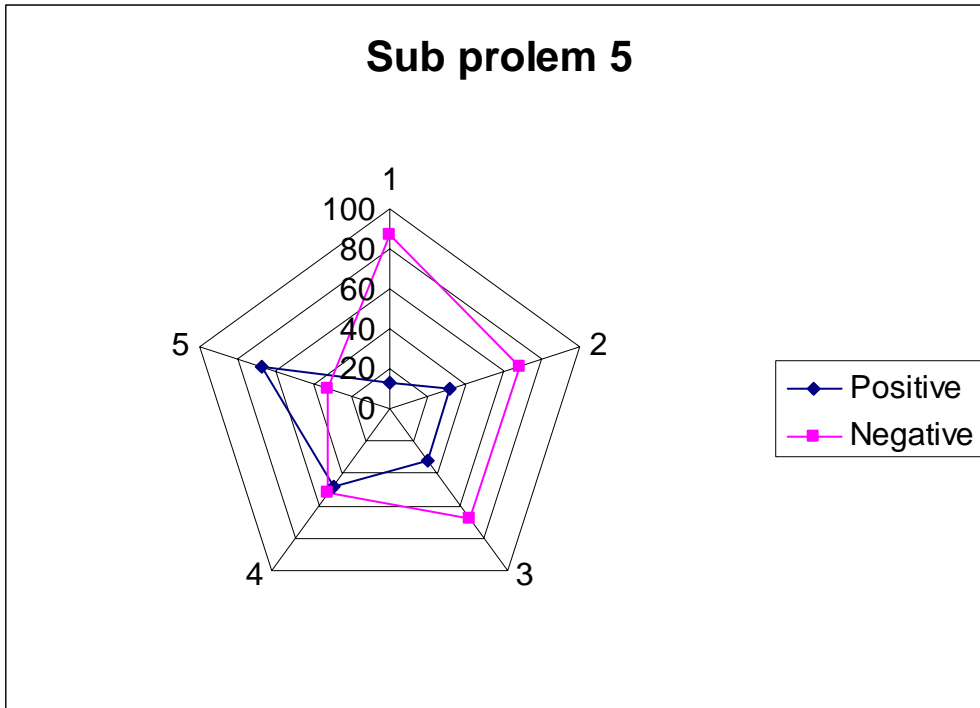
From the written survey the following information was generated:

- The lack of knowledge, training, finances and manpower affects successful productivity improvement initiatives in the SMME sector
- Lack of the unknown leads to uncertainty
- Attitude of “if it is not broken, don’t mess with it” can affect growth
- Certain SMMEs feel team based initiatives have little or no effect on promoting quality or productivity and
- The majority of the recipients are prepared to try new tools, but because of time constraints, focus or other issues they do not have time or possibly the ability to manage these tools.

Table 5.5: Results of the questions regarding the extent to which productivity is evaluated.

| <u>Question</u> | <u>Positive %</u> | <u>Negative %</u> |
|------------------------|--------------------------|--------------------------|
| 5.1 | 13 | 87 |
| 5.2 | 32 | 68 |
| 5.3 | 32 | 68 |
| 5.4 | 48 | 52 |
| 5.5 | 67 | 33 |

Figure 5.5: Radar diagram for table 5.5



Interviews: Outcomes from the SMMEs interviewed:

- SMME management know what the audits cost the company on a yearly basis
- Certain of the management of the SMME companies know that if they lose the QMS accreditation, they will lose the customer
- Certain SMMEs stated that more business was granted or generated because of the QMS they have in place.

Interviews: Outcomes from the larger companies interviewed:

- The lack of knowledge as to what the customer actually wants
- The Chinese import threat which many of the SMMEs are not aware of
- The SMMEs are definitely committed to what they are doing. Mentoring or guidance is required with certain of the smaller companies
- Productivity in the SMME sector is not a major priority, which is directly linked to the financial side of the business
- Larger companies willing to assist and advise the SMME sector supplying them and
- Technically the SMMEs are very good, but do lack management skills.

Test

The findings of the written survey as indicated in **Table 5.5 and Figure 5.5** and international literature, support hypothesis 5: "SMME management does not understand the effect productivity has on the organisation". A lack of knowledge, understanding or commitment to productivity could lead to the downfall of any organisation. **Therefore hypothesis 5 is accepted.**

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

If the cap fits wear it. (Charles Dickens)

6.1. SUMMARY OF THE MOST IMPORTANT FINDINGS

A summary based on the facts established from the theoretical and empirical analysis is as follows. Firstly, the SMME sectors that took part in the evaluation do use quality tools, techniques, models and/or systems. The effectiveness of these quality processes was not evaluated. Secondly, technical abilities and commitment of the SMME sector evaluated was of a high standard, but there is a problem with the management and the understanding of the management processes in certain of the SMMEs.

Table 3.3 and 3.4, shows the sample population size and the researcher has also highlighted the problems encountered when trying to collect the information, specifically from the questionnaires (Chapter 3).

