INFLUENCE OF QUALITY INITIATIVES ON THE OPERATIONS OF A SELECTED METAL RECYCLING COMPANY IN KWAZULU-NATAL - A CASE STUDY

BY

BYELONGO ELISEE ISHELOKE

Dissertation submitted in fulfilment of the requirements for the

MASTERS DEGREE IN TECHNOLOGY: **BUSINESS ADMINISTRATION**

in the Faculty of Management Sciences, Department of Entrepreneurial Studies and Management at the

DURBAN UNIVERSITY OF TECHNOLOGY (DUT)

APPROVED FOR FINAL SUBMISSION

Supervisor : _____ Date:_____/_____/2013

Dr Hari Lall Garbharran

(B.A., HONOURS, M.P.A., D.P.A.)

Co-supervisor: _____ Date:____/_____/2013

Mr Angadh Moorley

(B.COM., HONOURS, M.COM., H.E.D.)

APRIL 2013

DECLARATION

I declare that this research dissertation is my own work and that all sources I have used or quoted have been indicated and acknowledged by means of complete references (in-text references and a list of references).

Signed _____
Date _____

I hereby declare that the dissertation submitted for the degree Master of Technology: Business Administration, at the Durban University of Technology is my own work and has not been previously presented in any candidature for any degree. Where other sources have been used, explicit references have been provided in the text as well as in the reference list appended accordingly.

Signed _____
Date _____

I hereby give consent for my work to be available for photocopying and interlibrary loan, and for the title and summary to be made available to outside organisations and future students.

Signed _____
Date _____

BYELONGO ELISEE ISHELOKE

ACKNOWLEDGEMENTS

I would like to grasp this opportunity to express my sincerest gratitude and appreciation to the following persons without whom the completion of this research study would have been an illusion:

God the almighty in His Holy Trinity for the gift of life and for giving me the faith in myself as I persevered throughout my studies.

Dr Hari Lall Garbharran – my promoter- for his professional conduct, his scientific inputs and for making me work not only hard but also smartly. I realised a Master's degree is as precious as a scarce gemstone as the qualification requires one to rise above the many challenges.

Mr Angadh Moorley – my co-promoter- for his availability to guide me, his kindness, fatherly approach as well as his perseverance in co-supervising this study.

Mr Deepak Singh and his team for their assistance with the generation of statistics and analysis thereof. It was a pleasure working with Mr Deepak Singh.

Dr Rosemary Townsend for her inputs and for being professional in co-editing this study.

Sara Bibi Mitha for library assistance and reference editing. She was such an incredible help.

My parents and family for their support: Mr Byelongo Sangara and Mrs Mlebinge Justine. Mrs Elisabeth Byose Misa for being a loving wife and our children, Enos Sangara Isheloke, Justine Mlebinge Byelongo Isheloke, and

Monica Byelongo Isheloke who allowed that I deprive them of much time to conduct research.

Friends who have been there for me when I needed some help, The Jardines' family, Shalom Evangelical Ministries, Johan Kohler, Jon Dikson, Alastair Keneth, Axel von Blottnitz (in memoriam), Raita Pyhala, Prof. Harro von Blottnitz, Julian Cloete and David Maccalum.

The DUT departmental team for some administrative assistance. Prof. Annelie Jordaan and Dr Shalini Singh for encouraging me to go for this qualification at the initial stage. The DUT post-graduate departmental support for providing some funding for this research.

The management team of the Eurotrade Metals Africa (EMA) for authorising this research study and for their participation: Iain Maccmillan Davie, Paul Perry, Sharlene Webb and Mandla Msomi. The EMA operations workers and field workers for their participation.

The Alliance Française of Durban, Esperanto Association of Southern Africa and Crawford North Coast, and especially, the Eurotrade Metals Africa/Lee scrap Metals, for employment-related opportunities while I continued with this study.

Those dear ones who allow that I may omit their names in this acknowledgement. They were equally helpful.

DEDICATION

To Byelongo Sangara (my father),
Mlebinge Justine (my mother),
Elisabeth Byose Misa (my wife),
Enos Sangara B. Isheloke (my son),
Justine M. Byelongo Isheloke (my daughter),
Monica Byelongo Isheloke (my daughter),
Anzuruni Msabah, Binaisa Mioka, and Emoneto Sangara
(my young brothers),
Masoka Binti Sangara (my young sister),
Mamicho Byosaa Tausi, Bwenge Byelongo and Bichingini Byelongo
(respectively, my beloved late sister and young brothers),
Rachel Ilambo (my niece),

I dedicate this research dissertation.

ABSTRACT

The aim of this study has been to establish the influence of quality initiatives on the operations of a selected metal recycling company in KwaZulu-Natal. The rationale for this study was based on the information that the financial turmoil has led to a significantly reduced demand for scrap metals and that there is a shortage of information on quality initiatives in the secondary metal industry in this province. Little research, if any, has been done on this particular topic. Hence, there was a need to conduct research of this magnitude.

A review of literature provided the basis for the investigation. A multi-method approach was followed as the project required both quantitative and qualitative methods. The research required interdepartmental inputs. The theme of study focused on what could be seen as a topic of research in the department of quality, while the actual research was conducted within the ambit of business administration as a field of study.

The data collected through the questionnaires and the operations' know-how observed in the yard were subject to scrutiny to enhance relevance in the field of study. As the target population of 70 people was small, it became appropriate to do a census study. A total of 68 people returned filled-in questionnaires administered to operations workers and their management. The response rate was 97%.

The study evaluated the importance of training on quality and safety as an integrated domain and the impact thereof in the secondary metal products industry. It further identified a number of drawbacks that hamper the effectiveness of metal operations.

The results revealed that excellent quality initiatives have a positive impact on the value-adding operations.

A total of 75,5% of respondents agreed that quality enhancements increase products sales. While this study contributes to the bulk of knowledge in scrap recycling industry, it also opens up interesting avenues for future research.

Key words: Quality initiatives, metal recycling, metal and mineral operations, secondary metal products, continuous quality improvement, health and safety, and integrated quality approach.

TABLE OF CONTENTS

CHAPTER 2: LITERATURE REVIEW

CHAPTER 4: ANALYSIS OF RESULTS AND DISCUSSION OF FINDINGS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

5W 2 H	What, Who, When, Why, Where, How and How much
ABP/BTECH	Advanced Business Programme/Bachalaureas Technoligae
AMS	Aids Management System
BBEE	Broad Based Black Economic Empowerment
BEE	Black Economic Empowerment
BIR	Bureau of International Recycling
COQ	Cost of Quality
DFMEA	Design, Failure, Mode and Effect
DRC	Democratic Republic of Congo
DRIVE	Define, Review, Identify, Verify and Execute
DUT	Durban University of Technology
DV	Dependant Variable
EMA	Euro trade Metals Africa
EMS	Environmental Management Systems
FMEA	Failure modes and effect analysis
HIV/AIDS	Human Immune-deficiency Virus/Acquired Immune Deficiency Syndrome
HMS	Hard Metal Steel
HR	Human Resources
IDAARA	Indices, Data, Analyses, Action, Review, Again
ISO	International Organisation for Standardisation
ISRI	Institute of Scrap Recycling Industry
IT	Information Technology
IV	Independent Variable
JIT	Just In Time
KSF	Key Success Factor
KZN	KwaZulu-Natal

LMS	Light Metal Steel
MTO	Make-to-Order
MTS	Make-to-Stock
OHSAS	Occupational Health and Safety Assessment Series
PDCA	Plan, Do, Check and Analyse
PDPC	Process, Decision, Programme, Chart
PDSA	Plan, Do, Study, and Act
PPE	Personal Protective Equipment
PVC:	Polyvinyl Chloride
Q=P/E	Quality equals Performance over Expectations
QFD	Quality Function Deployment
QMS	Quality Management System
RASA	Recycling Association of South Africa
RIOS	Recycling Industry Operational Standards
RSA	Republic of South Africa
SA	South Africa
SABC	South African Broadcast Corporation
SAEM	South African Excellence Model
SAIM	South African Institute of Management
SAS	Scandinavian Company
SASS	Snake Analogy Safety Strategy
SECQA	Safety, Environmental, Corporate governance, Quality, HIV/Aids management systems or codes of practice
SME	Small and Medium Enterprises
SPC	Statistical Process Control
SPC	Statistical Process Control
SWOT	Strengths, Weaknesses, Opportunities and Threats
TPS	Toyota Production System
TQM	Total Quality Management
UEA	Universal Esperanto Association
USA	United States of America

USD	United State Dollars
Vs	Versus

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter introduces the research topic under investigation. The problem statement, the hypothesis, the variables, the objectives as well as the definitions are explained.

The research aim is to investigate the influence of quality initiatives on the operations of a selected metal recycling company in KwaZulu-Natal. Following the global economic crisis, the metal industry, particularly the metal recycling industry, strives to cope with numerous challenges, such as lack of liquidity, safety, metal or cable theft, metal quality, strategic management and environmental threats.

In order to redress the situation, metal recycling companies sought to take quality improvement initiatives. Cost-effective quality initiatives have, therefore, become paramount. These activities include on-going training, quality improvement and control, safety enhancement, smooth metal recycling operations and environmentally friendly projects.

The research is a case study of one of the major metal recycling companies, Eurotrade Metals Africa, also known as Lee Scrap Metals, based in Durban, KwaZulu-Natal. The

company was founded in 1992 in London. Following a rapid growth in business, the company became a full service recycler for ferrous and non-ferrous metals. In 1998, Eurotrade relocated to South Africa and has extended its activities to include scrap metal recycling, waste management, mineral processing, logistics, venture capital and real estate development.

Eurotrade Metals and Mineral group operates six branches, with a turnover in excess of USD20M per annum. The company owns USD3.5M of real estate and net group assets in excess of USD5M. According to Davie (2007), the company employed 200 personnel who work in Phoenix Industrial Park, Durban and Pietermaritzburg before the recession. Despite the effects of the global economic recession, which saw the company retrenching almost half of the people working in the operations department, the company sees itself as a niche boutique recycler, producing high quality graded metal products. In order to meet this expectation, it is imperative to take quality initiatives.

1.2 Problem statement

The metal industry, in general, depends on international trade. In his contribution on the world scrap market, Brookes (2009:12) states that financial turmoil has led to a significantly reduced demand for scrap metals. This situation has caused a severe deterioration in metal trading conditions (Widmer, 2009:10). Grobler, Warnich, Carrell, Elbert and Hatfield (2006:21) observe that many companies

are turning themselves inside out to remain competitive in the market.

This is exactly what the organisation under consideration strives to achieve. Moreover, there is a shortage of information on quality initiatives in the scrap metal operations in KwaZulu-Natal. There are numerous publications on quality issues but the gap still exists when it comes to the literature on quality initiatives. Quality initiatives in the operations of secondary metal products will also address the problem around metal theft and other safety issues. Quality goes hand in hand with the legality of the business.

According to a report on SABC 3, during an interview on Special Assignment (Moyo, 2010), metal theft is a major challenge that ESKOM faces on a daily basis. Since the scrap metal companies are buyers of cables and other metal products they become acquainted with individuals or syndicates who in many instances become a problem to the country's economy. ESKOM loses 200M Rand as a consequence of metal theft annually. This affects the taxpayers, the customers who, in many cases, do not receive the service they paid for, but it also presents a danger to the thief himself or herself, as he or she may be electrocuted and killed on the spot.

1.3 The hypothesis

There is an influential relationship between quality initiatives and metal recycling operations.

1.4 The variables

Independent Variable (IV): Quality initiatives
Dependent variable (DV): Metal recycling operations

1.5 Research aim

The aim is to examine the influence of quality initiatives on the operations of a selected metal recycling company in KwaZulu-Natal.

1.6 Research objectives

1.6.1 To determine the influence of quality initiatives on the company's productivity.
1.6.2 To evaluate the significance of education on quality issues towards enhancing health and safety in recycling firms.
1.6.3 To identify the drawbacks that hamper the effectiveness of quality initiatives in metal operations.

1.7 Definitions of terminology and key concepts

1.7.1 Quality vs. Quality initiatives

According to Juran, as cited by Mitra (2008:82), quality is the fitness of a product for its intended use. Lakhal and Pasin (2008:1092) suggest that another term for quality improvement initiatives is innovation or internal process improvement. Others refer to quality initiatives as strategic improvement. Kelemen (2003:88) illustrates quality as a process culminating in continuous improvements.

1.7.2 The value chain and its operations function

The value chain is the entire sequence of activities that gradually add value from initial inputs to the final outputs destined to the customers (Robbin and Coulter, 2007:569). Porter's value chain framework analyses the primary and the support activities, that is, the operational activities (De Beer, 2009; Shapiro, 2007:13).

1.7.3 Scrap yard vs. Metal Recycling Company

Metal recycling companies are those firms which deal with metallic materials such as scrap vehicles, microwaves ovens, cables, accumulators and lubricants. These companies collect, store, process ferrous or non-ferrous metals, either for export or reuse in local markets (Department of Agriculture, Environmental Affairs and Rural Development, 2009:1-2; Department of Agriculture, Environmental Affairs and Rural Development, 2010:2-4). A scrap yard is a place where a bunch of scrap could be found, car parts and other waste included, most of the time for sale (Appendices G and F).

1.7.4 Metal waste vs. Secondary metal products

There is an on-going debate as to whether scrap metals should be regarded as waste products (Appendix G). Experts in the field and metal dealers suggest the distinction between waste and scrap metals, which they regard as raw materials and could become finished goods, whereas waste are unwanted metal products (Department of

Agriculture, Environmental Affairs and Rural Development, 2010).

1.7.5 Recycling

Environ (2008:1), as cited by Vumase (2009:84), defines recycling as “one way to reduce waste to land fill”, and also that it is a way of reprocessing material such as steel and aluminium cans, waste tins and other yard waste to its “original useful format”. Medical waste management principles can be used in first aid training of the metal recycling companies (Appendices F and G).

1.8 Rationale for the study

To improve productivity and to manage the effects of the global economic recession, the company will have to invest in the training and development of its personnel. Aspects of quality initiatives such as quality improvement, quality control, skills development programmes and ongoing training will be examined. Grobler *et al*. (2006:21) maintain that improved quality means survival of the business. Amidst the crisis and the economic recession, competition will increase and only metal firms with quality products will thrive (*Downturn brings opportunity*, 2008). It is foreseen that the research study will benefit the company and its pool of customers, the metal industry and the people researching or interested in the metal recycling business.

1.9 Scope of the study

The study falls short in that it does not address all the components of the value chain. Quality improvement, quality control, skills development programmes and ongoing training could have a significant impact on other departments as well. Unfortunately, those other components of the value chain fall beyond the scope of this work. Otherwise, it would be time-consuming and expensive. Furthermore, the metal and mineral industry is very broad. The investigation focuses on a company based in KwaZulu-Natal. Therefore, its findings should be understood within these limits. Lastly, the case study approach is straightforward and falls within the ambit of the researcher's expertise.

1.10 Research methodology

This study followed a multi-method approach, i.e, method triangulation. This approach enabled the researcher to draw both qualitative and quantitative data for analysis (Bennett, 2003:57). Depending on the situation, either explorative or descriptive methods were used to address quality initiatives. As the target population was small (70 respondents), it became appropriate to do a census study. A total of 68 people returned questionnaires. The response rate was 97%. The data collected from the responses were analysed with the Predictive Analytical Software (PASW) version 18.0.

1.10.1 Target population

In an interview, Davie (2007) informs that the company employs 200 personnel. The study targeted only those who work in the operations.

1.10.2 Research design

This research is predominantly quantitative. Firstly a literature review on the topic is given. In addition, a systematic observation, a questionnaire and interviews were used to collect data.

1.10.3 Sampling technique

The study uses a census to identify the sample. Questionnaires, interviews and observation techniques were also utilized for data collection.

1.10.4 Sample selection

A census revealed that 70 people work in the operations. Through informed consent (Appendix B), the people working in the operations agreed to take part in the study.

1.10.5 Size of sample

A sample of 70 was identified through a census. According to Sekaran (1992:253), for a population of 50, a sample size of 44 is the minimum required. For a small population of 70, surveying all is in accordance with scientific approach to research.

1.10.6 Questionnaire design

The questions derived from the literature review (Brian, 2000) Likert scale type of questions were predominantly used. The questions are easier, better analysed and allow statistics to be drawn for interpretation. A section includes biographical questions to allow comparison across gender and age. The questionnaire was in English (Appendices C and D). Field workers assisted those who required translation of the English language.

1.10.7 Pilot test

A pilot study was conducted at Eurotrade Metals Africa (EMA) with 5 workers. The purpose of the pilot study was to test the questions for ambiguities and wording problems so that changes can be made to the questionnaire before collecting the data for analysis. It was after the pilot study that the researcher resolved to simplify the language in the questionnaires (Appendices C and D).

1.10.8 Data collection methods

The information feeding this research study was sourced from primary and secondary data. Parumasur (2008) advises that a triangulation approach to data collection enhances accuracy.

1.10.9 Interviewing procedure

After verbal, written or telephonic arrangement, a few structured or unstructured interviews were conducted (Appendices A and B).

1.11 Outline of the study

Chapter 1: Introduction

The purpose and the raison d'être are explained here.

Chapter 2: Literature review

This chapter presents what experts say about the topic of study in detail. Definitions are given and theories are explained.

Chapter 3: Research methodology

The quantitative and qualitative methodologies are explained in this section. It is here that the research design, therefore, takes shape.

Chapter 4: Presentation, interpretation and discussion of findings

The research findings are analysed and presented in this chapter. Tables, figures are used to present the statistical discoveries such as correlations. More tables are appended for this very purpose (Appendix E with its sub tables A to Z and A' to G').

Chapter 5: Conclusions and Recommendations

A summary of the investigation is hereby given. Relevant recommendations are also provided as a contribution to the field of study.

1.12 Conclusion

This chapter has served as the introduction of the topic of study. The problem statement, hypothesis, variables, aim and objectives were explained. In addition, terminologies and key concepts have been defined.

In the next chapter, the concepts “dependent and independent variables” will be discussed. Relevant literature will be reviewed. This will be coupled with field observation and planned interviews with experts in the field or metal dealers.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This literature review examines quality theories, quality improvement tools and quality initiatives from early times to date. It includes the philosophies of famous quality gurus and highlights their points of similarity or disagreement. This review will also explore a few models that could be used within the metal recycling industry as far as quality initiatives are concerned. Additional reviews are conducted to address the importance of training, retraining on quality and safety matters. The review will look at practical ways to surmount drawbacks to quality, training and safety within the secondary metal recycling industry. The researcher will undertake to link the theories, findings or models to the reviewed literature.

2.2 Quality initiatives defined

Crosby as cited by Evans and Dean (2003) highlights the idea that quality is free, whereas Moller's definition emphasizes the concept of personal quality as core to TQM. Besterfield (2009:2) implies that quality brings forth the idea of excellent product or service that either fulfills or surpasses the stakeholders' expectations. A customer may expect a certain outcome from a light steel washer and a different one from a chrome-plated steel washer because they are of different quality. When a metal product exceeds the expectation of the recycling firm and their network along

the metal recycling value and supply chains, it is considered to be of high grade or quality. Based on perceptions, quality can be schematized quantitatively as follows: Q =P/E; Where Q=quality; P=performance and E=expectations.

If Q is greater than 1.0, the customer has a good feeling of happiness, satisfaction or pleasure as far as the product or service is concerned. Usually, an organization will determine performance and the customer determines the expected outcome/output. With competition and with efforts towards complete recovery from the global economic recession, customers are becoming even more demanding as far as their expectations are concerned (Besterfield, 2009:2).

Lakhal and Passin (2008:1092) suggest that another term for quality improvement initiatives is innovation or internal process improvement. They do, however, acknowledge the lack of information linking improvement of internal processes to better product quality. Suganthi *et al.*, as cited by Naidu (2007:18), summarize the philosophy of quality gurus:

- There are no shortcuts to quality, prescribed processes must be followed;
- There are no quick fixes, quality is a time consuming activity;
- Top management support and commitment are crucial for the success of quality initiatives;
- Ongoing training is needed extensively; and
- Quality is everybody's responsibility.

Others refer to quality initiatives as strategic improvement. Kelemen (2003:88) illustrates quality as a process culminating in continuous improvement. In order to improve quality continuously, it is necessary to equip personnel through ongoing training on health and safety as well as on quality improvement tools such as Six Sigma, TQM and ISO standards (Antony and Preece, 2003; Naidu, 2007:18-41).

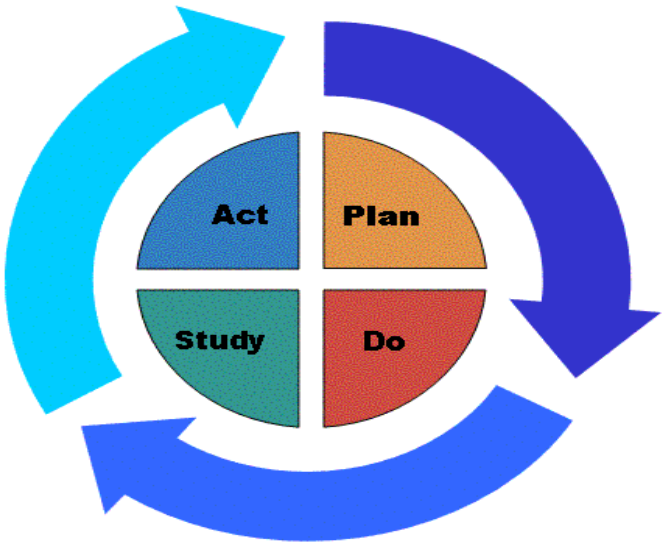
2.3 Quality theories and implication on quality Initiatives

Many theorists, also called quality gurus, have voiced their philosophies on quality theories over the years (Van kemenade, 2010:49-59). Drs. Shewhart, Deming and Taguchi's theories and tools have been instrumental across the industries. Tools that are key in translating quality theories into something doable include: Dr. Shewhart's Cycle for Learning and Improvement, Dr. Deming's 14 Points and 7 Deadly Diseases, Dr. Deming's Operational Definitions, Dr. Deming's Leadership and Training Theories and Dr. Taguchi's Loss Function.

2.3.1 Shewhart's Cycle for Learning and Improvement

Dr. Walter A. Shewhart, arguably the father of today's quality control, developed the "Plan, Do, Study and Act" (PDSA) Cycle. This quality management concept and tool is a never-ending wheel-like process which characterizes continuous quality improvement. To illustrate this quality tool, the Plan, Do, Study and Act model in figure 2.1 on page 15 is of importance (OmniLingua, 2004:2).

Figure 2.1: The PDSA model

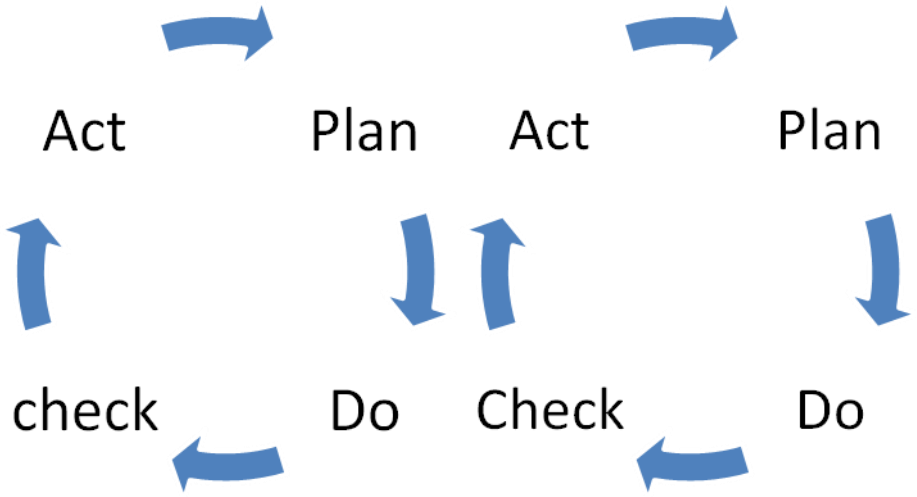


Source: OmniLingua (2004:2). The PDSA model of continuous and continuing quality improvement. The circumstances and the know-how determine the size of the segments.

Figure 2.1 illustrates the importance of planning before taking the decision or doing what has been decided. It also emphasizes the need to conduct further study before implementing a certain course of action. Without any doubt, such a model could be used across the departments as the firm strives to improve quality (OmniLingua, 2004:2). The people that find it difficult to implement development projects must identify strategic infrastructure development needs and develop a long-term planning system. The PDSA model is instrumental in identifying the causes of poor translation quality in order to enhance quality.

The PDSA model is also suitable for the metal recycling industry. This model resembles the Deming's "Plan, Do, Check and Act (PDCA) cycle" (Van kemenade, 2010:49-59). Not only will this model be necessary to improve the many data based decisions on process improvement, as opposed to decisions based on mere opinion or rumors, it will serve the purpose of decision-making about operational activities, that is, the sorting and grading of metals (ferrous and non-ferrous), the baling of sub grade, aluminium, copper, the loading of secondary metal products, the handling and storage of brass, ali castle, etc. The PDCA cycle is explained and illustrated below:

Figure 2.2: The PDCA cycle



Source: Adapted from Evans and Dean (2003:79).

The Plan, Do, Check and Act (PDCA) Cycle in Figure 2.2 above is known as the Deming's Cycle (Van kemenade, 2010:49-59). It is a self-explanatory tool usable in most

circumstances. The “Check phase” is replaced sometimes with the “Study” (Evans and Dean, 2003:79) since it is better to study and/or analyze a situation than simply to check it. Evans and Dean (2003:79) cite the PDCA or PDSA cycle among data collection and analysis tools. Some of Deming’s theories are further explained below.

2.3.2 Deming’s 14 Points and 7 Deadly Diseases

2.3.2.1 Demining’s 14 Points

Dr. W. Edwards Deming explains that productivity increases as quality improves because quality products translate into lesser rework. Metal recycling companies should embrace the 14 points suggested by Deming to address quality in an effective manner. An organization that considers quality to be an investment and expects higher returns on that should embrace Dr. Deming’s 14 Points given below (OmniLingua, 2004:3-4):

- The creation of constant improvement of products and service is a must;
- The mindset should change from the one that separates quality from the “real” work to the one that incorporates work and quality as one and the same thing;
- Quality is to be built into the product and not merely to be inspected for;
- The aftermath cost is to be part of the total cost and the necessary precautions are to be taken;

- The production and service improvement must affect every aspect of the work and are to become ongoing systems;
- Ongoing training of the workers and management is a must. It will help develop the learning culture between peers and across the ranks;
- The manager should be hired among suitably qualified graduates, whereas best workers should be promoted accordingly. Seldom has the opposite occurred;
- Everybody is to speak up about what needs to be improved without any fear;
- Barriers between staff areas are to be broken down;
- Slogans, exhortations and targets for the workforce should not impede the relationship among the staff. Instead, effective plans to accomplish the goals should be put in place;
- No quotas to motivate or evaluate are needed. Quotas do not allow for variation and the workers might lose focus;
- The organization should stop getting in the way of workers who want to take pride in doing their job by interfering too much. The barrier to pride in workmanship should be removed;
- Institute a vigorous programme of education and retraining. New techniques and discoveries in the field should be taught to all workers; and
- Deming's PDCA Cycle (Plan, Do, Check and Analyze) is to be used. This will allow transformation in a proactive way.

2.3.2.2 Deming's 7 Deadly Diseases

The process of transforming the company is a difficult one, especially after the realization of the challenges to be surmounted.

The 7 Deadly Diseases pointed out by Dr. Deming include (OmniLingua, 2004:3-4):

- Lack of constancy in planning for product and service that will keep the firm in business and provide jobs;

- The problem of emphasis being put on short-term profits, short-term thinking because of the fear of unfriendly takeover and by the push from bankers and owners of dividends;

- Evaluation of performance, merit rating and annual review;

Mobility of management – job-hopping;

- The problem of focusing on visible figures only, while little consideration is put on unknown or unknowable ones;

Excessive medical costs; and

- High costs incurred in paying for lawyers who work on contingency fees (OmniLingua, 2004:3-4).

The following section discusses Dr. Juran's theory: The Quality Trilogy (Evans, 2005:28).

2.4 Quality trilogy

Another quality guru is Joseph M. Juran. Juran was employed at Western Electrical since the 1920s where he pioneered the evolution of the statistical method for quality. As a corporate industrial engineer, he authored the famous quality control handbook. Deming believed employees and employers should use statistics as their common language, but Juran contends that at different levels, people speak in different languages. For example, he expresses his opinion that senior managers speak in the language of dollars, whereas workers speak in the language of things. In the same context, he maintains that middle managers must be able to use both languages. This explains his view that in order to catch senior managers' attention, quality should be expressed in the language of dollars (Evans and Dean, 2003:54-55).

According to Evans (2005:27-29), Juran and Deming's views are opposed as far as the language that needs to be spoken by the different hierarchies is concerned. Whereas Juran envisaged numerous (if not two) languages for each of the organizational levels, Deming thinks only statistics should express the wants and needs of managers, workers and middlemen. Juran's philosophy appears to support Deming's statistical approach when it comes to increasing conformation to specifications through the elimination of defective products. Simply put, Juran advocates the use of statistical tools (Evans, 2005:27; Evans and Dean, 2003:43-55). However, according to Douglas, Coleman and Oddy (2003:317), citing the findings of Witcher (1993) and Taylor

(1995), for other organizations, ISO 9001 has become a requirement to be included in the value chain.

While there is much factual information in Juran's philosophy on quality, the definition of quality as "fitness for use" remains perhaps the most influential concept. This is curious when Deming personally or the many other quality gurus advocate no specific definition of quality. Juran explains fitness in term of quality design, quality of performance, availability and field service. Although it is beyond the scope of this study to go into the details of Juran's philosophy, it is worth mentioning that Juran's description of quality trilogy has impacted the quality evolution with its three-field practices, that is, quality planning, quality control and quality improvement (Evans and Dean, 2003:43-55). He explains that doing it right the first time is the most economic behaviour a company ought to have. This builds quality into the products or services. However, it is imperative for companies to do the right things all the time. Alongside Juran, Crosby is another eminent quality guru. Crosby developed the Zero Defect philosophy.

2.5 The Zero defect philosophy

According to Basu and Wright (2003:16-17), Philip B. Crosby is a guru of the late 1970s. As a well known guru, Dr Crosby was the populist who marketed the concept of quality management and zero defects to America (USA). He further links the zero defects to the ideal of Six Sigma. Contrasting the four authors, Basu and Wright (2003:16) find Crosby's approach softer than Deming's, Juran's,

Feigenbaum's and even Six Sigma. The zero defect concept is based on the assumption that it costs more to produce defective items. Therefore, it is always cheaper to do things right the first time. Kesner (2012:126) states that there is a significant correlation between speed of response and the minimization of financial impact of incidents. This explains the reason why a zero defect attitude is to be promoted.

For example, it is efficient to put in place infrastructures that are dust free instead of waiting to be sued by metal workers who contract tuberculosis as a result of inhaling dust. According to Faurie (2011:12), "dust causes scar tissue on the lungs and weakens the victim's immunity, leaving the sufferer susceptible to other diseases, such as tuberculosis".

Also, it is known that the international standard for acceptable dust exposure is 0.025 mg/mm. It is, however, a fact that even bigger companies find it difficult to reduce the dust level to the acceptable rate (Faurie, 2011:12).

To obtain dust-free working conditions, metal recycling companies must implement a dust-free strategy. In other words, quality is achieved where there is conformance to requirements. Basu and Wright (2003:16) put in place the concept of non-conformance, that is, "cost of waste and scrap, downtime due to poor maintenance, putting things right, product recall, replacement and at worst, legal advice". Mathematically, Basu and Wright (2003:16) estimate the cost of non-conformance to vary between 20-30% of the total operating cost. Crosby suggests that 85%

of quality problems are within management control whereas Deming levels this to 90%. Crosby professed that workers should not be blamed for errors, but rather it was the responsibility of management to enforce quality. Workers were to follow the pattern of seniors.

Evans (2005:29-30) and Evans and Dean (2003:56) also cite, amongst others, Philip B. Crosby as the third quality guru in a sequence of a few. While they agree on the absolute of quality management and basic element of improvement, Evans and Dean discuss, in a more argumentative way, Crosby's quality philosophy. In agreement, the two sources cite the following as the basic elements of improvement or the absolute of quality:

- Quality means conformance to requirement, not elegance. Crosby dispels the myth that quality is simply a feeling of excellence. Setting requirement is a responsibility for management;
- There is no such thing as a quality problem;
- There is no such thing as the economics of quality: it is always cheaper to do the job right the first time. Evans and Dean (2003:56-57) make a support statement to the premise that the concept "economics of quality" has no meaning and that quality is free. Instead they are of the opinion that what costs money is all that involves not doing the job right the first time;
- The only performance measurement is the cost of quality. The cost of quality is the non-conformance expenses;

- A company with a well-run quality management programme can achieve a cost of quality that is less than 2.5 percent of sales, primarily in the prevention and appraisal categories; and
- He further states that Crosby's programme emphasizes the need to use measuring tools and publicize the cost of poor quality.

The following section discusses Feigenbaum's theory: Quality from the customers' perspective.

2.6 Quality from the customers' perspective

Feigenbaum's work impacted the USA as far as the quality is concerned. He published his first book in 1961: "Total Quality Control". Thus "Total Quality Management" is a concept that originated from his book. According to Feigenbaum the impacts of total quality control are:

- Managerial and technical implementation of customer-oriented quality initiatives. That, he says, is a prime responsibility of general management; and
- Another impact is the main-line operations of marketing, engineering, production, industrial relocation, finance, service and quality control.

Perhaps, the most recognizable contribution of Feigenbaum was his insight to determine quality from the customers' perspective and not the designers. For him, the organization ought to do the best to satisfy certain customers' conditions (Basu and Wright, 2003:15).

Customer satisfaction and continuous quality improvement are two concepts stated in agreement as necessary for quality by most authors (Nankana, 2005:112-116; Evans, 2005:7-80; Evans and Dean, 2003:15-79; Basu and Wright, 2003:x-29). Feigenbaum's theory focuses on customers' quality satisfaction. Basu and Wright (2003:15-16) compare the concept they called "Fit Sigma", as an improvement of the Six Sigma methodology, to Feigenbaum's customer-oriented satisfaction. In addition to the above philosophies, a number of theories originated in Japan.

2.7 The emergence of quality theories in Japan

Basu and Wright (2003:17-18; 2008) state numerous quality specialists who emerged in Japan. Amongst others, they studied the philosophies or discoveries of Genichi Taguchi, Ishikawa, Shingo, Imai and Toyota. For example, they mention that Americans and European have adopted Dr Taguchi's method the most. Whereas they comment that Toyota was the epitome of lean production, they only briefly cite Shingo, Imai and Ishikawa.

The Ishikawa diagram is perhaps the best known concept of Ishikawa's discoveries. The Ishikawa diagram (figure 2.4) is discussed in section 2.13. Unlike what they mention for Ishikawa, Basu and Wright (2003:17-18) describe the aim of Taguchi's approach to quality as to:

- Determine the existing quality level measured in the incidence of down time, which he called "off line";

- Improve the quality level by parameter and tolerance design; and

- Monitor the quality level and lower level process control to show upper and lower level variances.

Basu and Wright (2003:18) cite themselves amongst the other quality "pioneers". They are linked to the Total Quality Management (TQM) philosophy. The TQM as a concept is said to be the fourth level in quality management hierarchy.

2.8 Quality management hierarchy

According to Smit (2011:19), the government must be more proactive in its approach to inspecting quality and safety. First-hand insight on safety can only be gained through the inspection of sites. Thus, a quarterly safety report required by the government should be preceded by field inspection by an authoritative body.

Basu and Wright (2003:18) identify a four-level quality management hierarchy: inspection, control, assurance and Total Quality Management (TQM). They comment that quality inspection and quality control are based on supervision. Good supervision will prevent mistakes from occurring. They further state that the most basic activities involved with quality are inspection, detection and error correction.

Moving on to the next level of the hierarchy of quality control, inspection correction, investigation is conducted to

take the necessary actions (with the aims) to prevent the reoccurrence of misdeeds. Again, inspection plays a major role in this regard. Quality assurance is the third level. It includes the setting of standards, the putting in place of support mechanisms and documentation (standard and auditing against those standards to see whether they were met). Quality assurance will require the approval of the third party, usually an authoritative body.

The next discussion focuses on the Ten Point Philosophy as it applies to senior management. The Ten Point Philosophy was developed by John Oakland.

2.9 The Ten Point philosophy

Keegan (2009:14) explains the interplay nature of research methodologies. It is proven that, nowadays, qualitative and quantitative methodologies are used together to achieve more. Basu and Wright (2003:20-21) discuss the philosophy of Professor Oakland. Oakland has developed an approach which is aligned neither with qualitative nor quantitative approaches, although several commentators think that it leans towards qualitative, because of unquantifiable constructs it addresses, that is, culture, communication and teamwork. The Ten Point Philosophy of Oakland includes:

- Making a long-term commitment;
- Changing the culture to “right first-time”;
- Training the people to understand the customer-supplier relationship;
- Buying products and service on total cost;

- Recognizing that systems improvement must be managed;
- Adopting modern methods of supervision and training, and eliminating fear;
- Eliminating barriers, managing process, improving communication and team work;
- Eliminating arbitrary goals and standard based on numbers, eliminating barriers to pride of work, using correct methods to get the facts and not accepting fiction or hearsay;
- Constantly educating and training and using in-house experts where possible (bearing in mind that Oakland himself headed a consulting group); and
- Utilizing a systematic approach to TQM implementation.

Training could, for example, address the use of shear machine, baling machine and excavators' technology in the metal recycling industry. There is nowadays technology in place to improve the excavator's safety. Such technology is what the metal industry needs (Wait, 2011:21). It is, however, true that technology comes at a price.

Basu and Wright (2003:20) notice that Oakland and Deming agree on finding that the purchase price is not the final cost, and that total cost should include performance, running, repairs and maintenance costs. There is a big similarity between Oakland's 10 points and Deming's 14 points of quality (compare with section 2.3.2.1).

Barnes (2008:279) informs that "meeting customer requirements is essential if quality is to be managed efficiently. Therefore, understanding customer requirements is a necessary prerequisite, if quality is to be managed well.

In conclusion, Basu and Wright (2003:21) state that the Ten Point Philosophy of Oakland is a "straight forward, methodical way of implementing a quality initiative". Another European quality specialist selected for the purpose of this study is Jan Carlzon. Carlzon developed "the moment of truth" philosophy.

2.10 The "moment of truth" philosophy

Basu and Wright (2003:22) discuss in detail the philosophy of Jan Carlzon, the Scandinavian author. Carlzon devised the "moment of truth" concept for the northern European Airlines. The Scandinavian (SAS) company was running the risk of sinking as it was on the point of losing USD20M. Having established the moment of truth, Carlzon saved the airlines from the loss and turned the whole phenomenon into a profitable business, yielding a profit of $USD40M.

Yusuf, Gunasekaran and Dan (2007:513) are of the view that organizations that understand customers' needs and subsequently cater for a product to meet them gain a competitive advantage.

Basu and Wright (2003:22) explain that the Scandinavian example above is an exception. Few turnarounds are dramatic and generally benefits accrue over longer terms. The philosophy of TQM is to look for continuous

improvement, not major breakthrough; any major breakthrough is a bonus. No organization can ever say that TQM has been achieved – the quest for improvement is never-ending. There are other quality gurus and pioneers worth mentioning. One of them is Dr. Walter Shewhart who invented the Statistical Process Control (SPC).

2.11 Statistical Process Control as a quality measurement tool

Goetsch (2002) credits the invention of statistical process control (SPC), a quality measurement tool, to Shewhart. He says that statistical process control (SPC) originated in the year 1931, apparently from Shewhart's book *The Economic Control of Quality Manufactured Product*. Like Deming and Juran, Shewhart was a statistician. During his year of service at Bell laboratories, he pioneered that industrial processes themselves could yield data which could indicate any interference with the process of doing work, be it to signal that process was in control or affected by causes beyond understanding. Goetsch's opinion is consistent with Besterfield (2009:45) as far as Shewhart's contribution is concerned.

Metal businesses could choose to adopt a particular philosophy. In the same perspective, they could seek the ISO certification as a Quality Management System (QMS). The ISO 9000 is explained below.

2.12 ISO 9000

Basu and Wright (2003:22) are of the opinion that ISO 9000 proves that quality standards have been met. This correlates with the findings of Moodaliyar (2010:96) who has shown that ISO 9001:2000 led to a reduction in customer complaints and is effective in enhancing customer satisfaction, leadership and continuous improvement. The meeting of these standards is the prerequisite for ISO 9000 certification. To sustain the quality management system, the framework of ISO 9000, the company will undergo a quality audit by an outside accredited body every year. Customers, employees and other stakeholders will be assured of the degree of seriousness to follow a quality management system through ISO 9000 compliance. This is a quality assurance system per se.

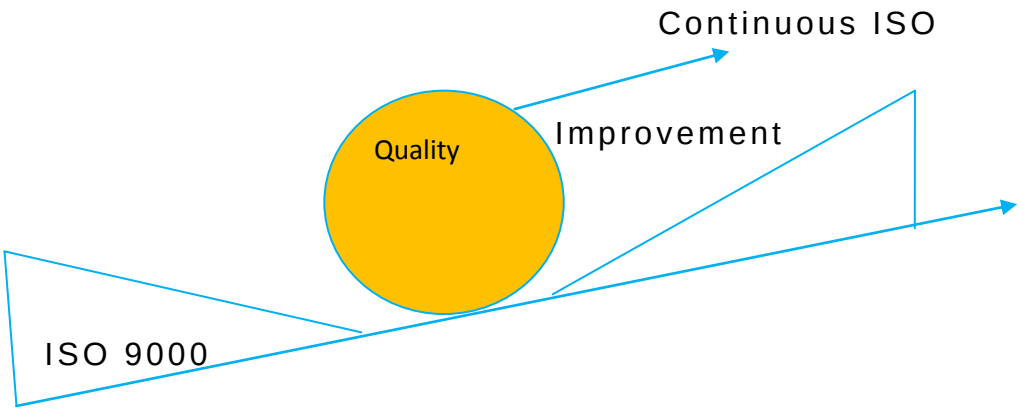
Nankana (2005:117), Goetsch and Davis (2002:5-180), Evans (2005:79-80) and Evans and Dean (2003:57-58) share the view that ISO 9000 is there to assure the customers of the readiness of the product or service to meet certain specified standards of performance and, most importantly, to warrant the customers that the product or service will meet the standard or requirement in a consistent way. From the sources above, the following could be seen as the advantages of putting ISO 9000 systems in place (amongst other things): customer-orientation, emphasis on continual improvement, and a guarantee for having a quality management system in place.

Goetsch (2002:238) reports a comment by one manager that ISO 9000 demands a lot of paper, ironically, enough paper

to sink a ship. This supports the necessity of documentation and a number of required audits, that is, by an external registrar and by internal employees. ISO documentation includes: proofs, practices, procedures, QMS and quality policy (Goetsch, 2002:220).

The illustration referred to in Basu and Wright (2003:22), in Figure 2.3 below, provides more insight into the limitation of ISO 9000 systems.

Figure 2.3: ISO 9000



Source: Basu and Wright (2003:22).

Basu and Wright (2003:22) note that ISO 9000 can stop quality achievement from slipping backwards. However, they also recognize that there is a danger as ISO 9000 could be the wedges that impede quality progress.

In a research questionnaire, findings revealed that "the use of ISO 9001 certification purely as a marketing strategy without paying due attention to product quality could lead to the organization failing to sustain this practice in the long term" (Moodaliyar, 2010:74).

In conclusion, Basu and Wright (2003:22) are of the view that TQM does not require the existence of ISO systems in place. They do, however, mention that the existence of ISO systems, if used properly, could be a bonus for effective quality management. The following section discusses the Quality Circle.

2.13 Quality Circle as a philosophy

Juran (1988), as cited by Basu and Wright (2003:27), predicted the Japanese world leadership in quality based on quality circles. This is the reality today. The Japanese revolution was influenced, to some extent, by the concept of forming quality circles. Basu and Wright (2003:27) go on to state the reasons why they believe quality circles would work in Australia, the United Kingdom, Europe, South America, Africa, Asia and India, or the world. They state the following conditions under which quality circles would work:

- The circle should consist only of volunteers;
- They should come from different functional areas;
- The problem to be valued should be decided by the team and not imposed by seniors;
- Management support to the team is a *sine qua non* condition even when recommendations made by the circle are of a trivial nature or costly in money, for example, a recommendation to buy the needed safety equipment, machinery and/or monogram and overalls);
- Training on teamwork (group dynamics), problem solving techniques and reporting mechanisms. Basu and Wright (2003:27) say that the basic methods are to

ask why, what, where, when, who and how. This forms a standard quality circle approach to problem solving. Members should be trained to familiarize themselves with the problem solving tool;

- Members elect their learners; and
- A middle manager should mentor the quality circle as per management appointment.

Lindborg (2003:84) suggests that "quality requires that complaints should not simply be tolerated but actively encouraged in order to hear the voice of the customer even when the message is not positive".

In conclusion, Basu and Wright (2003:27-28) suggest to management to initiate social events in recognition of an attainment to support the quality circle. They discuss a concept close to quality circles but different: the quality project team. The following section explores the Ishikawa model.

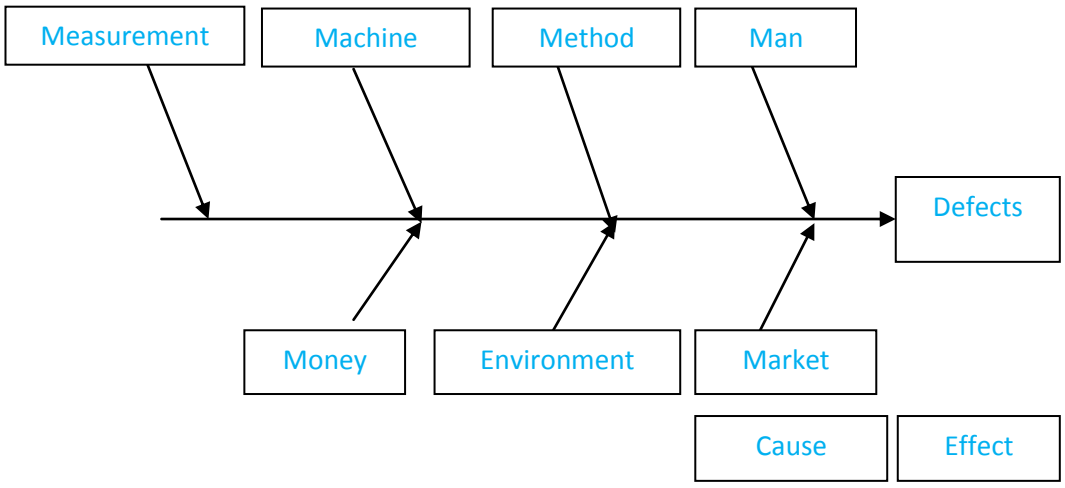
2.14 Ishikawa diagram (Cause and Effect)

The cause and effect or fishbone technique was named after its initiator Kaoru Ishikawa (1979, 1985). It is a technique useful in brainstorming sessions and could be used for most group work. Initially, the team has to agree on the problem to be solved. Basu and Wright (2003:29) explain: "a diagram is then drawn consisting of a 'backbone' and four (or sometimes more) first bones to identify likely causes; common starting points are people, equipment, methods and material".

According to Goel *et al.* (2005), the most common causes of the problem (referred to as bones and situated on the horizontal lines) are "material, methods, machines, and people". Basu and Wright (2003:29-30) agree with Goel *et al.* (2005:210-211) and call the cause a "common starting point". Instead of machines, they use the term "equipment". They expand the cause to include money, methods, material, marketing, measurement, management and mystery (lack of communication, secret agenda...) and maxims (rules and regulations). Alongside failure modes and effect analysis (FMEA), regression analysis, hypothesis testing, the cause and effect analysis (or Ishikawa technique) is used as a problem-solving tool, especially during the analysis or solution finding phase.

The Ishikawa diagram is illustrated in Figure 2.4 below.

Figure 2.4: Ishikawa Diagram



Source: Bicheno (1994) as referenced by Singh (2006:103).

Whereas Basu and Wright (2003:29-30) and Goel *et al.* (2005:203-2010), with aids of illustrations, elaborate on the cause and effect (Ishikawa or fishbone diagram), El-haik and Roy (2005:11-12) briefly explain the complementarity of seven basic tools which form the root cause analysis, that is, cause and effect diagram, check sheet, control chart (special cause versus common cause), flow chart, histogram, pareto chart and scatter diagram.

Besterfield (2009) recognizes the advantage of a cause and effect diagram to be "the ease of construction and its simplicity". This is because it follows the sequence of production. The Ishikawa diagram, although used in brainstorming sessions, is a different tool. The brainstorming is also a tool on its own right. Geol *et al.* (2005:205-212) agree with Besterfield (2009:84-85) on the usefulness of using the diagram. The following section discusses the brainstorming technique.

2.15 The brainstorming technique

Basu and Wright (2003:30) find the brainstorming methods to be funny and enjoyable. It is a teamwork technique whereby group members are given a problem to solve and each one expresses his/her ideas towards the solution. The problem to be solved should be defined prior to the brainstorming process. The rules and "criteria" should be agreed upon. Five minutes will be given to allow participants to gather a relevant opinion.

Thornton (2004:63-64) emphasizes the crucial role of the facilitator and the importance of using technology

(computerized data recording) or, at best, of using blank paper if the facilitator is not at ease with PowerPoint and projection. This supports the idea of training and re-training of employees on matters such as Information Technology (IT). A proper brainstorming session entails the following:

- Recording the suggestion (one person should be responsible);
- Encouraging everybody to "freewheel" and not criticizing poor contribution;
- Allowing everyone to make at least one contribution (suggestion);
- Working around the room to take suggestions;
- Being patient with participants; giving a second chance to contribute, passing on to the next person, then returning to collect the ideas later;
- Knowing that there are many contributions after the first 20 minutes. There will certainly be another burst of ideas. Often the second is more creative;
- Writing the ideas for all to see until the end of the session; and
- Reviewing together when ideas have dried up, sorting them or classifying them to make a meaning out of the most.

Thornton (2004:63-64) supports Basu and Wright (2003:29) on the use of fishbone or Ishikawa diagram during the brainstorming session, for example, in order to sort the suggestions or prioritize the possible solutions. The Ishikawa diagram would also be instrumental in defining

concepts such as quality initiatives and what it entails (Putman and Paulus, 2009).

2.16 The importance of training and retraining for quality improvement

Training and retraining of both workers and managers must be done on an ongoing basis. Leaders must determine when additional training is needed and when training or retraining is not necessary because it no longer adds value. OmniLingua (2004:5) advises to train, retrain and analyze individual needs in order to meet and exceed the clients' expectations by giving the customer the optimum products or service.

According to Rigmore, Yetton, Nunan, Gleeson and Shain, as cited by Normand, Littlejohn and Falcorner (2008:26-29), the operations manager has a role to play for quality training or education to take place in the operations. A two trajectory approach, that pushes and pulls both ways, is termed a top-down approach to training or education, which works better within a "managerial-cultured" company, and a bottom-up approach which suits a metal firm under collegiate cultural circumstances (Nicole, Coen, Breslin and Howell, 2004).

The question remains how to introduce flexibility at strategic level, so that learning or training could become a success story for many. Nicole *et al.* (2004) and Normand, Littlejohn and Falconer (2008:25-36) agree with the authors below that flexibility is achieved when:

- Quality of teaching is improved as well as the learning experience and process;
- There is a shift from short-term, subject-focused to lifelong learning;
- The trainer taps into the global market;
- The training and/or education widens the access and embracing diversity;
- Social inclusion and employability is addressed;
- New knowledge society emerges from that training; and
- Competition or benchmarking with other metal recycling firms is about developing quality education or training programmes.

Intensive investment in training is always important. Often, the key to resolving problems in a company lies in training (*United Nations Conference on Trade and Development*, 2005). Training remains the most valuable "add ons" for metal customers. Taking initiatives by focusing on dedicated training is a way of bridging the knowledge gap. The cost of quality (COQ) is to be taken into account before implementing a particular quality initiative. Measuring quality and the COQ are explored below.

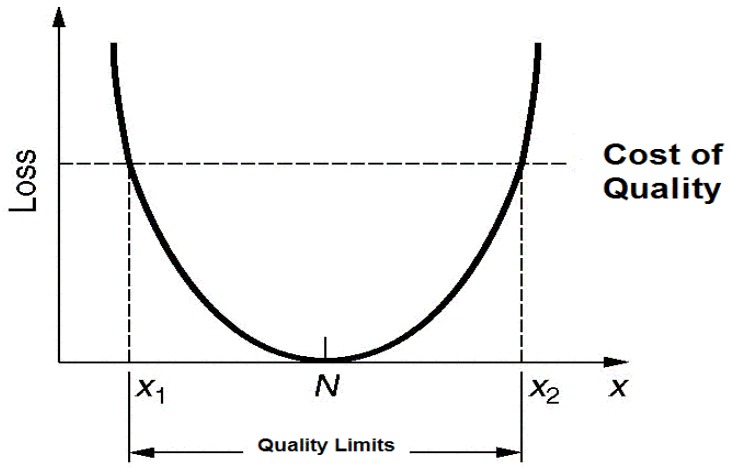
2.17 Measuring quality

It has been established over the years that a product or "service" is either good or bad. Dr. Taguchi, in his Loss Function measurement of quality, is convinced that the customer becomes increasingly dissatisfied as performance departs farther away from the targeted level. He advises using a quadratic curve representing the customer's

dissatisfaction with a specific product. The curve is centred on the target value, which provides the best performance in the eyes of the customer. Management ought to determine the target value using forecasting techniques (OmniLingua, 2004:7).

Engineering-driven specifications are replaced in this method by “lower consumer response to” and “upper consumer response to” drawn as a chart. A focus on the actual consumer response to and measurable financial impact of variances in performance or quality of the products or services proves to be effective and efficient as a method. Dr. Taguchi’s Loss Function is illustrated below as Figure 2.5.

Figure 2.5: Cost of quality



Source: OmniLingua (2004:7).

Figure 2.5 demonstrates that the customers’ needs are met at the lowest loss. The farther quality or performance moves from right to left, the worse loss the customers suffer

(Barnes, 2008:279). Quality should, therefore, be carried throughout the processes. Quality should also aim at meeting or exceeding customers' expectations.

2.18 Quality measurement and improvement tools

As mentioned, there are various quality philosophies. The overlapping character of quality and measurement tools makes it difficult to categorize. What appear to be quality measurements or improvement tools may at best also become quality philosophy over the long run. As it is beyond the scope of this study to elaborate on all quality tools or philosophies, it will suffice to cite a number of them. Evans and Dean (2003:79-80) classify the following as quality planning tools: quality function deployment (QFD), the house of quality, and concurrent engineering.

In addition, the following tools serve both the planning for quality and other managerial functions: infirmity diagram/KJ methods, interrelationship diagram, true diagram, Matrix data analysis, process decision program chart (PDPC), Arrow diagram. Evans and Dean (2003:79-80) classify the following as continuous improvement tools: flow charts, check sheets, histogram, pareto diagram, cause and effect diagram, scatter diagram, control chart, the Deming's cycle, poka-yoka (mistake-proofing), creativity and innovation.

Gupta (2004) briefly introduces other quality planning tools. They included the balanced business plan, project plan, and alignment effect, effect of the customer and business voices as well as the team information. Although the problem definition is discussed as a separate tool, it can be confined

to the DMAIC process (Gupta, 2004:169). Other tools discussed include Project Charter, Business Case and Project Scope (Gupta, 2004:166-169).