The sample size with regards the questionnaires might not be representative but after analysing a National survey done by the Department of Trade and Industry (dti) on “Consumer and Corporate Regulation Division National Survey” in December 2003, where it was decided that they would use a sample size of 900 for the national survey, of which only 11 were chosen from the Eastern Cape, it was felt that the sample size was acceptable (<http://www.thedti.gov.za>). The researcher found with the

interview sessions conducted with the SMMEs and larger companies that after the first few interviews were completed the rest were repeating what had already been established, thus covering a representative sample population with regards interviews.

It was also evident from the interviews done with the larger companies, that these companies cannot do without the SMME sector and that they would support them with regards management, quality, productivity and machine maintenance issues as what will have an effect on their company.

Some of the more concerning issues to come out of the interviews was the fact that certain of the SMMEs do not realise the affect the Chinese imports are going to have on the economy and more specifically on their own company. The SMMEs are going to find it more difficult to compete on the basis of quality and price. If the government fails to support the SMME sector (with regards to the Chinese imports) the researcher predicts that it will just be a matter of time before the SMME sector starts shrinking.

Another concern is that the quality gap is widening when it comes to the use of quality in the larger companies compared to the SMMEs. The larger companies are becoming more advanced, technical and quality conscious to keep ahead of their competitors. The SMME sector is wanting to keep up with its larger customers, but can no longer do so because of constraints such as manpower, money, technology, extra, to mention a few, with the result that the SMMEs are now increasingly making use of consultants to solve this problem (increased quality focus by the larger

companies) thus becoming more reliant on the consultants. The researcher feels that this is a step backwards for the SMMEs as they cannot keep up with the advances in the quality field.

Another concern is a lack of knowledge of what support the SMME sector can access and is entitled to through government regulation. A publication on “Integrated Small-Enterprise-Development Strategy” published in 2005, <http://www.dti.gov.za>, contains information on how the “dti” has tried to address the “Unlocking the potential of South African entrepreneurs”.

6.1.1. Leadership issues

Analysing the points Wright and Phillips (1990:48) highlighted with regards pitfalls in South African Small Business management:

- Failure to develop essential management skills
- Poor record keeping
- Bad money management
- Neglect of marketing and advertising planning
- Poor planning
- Inaccurate job costing and estimating and hence pricing
- Poor management of workers
- An inability of the owner to change his role as the business grows.

The empirical study addressing pitfalls in South African Small Business has shown that not much has changed. During the researcher’s interviews with the larger

companies nearly all of these factors were mentioned. This is a concern, again indicating that there are major shortcomings in the management capacity in some SMMEs.

6.1.2. Knowledge issues

Top management of the SMMEs plays little or no part in the implementation of QMS in the companies. This can be seen from **Figure 4.21** which shows the use of consultants to implement the QMS. If top management does not have the knowledge or skill to operate the QMS, how is it going to be effective once the consultant has left?

According to the ISO 9000 requirements (<http://www.iso.org/iso/en/iso9000-14000/index.html>), top management has to ensure that customer's *requirements* in the form of needs and expectations are determined and converted into requirements. This is not being done effectively in certain SMMEs, which could be one of the major reasons why certain of the SMMEs are losing their accreditation.

Another factor that could have a major influence on the quality process is the lack of knowledge and understanding some of the senior SMME management has on the quality process. These factors will have a direct influence on the use of quality tools, techniques and models used in the SMME sector.

6.1.3. Tool, techniques, models and system issues

The effectiveness of these processes can only be realised if the understanding of these processes are available and evaluated on a regular basis. Some of the companies indicated that the reason they had implemented some of these processes is that they did so at the request of the larger companies.

If the complete commitment and understanding of these processes are not driven effectively and efficiently from top management, how is top management going to effectively get the support for these processes from the employees?

6.2. CONCLUSION

To conclude, the above issues are extracts of the most important findings, which can be linked to certain of the issues highlighted in the literature study. Thus, showing that the principal reasons, problems or cause for the lack of use of quality processes in the SMME sector is because of the following reasons or a combination thereof:

- Understanding and knowledge of the processes
- Support and commitment
- Poor planning
- Communication and
- Management shortcomings.

Once the SMME sector comes to realise and understand the benefits of quality tools, techniques systems and models, the resultant quality and productivity improvements, only then will they be effectively implemented in the SMME sector.

Other major concerns are the future effect that the imports from China are going to have on the SMME sector, the SMME sector's lack of knowledge with regards this issue, as well as the government's lack of vision with regards to this same issue and the long term effect it is going to have on the economy as a whole, which is going to be linked directly to job losses.

To be fair to the Government, the Government have tried to address the problems encountered by some sections of the SMME sector, but again the lack of vision, management and the ability shown by certain SMME management to access this information can only lead to ever increasing problems that this sector is going to experience.

In discussions with Mr V. Trivedi, Principal Counselor and Head of Manufacturing Service, Confederation of Indian Industry (CII) an organisation set up by the Indian Government to help the Medium, Small, and Micro enterprises (MSMEs) in India and the researcher, which took place at the 2nd Annual Tirisano Cluster focusing on "Global Competitiveness Through Technology", on the 23rd of November 2006 in Port Elizabeth, he mentioned that the "CII" had successfully accredited critical MSMEs that supply the motor trade in India, and stated that some of the MSMEs had lost their accreditation because of the same constraints that the researcher has found affects

the South African SMME sector. Mr Trivedi then stated that the CII were in the process of implementing a “Best Management Practice” model for the Small and Micro Enterprises (SMEs) in India as it was easier to introduce this process into a SME company (because it focuses on what the SME management can understand, implement and maintain).