Singh (2006:75-114) explains numerous business improvement tools. Amongst other tools, she discusses: Management system/code of practice, Scenario analysis, The "5W 2 H" approach, SWOT analysis (Strengths, Weaknesses, Opportunities and Threats), Quality Function Deployment, Gap analysis and training, Benchmarking process, Self-assessment, Plan-Do-Check- and Act (PDCA) Cycle, Brainstorming, Cause and Effect diagram, the Pareto diagram and the Cost of quality.

Nankana (2005:268-275) discusses numerous tools for quality planning and improvement. As quality planning tools, he discusses affinity diagram/KS method, interrelationship diagraphs, tree diagram, matrix diagram, matrix data analysis and process decision program charts (PDPC). It is within the ambit of this research to discuss the models that form an integral part of the investigation. Among other matrix diagrams, it suffices to discuss the house of quality.

2.18.1 The House of Quality

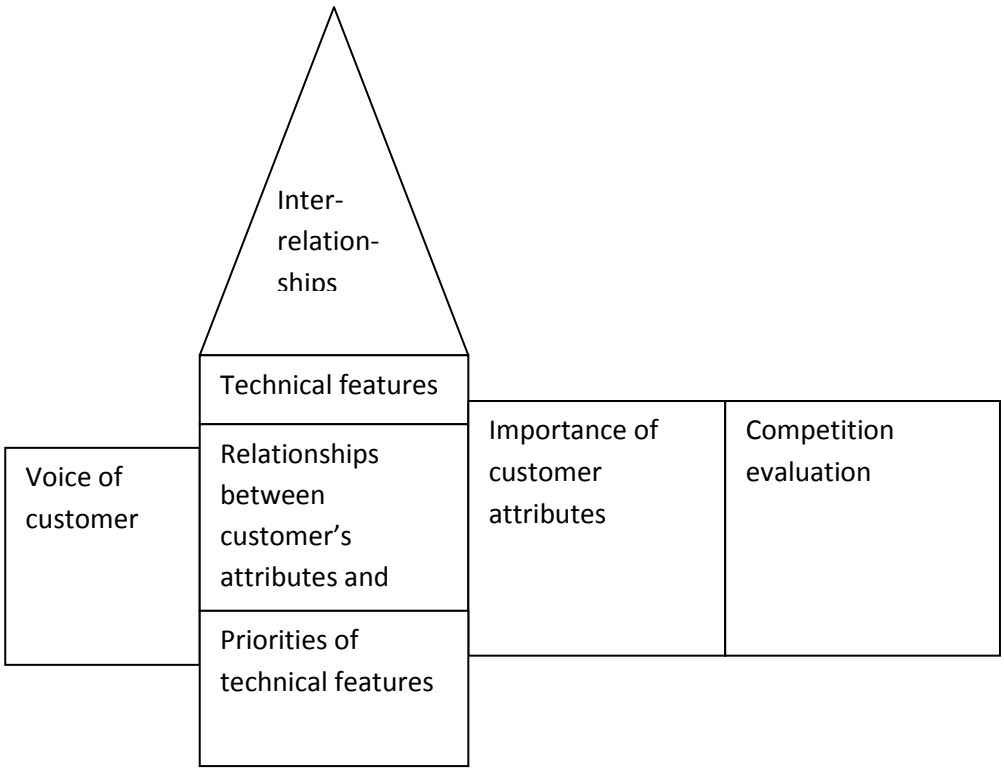
Nankana (2005:268-275) discusses a set of matrices used to address customer requirements, technical features, production planning and control mechanisms. Among other things, "The Customer Requirement Planning Matrix" is identified as a very instrumental tool. Due to its structure, it is called the "House of Quality". Nankana (2005:268)

states that the house of quality links customers' attributes to technical features in order to guarantee the support between engineering decision and customer needs. It helps to ensure all decisions are made with the aim of meeting customers' needs.

Figure 2.6 illustrates a famous matrix diagram – the House of Quality.

As a model, the House of Quality gives the customer a chance to express his or her views. It also looks at technical features as well as internal and external forces.

Figure 2.6: The House of Quality



Source: Nankana, 2005:268

As illustrated above, the House of Quality requires the following six basic steps: to identify the customer's attributes; to identify technical features; to relate the customer's attributes to the technical features; to evaluate technical features and develop targets; and to determine which technical features to deploy in the production process. Amongst other tools, the SWOT-analysis was selected for the purpose of this study.

2.18.2 SWOT-analysis

According to Johnson, Scholes and Whittington (2006:148-150), the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis is a summary of major issues from a company's environment and threshold capabilities that impact on the business. Its usefulness is in drawing a comparison with competitors. In other words, "a SWOT-analysis explores the relationship between the environmental influences and strategic capabilities of an organization compared to its competitors".

An illustration of a SWOT-analysis follows in Table 2.1 on page 45.

Table 2.1: Eurotrade Metals Africa's SWOT-analysis for the period going from January to October 2010

Environmental impact	**Environmental change**
Strengths Entrepreneurial skills of MD and Chairman; Experienced employees; Modern infrastructure; IT; Skilled labour; Ongoing training.	Opportunities Potential investors; Post-recession new markets for ferrous and non-ferrous; J I T inventory system; Prioritization of the mineral sector.
Weaknesses Lack of liquidity; Shortage of suppliers; Lack of formal qualification for some managers; Lack of safety stock; Poor division of labour; Managerial non enforcement of safety policies.	Threats Conflict of interest between shareholders; Theft problem; Truck being repossessed by the bank; Impact of the economic crisis; Poor cooperation between the shareholders; Company not BEE or BBBEE compliant; Inequality in the pay system.

Source: Self-generated

Table 2.1 depicts the SWOT-analysis of the company under investigation. While the firm possesses a number of strengths, such as modern infrastructures, IT, and experienced workforce; it is revealed that a number of weaknesses impact negatively on its productivity. These weaknesses include the lack of liquidity, lack of safety stock and the lack of formal qualification for a number of decision-makers. The company could take advantages of some opportunities as the economy emerges from the downturn.

For example, a few investors have shown interests in the metal recycling business.

However, the company will have to surmount a couple of threats before it can be sure of a brighter future. Threats include the regular theft of ferrous and non-ferrous metals, conflict of interests between workers from different groups, poor cooperation between shareholders, and so forth. As an analytical tool, a SWOT-analysis is instrumental in helping the company to identify the drawbacks and devising new ways of addressing the pitfalls.

Johnson, Scholes and Wittington (2006:150) warn that the SWOT-analysis can generate a long list of apparent strengths, weaknesses, opportunities and threats without distinguishing which ones matter the most. In the same perspective, it can present a general situation without giving the necessary details or explanation. Therefore, the SWOT-analysis should not replace a scientific approach to research, whereby facts are weighed and a rigorous analysis conducted. Similar to the SWOT-analysis, the IDAARA (Indices, Data, Analysis, Action, Review, Again) is instrumental in problem-solving efforts. It is discussed in the next section.

2.18.3 The IDAARA mechanism

As Nankana (2005:4) emphasizes, there is a need to create a problem bank, prioritize the resolution of problems, organize teams with proper facilitation and empowerment in order to resolve the problems in question. The IDAARA mechanism in Figure 2.7 is a good problem-solving tool.

Figure 2.7: The IDAARA mechanism

Indices
‘ Data
‘ ‘ Analysis
‘ ‘ ‘ Action
‘ ‘ ‘ ‘ Review
‘ ‘ ‘ ‘ ‘ Again
‘ ‘ ‘ ‘ ‘ ‘
‘ ‘ ‘ ‘ ‘ ‘
‘ ‘ ‘ ‘ ‘ ‘(Organization)

Source: Nankana (2005:4)

The Urdu word IDAARA, in Figure 2.7, means an organization. It emphasizes the process needed to manage an organization by making proper decisions. Like the IDAARA mechanism, the Design Failure Mode and Effect Analysis (DFMEA) can be used in the decision-making process. The DFMEA aims at identifying failure modes, determining the effect of failure on the customer, identifying the likelihood of occurrence, determining the potential cause of failure and taking corrective actions as well as establishing control mechanisms. Another concept selected for this investigation is the Concept Engineering. Below is a discussion of some drawbacks to quality initiatives.

2.18.4 Drawbacks to quality initiatives

In order to address drawbacks, it would help to incorporate the ISO 14001 standards with other QMS. These standards

are accredited in South Africa (Strachan, 2010:1). As part of efforts to establish KZN guidelines for metal recycling business, the following ISO 14001 would help to develop comprehensive, environmentally friendly best practices within the metal recycling industry which should address the following: identification of environmental aspects, legal requirements, workers' ongoing training, effective communication across the ranks, control mechanisms, especially on metal recycling operations, emergency preparedness and solutions to the problems, monitoring and measurement instruments, overall evaluation, procedure and aftermath rectification, records and, last but not least, auditing mechanisms (Fasheun, 2010:1; Christie, 2010:1).

Christie (2010:1-2) suggests an easy to use KZN environmentally friendly Norms and Standards for metal recyclers to be developed along the following headings: definitions, legal matrix, exemptions, identification of scrap sources or input categorization, process flow, environmental impacts, management measures, treatment processes and techniques, product quality requirements and quality assurance. Rubinstein and Barsky (2002:1) distinguish secondary resources from other waste products. Fasheun (2010) emphasizes the need to consider the beneficiation of secondary metal products. He mentions the importance of capacitating local scrap recycling companies so that their final products could be processed and produced in South Africa rather than beneficiating Western or Eastern countries. This he mentions against the will of some metal dealers who see the West and the East as their regular market.

In addition to the above, the literature will be coupled with the practical know-how acquired through a systematic observation or applied findings. This is exactly what Appendix F seeks to achieve. Appendix F outlines numerous assets of importance in a metal recycling company.

The operations that take place in the metal recycling industry are complex, and they demand numerous raw materials, infrastructure, assets and practical know-how. According to Eyring, Johnson and Nair (2011:95), “an open mind is perhaps the most important asset anyone can bring to emerging markets”. Appendix F classifies some of the needed inputs and expected outputs. In order to add value, operations management will need to commit to effective and efficient utilization of resources, systems and processes throughout the company’s value chain. An illustration of the value chain framework is reproduced in Figure 2.8 on page 50. The value chain framework is also discussed therein.

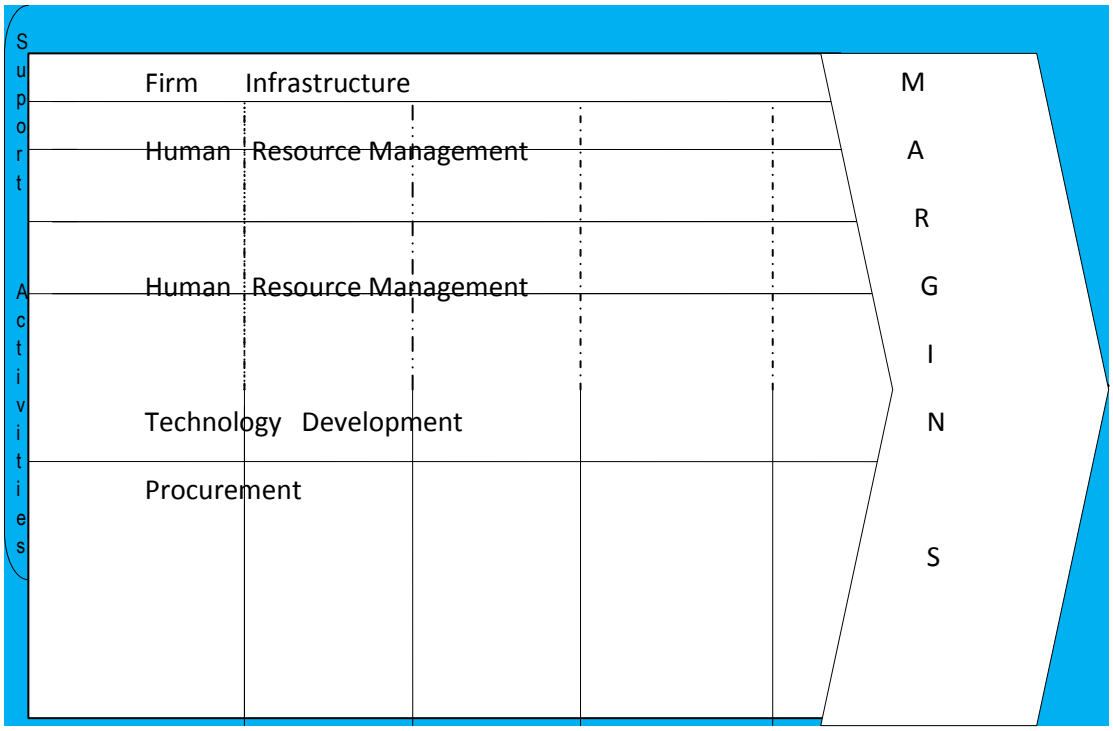
2.18.5 The Value Chain framework

According to Johnson, Scholes and Wittington (2006:137) the value chain represents the activities within and around a company which lead to the creation of a product or service. Michael Porter developed the concept.

Figure 2.8, on page 50, illustrates the value chain framework – an analytical tool used to determine which activities add value and which represent a cost to the company. This is consistent with Zylstra (2006:107), who stipulates that value chain end-result should be to list the

activities or depict a picture of those operations that are value-adding or not. Robbins and Coulter (2007:569) state that the value chain includes an entire sequence of activities that gradually add value from initial inputs to the final outputs destined for the customer. Quality improvement initiatives are what the value chain management encompasses.

Figure 2.8: The Value Chain framework



Source: Adapted from Porter (1985), as cited by Johnson, Scholes and Wittington (2006:137); De Beer (2009).

Figure 2.8 distinguishes between the primary and the support activities among the components of the value chain. As primary activities, it highlights the inbound logistics, that is, receiving (steel, tinplates, brass, hard melting steel

(HMS), light melting steel (LMS), minerals, shelvings), storing them (not to put skimming and copper together to avoid contamination), dispatching the resources to the product or service, that is, manual labour, stock control and the shipping of ferrous and non- ferrous products. Activities include:

- Operations: Operations consist of processing the raw materials (aluminium, motors, gun metals, subgrade, solder dross, ali foil, ali radiators, copper 1A, shinning bright, ali old rolled (Appendix G). into the finished secondary products or services (machining, packaging, assembly, testing);
- Outbound logistics include collecting, storing and dispatching the mineral or the metals to the buyers (warehousing materials, handling, shipping);
- Marketing and sales: the company will make use of the 4 p's (product, people, packaging, place) strategy. It will, for example, look into ways to increase metal product sales, its price, advertising and sales administration; and
- Service entails all activities that add value and maintain it through the entire chain, that is, installation, repair, training and spares (Johnson, Scholes and Wittington, 2006:137).

The above primary activities are fundamental in adding value. They do, however, request the existence of support activities. Secondary or support activities are necessary for the company to improve its performance. In other words, they render primary activities more effective and efficient

(Johnson, Scholes and Wittington, 2006:137). Support activities include:

- Procurement: Procurement is the process of acquiring scrap metals from individual suppliers or industrial suppliers. Although Porter refers to procurement as a support activity, other professionals think it is partly a primary activity (De Villiers , Nieman and Niemann, 2008:11);
- Technology development (IT facilities, computers, projector, shear remote control, side lifters, spectrometers, R & D, increasing the size of the bales, process development and raw material improvements). Technology is essential for the company's innovative initiatives to take place and guarantees the scrap metal's sustainability (Grobler *et al.,* 2006:21). Technology development will ease the operating activities, reduce the labour and contribute to a profit- and wealth-making business. It is also used to increase the firm's skills and training that render performance easy and efficient (Grobler *et al*., 2006:26);
- Human resource management (HRM): This function is the most important. It transcends all primary activities. The most valuable assets of a company are its people. It is impossible to have a well-managed company if the firm does not have a qualified HRM. This activity involves recruiting, managing, training, developing and rewarding the workforce. It is internationally known that employees from foreign origin are underpaid, abused and are not affiliating to mining or metal

unions because of frustrations in the system. HRM will need to observe the national law for equal rights enforcement for all employees; and

- Infrastructure: The land and building, motor vehicles and equipment fall under the infrastructure. The company should have efficient planning systems, finance, quality control, information management as well as numerous structures or routines which determine the organizational culture (Johnson, Scholes and Wittington, 2006:137).

Shapiro (2007:13) states that every company is a combination of operational activities that are performed to design, produce, market, deliver and support its products. He further observes that the supply chain is but a sub ensemble of the value (added) chain. Companies that better control their value chain costs are winning over competitors. The same is true for firms that embark on the differentiation of products through higher quality, customer service, product variety, unique market presence, and so on.

The value chain framework is instrumental in raising questions as to what the company should prioritize, de-emphasize or outsource. Last but not least, the value chain analysis can provide important insight into what management needs to base its strategic decisions on (Johnson, Scholes and Wittington, 2006:137).

Shapiro (2007:13) identifies more support activities in the value chain framework, namely, Information Technology (IT), Value Chain Management, Demand Management and Corporate Financial Management. The value chain

framework as an analytical tool can be used concurrently with other instruments such as the Just In Time (JIT) inventory system and the cause and effect analysis. The JIT is important for this study because it is the inventory system currently used in the company under investigation. The following section explains the JIT inventory system.

2.18.6 The Just In Time (JIT) Inventory System

The JIT inventory system is believed to be instrumental in improving distribution operations. Simply put, Debonairs Pizza makes pizza ready only after the order has been finalized. They do not make the pizza a few weeks or months before the customer's order, but they make it Just in Time. It is about reducing the inventory and increasing the material flow. The same applies in the metal recycling business.

The JIT, as a concept, evolved from the Toyota production system (TPS) only to become the Kanban philosophy before it was known as JIT. Nowadays, it has improved into Lean Manufacturing – a holistic approach to enterprise productivity (Zylstra, 2006:13).

The company under investigation has dropped its scrap stockpiling and embarked on JIT inventory system in the first quarter of 2010. The scrap piling up strategy has proven not to be effective as it allowed gradual increase in metal theft due to petty stealing by employees or organized crime involving a cartel of internal and/or external syndicates.

Metal theft has become a major challenge for ESKOM, hence the need to involve business against crime and other governmental institutions to regulate ferrous and non-ferrous metal trading. Mangan, Lalwana and Butcher (2008:8) define effective logistics as "getting in the way, the right product, in the right quantity, and right quality, in the right place, at the right time, for the right customer, at the right cost". This explains what JIT stands for. With JIT and lean strategies, competition focuses on delivery time as a key success factor (KSF). This has become so with the help of containerized shipping of metal products, i.e., aluminium, copper, steel, HMS, LMS, and so forth, since 1956. The containerization came into being when Malcolm McLean stacked 58 aluminium truck bodies aboard a tanker ship from New York to Houston (USA). This was a major revolution in the metal trading business. The JIT inventory system goes together with the "Pull" strategy which translates in the Make-to-order (MTO) as opposed to the "Push" or Make-to-stock (MTS). The following section briefly discusses the Scenario analysis and Define, Review, Identify, Verify, Execute (DRIVE) approach. The two are also excellent analytical tools.

2.18.7 Scenario Analysis and the DRIVE Approach

According to Shapiro (2007:445), the scenario analysis remedy the overconfidence and tunnel vision which impede strategic thinking. It avoids framing which refers to "thinking that extrapolates the past without modification into the future – that is, a failure to think 'outside the box' when describing the company's current situation".

It is a good practice to construct extreme scenarios, that is, one scenario of positive elements and another of negative ones. Managers who are skilled in contingency planning can evaluate the impact of scenario analysis in order to categorize events into low probability and frequent events. This enables them to identify occurrences that could have a significant impact on the company's supply chain, in particular, and its value chain, in general. During the contingency planning, managers can use tools such as the Define, Review, Identify, Verify and Execute (DRIVE) approach. In fact, this self-explanatory approach is suitable for any organization (Shapiro, 2007:446). The following paragraphs elaborate on the benchmarking technique – an excellent tool in the problem-solving or solution-finding process.

2.18.8 The Benchmarking technique

According to Johnson, Scholes and Whittington (2006:144-148), benchmarking is a technique used to spot opportunities in order to outperform another organization. It does not mean to outperform only a competitor, but it does mean any organization performing better than the company in question. The benchmarking technique is instrumental in assessing the ability to meet and beat the competitor. Various approaches to benchmarking include:

- Historical benchmarking: It undertakes to compare the company's performance to its past performance. Its shortcoming is that it neglects the competitors' ability to outperform the company. Many commentators regard this approach as self-complacent;

- Industry/sector benchmarking: This technique consists of comparing the performance to what sister organizations or competitors do. The danger is that the whole industry or sector could be flawed (underperforming), thus corrupting the benchmarking process; and
- Best-in-class benchmarking: This is believed to be the best as it seeks to match the current practices with the best across the industries or wherever the best practice is found.

Safety and productivity should be the metal industry's number one priority (Kesner, 2012:119-121). "Backed up teams of qualified engineers with extensive experience in all aspects such as steel wire rope chain and cast products are available to advise on the design, selection, installation and maintenance of safety critical products" (*Concern about safety and productivity*, 2011). In metal recycling, warehouse safety can be improved by installing cameras and by using Easi Access Rentals' 15.5m electric boom lift. These lifts allow access even through narrow aisle spaces (Warehouse safety improves, 2012:9).

According to Johnson, Scholes and Whittington (2006:145), "the shortcomings of industry norm comparisons have encouraged organizations to seek comparison more widely through the search for best practice wherever it may be found". This does not mean the company should not implement other forms of benchmarking prior to comparing its practices to the best across the industries. This is consistent with the findings of Kirca, Hult, Roth, Cavusgil, Perryy, Akdeniz, Deligonul, Mena, Pollitte, Hopper, Miller

and White (2011:47-73) who teach that firms can transfer their specific assets to generate higher returns in international markets.

2.18.9 ISRI specifications and RIOS

The ISRI (Institute of Scrap Recycling Industry) scrap specifications provide the necessary guidelines for metals quality and grades across the industries. It is very comprehensive but individual companies may adjust the specifications to suit their contractual agreement. The ISRI and its products are available to subscribed members and partners only. Registered companies can access most recent metal quality specifications and other products on line www.isri.org/specs (Scrap Specifications Circular, 2008:1-121).

There are, however, alternatives to the ISRI specifications such as BIR, the British equivalent. South African metal recycling industry is yet to develop its own standards, but for the purpose of this study, the internationally and domestically accepted standards as per ISRI are used. Metal recycling firms are free to adhere to any of the umbrella organizations and match its recycling operations and quality operational definitions to the normsaccepted by industry.

The ISRI has developed the Recycling Industry Operations Standards (RIOS). RIOS specifies quality in the operations but also the necessity to improve safety (RIOS, 2006:1-3; ISRI Safety Report, 2007).

2.19 Integrating quality and safety into recycling processes

Recycling companies registered with ISRI have subscribed to integrative safety procedures. The ISRI motto is “safely or not at all” throughout the metal recycling processes. ISRI safety emphasizes ongoing training on issues such as how to avoid slips, trips, falls as well as effective use of the working space. This is equally important for truck drivers’ safety enforcement. Also, this has led to the “no-zone strategy” and includes safe tarping procedure (Dave, 2009; Safety or not at all: New Employee Safety Orientation, 2009; Safety or Not at All: Truck Drivers’ Safety, 2009). This is consistent with the findings of Singh (2006:213) that integration of management systems is suitable for any type of organization.

2.19.1 Safety equipment in the operations

To protect workers, they must wear all the necessary Personal Protective Equipment (P.P.E). This is to say that safety precautions should be prioritized (Kesner, 2012:123; Pearson, 2012:123-124; Wells, 2012:125-127). The cutter or welder should wear long pants and a long sleeve cotton shirt. The pants should not have cuffs to catch sparks. Flammable items, such as matches or a lighter are not to be found on the cutter/welder. A button from the colour shirt should be used together with the welding jacket and a pair of safety gloves. Welding helmet and goggles could be worn. Goggles are to be worn for light cutting or for a short period of time. Proper ventilation is imperative to remove contaminated air from the work environment. If the current

or electricity setting is unknown, it is best to set it higher than needed prior to cutting. More current will perfect the job. To avoid poor quality, the current can always be adjusted. Whenever the quality of the cut is reduced, electrode and nozzle should be replaced from the cutting torches (Bowditch *et al*., 2005:213-214; Burner Safety, 2009).

In addition, the first aid box should be regularly updated, and the disposal of infectious waste after cleaning the wounds or giving first aid help should be segregated from administrative or other general waste. This is key to ensuring sustainable health for the entire workforce and enforcing environmentally friendly practices (Abor and Bouwer, 2008:356-364).

The following section exposes the Safety, Environment, Corporate governance, Quality and HIV/AIDS (SECQA) model in Figure 2.9 on page 62. The model demonstrates the need to take an integrative approach to quality so that organizations would be effective in their operations.

2.19.2 The SECQA model

The Safety, Environmental, Corporate governance, Quality, HIV/Aids Management Systems or codes of practice (SECQA) were integrated by Dr Shalini Singh in 2006. The SECQA model is an integration of the above-mentioned five management systems in one. Whereas many authors discuss quality in an individualistic point of view, and whereas many organizations have opted to a particular

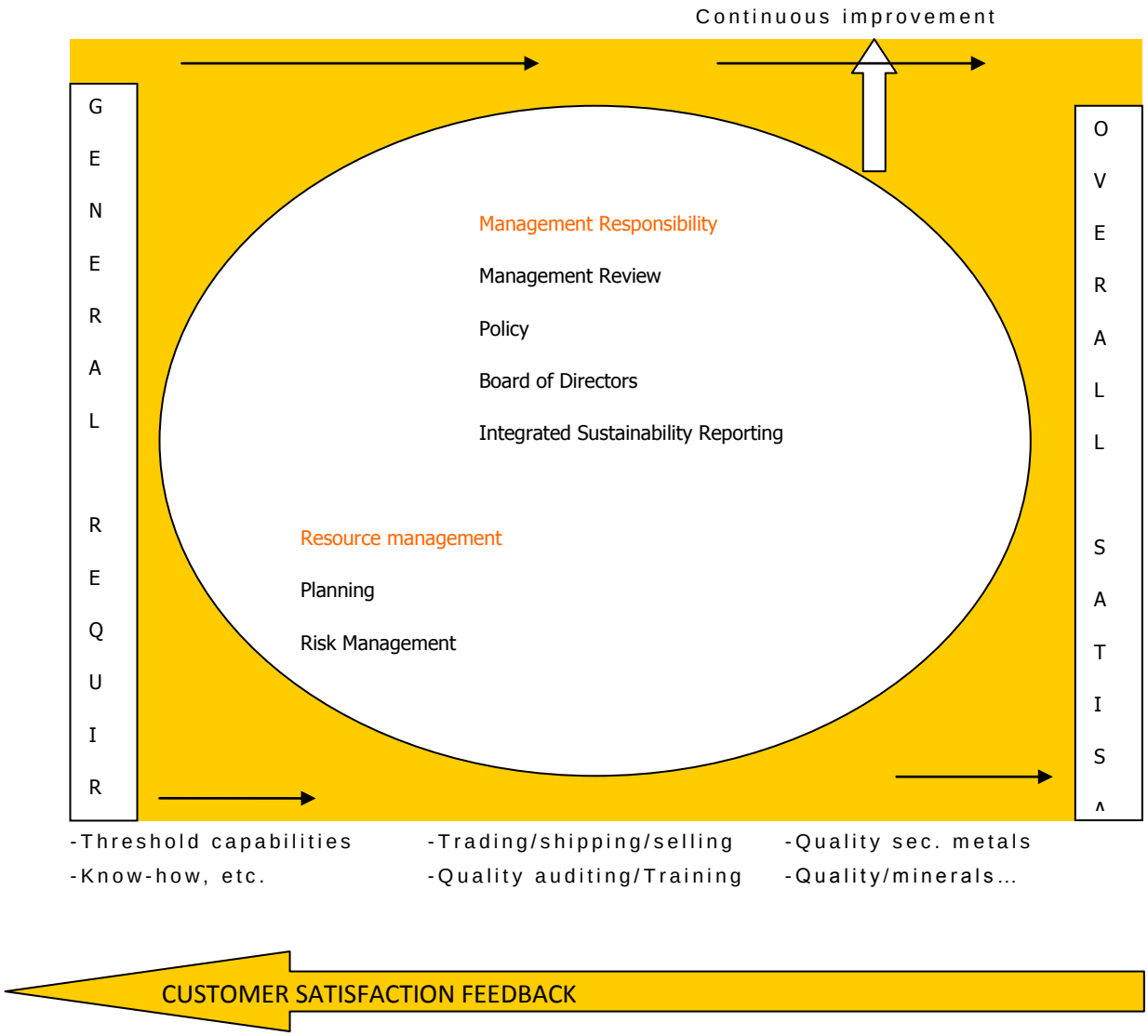
quality initiative, taken to address a specific problem, Singh (2006:13) proposes an integrative approach to quality.

The benefit of the SECQA model for all types of organizations includes the ease to adhere to and comply with the Occupational Health and Safety Assessment Series (OHSAS 18001:1999), the International Organization for Standardization (ISO 14001:2004), the Environmental Management System (EMS), Corporate governance code of practice (King II Report), the ISO 9001:2000 Quality Management System (QMS) and the Aids Management System (AMS). This will pave the way to external audits against the above-mentioned systems.

It is hoped that the SECQA model will become the springboard for organizations seeking to get the South African Excellence Model (SAEM) status (Singh 2006:v).

The SECQA model is illustrated in Figure 2.9 on page 62:

Figure 2.9: The SECQA model on continuous improvement



Source: Adapted from Singh (2006:134). Inputs, processes, customer feedback and outputs expanded by the researcher.

Figure 2.9 suggests the need to follow an integrative approach to quality within the metal recycling industry in KwaZulu-Natal. In order to achieve overall satisfaction of all the stakeholders, quality should be addressed at all levels. This requires, for instance, the incorporation, into metal recycling businesses, of various systems such as

safety (OHSAS 18001, 1999), environmental management (EMS ISO 14001, 2005), Corporate governance (King II Report), quality (ISO 9001, 2000) and HIV/AIDS management (AMS 16001, 2003) systems. Numerous other quality improvement models do exist. However, for the purpose of this study, the SECQA model draws the researcher's attention because of its simplicity (Singh, 2006:132-134).

The firm under investigation seeks to match the standards of ISRI in its metal operations. ISRI incorporates quality, environment, health and safety into a comprehensive model/approach easy to be implemented at all levels (ISRI safety report, 2007, RIOS, 2006:1-3). This is consistent with the integrative approach to quality that Singh (2006) proposes. There are, however, other companies in Kwazulu-Natal which follow the Bureau of International Recycling (BIR) – a British equivalent of ISRI (Christie, 2010:3).

2.20 Efficient utilization of resources

In a research questionnaire administered by Zondo (2005:v; 2005:13) amongst managers of Smiths Plastics (Pty) Ltd, it was established that gain sharing enhances employees' effective participation in problem solving and helps do the following:

- Achieve customer satisfaction;
- Enhance team work;
- Create the sense of ownership;

- Effective cost-management;
- Become a learning organization;
- Better interpersonal communication;
- Maximize productivity; and
- Increase profits and minimize costs.

Gallagher as cited by Tosh (2006) believes that better use of resources contributes to the overall competitiveness of the industry. Even for the provincial or national government plan to provide the poor with housing facilities, the role players need to ensure the environmental sustainability of what they do. Instead of wasting resources, the people involved should maximize the resource use and its re-use, and maximize the use of renewable and recycled inputs.

In addition, the use of non-toxic materials, environmentally friendly resources, achievement of quality criteria and the use of labour-intensive methods, skills training and capacity enhancement of the beneficiaries in the projects is to be commended. In other words, the metal recycling industry should be supported in such a way that the "lowest environmental impact" will cause the "biggest social impact" to occur while addressing the problem of unemployment that largely affects the previously underprivileged communities ("I pap for the environmental goods and services sector", 2009:22).

It is maintained that financial management has a huge impact on the daily operations of a company. There is, however, the conflict of interest between top managers who focus on a long-term strategy and accountants employed by

the very same company but who value more short-term cost cutting measures (Doost and McConville, as cited by Tosh, 2006:22).

Effective operations requirement and quality improvement initiatives demand sound budgeting systems in place. Recycling companies are, in general, reactive instead of being proactive as they conduct recycling operations while trying to take an integrative approach to quality, environmentally friendly practices and the compliance with the law (Dahlmann, Brammer and Millington, 2008:264-289). Efficient utilization of scarce resources was even a prerequisite for coping with challenges throughout the world's economic crunch. The following section elaborates on the economic recession.

2.20.1 The Global Economic Recession and the Metal Business

The global economic meltdown has brought forth many challenges to the metal recycling industry. Not only was the metal industry affected with a skills shortage as over one million job losses were reported, but also the industry needs experienced labour to fill the gap. It is estimated that only between R2 million and R4 million worth of expatriate professionals would compensate for the shortage (Garrun, 2010:1).

The above is consistent with what has been experienced in the company under investigation where more than twenty trucks were repossessed by the bank after the company failed to pay back as a result of the economic recession.

The company owes more than R25 million loaned from the bank for infrastructure renovation and shipping trucks, such as sidelifters, tippers (Davie, 2010).

It has been the first recession in 17 years which saw South Africa losing almost 900 000 jobs, most of them to the detriment of the poor or previously disadvantaged families. Most economic indicators show that South Africa, and, without any doubt, KZN, is now coping with the economic slow-down, as the economy is now creating jobs. In order to respond to international standards and embark on environmentally friendly initiatives, the focus should be on green jobs creation. That is exactly what capital investment programme as a strategy aims to achieve (Zuma, 2010).

The focus on green jobs should not be seen as something to be done on a national level only. It should be emphasized at company level as well. To focus, one needs to revamp recycling of ferrous and non-ferrous metals in the same way it would promote an ongoing recycling and reuse of goods so that the already scarce resources could be stretched, utilized in the most effective and efficient manner, for the betterment of the services to the public. In an interview Clinton (2009) emphasizes the needs to place the scrap recycling industry at the centre of the job creation strategy. Metal is but one effective way to reduce energy consumption. Facts from the industry reveal that:

- 33% of the US aluminium supply comes from recycled materials;
- 2 out of 3 pounds of steel made in the US is manufactured using ferrous scrap;

- Recycling one ton of aluminium sources up to 8 tons of bauxite ore and 44 megawatt hours of electricity;
- More than 150 million metric tons of scraps are processed annually; and
- 44 million of scraps are exported to 153 countries annually. (*How scrap recycling protects the environment while providing "green jobs" for Americans*, 2009).

The economic crisis handicapped the metal buyer and paralyzed the investor confidence. While most firms were affected, leading to retrenchment, cutbacks on training and safety initiatives, a few metal firms benefited from the crisis. Write-down and provision based on an asset by asset basis totalled 209 million despite volatility and uncertainty in the metal business. It has been the deepest recession since World War 2. In order to counter the economic slowdown, the financial sector has been receiving help in the form of money and new instruments, with the aim of restoring stability to the international financial market. To do that, the South African government has enacted stimulus packages increasing public spending and reducing taxes to support demand. This will pave the way to sustainable recovery of the economy (Janholt, 2009:3-5).

2.20.2 Recovering from the economic recession

According to the TV programme SABC 2 (2013), the world economy is now recovering. The metal industry has managed to pick up from the recession due to the current increase in international metal demand. During the economic recession, the steel production as per May 2009 went down by 12%. This has impacted negatively on the economy as far as the country is concerned. In an interview, Mboweni (2010) said that the global economic meltdown as well as the inflation fluctuations have badly affected the lives of the poor.

It is, however, true that economic downturn will, under certain conditions, be profitable to the metal recycling industry. The economic recession brings about a possibility to store an enormous reserve of secondary metal products. This is because there was no market for some scrap products, no opportunity for investment in the banks as the banking sector itself was badly hit, and neglect of ecology, low quality and short life of tools or equipment also count (Rubinstein and Barsky, 2002:1). In other words, downturn brings opportunity. According to Mabuyakhulu (2009:13-18), social partnership between organizations is the only credible solution for recovery from the recession.

In recent chaos, the "European people have voted against the champions of austerity measures" because they think austerity is against the interest of the public and against the interest of the poor. In an interview, Mbeki (2012) said that this perception led to the European voting out their political leaders in the government. In the budget speech, the

Minister of Finance, Pravin Gordan, mentioned that austerity is a situation where there is a deficit in the budget. The situation becomes unsustainable as the deficit continues to rise (Gordan, 2012). This is common during the economic crisis across the world.

In a TV programme Vuyo Mbuli of the SABC 2 (2010) was told that government should finance small businesses. Despite the fact that liquidation in financial terms has gone down in 2010 compared to what it was in 2009, which is a good sign of recovery, small business still need support from institutions. It is in small and medium enterprises' (SMEs) sector that more jobs can be created to alleviate the impact of the economic crisis. Whereas SMEs need funding to survive the many post-recession challenges, banks are reluctant to funds companies out of fear.

To remedy this, banks just need to spread the risks across the industries through proper diversification strategies. In addition, banks need also to put in place mechanisms to reduce the failure rate of repayment by SMEs. In other words, risk-taking is worth the efforts if the economy is to survive and fully recover. Generally, the world had to cope with the recession, but already it is reported that the economic growth is again slowing. In order to arrive at a lasting economic solution, it is suggested that finance ministers come up with more than a commitment to help turn the world economy around. For example, they should provide liquidity to those institutions in need (Reuters, 2011).

2.21 Conclusion

In summary, the literature review explored quality theories, quality improvement or measurement tools and issues around training, retraining and health and safety in the operations of a recycling company. Amongst the other philosophies, Deming, Juran, Crosby theories were reviewed. Implementing these theories in the day-to-day operational activities is an initiative worth taking.
However, the drawbacks remain a challenge as many managers, let alone workers, are not familiar with quality theories and improvement tools. Thus, there is an urgent need to enforce training and retraining at all organizational levels. An integrative metal recycling approach to quality would address the above challenges. The SECQA model could be used to devise an appropriate model for the metal recycling industry.

The next chapter will discuss the research methodology.

CHAPTER 3

RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

This chapter discusses the research design, the questionnaire administration and response rate, the pilot study, descriptive and inferential statistics as well as reliability and validity of findings.

In order to study data, it is important to make a good choice of research methodology. According to Keegan (2009:11), there are two research categories, namely, quantitative and qualitative research methods. Whereas quantitative research measures the proportion of a population who think or behave in a particular way, qualitative research is there to explore questions on what, why and how.

Jancowicz (2005:196) defines research design as a planned arrangement of conditions for analysis and collection of data in a manner that seeks to combine relevance and procedure. The research process undertaken throughout the investigation is examined below.

3.2 Hypotheses

There is an influential relationship between quality initiatives and the metal recycling operations. According to Leedy and Ormrod (2005:135), a case study approach is key to generating preliminary support for hypotheses.

3.3 Case study approach

The study has followed a case study approach. A selected company was investigated for more than two years. All the knowledge hereby imparted is, therefore, to be understood within the context of this very company.

According to Yin (2009), a case study is an empirical research about an actual phenomenon as it happens in its natural environment. This type of inquiry allows the participants to improve their problem-solving skills and take better decisions in the operations as it trains them throughout the investigation.

The current study has used this approach to answer the what, how and why of research questions with the aim to provide description, examine and generate theory. The case study approach is advantageous, in that it allows collecting both quantitative and qualitative data. It uses methods such as archival records, interviews, questionnaires, documents as well as direct observations (Eisenhardt, 1989:532). Yin (2012:11) adds methods such as participant observation to mean the researcher also takes part in the empirical study and physical artifacts where information is downloaded from the internet sources in a work situation. Since the current study used all the above methods, it has followed a case study approach.

3.4 Independent variable

The independent variable is quality initiatives. The management of the company under investigation took several quality initiatives, such as training on continuous improvement tools, and health and safety issues.

3.5 Dependent variable

The dependent variable is the metal recycling operations. These operations will depend on efficient initiatives to take decisions that improve productivity in the short-run as well as wealth in the long-term. Figure 3.1 on page 74 depicts the flow of the research activities.

Figure 3.1: Flow of research activities

Source: Self-generated. Figure 3.1 depicts the research process followed for this study.

Figure 3.1 is relevant in that it shows researchers in the field the research processes.

3.6 Research design

3.6.1 Types of research

Research methodologies were used either under quantitative or qualitative categories. According to Keegan (2009:11), two distinctive designs may emerge depending on whether the investigation is empirical or not.

Any research methodology seeks to present facts or assumptions and to test hypotheses. At times, it also aims at answering relevant research questions (Blumberg, Cooper and Schindler, 2008:196).

Mouton (2001:56) distinguishes between research design and research methodology. Whereas research design focuses on the end product, that is, what type of work is undertaken and what outcome should be expected; research methodology deals with the actual research process, the instruments of research and the procedures. Keegan (2009:15) acknowledges the value of both quantitative and qualitative research. The mixed or hybrid methodologies that include elements of quantitative research as well as qualitative research have become common nowadays. The combination of research methods is consistent with the findings of Nancarrow, Spackman and Barker (2001:3-28).

The research undertaken in this study followed method triangulation. Gibbert, Ruigrok and Wicki (2008:1465-1474) explain the importance of following a mixed approach in research. A questionnaire, an observation checklist and an

interview schedule were used as instruments for data collection. In order to minimize interviewee bias and the limitation of memory recall, Golden (1992), as cited by Van de ven and Poole (2005:1377-1404; Lavie, 2006:153-174), suggests “to triangulate the interview data with secondary sources such as annual reports, press releases and published newspaper articles”. This case study approach worked perfectly for the type of company under investigation. A case study approach allows greater insight and understanding of the dynamics of the studied environment (Maree, 2007:76).

During a direct consultation with Parumasur (2008), a professor at the University of KwaZulu-Natal (UKZN), it was established that this research followed a method triangulation. Such an approach was instrumental in guaranteeing the accuracy of the findings. In this investigation, qualitative methodology comprised the interviews, E-mails, blogs and observation. Quantitative methodology concerned the use of questionnaires as part of the data collection technique (Erikson and Kovalainen, 2008:141-155). This approach is consistent with Mouton (2001:92-93).

3.6.2 Questionnaire Administration and Response Rate

Research questions derive from the literature review. This research study followed the same pattern. A questionnaire was designed and administered to the respondents in the metal recycling company under investigation. Likert Scale types of questions were predominantly asked. This was the

case because Likert Scale questions are more easily analysed to allow statistics to be drawn for interpretation (Brian, 2000). A section included biographical questions to allow for comparison across gender and age. Only the English version of the questionnaire was used for statistical analysis. This allowed the language barrier to be overcome. The questions differed as to whom the questionnaires were intended for, except the section that required biographical and open-ended information. Table 3.1 illustrates the Likert scale.

Table 3.1: An example of Likert scale question

I do understand what Quality Initiatives mean:

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

Source: Research questionnaire for this study addressed to Operations workers (Appendix B).

The questions addressed to the operations' workers included two biographical questions, one Likert scale with nine sub-questions and one open-ended question. Biographical questions addressed the gender and the age group, whereas the Likert scale focused on training and safety issues. The drawbacks to quality initiatives were identified through the use of open-ended questions.

On the other hand, the questions addressed to operations' management followed suit as far as the biographical and open-ended questions are concerned. However, dichotomous (yes or no) questions were different from those addressed to operations workers. For management, Likert scale questions aimed at highlighting numerous quality measurement and or analysis tools. This sought to establish whether management was equipped in dealing with operational issues. It was hoped that such questions would help identify those areas where management lag behind or desperately need training, retraining or unlearning. This is consistent with the theory of the company as a Learning Organisation (Johnson, Scholes and Whittington, 2006:589).

All the operational workers and decision makers in the operations department completed the research questionnaires.

3.6.3 Survey approach

The research undertaken in this study was predominantly quantitative. However, in order to collect sufficient data, theoretical information was also generated.

A case study approach was followed to analyse the significance of quality initiatives in scrap processing firms. A systematic observation was useful in order to collect data in the yard. Thus, the method triangulation, which means a combination of three approaches, and in this case, the use of questionnaires, interviews and systematic observation, was used for data collection. In an unstructured interview

with Parumasur (2008), it was established that the triangulated approach to research is effective. This is because it is holistic in nature. According to Keegan (2009:14), research methodologies should be complementary.

During the global economic recession, customers were becoming more price sensitive (Schuler and Susan, 2008:207). It was, therefore, imperative for companies to take quality initiatives responsibly. This was an attempt to make a positive impact on the business environment. Quality has always been a priority of many companies, especially during the last twenty years (Lakhal and Pasin, 2008:1087). The economic slowdown made the metal customers reluctant to buy as they sought good value for money. Thus any purchase of ferrous and non-ferrous metals had to take this into account (*Downturn brings opportunity*, 2008:29).

In view of the above, South Africa did all it could to contain the effects of the global economic slowdown. However, the economic meltdown had already badly hit the mining, mineral and metal recycling industry. In an interview with SABC 2, Manuel (2008) said that, it was predicted that South Africa was yet to see the second negative quarter of its economy. It was clear at that point in time that the metal recycling industry needed to take all preventative measures in view of the state of the economy.

3.7 Pilot study

A pilot study was conducted even though the sample size was very small. The English version of the same questionnaire was administered to the operations management. There was almost no difficulty as far as the questionnaire was concerned. All that was needed was to provide some help to illiterate general workers. The main change to the initial questionnaire was the shortening of the sentences and the reformulation thereof. These changes were introduced as a result of the pilot study outcome.

3.8 Data analysis

This section discusses specific types of descriptive and inferential statistics that were worked out. These statistics were useful in the process of making necessary analyses and conclusions contained in this research product.

In order to analyse the information, the researcher used a number of tools such as Tables, Figures, Models and Charts.

The analyses took into account at least two variables. These variables included Quality Initiatives and Metal Recycling Operations.
The following variables described an association with quality initiatives:

- Understanding Quality Initiatives;
- Meeting bales' specifications;

- Making bales out of intended materials;
- Freeing bales from dust, rubber, plastics and dirt;
- Enhancing quality of bales to increase products' sales;
- Having read quality and safety policies;
- Prioritising ongoing training; and
- Determining drawbacks to quality initiatives.

The constructs above come from the questionnaires that were distributed to the operations' workers, except the last that appealed to both the management and the workers. The following variables described an association with metal recycling operations:

- Prioritising safety;
- Containing the effects of the global economic recession;
- Determining the drawbacks in the processes, trading, recycling, shipping, baling, sorting, loading and grading of secondary metals; and
- Contributing to productivity enhancement.

The last construct comprised quality measurement instruments and analytical tools that, if used properly, could enhance productivity. Organisational performance must be driven through increasing productivity (Sparta, 2006:6-7; Harrington, 2006:12-13).

These analytical and quality measurement tools include: Strengths, Weaknesses, Opportunities and Threats (SWOT-analysis), Benchmarking, Brainstorming, Pareto Analysis, SACQA model, DRIVE, Institute of Scrap Recycling

Industries (ISRI), Recycling Institute of Organisational Standards (RIOS model), Cost of Quality (COQ), IDAARA (Indices, Data, Analysis, Action, Review, Again) mechanism, Ishikawa diagram, and the House of Quality.

3.9 Reliability and validity

3.9.1 Reliability

Reliability refers to the evidence of replication should the research be conducted again. For example, should the research questions be asked by somebody else, the respondents should provide the very same answer. This is important because the readers or the researcher can depend on the findings as they are consistent and stable. A coefficient of reliability is computed by taking several coefficients. A value of 0.70 or higher is considered to be acceptable (Introduction to SAS UCLA: Academic Technology Services, Statistical Consulting Group, 2007).

Table 3.2 presents the cronbach alpha coefficients:

Table 3.2: Reliability testing

Sections	**Cronbach's Alpha**
Quality and Safety	.477
Product	.732
Financial	.504
Overall	**.796**

The overall reliability score of 0.796 indicates a high degree of acceptable, consistent scoring for the different categories for this research. The product category has a high, acceptable reliability value, but those for quality and safety, and financial statements are slightly below the standard. This is due mainly to the nature of the sample, and the fact that the questionnaire was an untested construct.

In this study, an attempt was made to guarantee a reliable outcome in these ways:

- Personal distributing: The researcher undertook to distribute the questionnaire to each respondent. This entailed the need to explain the importance of being objective and to guarantee the anonymity of the respondents;
- Questionnaire in envelopes: The respondents were free to post the questionnaire back to the researcher without indicating a return address. They had previously received the research instrument in an envelope in order to guarantee they provide reliable information without the fear of being traced or condemned;
- Open-ended questioning: In order to allow the respondents to speak out their minds, open-ended questions were asked and space was provided for that matter. The respondents made good use of the space as they provided quality inputs about what needs to be improved; and
- Anonymity: It was stressed that all participation must be anonymous for ethical reasons.

3.9.2 Validity

Validity suggests the relevance of the findings or information provided. This is consistent with Neuman (2006:178), who explains that validity refers to the extent to which a questionnaire measures what it was supposed to measure. Gilbert, Ruigrok and Wicki (2008: 152-153) discuss the validity criteria in case study research. It is said that internal validity is supported by careful review of academic literature.

According to Saunders *et al*. (2005:308), research instruments should be appropriate to measure what the researcher intended to investigate for the results to be valid.

Whereas Speziale and Carpenter (2003:70) identify three main approaches for estimating the validity of a questionnaire, namely, construct validity, criterion-related validity and content validity, De Vos (2002:167) distinguishes between four types of validity, namely, face validity, content validity, criterion validity as well as construct validity.

According to De Vos (2002:167), the four types of validity are:

- Face validity – it refers to whether the statements are appropriate; it relies on the subjective judgment by the researcher;

- Content validity – it is the accuracy with which the instrument tests the information available for the study;
- Criterion validity – it is the relationship between two measures with the second measure performed to double check the accuracy of the first measure; and
- Construct validity – it is the extent to which the content of the investigation is actually measured by the questionnaire.

Unlike Speziale and Carpenter (2003:70), who do not consider face validity, Struwig and Stead (2004:142) and De Vos (2002:167) do. They also agree on what face validity is all about. However, Struwig and Stead (2004:142) add that face validity does not depend on any established theory as content validity does.

In this research project, validity was catered for by ensuring the questions that were asked, addressing core issues in the operations, health and safety as well as quality initiatives. The promoter and co-promoter reviewed the questionnaire and provided guidance. The promoter and the co-promoter, therefore, played an instrumental role to enhance validity of the research project.

3.10 Factor analysis

3.10.1 The importance of factor analysis

According to Struwig and Stead (2004:138), factor analysis is used to guarantee the validity of research. It is a

statistical technique whose main goal is data reduction. A typical use of factor analysis is in survey research, where a researcher wishes to represent a number of questions with a small number of hypothetical factors. For example, as part of a national survey on political opinions, participants may answer three separate questions regarding environmental policy, reflecting issues at the local, state and national level. Each question, by itself, would be an inadequate measure of attitude towards environmental policy, but together these questions may provide a better measure of the attitude. Factor analysis can be used to establish whether the three measures do, in fact, measure the same thing. If so, they can then be combined to create a new variable, a factor score variable that contains a score for each respondent on the factor.

Factor techniques are applicable to a variety of situations. A researcher may want to know if the skills required to be a decathlete are as varied as the ten events, or if a small number of core skills are needed to be successful in a decathlon. One need not believe that factors actually exist in order to perform a factor analysis, but, in practice, the factors are usually interpreted, given names, and spoken of as real things.

The rotated component matrix is shown in Table 3.3 on page 87.

Table 3.3: Rotated component matrix

	Component		
	1	2	3
I understand what quality initiatives mean	-.099	.833	.020
The company prioritizes training for safety and/or quality issues	.166	.550	.438
I have read the quality and/or safety policy of this company	.430	.135	.575
The company is ensuring bales meet the specifications	.421	.690	.095
The company is ensuring that bales are made of the intended materials	.810	.321	.147
The company is ensuring that our products are free from dust, rubber, plastics and other dirt	.619	.329	.274
Safety is more important than profit in this company	.012	.090	.912
Quality enhancement contributes to our products' sales	.730	-.237	.375
We have contained the effects of the global economic recession	.883	.028	-.064

Factor analysis ensures, for example, the construct validity of research when confirmatory analysis is conducted (Struwig and Stead, 2004:138). It is a statistical technique whose main goal is data reduction. A typical use of factor analysis is in survey research, where a researcher wishes to represent a number of questions with a small number of hypothetical factors. With reference to the tables above:

The principle component analysis was used as the extraction method, and the rotation method was Varimax with Kaiser Normalization. This is an orthogonal rotation

method that minimizes the number of variables that have high loadings on each factor. It simplifies the interpretation of the factors (Struwig and Stead, 2004:138).

Factor analysis/loading show inter-correlations between variables; items of questions that loaded similarly imply measurement along a similar factor. An examination of the content of items loading at or above 0.5 (and using the higher or highest loading in instances where items cross-loaded at greater than this value) effectively measured along the nine components (Struwig and Stead, 2004:138).

It is noted that the variables of the components have factors that overlap, indicating a mixing of the factors. This means that the questions in the overlapping components did not specifically measure what it set out to measure or that the component split along themes. One possibility is that respondents did not clearly distinguish between the questions constituting the components. This could be with respect to interpretation or an inability to distinguish what the questions were measuring.

3.10.2 Relationship of variables

The variables: I understand what quality initiatives mean vs. The company prioritizes training for safety and/or quality issues vs. I have read the quality and/or safety policy of this company, interrelate.

Part of what represents quality initiatives is to single out training for safety and/or deal with issues about quality.

Whereas for management this entails the preparedness to utilize quality measurement tools as well as analytical techniques, for operations' workers, this should start with letting the incumbents become aware of the company's quality and/or safety policy. The more the employees are trained, the more they read the policy and the easier it becomes to implement quality and safety initiatives for the benefit of all.

Also, the other last three variables are related. Bales specifications (0.690), bales made of intended materials (0.810) and, the Company removes all the dirt (0.619). This implies that, the more the bales are made of quality materials, the more specifications are met and, subsequently, the easier it becomes to remove dirt on bales. This finding is in line with the specifications put forward by ISRI, the Institute of Scrap Recycling Industry (Scrap Specification Circular, 2008:1-121).

3.11 Population

The research investigation was a census study where 70 employees participated, that is, operations management and operations workers. They include male and female incumbents. Operations' people were mostly manual workers while management comprised senior decision makers and operations' supervisors. It was observed that while management were mixed as they were Whites, Indians, Coloured and Blacks, operations' workers were all Blacks except their operations' manager. According to Nunes and Breene (2011:80-95), "high performance companies need

up-and-comers who can grow a new business, not just manage an old one". This is important in order to "jump the S curve which requires frequent injection of new blood and a continual shake-up of the top team" (Nunes and Breene, 2011:85).

The company case studied is Eurotrade Metals Africa, also known as Lee Scrap Metals. After the global economic recession, tens of workers from the operations department were retrenched. The company deals with waste management, scrap recycling, metal trading and so on. For the purpose of this survey, metal recycling operations were the key areas of interest. Concepts such as quality initiatives, health and safety, training and related constructs were explored.

3.12 Sample

According to Keegan (2009:34), the research sample is the sub-sample of the population who has been chosen for the purpose of a particular study. It consists of the people who meet the requirements to represent their team. Mouton (2001:124) states that it is essential to discuss the sample and its characteristics for the readers to understand the nature of the findings.

Blumberg, Cooper and Schindler (2005:211) state that there should be a sampling frame from which the sample is drawn. The target population was 70 people who work in the operations department. The sampling frame is a complete

list of all elements in the population from which the participants are drawn.

3.13 Sampling method

A census study was conducted. This is due to the fact that the target population of 70 is small. The case study, therefore, took the form of a survey. Leedy and Ormrod (2005:135) substantiate the importance of a case study approach in supporting hypotheses.