At the same conference Dr P. Fernandes, Managing Director of the Automotive Industry Development Centre (AIDC) stated in his opening address that government must pay more attention to the motor manufacturer component suppliers in South Africa, which include a large percentage in the SMME sector, if this country wants to maintain and improve its global competitiveness through technology.

6.3. RECOMMENDATIONS

In the summary and conclusions it has been established that a gap exists between theory, practice and knowledge with regards quality and productivity in the SMME sector. In order to close these conceptual gaps, what must the SMME sector do to improve the use of quality and productivity processes?

The current management practices within the SMME sector will have to be revised to focus on the understanding of the quality and productivity processes. Once understood, implemented, controlled and driven effectively, these processes will result in major improvements within the SMME sector.

Organisations may have to consider the following proposed recommendations to modify their focus areas and practices.

Recommendation 1: Analyse and focus on the “key process areas” which will result in the best returns for the company (internally and externally).

Recommendation 2: SMMEs must create an environment to promote learning, training and understanding within the organisation.

- Develop an understanding of the quality and productivity processes
- Involved and get the entire workforce committed to the changes
- Identify and prioritize the easiest and best quality and productivity initiatives that can be supported in the organisation
- Monitor and assess the quality and productivity processes on a regular basis, communicating the results
- Create a cross functional and organisation wide process where knowledge is produced and shared
- Develop an understanding of the larger customer company’s requirements.

Recommendation 3: SMMEs to challenge government with regards the effects of imports from China and other countries where the products imported could lead to large scale unemployment.

- Government need to create and communicate the benefits to larger companies if they use local and SMME suppliers
- SMMEs and the larger customers must know what these benefits are, and where they must focus to get the best results.

Recommendation 4: Do not leave the communication with regards the agreed supply or manufacturing quality problems highlighted within the SMME by that SMME until it is too late. Where a problem has been highlighted and the SMME realise that they do not have the expertise, capacity, knowledge base or manpower to solve the problem it is imperative that the situation is communicated to the customer. Larger companies have indicated and shown their willingness to help solve the problem.

Recommendation 5: The management of the SMME sector must research what the government has made available to the sector through legislation and try and access this support. The following website can be used to research certain critical information applicable to the SMME sector (<http://www:thedti.gov.za>).

6.4. RECOMMENDATIONS FOR FURTHER RESEARCH

A number of issues could be addressed with further research as identified in the project.

The researcher feels that the lack of knowledge indicated in the research with regards quality tools and techniques and the use thereof in the SMME sector, is the most pressing issue. If the correct tools, coupled with the techniques are used to address

the shortcomings, this could only lead to the improvement and growth of the companies that introduce the knowledge correctly.

Further research in this area could be the development and testing of relevant and easy to use quality management process in a model and flow chart format, which will improve productivity, quality, and at the same time address the needs and requirements of the Quality Management System, which could be something like “The Best Management Practice Model” the CII are introducing into the SMEs in India.

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Annexure A:



**Nelson Mandela
Metropolitan
University**

f o r t o m o r r o w

To Whom It May Concern

We have the pleasure of introducing Mr. Andrew Murray to you. He is currently studying towards his Masters degree in Industrial Engineering. His research topic is the evaluation of Quality Tools in the SMME (small, medium and micro enterprise) sector.

He has almost completed his literature survey for the thesis and now needs to collect several sets of data from samples of respondents selected from industry. This data is important for the successful completion of the research; he has constructed a set of questionnaires as a collection instrument. After receipt of the completed questionnaires from respondents and processing of the data, it might be necessary to conduct a series of interviews with representatives of some of the sample group.

It is hoped that once the study has been completed, the findings will be able to contribute significantly to the understanding and shortcomings with regards quality processes in the SMME sector.

Mr. Murray is no newcomer to the quality practice. Apart from having extensive exposure in industry, he has lectured on the topic at various levels and is the coordinator of the "B-Tech Quality" at the institution.

As Mr. Murray's promoters for his master's research, we would like to appeal to you to please assist him in his data collection by completing and returning his questionnaires and by agreeing to be interviewed by him, should he request an interview at a later date. **By devoting a little of your valuable time to this research**, you will be making an important contribution the expansion of knowledge in the field of Quality Concepts, within the SMME sector.

We thank you in anticipation.

Yours sincerely

Dr. Shaun Krause and Mr. Piet Roodt
Nelson Mandela Metropolitan University

Annexure B:



**Nelson Mandela
Metropolitan
University**

for tomorrow

Survey on the use of Quality Tools in the SMME sector

Dear Colleagues

I am currently engaged in post-graduate studies, the research topic of my thesis is the evaluation of Quality Tools in the SMME (small, medium and micro enterprise) sector.

As part of my research, I will be conducting a survey to obtain data with regards the use of quality tools in the SMME sector. For this purpose a number of organisations, including yours, have been selected to participate in the survey.