A survey questionnaire was administered upon informed consent. Operations' manual workers and their foremen or managers were asked to fill in the questionnaire. The respondents consisted of 68 from 70 questionnaires that were distributed. Operations' workers and management participated in this case study.

3.14 Ethical consideration

Ethical standards were maintained throughout the research study. The promoter and the co-promoter played their role as they requested full reference of the sourced information and reminded the research student to avoid plagiarism. According to Ntlabezo and Booyens (2005:38), the term "ethics" means reference to quality of research procedures and the adherence to professional practices.

A letter to the respondents highlighted what to expect in the questionnaire as well as the accepted conduct of participants (Appendix D). On top of that, their

confidentiality was guaranteed. It was emphasised that the data collected were to be used for research purposes only. A written permission to conduct research throughout the Master's studies in the company under investigation was given to the researcher.

3.15 Conclusion

In this chapter, the research methodology and design were explained. The population and the triangulated approach to research have been examined. Furthermore, aspects such as questionnaire administration and response rate, pilot study, descriptive and inferential statistics were explained. Also, a section detailed reliability and validity of the findings. It has been established how the questionnaire addresses the variables implied in the research study.

The following chapter is chapter 4. In this chapter, the data collection will be discussed. A survey questionnaire was administered to both operations' workers and their management.

CHAPTER 4

ANALYSIS OF RESULTS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents the results and discusses the findings obtained for the questionnaire in this study. The data collected from the responses were analysed with the Predictive Analytical Software (PASW) version 18.0. The results are presented in the form of graphs, cross tabulations and other figures.

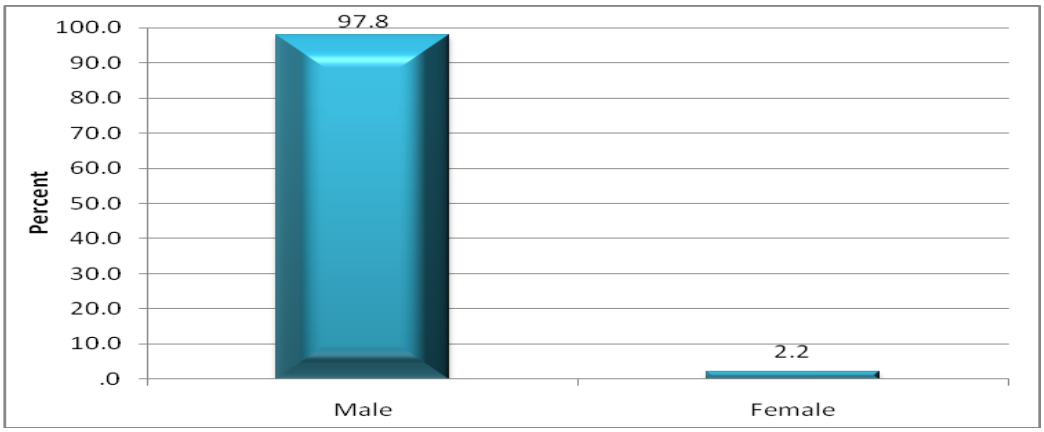
4.2 Demographic data

4.2.1 Workers' and managers' demographics

4.2.1.1 Operations workers' gender

Figure 4.1 represents the operations workers' gender.

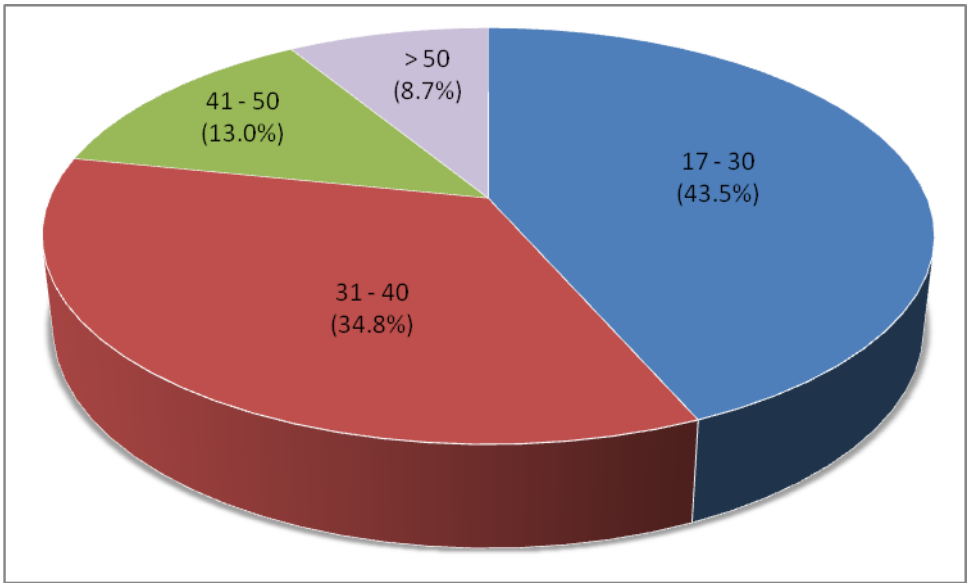
Figure 4.1 Operations workers' gender



The sample consisted of 97.8% males. A total of 2.2% represents the females. Table 4.2 represents age as a factor in this research study.

4.2.1.2 Operations workers' age (years)

Figure 4.2 Operations workers' age (years)



A total of 78% of the sample were between the ages of 17 and 40 years. The remaining 22% were over the age of 40 years. The smallest grouping was for the over 50 year olds.

Table 4.1 below summarises the age (years) and gender cross-tabulation for workers.

Table 4.1 Age (years) and gender cross-tabulation for workers

			Gender		Total
			Male	Female	
Age (years)	17- 30	Count	19	1	20
		% of Total	41.3%	2.2%	43.5%
	31- 40	Count	16	0	16
		% of Total	34.8%	.0%	34.8%
	41- 50	Count	6	0	6
		% of Total	13.0%	.0%	13.0%
	> 50	Count	4	0	4
		% of Total	8.7%	.0%	8.7%
Total		Count	45	1	46
		% of Total	97.8%	2.2%	100.0%

The only female was between 17-30 years old. Of the males, 8.7% were older than 50 years old.

The only female (2.2%) who responded to the questionnaire works in the office of the operations department. She does not work in the yard because of the nature of manual operations involved. In the scrapmet department, there was a lady involved as well as in a recently closed branch in Stanger. Nevertheless, at the time of administering the questionnaires, no woman was working in the metal recycling operations, specifically in the yard. This reality

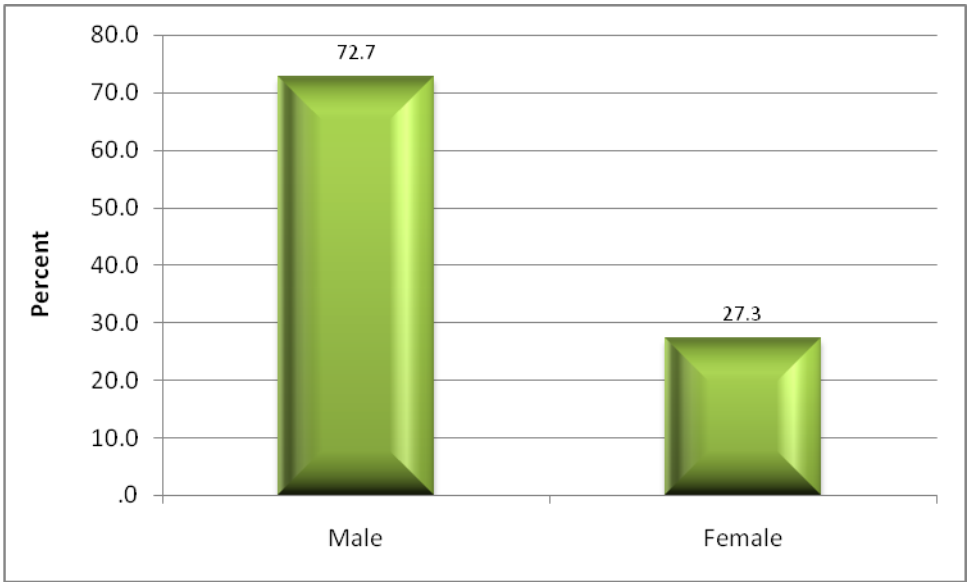
has something to do with safety considerations as the metal recycling industry is a high risk environment.

4.2.2 Managers' demographics

The tables and figures below present a summary of the demographic data. Table 4.3 represents Gender as a factor in this study.

4.2.2.1 Operations managers' gender

Figure 4.3 Operations managers' gender

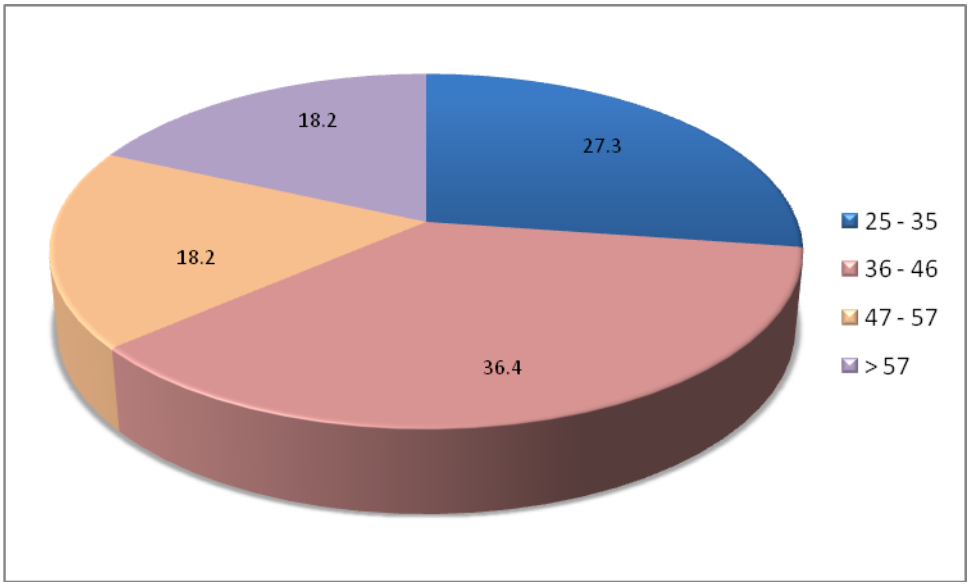


A little more than a quarter (27.3%) of the respondents were female.

Table 4.4 represents the age as a factor in this study.

4.2.2.2 Operations managers' age

Figure 4.4 Operations managers' age (years)



The largest grouping for age in the office was for the 36-46 years' group (36.4%). With 18% of operations workers being over 57 years old, the company has to promote skills, passing training to the inexperienced young ones in the operations.

Table 4.2 below summarises the age groups by gender for managers.

Table 4.2 Age group by gender for operations managers

Age (years) * Gender Cross-tabulation for operations managers

			Gender		
			Male	Female	Total
Age (years)	25-35	Count	2	1	3
		% of Total	18.2%	9.1%	27.3%
	36-46	Count	3	1	4
		% of Total	27.3%	9.1%	36.4%
	47-57	Count	1	1	2
		% of Total	9.1%	9.1%	18.2%
	> 57	Count	2	0	2
		% of Total	18.2%	.0%	18.2%
Total		Count	8	3	11
		% of Total	72.7%	27.3%	100.0%

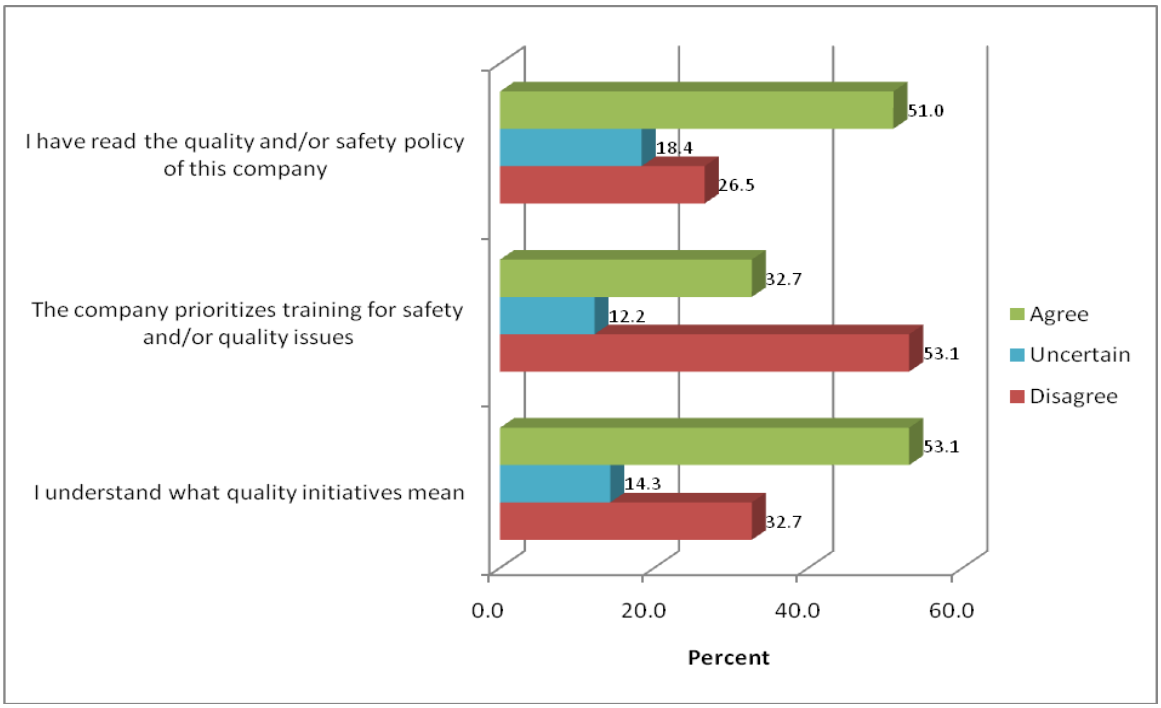
Of the male respondents, most of them (27.3%) constituted the 36-46 years age group. The smallest number (9.1%) was found in the 47-57 years age group.

4.3 Section analysis

The graphs below are a summary of the results for each of the sections that constitute the study. Figure 4.5 on page 99 summarises the findings on quality and safety.

4.3.1 Quality and safety

Figure 4.5 Quality and safety



A total of 51% of the respondents understand safety and quality and have read the necessary documentation. A total of 32.7% of the respondents don't know the meaning of quality initiatives. A total of 53.1% of the respondents did not feel that the company prioritized safety and quality issues, whilst 32.7% felt that the company did so. This is so because safety and quality have not been integrated in the company under investigation to the point that the manual workers can comprehend the impact. It is, therefore, consistent with the findings of Singh (2006:213) that safety and quality as well as other management systems have an impact when they are integrated.

4.3.1.1 Reasons for scores in the graph

It has been established that 51% of the participants have read the quality and/or safety policy. This is true. The company had been providing training on matters that concern quality and safety, although more needs to be done. The training led to the workers familiarising themselves with the policy. Quality initiatives should be an initiative by operations managers as well, and all the workers need to be sensitized about it.

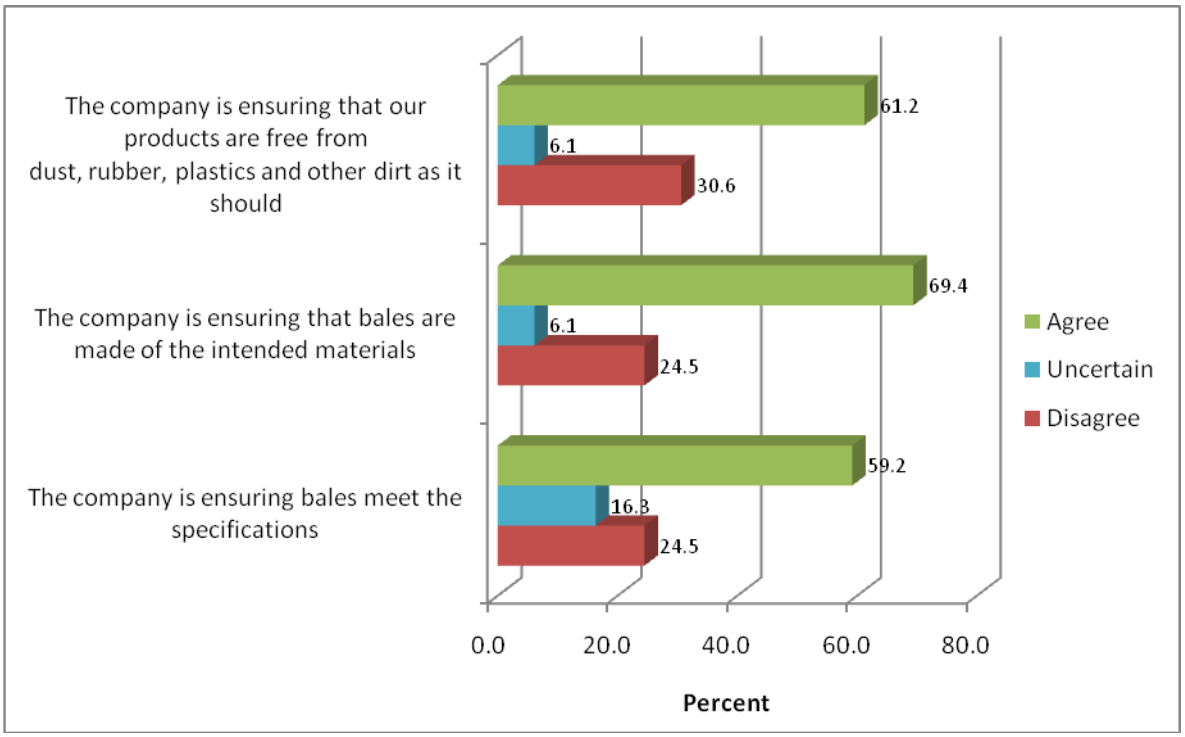
The findings reveal that 53.1% disagreed on the question that aimed to establish whether safety and/or quality are a priority at Eurotrade Metals Africa. It is so because the management had allowed training to take place for general workers, whereas management generally pretended not to be in need. In an interview, Davie (2007) said that the importance of training and retraining cannot be overemphasized when it comes to resolving operational problems or avoiding them in the first place.

It is encouraging to realize that 53.1% of the respondents understood the meaning of quality initiatives. Again, training is a contributing factor to the attitude and knowledge of the workers. That is why Seggie (2010:26) supports the changing of company culture into one of coaching and training.

Figure 4.6 summarises what has been said by participants about the product as far as its quality is concerned.

4.3.2 Product and quality

Figure 4.6 Product and quality



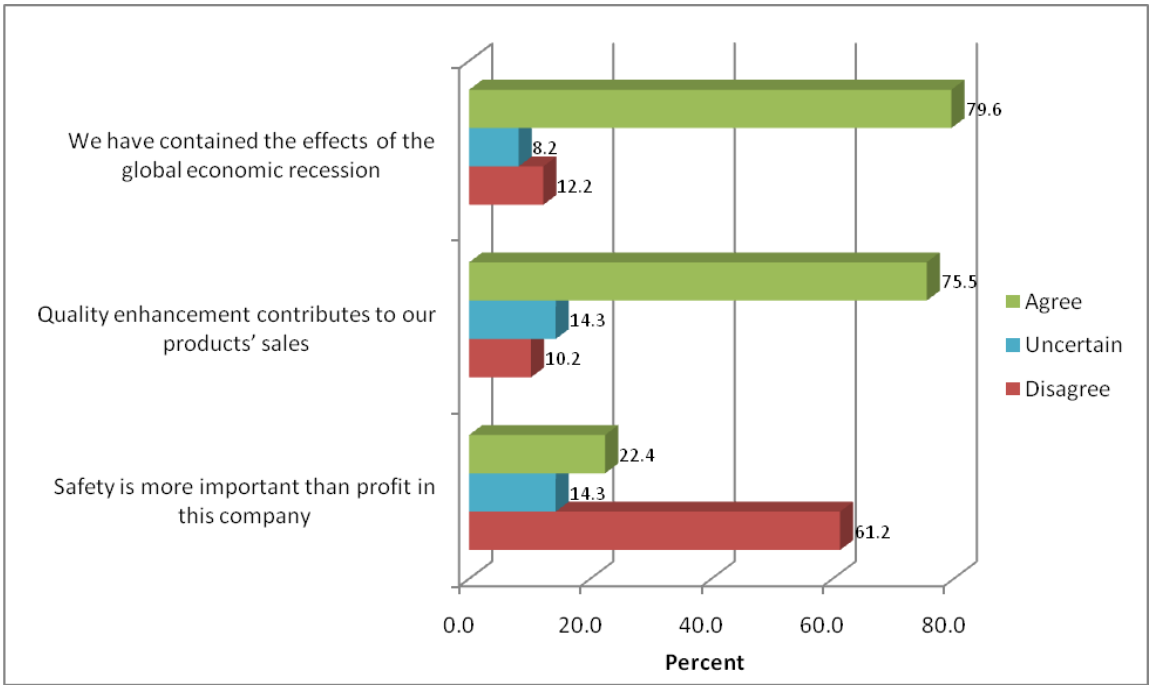
The company is ensuring that products are free from dust, rubber, plastics and other dirt. This is true. On every baler, the operator is assisted by one or two manual workers whose job it is to remove dirt, help unjam materials, pull out plastics, and, at times, burn out other dirt. This is done during or just after the bale has been produced, before it is late. A total of 61.2% of the respondents agree with the statement. This finding is consistent with the requirements of RIOS (Recycling Industry Operations Standards) according to which attention should be paid to detail to ensure quality and safety in recycling operations (RIOS, 2006:1-3).

The company is ensuring that bales are made of intended materials. This is happening. The company has put in place a quality controller whose job is to grade materials according to quality, supervise the operations, thus removing any unwanted material. This is done because "Quality is conformance to requirements" (Mitra, 2008; Besterfield as referenced by Naidu, 2007:17). For the same reasons, the company strives to meet the specifications and be up-to-date with the ISRI standards.

Figure 4.7 presents the findings on the finances of the company.

4.3.3 Financial outputs

Figure 4.7 Financial outputs



With regard to financial outputs of the questionnaire an alarming 79.6% are of the opinion that the company has successfully contained the impact of the global economic recession. However, this appears to be superficial as the situation is still volatile. The positive answer to that question has been influenced by the early signs of the company entering in a partnership agreement with the investors from Angola to help with the liquidity. As this proved to be unpractical, after the unwillingness of the "partners" to carry out the activities in Durban, the situation seems to have worsened. As a result, the employees will have to work either part-time or be retrenched. The possibility of the company being declared insolvent and/or finding itself liquidated is not to be ruled out. This makes the whole scenario unsure as to whether the company has contained the effect of the global economic recession. Zuma (2012) announced that South Africa, as a country, did well to contain the economic slowdown as unemployment was reduced from 24.5 to 23.5 during the same period. The Zuma State of the Nation address is consistent with empirical findings above as they both outline the veracity of the recession being contained.

The many efforts to keep the powerful mining sector globally competitive and, by doing so, impacting the secondary metal market, have yielded positive results. This phenomenon, however, should translate in companies, such as the one being studied, also containing the effects of the global recession (De Lange and Sikhakhane, 2012:2).

Internationally, it has been observed that although there is no sign of another round of recession headaches, already the global economy is reported to have again become very slow. This is to do with the slowing down of the economic growth as reported in the banking sector (*Bankers see no need to act in sync*, 2011:19). A total of 8.2% represents uncertainty as far as the overcoming of the global economic recession effects is concerned.

It is, however, true that quality enhancement has contributed to the company's product sales. A total of 75.5 percent agree with the fact that quality affects sales in a positive way, while 14.3% remain uncertain due to the lack of stability in the metal market. This is consistent with the findings of Basu and Wright (2003:22), who explain that sales increased in a Scandinavian company as a result of quality initiatives being taken. The company that was running the risk of sinking, managed to secure a profit of USD40M. The 10.2% who disagree are probably those incumbents who, because of unsuitable qualifications or experience, fail to adapt to the working environment.

With no surprise, an alarming 61.2% of the operations' workers, involved with recycling operations in the yard, have voiced their concern that safety is not more important than sales in this company. This could be explained by the fact that even with damaged gloves, the workers are sometimes compelled to work. The excuse that is given is that gloves have been ordered but it takes time before delivery. This excuse is to no avail as the company must have a safety stock or purchase P.P.E from a supplier that meets the JIT

delivery system. It is, however, encouraging that the company has recently provided the necessary equipment, especially safety gloves for the manual workers.

While 22.4% agreed that safety is more important than sales in this company, 14.3% remained uncertain. This finding highlights the need to provide more training to the workforce in the studied company (Rorke, 2011:36).

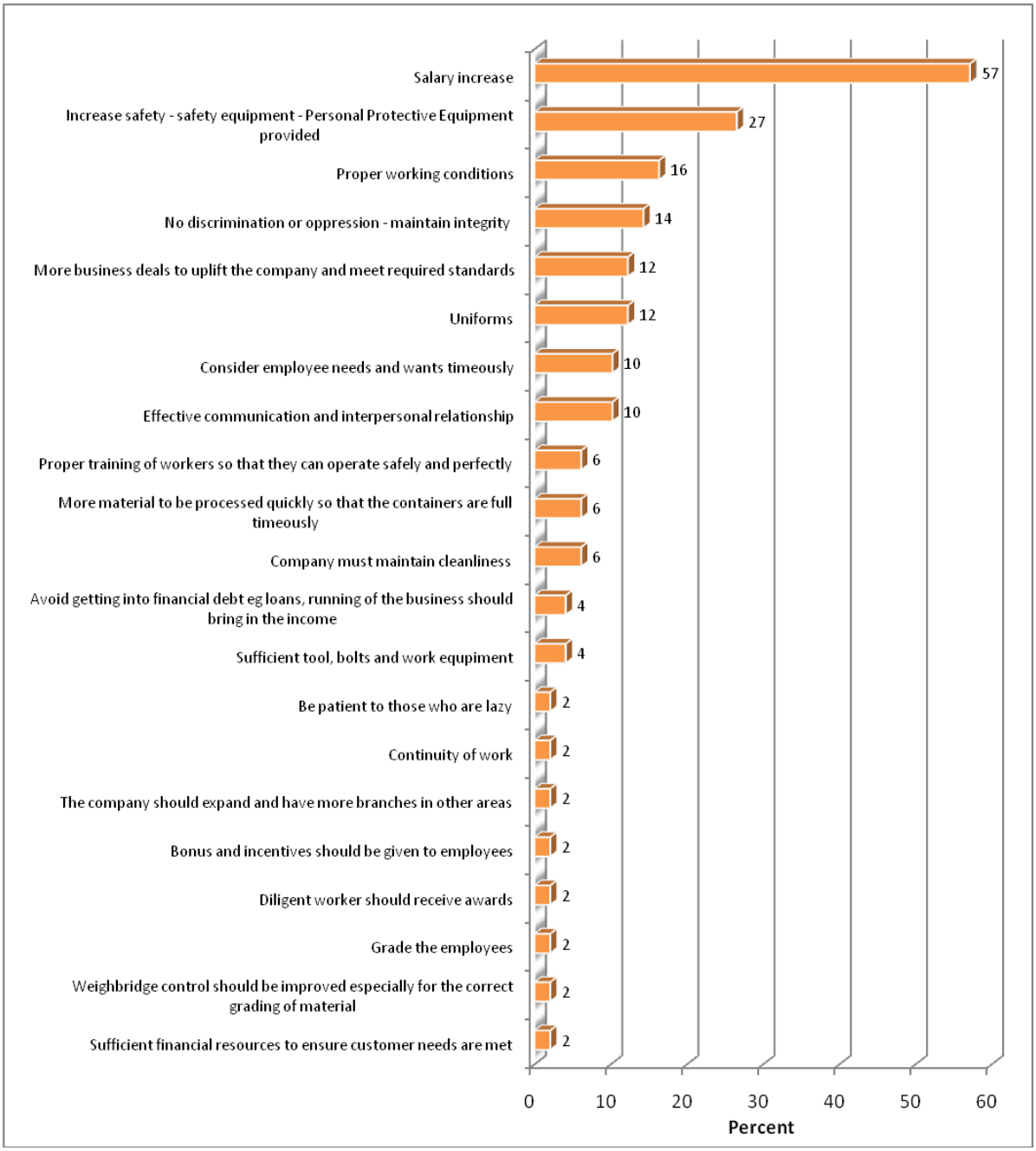
4.3.4 Results yielded through open-ended questions

4.3.4.1 Identification of drawbacks to quality initiatives

Figure 4.8 identifies the hindrances to quality initiatives in the company under investigation.

It furthermore presents related findings. The findings were gathered through an open-ended question posed in a questionnaire.

Figure 4.8: Identification of drawbacks



The most pressing statement was with regard to salaries (57%). The second most common statement referred to safety (27%). The finding on salaries is due to the disparity between the huge earnings of management and the

very low wages given to operations manual workers. Moreover, there is no grading procedure that takes into account the duration or the level of experience and the qualification of the workers. The average wages in this company have been as low as R2000 a month, said Davie (2010). Consequently, the low wages impacts negatively on productivity as workers lack motivation. This finding is consistent with the findings of Zondo (2005:13), who established that gain sharing enhances employees' effective participation in problem solving and puts a smile on their faces.

As shown in the statistics above, 27% of the respondents believe safety should be improved. This means that a proactive safety approach needs to be taken rather than responding to safety issues only when an incident occurs as it has been the case in some cases. Safety implications go hand in hand with proper working conditions. Thus, 16% of the participants who work in the yard are of the opinion that the working conditions are to be leveled to the standards. It is, however, encouraging to note that the infrastructures that have been put in place make this company one of the best in its field, when it comes to the shaded yard and the quality of office infrastructures and computer devices put in place. At some stage, the company was considered to have met the European standards of infrastructures in the metal recycling industry. It was just one of the best, if not the best in KwaZulu-Natal (Davie, 2010).

However, the 16% of respondents represent those who are aware of the need to align the company with Quality of

Working Life (QWL) requirements. A total of 14% were of the opinion that the company should not practise discrimination or oppression and that the integrity should be maintained. The ascendance of people of colour to senior positions is a palliative to this complaint. A total of 12% of the operations' workers expressed the need for new uniforms. Again, this has something to do with safety and the QWL of employees. A total of 10% of respondents want the company to consider the employees' needs and wants. Although this statement lacks clarity, it is another signal of those who are dissatisfied with the operations' activities. Another 10% think there should be efforts to improve communication and interpersonal relationships, probably between management and the workers as much as between peers. Although other variables scored very low, between 2% and 10%, there are also quality improvement initiatives of importance for the company to promote. For example, the need to provide the workers with proper training (6%) and the JIT principle recalled by the need to have more material processed on time (6%). There is also the call to improve the overall productivity, the need to maintain cleanliness (4%) and to avoid financial debt (4%). Provision of tools and equipment (4%) is also mentioned (Mangan, Lalwana and Butcher, 2008:8). Although the following variables were scored very low, they are equally important and should be seriously addressed. These include the following variables:

- Weighbridge control mechanisms (2%);
- Sufficient liquidity to ensure customers' needs are met (2%);

- Continuity of work (2%);
- Diligent workers should receive awards (2%); and
- Bonus and incentives should be given to the employees (2%) (Zondo, 2005:13).

The only outcomes that are questionable are the following: "be patient with those who are lazy (2%)", and, "the company should expand and open more branches in other areas (2%)". These outcomes are not feasible, considering that the firm appears to have amassed a number of problems in its operations, and it is running many risks as the productivity has been disrupted with the repossession of trucks and, even recently, of key plants such as the excavator, the Bobcats and the Hysters. The company cannot allow anybody to be lazy, if it is to survive (Davie, 2011). This is consistent with what Goel, Gupta, Jain and Tyagi (2005:210) say when they explain that some people can also be identified as a problem to the company. People condoning laziness are a real problem to any company.

Also, it does not make sense to open other branches when the company has to fight for the survival of the existing branch, and help generate some income for the already very slow business. This is consistent with Zylstra (2006:107) who states that value chain end-results, for example, investing in infrastructures, should concern only those activities that add value.

4.4 Hypothesis testing

The traditional approach to reporting a result requires a statement of statistical significance. Statistics refers to numerical information and the collecting, processing, analysing the data in a way that can be useful to the user (Du Plessis, 2006:33). A p-value is generated from a test statistic**.** A significant result is indicated with "p < 0.05". These values are highlighted in yellow. The chi square test was performed to determine whether there was a statistically significant relationship between the variables (rows vs. columns). The null hypothesis states that there is no association between the two. The alternate hypothesis indicates that there is an association.

Table 4.3 on page 111 summarises the results of the chi square tests. The results indicate that there are relationships between each statement and the respective category.

Table 4.3 Chi-square results

	Gender	Age (years)
I understand what quality initiatives mean	0.893	0.322
The company is ensuring bales meet the specifications	0.877	0.436
The company is ensuring that bales are made of the intended materials	0.907	0.475
The company is ensuring that our products are free from dust, rubber, plastics and other dirt as it should	0.913	0.052
Quality enhancement contributes to our products' sales	0.893	0.792
We have contained the effects of the global economic recession	0.877	0.14
Safety is more important than profit in this company	0.212	0.432
I have read the quality and/or safety policy of this company	0.783	0.79
The company prioritizes training for safety and/or quality issues	0.289	0.672

It is noted that there are no significant relationships between age and gender, and the statements. This finding implies that age and gender played no part in the manner in which respondents scored the questionnaire.

4.5 Correlations

Spearman's correlation was performed for the 9 ordinal statements. The results are presented below.

4.5.1 Spearman's correlation for ordinal statements

Table 4.4 Spearman's correlation for ordinal statements

	I understand what quality initiatives mean	The company is ensuring bales meet the specifications	The company is ensuring that bales are made of the intended materials	The company is ensuring that our products are free from dust, rubber, plastics and other dirt as it should	Quality enhancement contributes to our products' sales	We have contained the effects of the global economic recession	Safety is more important than profit in this company	I have read the quality and/or safety policy of this company	The company prioritizes training for safety and/or quality issues
I understand what quality initiatives mean	1								
The company is ensuring bales meet the specifications	.300*	1							

Table 4.4 Spearman's correlation for ordinal statements continued

	I understand what quality initiatives mean	The company is ensuring bales meet the specifications	The company is ensuring that bales are made of the intended materials	The company is ensuring that our products are free from dust, rubber, plastics and other dirt as it should	Quality enhancement contributes to our products' sales	We have contained the effects of the global economic recession	Safety is more important than profit in this company	I have read the quality and/or safety policy of this company	The company prioritizes training for safety and/or quality issues
The company is ensuring that bales are made of the intended materials	0.097	.454**	1						
The company is ensuring that products are free from dust, rubber, plastics etc.	0.171	.460**	.498**	1					

Table 4.4 Spearman's correlation for ordinal statements continued

	I understand what quality initiatives mean	The company is ensuring bales meet the specifications	The company is ensuring that bales are made of the intended materials	The company is ensuring that our products are free from dust, rubber, plastics and other dirt as it should	Quality enhancement contributes to our products' sales	We have contained the effects of the global economic recession	Safety is more important than profit in this company	I have read the quality and/or safety policy of this company	The company prioritizes training for safety and/or quality issues
Quality enhancement contributes to our products' sales	-0.136	0.221	.618**	0.226	1				
We have contained the effects of the global economic recession	0.073	.320*	.514**	.439**	.446**	1			
Safety is more important than profit in this company	0.176	0.275	0.162	.301*	0.234	0.195	1		

Table 4.4 Spearman's correlation for ordinal statements continued

	I understand what quality initiatives mean	The company is ensuring bales meet the specifications	The company is ensuring that bales are made of the intended materials	The company is ensuring that our products are free from dust, rubber, plastics and other dirt as it should	Quality enhancement contributes to our products' sales	We have contained the effects of the global economic recession	Safety is more important than profit in this company	I have read the quality and/or safety policy of this company	The company prioritizes training for safety and/or quality issues
I have read the quality and/or safety policy of this company	0.207	.315*	.299*	.457**	0.266	0.284	.341*	1	
The company prioritizes training for safety and/or quality issues	.319*	.347*	.296*	.289*	0.211	0.056	0.284	0.208	1

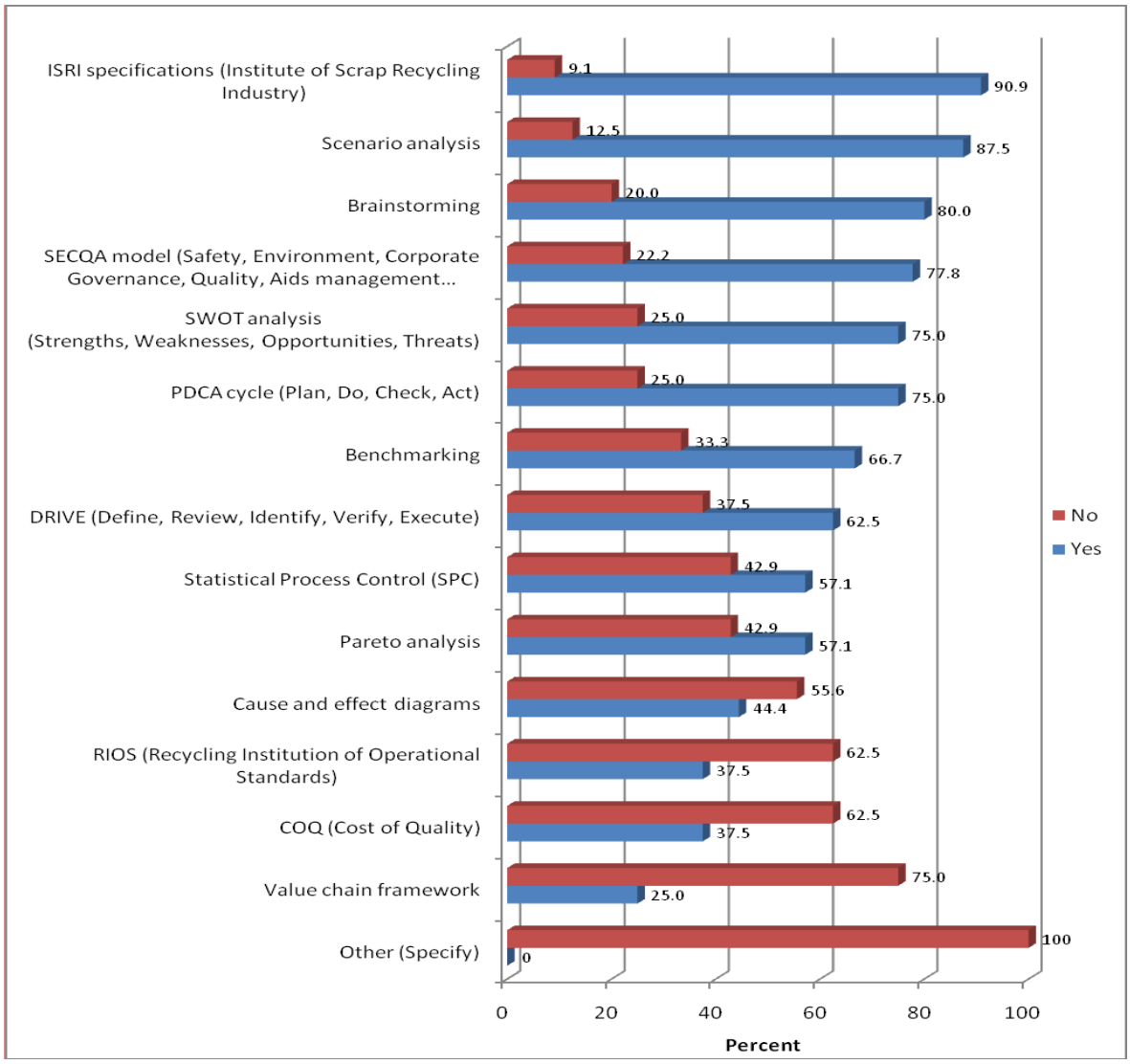
All of the highlighted values indicate a significant positive proportional relationship. The findings demonstrate that a change in one variable has a similar positive type of change on another variable. For example, the correlation value between "The company is ensuring bales meet the specifications" and "The company is ensuring that bales are made of the intended materials" is 0.454. This means that through the use of correct materials, the bales meet the required standards. This argument is extended to the rest of the table.

Figure 4.9 presents the findings on techiniques used by operations management.

4.6 Managers' responses

4.6.1 Responses to techniques used

Figure 4.9 Responses to techniques used



Due to the nature of the business, emphasis was placed more on certain methods when compared to others. The second and third methods from the top of the Figure 4.9 are general quality tools. Other quality tools such as SPC, Pareto analysis and Ishikawa diagrams (cause and effect) are used, on average, about 50% of the time.

A total of 90.9% of managers agreed that the company uses ISRI specifications in its operations, while 9.1% answered "No". Scenario Analysis scored 87.5% for those who ticked "Yes" and 12.5% for those who disagreed. 80% of managers answered "Yes" on whether the company uses brainstorming in its running of the business whereas 20% opted for "No". The first three variables represent the strength of the company. However, the 77.7% of managers who said that they use the SECQA model in their decision-making are mistaken as the SECQA model has only recently been published by Shalini Singh (Singh, 2010), and it is unlikely that those managers have been acquainted with the model. However, this indicates the importance of such an integrated quality model and its usability in the secondary metal recycling industry.

It is obvious that some managers did not comprehend the terminology or the tools used as quality improvement or analytical instruments. This is also due to the lack of exposure of certain people employed at senior managerial positions. The company's culture is one that favours experience over formal qualification and training. However, for smooth operations, education and experience are to go hand in hand.

The fact that 44.4% said “Yes” and that 55.6% disagreed that this tool is used by managers, demonstrates even further the need to train management to be familiar with the business improvement mechanisms such as these analytical tools. Alarming findings have also been made for other variables such as RIOS with 37.5% “Yes” and 62.5% “No”. This finding relates to the fact that many managers are not aware of the strategic moves of the company. It is true that the company matches itself to RIOS standards, but many decision-makers were not aware.

While the researcher understands why the 75% of managers disagreed about the use of value chain framework and only 25% answered “Yes”, the reason being the complexity and holistic nature of that framework beyond the actual capacity and commitment of the firm, there is no clue as to why 62.5% answered “No” about the use of COQ whereas only 37.5% answered “Yes” to that question. Although 62.5% agreed that the company uses DRIVE as another analytical tool, 37.5% disagreed with that statement. Many managers answered “Yes” to say that the company uses this model in its decision-making process probably by merely looking at the words that define DRIVE (define, review, identify, verify and execute). It is possible that they barely understood the implications as there is no formal indication that this tool is being used in this company. It is possible that managers were benchmarking the company with the best practices to their knowledge. This is consistent with the teachings of the benchmarking technique that, among the other possibilities it outlines, the borrowing of best-in-class

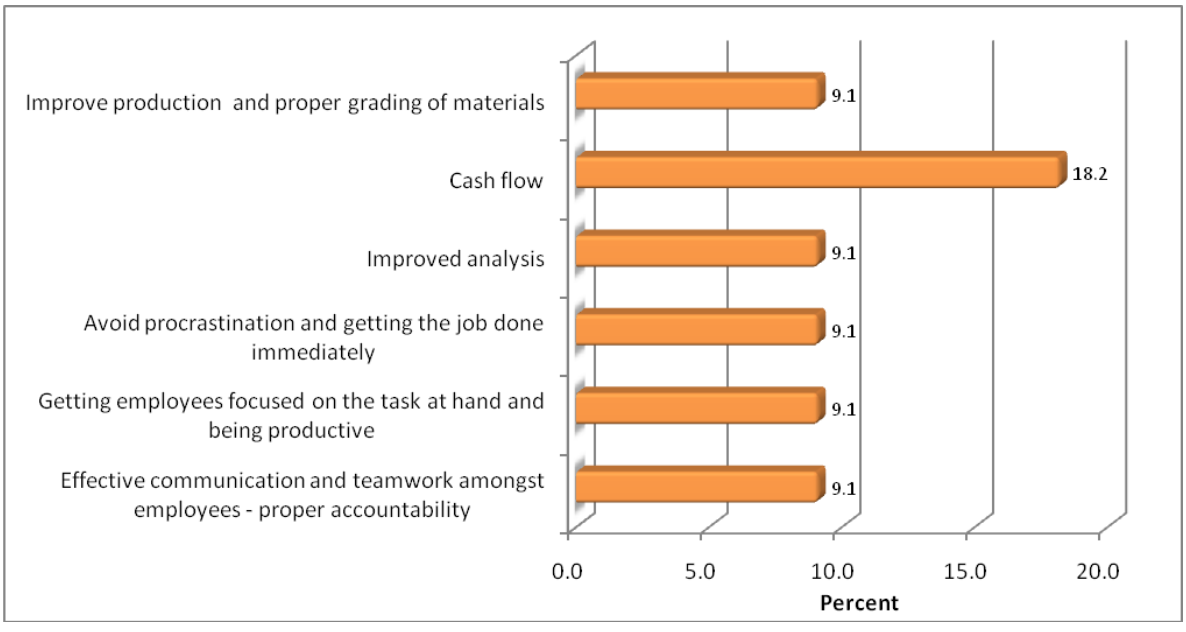
practices of the best in the industry (Johnson, Scholes and Whittington, 2006:144-148).

However, the fact that 62.5% of the respondents and 75% of respondents answered "No", respectively, to the use of techniques such as RIOS and Value Chain Framework, demonstrates the need to provide quality training to management so that they can comprehend and utilize the very tools they ticked "No" for.
Figure 4.10 presents the comments of operations managers.

4.6.2 Comments by managers

Figure 4.10 Comments by managers

Other comments made by managers are captured in the figure 4.10.



The most common statement in Figure 4.10 was that regarding cash flow with a score of 18.2%. Most operations' decision-makers are of the view that the company's cash flow must be improved. The lack of cash in a company is a cause of concern as it precludes the smooth operations of value-adding activities due to insufficient funds or the inefficient management of cash resources or cash equivalents by the people entitled to do so. It is a known fact that the lack of liquidity can impede the overall productivity. This fact is consistent with the reality, as found in a communication to operations workers by the Company's Managing Director (Davie, 2011). The lack of liquidity affects the company's operations. This finding correlates with Bicheno (2004:16) who explains that lead time can be affected by waiting for parts due to lack of resources to buy them. The rest of the statements score the same (9.1%), as outlined in Figure 4.10. These include the following:

- 9.1% or nearly 10% suggested the improvement of production and proper grading of materials;
- 9.1% suggested the improvement of analysis (Goetsch, 2002:152);
- 9.1% suggested the avoidance of procrastination by getting the job done immediately (Basu and Wright, 2003:16);
- 9.1% suggested the employees focus on the task at hand and more productivity; and
- 9.1% suggested the improvement of effective communication and teamwork amongst employees as well as proper accountability (Bund, 2006:22).

All the above findings served to identify a number of drawbacks that need attention for the smooth operations of the recycling business in the company under investigation. This explains the views of Juran, as stated by Evans and Dean (2003:54-55), about the use of specific language at each level of management.

4.7 Hypothesis testing

Chi-square tests were used to determine whether there was any relationship between the column and row variables. The results are presented below. Table 4.5 presents the hypothesis testing.

Table 4.5 Hypothesis testing

The theory is the same as the workers' output.

	Pearson Chi-Square Tests	
	Gender	**Age (years)**
Benchmarking	0.134	0.112
Cause and effect diagrams	0.343	0.591
Pareto analysis	.047*	0.405
Brainstorming	0.301	0.29
SECQA model (Safety, Environment, Corporate Governance, Quality, Aids management systems)	0.391	0.36
Statistical Process Control (SPC)	0.147	0.646
DRIVE (Define, Review, Identify, Verify, Execute)	0.206	0.161
PDCA cycle (Plan, Do, Check, Act)	0.206	0.62
SWOT analysis (Strengths, Weaknesses, Opportunities, Threats)	0.206	0.62
COQ (Cost of Quality)	0.187	0.828
Scenario analysis	0.408	0.592
Value chain framework	.035*	0.446
ISRI specifications (Institute of Scrap Recycling Industry)	0.521	0.588
RIOS (Recycling Institution of Operational Standards)	.035*	0.659

Age did not play a significant role with respect to how the tools were used. However, there were three significant relationships with regard to gender and the highlighted statement values.

For example, Table 4.5 shows that there is a relationship that tends to be positive between Gender and Pareto analysis. It is so because, in this particular company, men abide by the 80/20 rule more than the women. Men are represented in numbers across the echelons in the studied company than women and this reality is reflected in the statistics above. The findings correlate with Normand, Littlejohn and Falconer (2008:25-36).

The chi-square tests showed a relationship between Gender and Value Chain Framework. It is a matter of exposure and nothing else. In the metal recycling operations, men are more exposed to working with machinery or plants and to getting involved with manual labour. It would be interesting to conduct the test in a situation where men and women are enjoying the same level of exposure.

These findings highlight the need to conduct training and retraining of both men and women, thus giving them the exposure and knowledge they need to be productive. The SWOT-analysis model could be used to identify those opportunities in the metal recycling company (Johnson, Scholes and Whittington, 2006:148).

For the above relationship between variables, it is in the same perspective that the reader has to understand the relationship between Gender and RIOS (Recycling Institution of Operational Standards). It is not a surprise to see men make an impact in an industry where women are seldom employed to do hard manual work and to operate machinery in a risky environment. These findings explain the need to implement the PDCA cycle (Plan, Do, Check and Analyze) in a way that benefits both men and women. It is also usable to encourage women in taking up employment in such a challenging environment (OmniLingua, 2004:3-4).

4.8 Summary of correlations

The findings reveal that there is a significant relationship between the following quality improvement or measurement tools:

- Brainstorming and Benchmarking (.756);
- Value chain framework and Cause and effect diagram (.745);
- ISRI specifications and Brainstorming (.667); and
- Value chain framework and Cost of Quality (.745).

Other significant relationships are found between Statistical Process Control (SPC) and Pareto Analysis; and between DRIVE and SPC as well as between RIOS and Value chain framework. They all scored 1.000.

The above findings could be explained by the fact that operations' management is keen to use quality improvement

tools. Their preparedness in terms of prior training or education is a catalyst.

Operators expressed how the company could improve productivity in response to the open-ended questions. It was suggested that operators should not be waiting for materials in production. Delays affect productivity.

4.9 Responses for open-ended questions

Figure 4.8, on page 106, indicates that the majority of people express their disagreement on a number of issues. The fact that 6% of the respondents complain about insufficient material shows that, at times, production was disrupted. Operators or processes should not wait for parts in production. Supervisors indicated that processes were running smoothly under their watch. Operators, who are on the frontline of the processes, showed the largest and strongest sentiment for disagreement with supervisors.

These findings highlight improvement opportunities in this area which correlate with Bicheno (2004: 16; Bicheno, 1994; Bicheno, 2009), who surmises that waiting for parts in production affects lead time. Therefore, decreasing the waiting time will result in increased productivity and this time can also be used as a benefit to the organisation in terms of training. As a recommendation, the organisation should evaluate all processes that wait for parts and use the value stream mapping tool to link similar processes as a means of maintaining a smooth flow of production.

Findings in Figure 4.8, on page 106, also suggest that defects and scrap are to be constantly monitored. These findings are beneficial to the organization in order to instruct the regular monitoring of defects and scrap in the operations. It is also important that immediate corrective action is adequately taken.

From the above, it can be confirmed that monitoring of defects and scrap reduces financial losses and customer dissatisfaction. The 2% of respondents who requested that work be continued without disruption as well as the 16% of respondents who suggested that working conditions be improved corroborate the need to improve the conditions and put in place sound mechanisms of control such as effective weighbridge monitoring for the correct grading of material.

The following section tests the managers' responses.

4.10 Testing the managers' responses

4.10.1 Reasons why the score was different between men and women

In the operations department, it is obvious that more men are employed. The reason being, women tend to avoid intensive manual labour. Thus, men are exposed to more practical experience. As far as this particular company is concerned, men appear to have had first-hand training as well. This could be one of the reasons why their answers are different from those of the women.

The women base their approach on a different perspective. With regard to safety concerns, although a priority for both men and women, men tend to accept taking some risk where women are extremely cautious. Perhaps, a platform where employees attend training across the gender barrier could add value to the metal industry.

Safety seminars are appropriate platforms to improve safety conditions in an industry. “It is a good opportunity for delegates to share knowledge and to gain insight into safe operating methods which have been beneficial and have worked elsewhere in industry”. Thus, men and women can be prepared to approach situations with more or less the same background and the same tools (Faurie, 2011:20).

4.11 Conclusion

In this chapter, the questionnaire results were analysed and discussed. The data collected were presented and detailed information provided. The researcher undertook to explain the findings and explain the reasons that justify the findings. Numerous tables and figures were used in the empirical findings of this research study. These descriptive statistics were followed with related inferential statistics.

The following chapter is chapter 5. This chapter presents final conclusions and recommendations to redress the drawbacks and provide some guidance for future research in the field.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes the research study on the impact of quality initiatives in the operations of a metal recycling company.

It embarks on making conclusions on each and every research objective as well as making conclusions on the research problem. It further provides recommendations and suggestions for improvement of the metal recycling business in the company under investigation, mainly based on empirical findings and analyses thereof. Finally, the chapter outlines recommendations for future research in the field or in the same company on a variety of issues that spark academic curiosity.

5.2 Conclusions

The following conclusions relate to the overall research aim which was to examine the influence of quality initiatives on the operations of a metal recycling company in KwaZulu-Natal.

5.2.1 Conclusions relating to the aim

The research study investigated the impact of quality initiatives in the operations of metal recycling company at a selected organisation.

A triangulated approach to research was followed. A questionnaire was administered to the operations' department, intensive field work was undertaken and many inputs were collected through a systematic observation. A literature was reviewed to align the study with what experts in the field had to say. A number of interviews were conducted with operations' decision-makers.

Apart from the combined methodology, i.e., quantitative and qualitative methods, it was recognized that the research required interdepartmental inputs. This was required by the theme of study which focused on what could be seen as a topic of study in the Department of Quality, while being carried out within the ambit of management scholar's expertise. This theme made this research very unique.

The review of literature consisted of a thorough study of quality improvement and quality measurement tools. Among the other tools, the PDCA cycle, the SWOT-analysis, the House of Quality, the Ishikawa diagram, the SECQA model, the COQ, the Brainstorming, the Benchmarking, the ISO 9001, the ISRI and the RIOS standards were detailed. The above tools were studied in connection with relevant theories on key words such as quality, quality initiatives, metal recycling operations and quality improvement tools.

It was specified that the secondary metal recycling industry is huge and presents numerous challenges. With the negative impact of the global economic recession, the industry was badly affected. This led to customers becoming price sensitive. Under the economic crisis, companies needed to become more competitive as resources became very scarce. As some firms out-competed others, the closure of many companies due to the aftermath difficulties was not to be avoided. It was appreciated that the South African government proposed packages to rescue the industry, but recently the banking system has acknowledged the slowdown in the global economy again (Bankers see no need to act in sync, 2011: 19). This challenge compels decision-makers in the field of secondary recycling companies to take precautions. Some of those precautions are believed to employ quality initiatives and to engage in continuous quality improvement. The use of quality measurement tools and the application of business analysis tools were an advantage. Thus, there is a need to suggest that both managers and operations' workers should embark on continuous training and retraining, to make use of these tools. The integrated approach to quality and safety management was proposed for metal recycling companies. This was aligned with what RIOS and ISRI standards propose.

It is, therefore, concluded that quality initiatives impacts positively in the operations of the secondary metal recycling company. Conclusions on research objectives follow.

5.2.2 Conclusions relating to research objectives

Objective 1: To determine the influence of quality initiatives on the company's productivity.