As a result of your exposure to quality in SMMEs, your views and concerns in respect of the study can help identify certain shortcomings in this particular industry.

Enclosed please find the survey covering the subject. It would be greatly appreciated if you could spare a few moments of your valuable time to contribute to the study by completing the questionnaire and returning it to me no later than **5th October 2005** at the latest, either by post, or e-mail:

Andrew Murray
47 Delphinium Drive
Westering
Port Elizabeth
6025

e-mail: Andrew.murray@nmmu.ac.za

All data will be treated as strictly confidential, and the findings of the study will be made available to all the participants upon completion of the study.

Should you require any further information concerning the study as a whole or the study in particular, please do not hesitate to contact me at:

| | | |
|------------|------------------------|--|
| Telephone: | 041 3601723 (home) | 041 5043429 (work) |
| | 082 77 10108 (cell) | e-mail: Andrew.murray@nmmu.ac.za |
| | 041 3601723 (fax home) | 041 5833835 (fax work) |

I look forward to receiving your response and thank you in anticipation for your willingness to participate in the survey.

Yours sincerely

Andrew Murray
Masters Student in the Faculty of Engineering

Annexure C:

47 Delphinium Drive
Westering
Port Elizabeth
6025

20 June 2005

Attention: Wayne Oosthuizen

Subject: A list of registered SMME's in the Eastern Cape.

Hi Wayne

I am currently busy with my "M" (research) that I am conducting in the Eastern Cape with regards the application of quality systems, models, tools and techniques in the SMME sector. I am busy with a questionnaire, which I have to send out shortly.

Dr. J Pietersen a statistician from the Department of Mathematics and Science at the NMMU is assisting me in drawing up the questionnaire requires the list of SMME companies that you have on your records so that we can set up a fair representative sample when collecting the info.

Your office said they could assist on receipt of a letter.

Thank you,

Andrew Murray
Lecturer: Industrial Engineering
NMMU
Email: Andrew.murray@nmmu.ac.za
Cell: 082 11 10108
W: 5043429
H: 3601723

Annexure D:

Sent: 29 September 2005 03:11 PM

a programme of

Dear ECMAC client

We have been contacted by an academic researcher from the NMMU who needs a questionnaire completed in order to research the impact of quality systems in SMMEs.

Given the nature and thrust of this research we feel it would be beneficial for our SMMEs to participate so that ECMAC may benefit from this research and continue offering efficient, value-added services.

We therefore kindly request that you spend some time on completing the attached document.

Should you have any questions, please do not hesitate to contact myself or Grant Minnie.

Kind regards

Wayne Oosthuizen
Operations Manager - ECMAC NMMM
Email: wayne@ecmac.net
Tel: 041-5022400

Annexure E:

SURVEY ON THE GENERAL INFORMATION WITH REGARDS YOUR ORGANISATION AND QUALITY PRACTICES

Information gathered is for research purposes only and no individual or organisation will be compromised in any way. No organisation or individual will be identified in the final report.

SECTION : A **BIOGRAPHICAL INFORMATION**

Organisation's Name

Respondent's Name, Title and Capacity

Telephone Number

Fax Number

E-mail Address

Mark with "X" next to appropriate answer

Main activity of the organisation

| | |
|----------------------|--|
| Manufacturing | |
| Service | |

Number of employees in organisation at location

| | |
|----------------------|--|
| More than 200 | |
| 51 to 200 | |
| 11 to 50 | |
| 6 to 10 | |
| 5 and less | |

Does your organisation have a quality function?

| | |
|------------|--|
| Yes | |
| No | |

Do you have an appointed quality representative in your organisation?

| | |
|------------|--|
| Yes | |
| No | |

The definition of small business (manufacturing only) based on the National Small Business Act No. 102.27 November 1996 is indicated in the table below.

Table 1: Small Business Identification Table

| Size | Paid employees (less than) | Total annual turnover (less than) | Total gross asset value (less than) |
|-------------|---------------------------------------|--|--|
| Medium | 200 | R15.00m | R19.00m |
| Small | 50 | R13.00m | R5.00m |
| Very Small | 10 | R5.00m | R2.00m |
| Micro | 5 | R0.20m | R0.10m |

SECTION :B: GENERAL QUESTIONS

Mark with "X" next to appropriate answer

1. Is your company classified as a SMME? (Refer to Table 1)

| | |
|-------------------|--|
| Medium | |
| Small | |
| Very Small | |
| Micro | |

2. Is your company accredited with a recognised Quality Management System (QMS)?

| | |
|------------|--|
| Yes | |
| No | |

3. If **yes** please indicate, which of the following systems you use (if no, go to 4).

Table 2: Some Quality Systems Used

| System | Use |
|---------------|------------|
| ISO 9000 | |
| ISO 14000 | |
| VDA | |
| QS 9000 | |
| ISO TS 16949 | |
| ISO 18000 | |
| HACCP | |
| Other | |

IF OTHER SYSTEMS ARE BEING USED PLEASE LIST:

.....