It has been established that quality initiatives impact positively on the operations of the investigated metal recycling company. The more training the workers receive, the safer the operations become as they learn to take precautions and to do the much needed daily housekeeping. It was furthermore established that the preparedness of managers influences the usability of quality improvement tools. Most importantly, it was found that, improvement in the quality of metal and improvement of recycling processes that lead to the better quality of metal products, increase product sales. A total of 75.5% of the respondents, agreed with this statement.

Objective 2: To evaluate the significance of education on quality issues towards enhancing health and safety in recycling firms.

A thorough evaluation of the importance of education for the enhancement of health and safety was made. It was established that much still needs to be done. Managers considered training as something reserved for subordinates only. This attitude was a matter of concern. The research findings reveal that a number of managers are not familiar with quality improvement tools. When they seem to know a specific tool, it appears that their knowledge is superficial and non-pragmatic. While some people thought that the SECQA model was appropriate as a model, it emerged that

they were not aware of the model per se. The fact that the company was not providing PPE to manual workers was a matter of concern and indicated the need of training to shape up their attitude towards health and safety as an integrated approach to quality management. It is, therefore, concluded that more training and retraining should be scheduled in this company both for managers and operations' workers. The findings confirmed that operations managers' preparedness in terms of prior training or education was a catalyst in the way they see health and safety as a priority.

Objective 3: To identify the drawbacks that hamper the effectiveness of quality initiatives in metal operations.

This objective was also achieved. Numerous hindrances to quality initiatives were identified throughout the investigation. These relate to the cost factor, to the attitude of the personnel involved or the management as well as to the system in place. The open-ended questions were instrumental in yielding the drawbacks that follow:

- Bad cash flow;
- Ineffective grading of materials or secondary metal products;
- Ineffective accountability or insufficient system of control for the weighbridge management;
- Insufficient consultancy approach whereas the company needed financial consultant before major problems arose. Nobody seemed to worry until the situation was critical;

- Near misses in time management at all organisational levels;
- Insufficient and irregularly patterned productivity; and
- Ineffective communication across the echelons.

Through relevant mechanisms of control, planning and the use of quality improvement tools, these drawbacks can be reduced to controllable variables. It is, therefore, concluded that precautions need to be taken to manage the challenges that arise in the way to process and quality improvement.

It is a matter of concern that a company that enjoyed approximately 50 tons of sub grades and approximately 23 tons of Hard Metal Steel (HMS) a day, and a container of 20-24 tons of copper every 2 to 3 days, and approximately 1 container of aluminium at the same pace as copper, finds itself producing a half of each of the above patterns, if not a third in dire circumstances. This phenomenon affected both metal and non-metal products.

In the same perspective, it is a matter of concern that a company that made, in 2007, an excess of R700 000.00 (Davie, 2007) a month after wages and salaries and other expenses have been paid, can hardly pay all the benefits to the employees today.

In order to cut cost, the same company that employed almost 200 people, finds itself retrenching (Budman, 2009:24-28) approximately two-thirds of its staff in a period of 3 years due to problems in the flow of cash resources,

mismanagement of funds, ineffective debt management, theft problems and near misses in cash equivalents management. The company failed to rise above the problems, to some extent, were exacerbated by the global economic crisis. However, the firm managed to contain the dire consequences by surviving even today. This finding demonstrates that the effects were contained.

5.3 Recommendations

This section provides recommendations for improvement of processes, health and safety, metal quality, in particular, and metal recycling business, in general. It has got two subsections, one relating to the empirical study and another for future research.

5.3.1 Recommendations relating to empirical study

Due to the many challenges in the company, the findings exposed that there are issues that need to be addressed. Adding to the negative effects of the global economic recession, it has become even more difficult to operate the business, and, in all cases, the various quality enhancement tools should be utilised.

Consequently, it is suggested that this organisation consider the following recommendations:

- Resume health and safety training and skills development programme as soon as the financial situation improves;

- Cut cost and manage the resources sparingly;
- Employ qualified managers when the finances allow it;
- Introduce quality improvement initiatives;
- Provide the workers with complete Personal Protective Equipment (PPE);
- Embrace an integrated approach to health and safety as well as quality. The SECQA model and "SASS 2011" should be an advantage, if implemented;
- Enforce Broad-Based Black Economic Empowerment (BBEE) progressively;
- A policy of pension funds and retirement incentives should be managed properly to ensure smooth retirement of those who are about to retire; and
- Evaluate all the processes that wait for parts or departments that need materials beforehand, innovate and provide for the materials on time.

5.3.1.1 Resume health and safety training and skills development programme

The company had in place safety strategy named "2011 Snake Analogy Safety Strategy" (SASS 2011). The SASS 2011 was useful in identifying all the major drawbacks in the operations and attempted to suggest remedies to the health and safety problems. SASS 2011 was used by the researcher as a training model in the operations. The "SASS 2011" was effective, not only in identifying the bottlenecks in the system, but also as an integrated health and safety as well as quality training model. As a concept, the snake analogy strategy originated in mining companies'

safety initiatives in Johannesburg. The Anglocoal pioneered the use of this strategy in South Africa (Wait, 2010:12; What's biting us, 2011:1-7; *Snake and spider safety awareness for employees,* 2012). It was meant to be implemented in safety workshops, presentations and through ongoing training. The strategy was implemented in the company by the research student as from 1 January to June-July 2011. Unfortunately, training has stopped as a result of cash flow problems. It is, therefore, recommended that training be resumed and that the management re-implement "SASS 2011" as a model for health, safety and quality training as soon as the cash flow improves.

The researcher identified "the anaconda-like safety issues" by using "SASS 2011" as a tool. The anaconda-like issues represent very big problems. Those problems hurt by swallowing or suffocating the employees and those that hurt them, the company or their colleagues. The following were identified:

- Management not leading by example;
- Supervisors not following operations rules and safety procedures;
- Double standards towards safety implementation and observance;
- Non-action culture;
- Lack of updated safety posters;
- Lack of follow-up;
- Lack of review mechanisms and control;
- Failure to meet safety requirements;
- Incompetence in dealing with safety issues;

- Not living up to safety standards;
- Failing to benchmark the best in the industry globally;
- Lack of safety strategy and budget;
- Working under the influence of alcohol (substance abuse);
- Walking next to moving machinery i.e. excavator, hyster, trucks, with little care; and
- Illegal drug usage and abuse before, during and after work.

According to Newbury (2012:9-11) top management must also "walk the talk". It is warned that the anaconda-like problems should be avoided by working safely or not at all. The researcher advocated for this strategy as an attempt to spur innovations in the operations as far as health and safety were concerned. This is consistent with the finding of Barton (2011:87-90).

The warning applies to the rest of snake analogy drawbacks that follow. The "python-like safety issues" were identified as being:

- Condoning the breach of safety procedure;
- Using company PPE at home after hours without permission and misappropriation of safety equipments;
- Unprepared ness towards safety problems;
- Lack of sense of urgency;
- Smoking in the yard or in the public space;
- Refusal to attend safety talk or training;

- Irregular maintenance of company's motor vehicle, machinery or plant;
- Delay in repairs and maintenance; and
- Taking chances and bypassing safety procedures.

The "cobra-like safety issues" included the following:

- Driver with no conductor when a conductor is needed;
- Suppliers and customers entering yard with no PPE;
- Wearing shorts, sandals, or being bare foot in the yard where sharp metals are found;
- Unqualified operators;
- Children allowed in the metal recycling yard; and
- Cumulative machinery or plant that lay unattended for weeks or months.

The cobra-like issues were problems such as highly visible hazards, but as people get used to them, the people then become complacent and this creates problems in the later stage.

Another snake analogy issue that was highlighted is the black mamba-like safety issues. These are the very dangerous, fast killing and problems that affect the person next to one as well. The following were identified:

- Not using the helmet, boots, overalls, dust masks, earplugs, safety glasses when they are needed;
- Jumping into the bailer while the machine is in motion;
- Manual work without PPE;
- Expired fire extinguishers or unfit water pipes;

- Not providing safety equipments or catering for first aid training;
- Lack of tag-out or lock-out procedures; and
- Not adhering to housekeeping rules.

Finally, the adder-like safety issues were identified. The adder-like problems represent dormant problems and have great camouflage ability. The problems describe latent issues or lucid situations which one is not aware of until it is too late. These problems include the following:

- Lack of planning as far as safety is concerned;
- Trapping others;
- Drinking and driving the company's vehicle;
- Using company's diesel for own purpose;
- Asking help from an unauthorized person with no safety precautions to protect that person; and
- Wet floors as well as oily pavements.

The "SASS 2011" provides no one-size-fits all solution to health and safety but it is useful as a brainstorming, SWOT-analysis tool and a multipurpose integrated training model. The list of issues is not exhaustive in this model and most are to be synergized or understood that they network. A more integrated approach the health, safety, and quality approach is recommended to deal with the issues generated by this tool. In order to communicate the "SASS 2011", the researcher used a number of slogans that explain the attitude the workers ought to take on daily basis across the departments. The slogans include: beware snakes around; qaphela izinyoka ezikungezile; pasop vir slange; attention

aux serpents. The manual workers had to utter these in their own language and/or learn the rest. This added fun to their learning and training. Initially the "SASS 2011" aimed at reducing safety incidents by 50% in 2011. The people that were involved were confident that this is achievable but, unfortunately, the strategy was discontinued as a result of cash flow disruptions. The "SASS 2011" is recommended as soon as the liquidity is improved.

5.3.1.2 Cut cost and manage the resources sparingly.

The company resolved to cut cost by retrenching and by putting a number of workers on short-time. The global economic crisis provides many similar examples of dismissals as a result of operations problems. A more friendly approach to cost-cutting measures would be the part-time basis employment. This is a far better approach to cost-cutting practices. This palliative measure is better than a dismissal for most operations workers. Innovative ways also need to be considered. Witepski (2008:36-37) states that innovating becomes easier if the person in charge of doing so knows how. Not moving forward is said to equal sliding backwards. Innovation should affect even the strategies and the human resources and not only the processes.

5.3.1.3 Employ qualified managers

The company must value experience and education rather than overestimating the importance of experience over training and education. While people are an asset, the most

important assets are those with open minds (Eyring, Johnson and Nair, 2011:95). The company should invest enough in the talent of its employees. This is obvious when the manpower have an opportunity to think on the job (Nunes and Breene, 2011:85). Investment in training needs to be done when the cash flow improves.

5.3.1.4 Introduce quality improvement Initiatives

Initiatives such “SASS 2011” proved efficient in a short-time and could trigger a positive attitude towards health and safety in the company. Similar initiatives are recommended for training purposes. Improvement opportunities should affect productivity or the production capacity of the company. The operations workers should not wait for materials, subgrades, steel, copper and aluminum, but the use of JIT inventory system and pile-up methods should be effectively managed as palliative measures. A safety stock of essential expensive materials or secondary minerals should be encouraged. An effective way of performing this function is to maintain a healthy relationship with both the supplier and the customers. The Value Chain Framework and the Supply Chain Management models are to be commended in this regard.

Bicheno (2009) correlates with the finding that waiting for parts in production is a drawback, especially if the waiting time is prolonged. Instead, the time should be devoted to training and retraining so that the workers and the employees can learn, unlearn and relearn. This makes the company to be a learning organization.

In order to resolve this waiting or “queue problem”, the organization should evaluate all processes that wait for parts and use the value stream mapping tool to link similar processes as a means of maintaining a smooth flow of production to improve the cash flow.

In addition, effective monitoring of defects i.e. monitoring of bales defects, solving metals and non-metals poor quality problems by grading them, cleaning them; reducing incidents and accidents; all these are a contributing factor in reducing financial losses and customer dissatisfaction. This is another cash flow remedy.

5.3.1.5 Provide the workers with complete PPE

The company is encouraged to provide protective equipment on a regular basis. The equipment must be of good quality to save the company money. Any cheaper choice presents problems in the future as the firm is obliged to buy more PPE.

5.3.1.6 Embrace an integrated approach to health and safety as well as quality. The SECQA model should be an advantage if implemented

A combination of the SECQA model and the “SASS 2011” could be an excellent instrument in enhancing health and safety in this and similar metal recycling companies.

5.3.1.7 Enforce Broad-Based Black Economic Empowerment (BBEE)

Cash flow problems can be solved by aligning the company with the legal framework. Organisations that comply with legal requirements in terms of implementing the BBEE can benefit from incentives and funding that the government put in place to help companies with major financial problems (Janholt, 2009:3-5). The efficient management of cash and loans is paramount in ensuring that the company secures further funding from creditors and financial institutions. Matching the company with the quality assurance standards and subscribing to these measures is another protective measure to resolve the problem of cash flow.

5.3.1.8 A policy of pension funds and retirement incentives should be managed properly to ensure smooth retirement of those who are about to retire

An example of pension funds being deviated by shareholders or some of them was a matter of concern. This demonstrated the need to put in place an effective pension funds system. The money contributed by workers for pensions should be used for the sole purpose. Provident funds or pension funds should not be used to remedy some financial problems such as wage payments.

5.3.1.9 Evaluate all the processes that wait for parts or departments that need materials beforehand, innovate and provide for the materials on time

Vaccaro *et al*. (2012:44-46) state:

"While innovation in broadest sense has received a great deal of attention from researchers, insights into management innovation have only recently begun to emerge. This study contributes to new insights regarding the relative influence of transformational and transactional leadership behaviours on management innovation" (Birkinshaw, Hamel and Mol, 2008:825-845; Birkinshaw and Mol, 2006:81).

It is imperative to make regular evaluation of the overall metal recycling activities in order to identify areas that need some innovation. Technology should be used to enhance innovation (Chadha and Kalra, 2010:33).

5.3.2 Recommendations for future research

This research explored the area of operations in the Value Chain Framework. The findings are limited to the specific field of study in the province. Therefore, for the broader secondary metal recycling industries in the region, it is suggested that similar research be carried out to see if there would be any trend in the different departments, companies and regions as far as quality initiatives are concerned.

5.4 Conclusion

This case study managed to evaluate the impact of quality initiatives on the operations and identified the drawbacks

that hinder smooth operations. Also, it portrayed the benefits of following an integrated approach to quality, health and safety.

Further research should be encouraged for the financial department of this and similar metal recycling companies to enhance the utilisation of cash resources. It is a matter of concern that managers were of the opinion that cash flow needed to be improved.

A research inquiry of this magnitude is useful because it contributes to the bulk of knowledge in the secondary metal and mineral industry.

LIST OF REFERENCES

Abor, P.A. and Bouwer, A. 2008. Medical waste management practices in a Southern African hospital [Online]. *International journal of health care quality assurance*, 21(4): 356-364. Available at: http://www.emeraldinsight.com [Accessed 23 August 2008].

Adair, J. 2002. *Effective strategic leadership: an essential path to success guided by the world's great leaders.* London: Macmillan.

Agarwal, A. and Strachan, P. 2008. Strategy: spread the world. *CIWM journal*, 42-43.

Antony, J. and Preece, D. (ed.). 2002. *Understanding, managing and implementing quality.* London: Routledge.

Bankers see no need to act in sync. 2011. *The Mercury*, 13 September: 19.

Barnes, R. 2008. *Operations management: an international perspective*. London: Thomson Learning.

Barton, D. 2011. Capitalism for the long term. *Harvard business review*, 89 (3): 84-91.

Basu, R. and Wright, J.N. 2003. *Quality beyond six sigma*. Burlington: Butterworth-Heinemann.

Basu, R. and Wright, J.N. 2008. Project management and six sigma: obtaining a fit. *International journal of six sigma and competitive advantage*, 4(1): 81-94.

Beck, M. 2010. Scrap export tariff demands in South Africa [Online]. *Recycling International.* Available at: http://www.recyclinginternational.com/recycling-news/111/research-and-legislation/south-africa/scrap-export-tariff-demands-south-africa [Accessed on 8 July 2012].

Bennett, J. 2003. *Evaluation methods in research*. New York: Continuum.

Bicheno, J. 1994. *Cause and effect JIT: the essential of lean manufacturing*. Johannesburg: Picsie books.

Bicheno, J. 2009. Management conjoint-analysis diffusion operations research and management science brandaid mix model. *Informs*, 39(6): 558-560.

Birkinshaw, J. and Mol, M.J. 2006. How management innovation happens. *MIT Sloan management review*, 47(4): 81-88.

Birkinshaw, J., Hamel, G. and Mol, M. J. 2008. Management innovation. *Academy of management review*, 33(4): 825-845.

Blaxter, L., Hughes, C. and Tight, M. 2006. *How to research*. 3rd ed. New York: McGraw-Hill.

Blumberg, R., Cooper, D.R. and Schindler, P. S. 2008. *Business research method*s. 2nd ed. New York: McGraw-Hill.

Boran, J., Houdkova, L., Ucekaj, V. and Stehlik, P. 2008. *Utilisation of energy from treatment of sludge* [Online], 19(4): 433-443. Available at: http://www.emeraldinsight.com [Accessed 23 August 2008].

Bowditch, W.A., Bowditch, K.E and Bowditch, M.A. 2005. *Welding technology fundamentals*. Illinois: The Good heart-Willcox company, Inc.

Brian, W. 2000. *Dissertation skills: for business and management students*. London: Continuum.

Brookes, P. 2009. World scrap market in 2009: volatility remains threat in challenging markets. *Metal Bulletin*, Summer (9079):12.

Budget speech in the parliament by Gordan, P. (special broadcast). 2012. SABC 2, 1400hrs.

Budman, M. 2009. Looking ahead to our place in the next economy. *International Business*, 24-28.

Bund, B.E. 2006. *The outside-in corporation: How to build a customer-centric organization for breakthrough results*. New York: McGraw-Hill.

Burger, S. 2011. Sustained infrastructure work needed to support aggregate, sand miners. *Mining Weekly*, 17(17): 26-28.

Chadha, R. and Kalra, J. 2010. Window of opportunity: lean six sigma clears up difficult project for auto supplier. *Quality progress*, 43(3): 32-39.

Chapman, A. 2004. *Quality Management: quality management history, gurus, TQM theories, process improvement, and organizational excellence* [online] Available at http://www.businessballs.com [Accessed 07 August 2009].

CIWM. 2008. Recycling on the go. *CIWM journal*, 6-7.

Concern about safety and productivity? 2011. *Mining Weekly*, 17(17): 29.

Courtis, J., Ratcliffe, B.E. and Allsop, D. 2005. *The bluffer's guide to management*. New ed. London: Oval Books.

Creamer, M. 2010. Demand Driver: Highveld experts current steel oversupply to be mopped up. *Engineering News*, 30 (35): 18.

Creamer, T. 2010. Shifting emphasis. *Engineering News, 30(29): 5.*

Crowe, D. and Brennan, L. 2007. Environmental consideration within manufacturing strategy: an international study [Online]. *Business strategy and the environment,* 16(4): 266-289. Available at: http://search.epnet.com [Accessed 7 May 2007].

Dahlmann, F., Brammer, S. and Millington, A. 2008. Environmental management in the United Kingdom: new survey evidence [Online]. *Management decision*, 46(2): 264-283. Available at: http:www.emeraldinsight.com [Accessed 23 August 2008].

Davie, I.M. 2007. Interviewed by B.E. Isheloke. Eurotrade Metals Africa head office, Durban, 13 April 9:30.

Davie, I.M. 2010. Conference call meeting with metal operations decision-makers and senior managers. Phoenix Industrial Park.

De Beer, M. 2009. Notes from discussion on line about Porter's value chain framework. Durban University of Technology.

De Bryn, C. 2010. Global steel output up 28% in first half. *Engineering News*, 30(29): 31.

De Lange, D. and Sikhakhane, J. 2012. Local government sidelined: service delivery ignored. *Daily News*, 10 February: 2.

Department of Agriculture, Environmental Affairs and Rural Development. 2009. *Industrial Cohesion Planning for the Scrap Metal Recycling Industry and Environment in KZN*. Durban: DAEA&RD.

Department of Agriculture, Environmental Affairs and Rural Development. 2010. *Industrial Cohesion Planning for the Scrap Metal Recycling Industry and Environment in KZN*. Durban: DAEA&RD.

De Villiers, G., Nieman, G., and Niemann, W. 2008. *Strategic logistics management: a supply chain management approach*. Pretoria: Van Schaik Publishers.

De Vos, A. 2002. *Research at grass roots for the social sciences and human service professions*. Pretoria: Van Schaik.

Dissanayaka, S.M., Kumaraswamy, M.M., Karim, K. and Marosszeky, M. 2001. Evaluating outcomes from ISO 9000-certified quality systems of Hong Kong constructors. *Total Quality Mangement*, 12(1): 29-40.

Douglas, A.; Coleman, S. and Oddy, R. 2003. The Case for ISO 9000. *The TQM Magazine*, 15(5): 316-324.

Downturn brings opportunity. 2008. The year the rules changed. *Metal Bulletin*, End-of-year issue: 29.

Du Plessis, S. 2006. Syllabus of quantitative techniques: statistics section, Business Studies Unit of DUT, January 2006.

Eisenhardt, K. 1989. Building theories from case study research: *Academy of management review*, 14(4): 532-550.

El-haik, B. and Roy, D.M. 2005. *Service design for six sigma: a road map for excellence*. New Jersey: John Wiley & Sons.

Enright, J. 2008. Strategy: putting design centre stage! *CIWM journal*, 56-57.

Erikson, P. and Kovalainen, A. 2008. *Qualitative methods in business research*. Los Angeles: Sage Publications.

Eurotrade Metals Africa. 2007. Trading status report. Phoenix Industrial Park: EMA.

Eurotrade Metals Africa.[Online]. 2009. Available at http://www.eurotrademetals.com [Accessed 9 October 2009].

Evans, J.R. and Dean, J.W. 2003. *Total quality, management, organisation, and strategy*. Ohio: Thomson/South-Western.

Eyring, M.J., Johnson, M.W. and Nair, H. 2011. New business models in emerging markets. *Harvard Business Review*, 89(1/2): 88-95.

Faurie, J. 2011. Health and safety: unhealthy outlook. Lawyers see further litigation regarding occupational diseases unless dust levels in mines decline. *Mining Weekly*, 17(17): 12.

Faurie, J. 2011. Engineers hoping to improve mine safety through biannual seminars. *Mining Weekly*, 17(17): 20.

Flanagan, M. J. 2009. Meeting with BKA delegates held on 11 June 2009 at 11:00 am. Lee Scrap Metals Head office, Durban-Phoenix, South Africa.

Fleet, G. 2008. Waste assessment: making a difference. *CIWM journal*, 38-39.

Gibbert, M., Ruigrok, W. and Wicki, B. 2008. What passes as a vigorous case study? *Strategic Management Journal*, 29: 1465-1474.

Gillingham, A. 2010. Taking advantage of global opportunities. *Engineering News*, November 19-20: 38.

Goel, P., Gupta, P., Jain, R. and Tyagi, R.K. 2004. *Six sigma for transactions and service*: *six sigma operational methods*. North Ryde NSW: McGraw-Hill.

Goel, P., Gupta, P., Jain, R. and Tyagi, R.K. 2005. *Six sigma for transactions and service*. New York North: McGraw-Hill.

Goetsch, D.L. 2002. *Construction safety and health*. New Jersey: Prentice-Hall.

Goetsch, D.L. and Davis, S. 2002. *Quality management: introduction to Total Quality Management for production, processing, and services*. 4th ed. New Jersey: Prentice-Hall PTR.

Goffe, R. and Jones, G. 2007. How to manage the most talented. *Harvard business review*, 74-75.

Griffin, B.W. 2005. *Cronbach's Alpha (measure of internal consistency)* [Online]. Available at http:// www. Bwgriffin.com/gsu/courses/ec [Accessed 2 October 2012]

Grobler, P., Warnich, S., Carrell, M.R., Elbert, N.F. and Hatfield, R.D. 2006. *Human resource management in South Africa*. 3rd ed. London: South-Western.

Gupta, P. 2004. *The Six sigma performance handbook: six sigma operational methods series*. New York: McGraw-Hill.

Harrington, H.J. 2006. Organisational excellence. *The SAIMAS: Journal of the Southern Africa Institute of Management Services*, XIII (1): 12-13.

Healing, J. 2010. Kudos for quality and safety. *Mining Weekly*, 16(15): 46.

Henke, J. 2009. *Quality improvements:. introduction to SAS* [Online]. Available at http://www.scaw.co.za [Accessed 9 October 2009].

Henke, J. 2009. *Quality improvements* [Online]. Available at http://www.scaw.co.za Accessed 8 July.

How scrap recycling protects the environment while providing "green jobs" for Americans [Online]. 2009. Available at http://www.isri.org [Accessed 9 October 2009].

I pap for invironmental goods and services sector. 2009. Durban: Buyisa e Bag.

ISRI Safety Report (*Safety DVD)*. 2007. Washington: Isri, Inc.

Janholt, T. 2009. Insights from industry expert. *Lauritze News # 10*, April: 1.

Jankowicz, A. D. 2005. *Business research projects*. 4th ed. London: Thompson.

Jeffries, E. 2008. Recycling: closing the loop. *CIWM journal*, 20-21.

Johnson, G., Schole, K. and Whittington, R. 2006. *Exploring corporate strategy: text and cases*. 7th ed. London: FT Prentice.

Katanga Business (film). 2009. Produced by Christine Pireaux. RTBF: Les films de la passerelles- les films d'ici_ RTBF.

Keegan, S. 2009. *Quality research: good decision making through understanding people, culture and market*. United Kingdom: Kogan page.

Kelemen, M. 2003. *Practical approaches to quality*. London: Sage Publications Ltd.

Kerr, A.W., Hall, H.K. and Kozuh, S.A. 2004. *Doing statistics with SPSS*. California: Sage Publishers.

Kesner, I.F. 2012. The crisis that keeps going…and going…and going. *Business horizons*, 55(2): 119-121.

Kirca, A.H., Hult, G.T.M., Roth, K., Cavusgil, S.T., Perryy, M.Z., Akdeniz, M.B., Deligonul, S.Z., Mena, J.A., Pollitte, W.A., Hoppener, J.J., Miller, J.C. and White, R.C. 2011. Firm-specific assets, multinationality and financial performance: a meta-analytical review and theoretical integration. *Academy of management journal*, 54(1): 47-72.

Lakhal, L. and Pasin, F. 2008. The direct and indirect impact of product quality on financial performance: a causal model. *Total quality management & business excellence*, 19(10): 1087-1099.

Lavie, D. 2006. Capability reconfiguring: an analysis of incumbent responses to technological change. *Academy of management review*, 31(1): 153-174.

Lawton, T., Finkelstein, S. and Harvey, C. 2007. Taking by storm: a breakout strategy. *Journal of business strategy*, 28(2): 27-29.
Leedy, P.D. and Ormrod, J.E. 2005. *Practical research*. 8th ed. New Jersey: Pearson/ Prentice Hall.

Lind, D.A., Marshal, W.G. and Mason, R.D. 2004. *Statistical techniques in business and economics.* New York: McGraw-Hill.

Lindborg, H. 2003. *The Shift to customers focus: understanding research*. 2nd ed. California: Sage Publications.

Longernecker, C.O., Neubert, M.J. and Fink, L.S. 2007. Causes and consequences of managerial failure in rapidly changing organizations. *Business Horizons*, 50(2): 145-155.

Mabuyakhulu, M. ed. 2009. *Breakthrough on road to economic recovery: bringing growth in KZN*. Durban: Famous Publishers.

Mangan, J., Lalwani, C. and Butcher, T. 2008. *Global logistics and supply chain management*. New Jersey: John Wiley & Sons, Ltd.

Manuel, T. (broadcast). 2008. Interviewed by SABC Lianne. SABC 2, 19 November, 722hrs.

Maree, K. 2007. *First steps in Research*. Pretoria: Van Schaik.

Mboweni, T (broadcast). 2010. SABC 2, 26 April, 1004hrs.

Mbuli, V (broadcast). 2010. SABC 2, n.d, 700hrs.

McMurrer, D. and Bassi, L. 2007. Maximising your return on people. *Havard Business Review*. 85 (3): 115-123.