4. If **no in question 3** is your company working towards an accredited QMS?

| | |
|------------|--|
| Yes | |
| No | |

5. If **yes in question 3** mark how far are you approximately, to completion

| | | | | |
|------------|------------|------------|------------|------------|
| 10% | 25% | 50% | 75% | 95% |
|------------|------------|------------|------------|------------|

6. Does your company use any of the following models?

Table 3: Some Quality Models Used

| <u>Model</u> | <u>Use</u> |
|---------------------------------------|------------|
| 20 Keys | |
| SAEF (South African Excellence Model) | |
| BOP (Best Operating Practices) | |
| Other | |

IF OTHER MODELS ARE BEING USED PLEASE LIST:

.....

7. Were you requested to implement quality initiatives (**some examples are in tables 2, 3 and 4**) by your customers?

| | |
|------------|--|
| Yes | |
| No | |

8. Were you requested to implement any quality tools or techniques to monitor your manufacturing process?

| | |
|------------|--|
| Yes | |
| No | |

9. Which of the following tools does your company use?

Table 4: Some Quality Tools Used

| | <u>Tool</u> | 1 | 2 | 3 | 4 |
|---|--------------------------|---|---|---|---|
| A | Pareto Chart | | | | |
| B | Fishbone Diagram | | | | |
| C | Check sheet | | | | |
| D | Histogram | | | | |
| E | Scatter Diagram | | | | |
| F | Run/Control Charts (SPC) | | | | |
| G | Stratification | | | | |
| H | Flow diagram | | | | |
| I | Design of experiments | | | | |
| J | Other | | | | |

Classifications being: **1** not at all **2** a little
 3 a lot **4** completely

IF OTHER TOOLS ARE BEING USED PLEASE LIST:

.....

COMMENTS OR SUGGESTIONS ON YOUR COMPANY'S QUALITY INITIATIVES

.....
.....

SECTION C: Questions addressing the Sub Problems

Mark with an 'X' next to the appropriate number as per example

| | | | |
|---|---|----|---|
| 1 | 2 | 3X | 4 |
|---|---|----|---|

Classifications for all questions unless otherwise stated:

- 1 not at all 2 little**
3 a lot 4 completely

1. Sub problem 1:How and to what extent does SMMEs use quality tools to improve productivity?

For Tools refer to Table 4

1.1 To what extent does the company use any recognized tools to analyse nonconformities?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

1.2 To what extent does the company indicate where the nonconformities originate?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

1.3 To what extent do you think the nonconforming classification could positively affect the company?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

1.3 By highlighting the area where the nonconformities occurs, do you feel that this could have a positive effect on the company?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

1.4 To what extent does your company analyse all quality problems recorded?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

1.6. To what extent are the nonconformities classified once highlighted?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

1 not at all 2 minor
3 critical 4 major

2. Sub problem 2: How and to what extent does SMMEs use quality techniques to improve productivity?

Table 5: Some Quality Techniques Available

| | |
|-------------------------------------|---------------------------------------|
| Benchmarking | Precontrol |
| Six Sigma | Business Process Reengineering |
| The 5 whys | Kaizen |
| Failure Mode Effect Analysis | Cost of Quality |

Classifications for all questions unless otherwise stated:

1 not at all 2 little
3 a lot 4 completely

2.1 To what extent does the company use any recognised problem solving techniques?(as per table 5 or other)

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

2.2 To what extent has your company developed its own problem solving techniques?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

2.3 To what extent do you think quality techniques could assist the company?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

2.4 Do you think it will be easy to introduce quality techniques into your company?

| | |
|------------|--|
| Yes | |
| No | |

3. Sub problem 3: How and to what extent does SMMEs use quality Models or Systems to improve productivity?

For Systems and models refer to Tables 2 and 3

Classifications for all questions unless otherwise stated:

- 1 not at all 2 little**
3 a lot 4 completely

3.1 To what extent was it management's initiative to implement a quality management system (QMS)?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.2 To what extent do your customers insist on a QMS?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.3 To what extent do you require your suppliers to conform to a formal QMS?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.4 To what extent was a consultant used to implement the QMS?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.5 To what extent has the QMS had a positive effect on your organisation?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.6 To what extent has the employees accepted the QMS cultural change?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.7 To what extent does the management support the QMS?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.8 To what extent do you feel the organisation has benefited from the QMS?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.9 To what extent does your organisation have a continual improvement culture in place?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

3.10 How often do your major customers audit your QMS?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4 = six monthly 3 = annually
2 = every 2 years 1 = not at all

3.11 Does your company have a dedicated Quality representative?

| | |
|------------|--|
| Yes | |
| No | |

3.12 Does your company quality representative carry out quality audits?

| | |
|------------|--|
| Yes | |
| No | |

3.13 How often do you have internal quality audits?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4 = monthly 3 = annually
2 = every 2 years 1 = not at all

3.14 To what extent is quality displayed visibly in your company?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4. Sub problem 4: How and to what extent does management display awareness and commitment to the change process?