Meredith, J.R. and Shafer, S.M. 2002. *Operations Management for MBA's*. 2nd ed. New York: John Wiley & Sons.

Mining for a sustainable future. 2010. Kumba Iron Ore. *Mining weekly*, 16 (35).

Mitra, A. 2008. *Fundamentals of quality control and improvement*. 3rd ed. New Jersey: John Wiley & Sons, inc.

Mohamed, S. 2010. Are we in the second round of the economic crisis? *Engineering News*, 30(18): 105.

Moodaliyar, R. 2010. The Effectiveness of the ISO 9001:2000 quality management standard on performance and customer satisfaction at a selected organisation. M.Tech, Durban University of Technology.

Mouton, J. 2008. How to succeed in your Master's & Doctoral Studies: A South African guide and resource book. Pretoria: Van Schaik Publishers.

Moyo (broadcast). 2010. SABC 3, n.d, 19hrs.

Naidu, P. 2007. Employee Perception of quality at a selected company. M.Tech, Durban University of Technology.

Nancarrow, C. and Tinson, J. 2006. Academic-practitioner symbiosis, BPS Qualitative Methods in Psychology. *Newsletter*, 1.

Nancarrow, C. and Tinson, J. 2001. Academic-practitioner symbiosis, BPS Qualitative Methods in Psychology. *Newsletter*, 1.

Nancarrow, C., Spackman, N. and Barker, A. 2001. Informed eclecticism: a research paradigm for the twenty first century. *International Journal of Market Research*, 43(1): 3-28.

Nancarrow, C., Spackman, N. and Barker, A. 2006. Informed eclecticism: a research paradigm for the twenty first century. *International journal of market research*, 43(1): 3-28.

Nankana, A.N. 2005. *The Seven Magnificent: simple, quick and cost effective tools for improvement*. New Delhi: New Age International.

Newbury, J. 2012. At home with John Newbury. *Management today*: t*he journal of Executive Learning, Information and Management*, 30(3): 9-11.

Ntlabezo, E.T. and Booyens, S.W. 2007. South African nurse managers' perceptions regarding cost containment in public hospitals. *Curationis*, 32(2): 35-39.

Nunes, P. and Breene, T. 2011. Reinvent your business before it's too late: watch out for those S curves. *Havard Business Review*, 89(1/2): 80-87.

OmniLingua. 2004. PDSA cycle. Available at: http://www.omniLingua.com/en/quality.html [Accessed 9 October 2010].

Parumasur, S.B. 2008. A talk with B.E. Isheloke. Durban University of Technology.

Pearson, C. 2012. The crisis that keeps going…and going…and going. *Business Horizons*, 55(2): 123-124.

Pilarsky, J. 2009. Stainless scrap: a vital resource. November 2009 ferro-alloy & steel scrap supplement. MBM page 25.

Porter, M. E. 1985. *Competitive advantage: creating and sustaining superior performance*. New York: Free Press.

Putman, V.L. and Paulus, P.B. 2009. Brainstorming, brainstorming rules and decision making. *The Journal of creative behavior*, 43(1): 29-40.

Ramlagan, R. 2009. An investigation into quality practices at private higher and further education institutions in the Durban Central Business District. M.Tech, Durban University of Technology.

Reuters. 2011. Bankers see no need to act in sync. *The Mercury*, 13 September: 19.

Rijnen, A. 2008. Quality and affordability can go hand in hand. *Business report*, 15 August, 9.

RIOS. 2006. *The key to continual QEH & S improvement*. Washington: ISRI.

Risk in fire regulation non-compliance. 2011. *KZN Industrial & Business News,* December-January: (66).

Robbins, S.P. and Coulter, M. 2007. *Management: foundation of planning*. 9th ed. New Jersey: Prentice Hall.

Rorke, T. 2011. Intensive investment in training needed. *Mining weekly*, 17(17): 36.

SABC 2 (broadcast) interview with Victor Kugomoestwane of Africa Business Centre by Peter Ndoro (broadcast). 2012. SABC 2, 15 February, 718hrs.

SABC 2 (broadcast) interview with Trevor Manuel by Lianne Mannas. 2008. SABC 2, 19 November, 722hrs.

SABC 2 (broadcast) interview with Thabo Mbeki on the change of leadership in European countries (broadcast). 2012. SABC 2, 8 May, +- 730hrs.

SABC 2 (broadcast) Morning Lives NUMW National Union of mine workers announced that safety is no. 1 concern, interviewed by Leanne Manas. 2012. SABC 2, 6 June 653hrs.

Safety benchmark at Port of Durban. 2010. *KZN Industrial & Business News*, December- January (66).

Sanders, Lewis and Thornhill. 2003. *Research methods for business students*. 3rd ed. Pearson Education Limited. Available at: http:www.booksites.net/download/saunders/studentfiles/cassestudy.pdf [Accessed 13 August 2009].

Schuler, R.S. and Susan, E.J. 2008. *Strategic human resources management*. Australia: Blackwell Publishing.

Scrap specifications Circular. 2008. Washington, DC: ISRI

Seddon, J. 2004. The great debate. *Quality world*, 30(11): 34-36.

Seggie, E. 2010. New safety programme rewards project management company. *Mining Weekly*, 16-18: 26.

Sekaran, U. 1992. *Research methods for business: a skills-building approach*. 2nd ed. New York: John Wiley.

Shapiro, J. F. 2007. *Modeling the supply chain*. 2nd ed. Belmont: Thomson brooks/cole.

Singh, S. 2006. An integrated approach to quality. D. Tech, Durban University of Technology.

Smit, P. 2011. Health and safety: Trade union welcomes DMR's quarterly safety report move. *Mining Weekly*, 17(17): 19.

Snake and spider safety awareness for employees [Online]. 2012. Available at www.sssafe.com.au/corporate-training. [Accessed on 2 June 2012].

Sparta, P. 2006. Driving organizational performance through increasing productivity. *SAIMAS*, XIII (1):6-7.

Stamatis, D.H. 2002. *Six sigma and beyond: foundation of excellence performance.* Florida: St. Lucie Press.

Stephens, L.J. 2OO4. *Advanced statistics demystified*. New York: McGraw-Hill Professional.

Steyn, A.G.W., Smit, C.F., Du Toit, S.H.C and Strasheim, C. 1994. *Modern Statistics in Practice*. Pretoria: Van Schaik Publishers.

Strachan, N. 2010. Minutes of the Metal Recyclers Steering Committee meeting – 28th January 2010. Department of Agriculture, Environment Affairs and Rural Development, Durban, South Africa.

Thornton, P.B. 2004. *Leadership: seeing, describing, and pursuing what's possible*. Indiana: Unlimited Publishing.

Tucker, A. 2008. Incorporating innovation. *Journal of Marketing*, October/November: 36.

TV programme (broadcast). 2013. SABC 2, 27 February, 1400hrs.

United Nations Conference on Trade and Development. 2005. New York: UN.

UCLA: Academic Technology Services, Statistical Consulting Group Cronbachs Alpha. 2007. [Online] Available at http://www.ats.ucla.edu/stat/sas/notes2/. [Accessed 24 November 2007].

Vaccaro, I.G., Jansen, J.J.P., Van Den Bosch, F.A.J. and Volberda, H.W. 2012. Management innovation and leadership: the moderating role of organizational size. *Journal of Management Studies*, 49(1): 44-46.

Van de ven, A.H. and Poole, M.S. 2005. Alternative approaches for studying organizational change. *Organisation studies*, 26(9): 1377-1404.

Van der Have, G. 2009. Winning the war on military waste. Page 18 September, *Recycling International*, September (7).

Van der Have, G. 2008. Scrap consumers knocking at Resteel door. *Recycling international, October (8):69.*

Van kemenade, E. 2010. Past is prologue: know the history of quality management to achieve future success. *Quality progress*, 43(1): 49-59.

Venter, I. 2010. Rampant Rand: Economist says yet more rand strength likely. *Engineering news*, November 19-25: 26.

Verburg, A. and Zom, K. 2010. Recycling of electric vehicle batteries: challenges looming large in the headlights. *Recycling international*, August 16: 24-27.

Vumase, S.B. 2009. An evaluation of operations and administrative procedures for health care waste management in public district Hospitals of South Africa. D.Tech, Durban University of Technology.

Wagger, D. 2009. RIOS training and membership. Email to Elisee. 11 June 2009 at 2255hrs.

Wait, M. 2010. Potent methafor: brand activations consultancy uses live snakes to drive the safety message home. *Mining Weekly*, 16(40): 12.

Wait, M. 2011. Safe & Efficient: Excavators improving safety, efficiency of slimes dams. *Mining Weekly*, 17(17): 21.

Warehouse safety improves. 2002. *Cold chain*, 26(1): 9.

Wells, M. and members of the Hylant group. 2012. The crisis that keeps going…and going…and going. *Business horizons*, 55(2): 125-127.

Welman, C., Kruger, F. and Mitchell, B. 2007. *Research methodology*. 3rd ed. Cape Town: Oxford Southern Africa.

What is biting us? 2012. Phoenix Industrial Park: Eurotrade Metals Africa.

Widmer, M. 2009. Facing up to the challenge: analyst Michael Widmer predicts what 2009 will bring for base metals. *Metal bulletin*, Summer (9079): 10-11.

Willemse, I. 2009. *Statistical methods and calculations skills*. Cape Town: Juta and Co. Ltd.

Willemse, W. 2010. Scrap export tariff demands in South Africa. *Recycling international* [Online] Available at: http://www.recyclinginternational.com/recycling-news/111/research-and-legislation/south-africa/scrap-export-tariff-demands-south-africa [Accessed on 8 July 2012].

Witepski, L. 2008. Keep moving through innovation. *Journal of marketing*, October/November: 36-37.

Yin, R.K. 2009. *Case study research: design and methods.* 4th ed. Newbury Park: Sage Publications.

Yusuf, Y., Gunasekaran, A. and Dan, G. 2007. Implementation of TQM in China and organisation performance. an empirical investigation. *Total quality management and business excellence*, 18(5): 509-530.

Zondo, R.D. 2005. Management attitudes towards gain sharing as a strategic tool for productivity improvement at a selected South African company. M.Tech, Durban University of Technology.

Zuma, J. G (broadcast). 2010. State of Nation's address. SABC 2, 11 February, 730hrs-747hrs.

Zylstra, K.D. 2006. *Lean distribution: applying lean manufacturing to distribution, logistics and supply chain.* New Jersey: John Wiley & Sons.

APPENDIX A: Covering Letter

15th August 2009

Dear Respondents

Please have a look at the entire questionnaire and read it before attempting to respond to questions. Use a cross to indicate your answer. The research questionnaire should take 15 to 30 minutes to answer (roughly).

Please ensure that you put the questionnaire in the envelop provided and mail it to:
P.O.BOX 61223
Bishops gate
4008
Or you may hand it to the researcher should that be easier. It is hereby emphasized that the information provided shall be used for research purposes only and that your confidentiality is guaranteed.

Thanking you in advance.

B.E Isheloke
M.TECH Student
Durban University of Technology

APPENDIX B: Letter of informed consent

16 April 2009

To whom it may concern

PERMISSION TO CONDUCT RESEARCH AT EUROTRADE METALS AFRICA

Please be advised that permission is hereby granted to Mr. Byelongo Elisee Isheloke to conduct research for his Master's Degree in Business Administration at the Durban University of Technology. We now know that his research is going to be on:

INFLUENCE OF QUALITY INITIATIVES ON THE OPERATIONS OF A SELECTED METAL RECYCLING COMPANY IN KZN -A CASE STUDY

Furthermore, this letter will allow him to conduct research during the full course of his research studies at the abovementioned institution until completion of study.

Kind regards

S. WEBB
EUROTRADE METALS AFRICA: MANAGER – KENT ROAD
031 308-9400
083 294 5040

APPENDIX C: Questionnaire to management

INSTRUCTION: Please mark with an X in one block only. ***Biographical information***

1. **Please indicate your gender**

Male	Female

2. **In which age group do you fall in?**

Less than 25	25-35	36-46	47-57	Over 57

3. **Mark the appropriate box with a cross.** ***If used properly, these tools contribute to productivity enhancement.***

4	**The company uses the following quality improvement or** analytical **tool/s (Put a cross once)**	Yes	No
4.1	Benchmarking		
4.2	Cause and effect diagrams		
4.3	Pareto analysis		
4.4	Brainstorming		
4.5	(SECQA model) Safety, Environment, Corporate Governance, Quality, Aids management systems		
4.6	Statistical Process Control (SPC)		
4.7	(DRIVE) Define, Review, Identify, Verify, Execute		
4.8	(PDCA cycle) Plan, Do, Check, Act		
4.9	(SWOT analysis) Strengths, Weaknesses, Opportunities, Threats		
4.10	(COQ) Cost of Quality		
4.11	Scenario analysis		
4.12	Value chain framework		
4.13	(ISRI specifications) Institute of Scrap Recycling Industry		
4.14	(RIOS) Recycling Institution of Operational Standards		
4.15	Other (Specify)		

4. **What would you like to see improved in the company?**

(Determination of drawbacks.)

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

APPENDIX D: Questionnaire to operations workers

INSTRUCTION: Please mark with an X in one block only. *Biographical information*.

1. **Please indicate your gender**

Male	Female

2. **In which age group do you fall in?**

Less than 17	17-30	31-40	41-50	Over 50

3. **. Mark your answer with a cross (X)** *Training & education orientated*

		1	2	3	4	5
Sequence	**Question**	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly**
3.1	I understand what quality initiatives mean					
3.2	The company is ensuring that bales meet the specifications					
3.3	The company ensures that bales are made of the intended materials					
3.4	The company ensures that its products are free from dust, rubber, plastics and other dirt.					

		1	2	3	4	5
Sequence	**Question**	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly**
3.5	Quality enhancement contributes to products sales					
3.6	We have contained the effects of the global economic recession					
3.7	Safety is more important than profit in this company					
3.8	I have read the quality and/or safety policy of this company					
3.9	The company prioritizes training for safety and/or quality issues					

4. **What would you like to see improved in the company?**
   (***Determination of drawbacks)***

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

APPENDIX E: Correlations

Correlations were performed for the tools used. The results are presented below.

It is unclear why males and females would score differently to the values in the questionnaire. It could be because they have not the same bulk of experience. In this company males are the majority to occupy the senior positions and appear to have far more experience and some relevant training than ladies.

Correlations tables A to Z and A' to G' follow on page 170 to 177.

Table A: Managers' responses

The highlighted values are significant.

	Benchmarking	Cause and effect diagrams	Pareto analysis	Brainstorming	SECQA	SPC	DRIVE	PDCA	SWOT analysis	COQ	Scenario analysis	Value chain framework	ISRI	RIOS
Benchmarking	1													
Cause and effect diagrams	0.067	1												
Pareto analysis	0.730	0.167	1											
Brainstorming	.756*	0.478	0.471	1										
SECQA	0.730	0.447	0.447	1.000**	1									
SPC	0.707	0.548	1.000*	0.730	0.730	1								
DRIVE	0.417	0.548	0.707	0.73	0.730	1.000**	1							
PDCA	0.149	0.447	0.471	0.333	0.300	0.707	0.730	1						
SWOT	0.149	0.447	0.730	0.333	0.300	0.707	0.730	0.333	1					
COQ	0.067	0.467	0.167	-0.149	-0.300	0	-0.091	0.447	-0.149	1				
Scenario analysis	0.488	0.293	.	0.655	0.645	0.447	0.471	0.655	-0.218	0.293	1			
Value chain framework	0.447	.745*	0.548	0.333	0.258	0.447	0.354	0.333	0.333	.745*	0.218	1		
ISRI	0.500	0.316	0.471	.667*	0.661	0.471	0.488	-0.218	0.655	-0.488	-0.143	0.218	1	
RIOS	0.548	0.730	0.707	0.400	0.400	0.612	0.548	0.400	0.400	0.73	0.258	1.000*	0.293	1

Table B
Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	47	95.9	97.8	97.9
	Female	1	2.0	2.2	100.0
	Total	48	98.0	100.0	
Missing	System	1	2.0		
Total		49	100.0		

Table C
Age
(years)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	17 - 30	20	40.8	43.5	43.5
	31 - 40	16	32.7	34.8	78.3
	41 - 50	6	12.2	13.0	91.3
	> 50	4	8.2	8.7	100.0
	Total	46	93.9	100.0	
Missing	System	3	6.1		
Total		49	100.0		

Table D
I understand what quality initiatives mean

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	12.2	12.2	12.2
	Disagree	10	20.4	20.4	32.7
	Neither agree nor disagree	7	14.3	14.3	46.9
	Agree	23	46.9	46.9	93.9
	Strongly Agree	3	6.1	6.1	100.0
	Total	49	100.0	100.0	

Table E
The company prioritizes training for safety and/or quality issues

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	9	18.4	18.8	18.8
	Disagree	17	34.7	35.4	54.2
	Neither agree nor disagree	6	12.2	12.5	66.7
	Agree	8	16.3	16.7	83.3
	Strongly Agree	8	16.3	16.7	100.0
	Total	48	98.0	100.0	
Missing	System	1	2.0		
Total		49	100.0		

Table F

I have read the quality and/or safety policy of this company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	2.0	2.1	2.1
	Disagree	12	24.5	25.5	27.7
	Neither agree nor disagree	9	18.4	19.1	46.8
	Agree	17	34.7	36.2	83.0
	Strongly Agree	8	16.3	17.0	100.0
	Total	47	95.9	100.0	
Missing	System	2	4.1		
Total		49	100.0		

Table G
The company is ensuring bales meet the specifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	6.1	6.1	6.1
	Disagree	9	18.4	18.4	24.5
	Neither agree nor disagree	8	16.3	16.3	40.8
	Agree	23	46.9	46.9	87.8
	Strongly Agree	6	12.2	12.2	100.0
	Total	49	100.0	100.0	

Table H
The company is ensuring that bales are made of the intended materials

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	12.2	12.2	12.2
	Disagree	6	12.2	12.2	24.5
	Neither agree nor disagree	3	6.1	6.1	30.6
	Agree	25	51.0	51.0	81.6
	Strongly Agree	9	18.4	18.4	100.0
	Total	49	100.0	100.0	

Table I
The company is ensuring that our products are free from dust, rubber, plastics and other dirt as it should

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	10.2	10.4	10.4
	Disagree	10	20.4	20.8	31.3
	Neither agree nor disagree	3	6.1	6.3	37.5
	Agree	25	51.0	52.1	89.6
	Strongly Agree	5	10.2	10.4	100.0
	Total	48	98.0	100.0	
Missing	System	1	2.0		
Total		49	100.0		

Table J

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	12	24.5	25.0	25.0
	Disagree	18	36.7	37.5	62.5
	Neither agree nor disagree	7	14.3	14.6	77.1
	Agree	5	10.2	10.4	87.5
	Strongly Agree	6	12.2	12.5	100.0
	Total	48	98.0	100.0	
Missing	System	1	2.0		
Total		49	100.0		

Table K
Quality enhancement contributes to our products' sales

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	4.1	4.1	4.1
	Disagree	3	6.1	6.1	10.2
	Neither agree nor disagree	7	14.3	14.3	24.5
	Agree	23	46.9	46.9	71.4
	Strongly Agree	14	28.6	28.6	100.0
	Total	49	100.0	100.0	

Table L
We have contained the effects of the global economic recession

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	6.1	6.1	6.1
	Disagree	3	6.1	6.1	12.2
	Neither agree nor disagree	4	8.2	8.2	20.4
	Agree	17	34.7	34.7	55.1
	Strongly Agree	22	44.9	44.9	100.0
	Total	49	100.0	100.0	

Table M
Uniforms

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	44	89.8	89.8	89.8
	Yes	5	10.2	10.2	100.0
	Total	49	100.0	100.0	

Table N
Salary increase

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	23	46.9	46.9	46.9
	Yes	26	53.1	53.1	100.0
	Total	49	100.0	100.0	

Table O
Increase safety - safety equipment - Personal Protective Equipment provided

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	36	73.5	73.5	73.5
	Yes	13	26.5	26.5	100.0
	Total	49	100.0	100.0	

Table P
More business deals to uplift the company and meet required standards

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	43	87.8	87.8	87.8
	Yes	6	12.2	12.2	100.0
	Total	49	100.0	100.0	

Table Q
Company must maintain cleanliness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	46	93.9	93.9	93.9
	Yes	3	6.1	6.1	100.0
	Total	49	100.0	100.0	

Table R
.16 More material to be processed quickly so that the containers are full timeously

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	46	93.9	93.9	93.9
	Yes	3	6.1	6.1	100.0
	Total	49	100.0	100.0	

Table S
Sufficient financial resources to ensure customer needs are met

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	98.0	98.0	98.0
	Yes	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

Table T
Weighbridge control should be improved especially for the correct grading of materials

Valid .00	48	98.0	98.0	98.0
Yes	1	2.0	2.0	100.0
Total	49	100.0	100.0	

Table U
Effective communication and interpersonal relationship

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	45	91.8	91.8	91.8
	Yes	4	8.2	8.2	100.0
	Total	49	100.0	100.0	

Table V
Sufficient tool, bolts and work equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	47	95.9	95.9	95.9
	Yes	2	4.1	4.1	100.0
	Total	49	100.0	100.0	

Table W
Grade the employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	98.0	98.0	98.0
	Yes	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

Table X
No discrimination or oppression - maintain integrity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	42	85.7	85.7	85.7
	Yes	7	14.3	14.3	100.0
	Total	49	100.0	100.0	

Table Y
Proper working conditions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	41	83.7	83.7	83.7
	Yes	8	16.3	16.3	100.0
	Total	49	100.0	100.0	

Table Z
Consider employee needs and wants timeously

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	44	89.8	89.8	89.8
	Yes	5	10.2	10.2	100.0
	Total	49	100.0	100.0	

Table A'
Proper training of workers so that they can operate safely and perfectly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	46	93.9	93.9	93.9
	Yes	3	6.1	6.1	100.0
	Total	49	100.0	100.0	

Table B'
Diligent worker should receive awards

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	98.0	98.0	98.0
	Yes	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

Table C'
Bonus and incentives should be given to employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	98.0	98.0	98.0
	Yes	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

Table D'
28 The company should expand and have more branches in other areas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	98.0	98.0	98.0
	Yes	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

Table E'
Continuity of work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	98.0	98.0	98.0
	Yes	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

Table F'
Avoid getting into financial debt e.g. loans, running of the business should bring in the income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	47	95.9	95.9	95.9
	Yes	2	4.1	4.1	100.0
	Total	49	100.0	100.0	

Table G'
Be patient to those who are lazy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	48	98.0	98.0	98.0
	Yes	1	2.0	2.0	100.0
	Total	49	100.0	100.0	

Appendix F: Assets used (Table 2.2)

Assets used in a metal recycling company

	NEEDS	USAGE
1	Land and buildings	
	Spacious yard, office venue & depot/warehousing, lavatories and ablution facilities, changing rooms, concrete slab, etc	-Keeping metal products, -Managing the operations & HR, -Inventory management & metal management.
2	Machinery/motor-vehicles	
	-Bobcat, -Hyster, -Excavator: feeding sub grade, castle, in baling machine, up/offloading metal products from vehicle. -Baling machine -Shear -Cropper: a small ferrous metal cutting machine with a big sharp blade -Trucks/sidelifters, skeletons or skelly type of trucks, tippers/vans/Bakkies -Cutting torches -Fuel and lubricants -Scales or weighbridge	-Loading sub grade/HMS steel in containers. -Pushing metal products, cleaning or for grading/sorting, etc., carrying bins full of metal products, unjamming bails by pushing them out of baler's door with folks, pouring out metal products from bins, up/off loading containers from trucks. -Bail sub grade, condense rims, cut castle aluminum, compress tins & other metal products (bail copper), bail wires, etc. -Shear HMS steel, cylinder, -Cut steel into pieces easy to load, etc. -Cut steel, fences -Shipping metal products -Cut castle aluminium, HMS steel, welding, etc. -Multi-purpose welding/cutting/burning/cleaning

Assets used in a metal recycling company continued

	NEEDS	USAGE
3	Equipment/tools All mechanical tools	
	Hygienic tools -Utensils -Brooms -Brushes, etc -Buckets -Pile of metal wire: used, to clean up pieces of metal or dirt.	Maintenance & repairs of bailing machine plants, Repair & maintain machinery, House-keeping.
4	Office equipment/stationery	
	-Computers/printers, etc. -Photocopies/faxing machine -Landline telephones/cell phones etc.	-Pastel accounting, computerized data -Office management, smooth operation -Office duties/administration, metal management

Assets used in a metal recycling company continued

	NEEDS	USAGE
5	Human resources (most valuable assets)	
	-Office workers -Management i.e. health, safety officers, quality controllers or auditors -Manual labour or general workers -Skills workers -Consultants -Machine operators	-Wages/salaries -Payment of cheque -Upgrading the system/process to match the best practice in the industry -Investment -Counter economic recession -Maintain/repair infrastructure -Training for safety & quality -Cutting edge technology -Research & development -Legal cost -COQ (cost of quality) -Skills department programmes -Health, safety & quality of people & environment, sorting, loading, cutting, welding, operation, and mechanical aid -Expert knowledge training, RASA, ISRI safety act -Operations: shearing, bailing, welding, recycling, processing, selling locally & internationally -Shipping overseas [Spaces between entries inconsistent. Rather have no space]

Assets used in a metal recycling company continued

	NEEDS	USAGE
6	Information, systems & processes	
	-ISO -6 Sigma -TQM -ISRI/RIOS/BIR etc. -Quality improvement tools -Safety act, OHSAS 18001, New second hand goods act	-Effective communication -Effective decision-making -Accreditation -Processing know-how
7	Raw material & other resources	
	-Scrap non-ferrous metals (Appendix G) -Scrap ferrous metals -PVC & other plastics -Other minerals -Water/electricity -Gas/gas bottle carriers	-Bailing, sorting, loading, recycling -Bailing, sorting, loading, recycling -Trading -Trading, recycling -Energy -Cutting and welding
8	Finance	
	-Cash -Cash equivalent	-Liquidity -Investments -Wages and salaries -Purchases

Assets used in a metal recycling company continued

	NEEDS	USAGE
9	Law	
	-BBEE or broad-based black economic empowerment -Rules& regulations -SA laws i.e. Health and safety acts -Safety act, OHSAS 18001, -New second hand goods act	-Compliance with SA law -Compliance with environmental laws -Environmentally friendly practices
10	Personal Protective Equipments (P.P.E)	
	-Helmets/head hats -Overalls -Gloves -Safety glasses -Earmuffs/earplugs -Safety equipment for cutters and welders -Safety boots -Nose masks	-Physical safety ("emotional safety")

Source: Observed and devised by the researcher.

Appendix G: A synthesis of secondary metal, non-metal and mineral products common in KZN

codes	Commodity	Number of items
	Copper	17 categories
101/102-101/123	Other: Tinned Copper Wire; Chrome Copper	2 categories
099/062-100/101	Copper/Milberry	3 categories
100/090-101/106	Berry	8 categories
100/107-101/119	Birch Cliff	4 categories
102/151-107/252	**Gun Metal**	15 categories
102/150-107/220	**Brass**	15 categories
115/505-115/506	**Circuit Boards**	3 categories
	Ferrous Stock	9 categories
345/718 xc	HMS 1 (Hard Metal Steel) LMS (Light Metal Steel – sub grade unbaled) LMS (baled) Cast Iron Steel Shavings Chrome Steel P & S (Plate & Structural) Stainless Steel-Magnetic Tin Plate	
102/158-200/455	**Other refining & Slags**	15 categories
102/166-200/455 115/203	**Refinery gear** PVC	16 categories
101/120	**China Mixed Metals**	15 categories
200/442-200/500	**Aluminium**	28 categories
300/374-446/350	**White Metal**	11 categories
345/717-345/720	**Stainless Steel**	11 categories
550/650-550/653	**Zinc**	4 categories

Source: Adapted by the researcher based on the Eurotrade Trading Status Report (Eutrade Metals Africa, 2007).