Classifications for all questions unless otherwise stated:

- 1 not at all 2 little**
3 a lot 4 completely

4.1 To what extent does the management give the desired support for quality initiatives?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4.8 To what extent does your management budget for continuous improvement programs?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4.9 To what extent does your management promote active suggestions for all levels within your company?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4.10 Has your company set up a suggestion improvement scheme for suggested improvement proposals from employees?

| | |
|------------|--|
| Yes | |
| No | |

4.11 To what extent has your company set up a formal reward system for successful implemented improvement proposals?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4.12 To what extent does your company keep a register or data indicating successful proposal implementation?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4.13 To what extent does the company promote the use of team based quality initiatives? (eg; Quality Circles)

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

4.14 To what extent do the initiatives follow a structured approach?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

5. Sub problem 5: How and to what effect does productivity have an effect on the organisation?

Classifications for all questions unless otherwise stated:

- 1 not at all 2 little
3 a lot 4 completely**

5.1 To what extent do the employees volunteer for the quality teams?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

5.2 If team based quality initiatives are used, to what extent do the teams promote quality and productivity improvement initiatives?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

5.3 To what extent does supervision use quality initiatives to get the desired support from management?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

5.4 To what extent are the team based quality initiatives and suggestions implemented?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

5.5 To what extent do the employees accept any new productivity or quality processes implemented by management?

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

Are there any additional comments you would like to share:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Thank you for your time

Annexure F:

| Category | Frequency table: Activity | |
|------------------|---------------------------|---------|
| | Count | Percent |
| Manufacturing | 21 | 67.74 |
| Service | 5 | 16.13 |
| Manuf. & Service | 5 | 16.13 |
| Missing | 0 | 0.00 |

| Category | Frequency table: Employees | |
|------------|----------------------------|---------|
| | Count | Percent |
| 51 to 200 | 8 | 25.81 |
| 11 to 50 | 18 | 58.06 |
| 6 to 10 | 3 | 9.68 |
| 5 and less | 2 | 6.45 |
| Missing | 0 | 0.00 |

| Category | Frequency table: Quality_fr | |
|----------|-----------------------------|---------|
| | Count | Percent |
| Yes | 31 | 100.00 |
| Missing | 0 | 0.00 |

| Category | Frequency table: Quality_req | |
|----------|------------------------------|---------|
| | Count | Percent |
| Yes | 29 | 93.55 |
| No | 2 | 6.45 |
| Missing | 0 | 0.00 |

| Category | Frequency table: B1 | |
|------------|---------------------|---------|
| | Count | Percent |
| Medium | 9 | 29.03 |
| Small | 16 | 51.61 |
| Very small | 4 | 12.90 |
| Micro | 1 | 3.23 |
| Missing | 1 | 3.23 |

| Category | Frequency table: B2 | |
|----------|---------------------|---------|
| | Count | Percent |
| Yes | 29 | 93.55 |
| No | 2 | 6.45 |
| Missing | 0 | 0.00 |

| N=31 Category | Frequencies Variable: B3_ISO9000 (Multiple Dichotomy; count value: 1) | | |
|------------------|---|-----------------------|-------------------|
| | Count | Prcnt.of Responses | Prcnt.of Cases |
| B3_ISO9000 | 21 | 60.00 | 67.74 |
| B3_ISO14000 | 2 | 5.71 | 6.45 |
| B3_VDA | 0 | 0.00 | 0.00 |
| B3_QS9000 | 0 | 0.00 | 0.00 |
| B3_ISOTS16949 | 6 | 17.14 | 19.35 |
| B3_ISO18000 | 0 | 0.00 | 0.00 |
| B3_HACCP | 0 | 0.00 | 0.00 |
| B3_MDW | 1 | 2.86 | 3.23 |
| B3_ISO17025 | 1 | 2.86 | 3.23 |
| B3_ISO9001 | 3 | 8.57 | 9.68 |
| B3_M635 | 1 | 2.86 | 3.23 |
| Totals | 35 | 100.00 | 112.90 |

| Category | Frequency table: B4 | |
|----------|---------------------|---------|
| | Count | Percent |
| Yes | 2 | 6.45 |
| No | 2 | 6.45 |
| Missing | 27 | 87.10 |

| Category | Frequency table: B5 | |
|----------|---------------------|---------|
| | Count | Percent |
| 50% | 1 | 3.23 |
| 75% | 3 | 9.68 |
| 95% | 9 | 29.03 |
| Missing | 18 | 58.06 |

| Category | Frequency table: B6 | |
|----------|---------------------|---------|
| | Count | Percent |
| 20 Keys | 1 | 3.23 |
| SAEF | 4 | 12.90 |
| BOP | 3 | 9.68 |
| Other | 2 | 6.45 |
| Missing | 21 | 67.74 |

| Category | Frequency table: B7 | |
|----------|---------------------|---------|
| | Count | Percent |
| Yes | 16 | 51.61 |
| No | 14 | 45.16 |
| Missing | 1 | 3.23 |

| Frequency table: B8 | | |
|---------------------|-------|---------|
| Category | Count | Percent |
| Yes | 14 | 45.16 |
| No | 16 | 51.61 |
| Missing | 1 | 3.23 |

| Frequency table: B9a | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 7 | 22.58 |
| A little | 6 | 19.35 |
| A lot | 2 | 6.45 |
| Completely | 3 | 9.68 |
| Missing | 13 | 41.94 |

| Frequency table: B9b | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 7 | 22.58 |
| A little | 7 | 22.58 |
| Completely | 3 | 9.68 |
| Missing | 14 | 45.16 |

| Frequency table: B9c | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 3 | 9.68 |
| A little | 1 | 3.23 |
| A lot | 7 | 22.58 |
| Completely | 13 | 41.94 |
| Missing | 7 | 22.58 |

| Frequency table: B9d | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 12 | 38.71 |
| A little | 6 | 19.35 |
| Missing | 13 | 41.94 |

| Frequency table: B9e | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 11 | 35.48 |
| A little | 5 | 16.13 |
| Completely | 1 | 3.23 |
| Missing | 14 | 45.16 |

| Frequency table: B9i | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 6 | 19.35 |
| A little | 5 | 16.13 |
| A lot | 5 | 16.13 |
| Completely | 6 | 19.35 |
| Missing | 9 | 29.03 |

| Frequency table: B9g | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 15 | 48.39 |
| Missing | 16 | 51.61 |

| Frequency table: B9f | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 2 | 6.45 |
| A little | 6 | 19.35 |
| A lot | 7 | 22.58 |
| Completely | 9 | 29.03 |
| Missing | 7 | 22.58 |

| Frequency table: B9i | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 10 | 32.26 |
| A little | 1 | 3.23 |
| A lot | 3 | 9.68 |
| Completely | 3 | 9.68 |
| Missing | 14 | 45.16 |

| Frequency table: B9j | | |
|----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 5 | 16.13 |
| A little | 2 | 6.45 |
| Completely | 1 | 3.23 |
| Missing | 23 | 74.19 |

| Frequency table: C1_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 8 | 25.81 |
| A lot | 14 | 45.16 |
| Completely | 8 | 25.81 |
| Missing | 0 | 0.00 |

| Frequency table: C1_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 2 | 6.45 |
| A lot | 19 | 61.29 |
| Completely | 10 | 32.26 |
| Missing | 0 | 0.00 |

| Frequency table: C1_3 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 4 | 12.90 |
| A lot | 13 | 41.94 |
| Completely | 14 | 45.16 |
| Missing | 0 | 0.00 |

| Frequency table: C1_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 2 | 6.45 |
| A lot | 10 | 32.26 |
| Completely | 19 | 61.29 |
| Missing | 0 | 0.00 |

| Frequency table: C1_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 5 | 16.13 |
| A lot | 15 | 48.39 |
| Completely | 10 | 32.26 |
| Missing | 0 | 0.00 |

| Frequency table: C1_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| Minor | 8 | 25.81 |
| Critical | 17 | 54.84 |
| Major | 5 | 16.13 |
| Missing | 0 | 0.00 |

| Frequency table: C2_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 4 | 12.90 |
| A little | 11 | 35.48 |
| A lot | 14 | 45.16 |
| Completely | 2 | 6.45 |
| Missing | 0 | 0.00 |

| Frequency table: C2_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 3 | 9.68 |
| A little | 11 | 35.48 |
| A lot | 15 | 48.39 |
| Completely | 2 | 6.45 |
| Missing | 0 | 0.00 |

| Frequency table: C2_3 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 3 | 9.68 |
| A lot | 14 | 45.16 |
| Completely | 14 | 45.16 |
| Missing | 0 | 0.00 |

| Frequency table: C2_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Yes | 27 | 87.10 |
| No | 4 | 12.90 |
| Missing | 0 | 0.00 |

| Frequency table: C3_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 4 | 12.90 |
| A lot | 7 | 22.58 |
| Completely | 19 | 61.29 |
| Missing | 0 | 0.00 |

| Frequency table: C3_2 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 3 | 9.68 |
| A little | 9 | 29.03 |
| A lot | 6 | 19.35 |
| Completely | 13 | 41.94 |
| Missing | 0 | 0.00 |

| Frequency table: C3_3 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 2 | 6.45 |
| A little | 7 | 22.58 |
| A lot | 18 | 58.06 |
| Completely | 3 | 9.68 |
| Missing | 1 | 3.23 |

| Frequency table: C3_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 2 | 6.45 |
| A lot | 16 | 51.61 |
| Completely | 12 | 38.71 |
| Missing | 0 | 0.00 |

| Frequency table: C3_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 4 | 12.90 |
| A lot | 18 | 58.06 |
| Completely | 8 | 25.81 |
| Missing | 0 | 0.00 |

| Frequency table: C3_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 8 | 25.81 |
| A lot | 18 | 58.06 |
| Completely | 5 | 16.13 |
| Missing | 0 | 0.00 |

| Frequency table: C3_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 2 | 6.45 |
| A lot | 12 | 38.71 |
| Completely | 16 | 51.61 |
| Missing | 0 | 0.00 |

| Frequency table: C3_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 2 | 6.45 |
| A little | 3 | 9.68 |
| A lot | 17 | 54.84 |
| Completely | 8 | 25.81 |
| Missing | 1 | 3.23 |

| Frequency table: C3_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 5 | 16.13 |
| A lot | 18 | 58.06 |
| Completely | 7 | 22.58 |
| Missing | 1 | 3.23 |

| Frequency table: C3_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 14 | 45.16 |
| Every 2 years | 5 | 16.13 |
| Annually | 7 | 22.58 |
| 4 Six monthly | 4 | 12.90 |
| Missing | 1 | 3.23 |

| Frequency table: C3_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Yes | 22 | 70.97 |
| No | 9 | 29.03 |
| Missing | 0 | 0.00 |

| Frequency table: C3_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Yes | 25 | 80.65 |
| No | 5 | 16.13 |
| Missing | 1 | 3.23 |

| Frequency table: C3_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Every 2 years | 4 | 12.90 |
| Annually | 11 | 35.48 |
| Monthly | 15 | 48.39 |
| Missing | 1 | 3.23 |

| Frequency table: C3_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 2 | 6.45 |
| A little | 4 | 12.90 |
| A lot | 19 | 61.29 |
| Completely | 6 | 19.35 |
| Missing | 0 | 0.00 |

| Frequency table: C4_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 4 | 12.90 |
| A lot | 15 | 48.39 |
| Completely | 12 | 38.71 |
| Missing | 0 | 0.00 |

| Frequency table: C4_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 16 | 51.61 |
| A lot | 9 | 29.03 |
| Completely | 5 | 16.13 |
| Missing | 0 | 0.00 |

| Frequency table: C4_2 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| A little | 9 | 29.03 |
| A lot | 13 | 41.94 |
| Completely | 9 | 29.03 |
| Missing | 0 | 0.00 |

| Frequency table: C4_3 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Yes | 11 | 35.48 |
| No | 20 | 64.52 |
| Missing | 0 | 0.00 |

| Frequency table: C4_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 23 | 74.19 |
| A little | 6 | 19.35 |
| Completely | 2 | 6.45 |
| Missing | 0 | 0.00 |

| Frequency table: C4_5 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 17 | 54.84 |
| A little | 7 | 22.58 |
| A lot | 6 | 19.35 |
| Completely | 1 | 3.23 |
| Missing | 0 | 0.00 |

| Frequency table: C4_6 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 14 | 45.16 |
| A little | 9 | 29.03 |
| A lot | 6 | 19.35 |
| Completely | 2 | 6.45 |
| Missing | 0 | 0.00 |

| Frequency table: C4_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 13 | 41.94 |
| A little | 9 | 29.03 |
| A lot | 6 | 19.35 |
| Completely | 3 | 9.68 |
| Missing | 0 | 0.00 |

| Frequency table: C5_1 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 9 | 29.03 |
| A little | 17 | 54.84 |
| A lot | 3 | 9.68 |
| Completely | 1 | 3.23 |
| Missing | 1 | 3.23 |

| Frequency table: C5_2 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 4 | 12.90 |
| A little | 15 | 48.39 |
| A lot | 9 | 29.03 |
| Completely | 1 | 3.23 |
| Missing | 2 | 6.45 |

| Frequency table: C5_3 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 18 | 58.06 |
| A lot | 8 | 25.81 |
| Completely | 2 | 6.45 |
| Missing | 2 | 6.45 |

| Frequency table: C5_4 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 2 | 6.45 |
| A little | 13 | 41.94 |
| A lot | 14 | 45.16 |
| Completely | 1 | 3.23 |
| Missing | 1 | 3.23 |

| Frequency table: C5_5 | | |
|-----------------------|-------|---------|
| Category | Count | Percent |
| Not at all | 1 | 3.23 |
| A little | 8 | 25.81 |
| A lot | 15 | 48.39 |
| Completely | 6 | 19.35 |
| Missing | 1 | 3.23 |

Annexure G

Research questions to be asked to the bigger companies

15/11/05

Why does your company support the SMME sector? (support, choice or necessity)

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What benefits does your company get from supporting the SMME sector?

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Do you insist on the SMME that supply your organisation with critical parts to have a recognised quality system in place?

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How does your organisation support the SMME sector to improve there quality?

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Do you know if the SMME sectors that supplies you with critical parts use any tools or techniques to improve their quality?

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How often does your organisation audit and/or rate the critical SMMEs that supplies the organisation?

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With your dealings with the critical SMME sector, how would you rate the skills and commitment of the management?

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What do you think could be introduced to improve the quality of the SMME sector?

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What are the major problems and drawbacks your organisation encounters with the critical SMMEs?

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If it was your choice would you support the SMME sector?

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Annexure H



**Nelson Mandela
Metropolitan
University**

for tomorrow

FACULTY OF ENGINEERING

Department of Engineering: Industrial

Research questions to be asked to the SMMEs regarding implementation of a QMS
07/06/06

The implementation of the QMS, was it implemented to satisfy your requirements or
the bigger company you supply? (Explain why you implemented one).

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Did the company get new business because of the implementation of the QMS.

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What was the cost of implementation and the ongoing cost elements of the QMS.

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Explain the cost effectiveness resulting from the implementation of the QMS

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What were the benefits of the implementation (quantify).

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Do the operators use and understand the QMS, and if yes, was it forced or was it voluntary (quantify you answer).

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Did the implementation increase the overall awareness of improvements?

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Has the exercise been a painful experience? (expand on problems experienced)

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Do you envisage any long term improvements?

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What the effect on the company was with regards the implementation of the QMS

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