

2

Quality Initiatives: Operations and Managerial Perspectives in a Particular Scrap Metal Company in Phoenix Industrial Park

Byelongo Elisee Isheloke

PhD Candidate: Business Administration at the Durban University of Technology
Email: ebyelongo@gmail.com

Livhuwani Mashudu Lima Mashamba

PhD Candidate: Public Management and Economics at the Durban University of Technology
Email: limadutphd@gmail.com

Dr. Hari Lall Garbharran

Senior Lecturer and Research Supervisor: Marketing at the Durban University of Technology

Abstract

The metal recycling industry is an important job creator in developing countries and is highly competitive in the provision of green jobs. The world's financial mayhem sent shockwaves globally, and in particular, to the scrap recycling industry with dire consequences to metal trade. This impacted negatively on the economy. In KwaZulu-Natal, for instance, many companies had to retrench or put employees on short time in an attempt to contain the effects of productivity shortages based on the metal business impairment as a result of the global economic crisis. The aim of this article is to present the managerial perspectives when dealing with scrap recycling operations. Quality theories were revisited and formed the basis for the investigation. The rationale is to suggest solutions to a plethora of problems caused by the financial turmoil. A thorough review of literature was conducted. A mixed method was used

throughout the study and particularly during data collection phase. In total, 90.9% of the respondents revealed that their management followed the Institute of Scrap Recycling Industry (ISRI) specifications. The study posits that continuous improvement is paramount for successful secondary metal operations. Suggestions for future research include the need to conduct research of this magnitude at provincial and national levels.

Keywords: Scrap metals, quality initiatives, metal recycling operations, health and safety, financial crisis, productivity, and global economic crisis.

1. Introduction

The metal industry, in general, depends on international trade, in the same way as the South African economy depends heavily on the mines. In a country faced with many challenges where the private sector seeks to create sustainable jobs and the public sector strives to provide the necessary infrastructure, the metal recycling industry can play a key role in ensuring that green jobs are created as found in America (*How scrap recycling protects the environment while providing green jobs for Americans* 2009). The project was a case study of a typical metal recycling company, one of the biggest in the province. Gibbert, Ruigrok and Wick (2008) highlight the relevance of case studies in research. Keegan (2009) does not contradict Gibbert, Ruigrok and Wick (2008). The global economic recession resulted in many challenges for the metal recycling industry which also impacted negatively on productivity and job retention.

More than one million job losses were reported in the metal industry in South Africa which led to severe skills shortages in the industry (Garrun 2010: 1). The recurrent unrest in the labour and mineral sectors which include strikes by workers for better wages and working conditions, and the fatal shooting of workers by police during strike action at Marikana, are cause for concern in an industry that tries to attract foreign currencies by encouraging investors to invest in the country. Unless drastic changes are introduced, effective planning and efficient implementation of plans are allowed, SA will soon find itself in an unbearable economic nightmare (Gear 2012:26). The decision by the ruling party, the African National Congress (ANC), not to conduct the nationalisation of the mines, although strategic currently, is not enough, as the country needs to put in place a clear implementation plan of the economic policy and sound

control mechanisms. Perhaps a vision in line with the New Partnership for African Development (NEPAD), championed by SA, throughout all sectors of the economy, is what the industry needs. The objective of this article is the following:

- To assess quality theories applicable to metal recycling management;
- To identify the major quality and safety challenges in the metal recycling industry from both operations' and management's point of view; and
- To suggest improvement tools to the business of metal recycling from management's perspective; and improvement to the operations from the workers' viewpoint.

This study will attempt to answer the following five questions:

1. What theories are applicable to the quality studies in the case of metal recycling companies?
2. What are the quality and safety challenges experienced by the companies under study?
3. What techniques are being used by the management for efficiency of their operations?
4. What perceptions do managers have on the performance of the business?

This article discusses the issues of importance to the scrap recycling industry, presents research findings, and last but not least, makes recommendations for the betterment of the secondary metal recycling business.

2. Literature Review

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) and scarcity of resources. Grobler, Warnich, Carrell, Elbert and Hatfield (2006:21) observe that many

companies are restructuring themselves internally in order to remain competitive in the market. Gallagher cited by Tosh (2006) believes that better usage of resources contributes to overall competitiveness in the industry.

The pitfalls, in doing the above, have negatively impacted on many businesses in the industry. Electricity, for example, is better saved through recycling activities. Recycling a ton of cans can save up to 3,312 m³ of CO₂; 3,112 Lt of oil or 33, 7 kw/hr of electricity. Grobler *et al.* (2006:21) maintain that improved quality is equivalent to the survival of the business. The metal recycling industry is increasingly acknowledged as one of the growth industries (see projections in Figure 1.

Figure 1: Recycling Market Revenue



Figure 1 indicates trends in market revenue for metal recycling. Although South Africa has been exposed to major events such as the Global Environmental Forum, Conference of the Parties (CoP) 17, the World Summit for Sustainable Development (WSSD), the KYOTO protocol and the Paris agreement, among others, little application has been witnessed that would foster drastic changes in the way one deals with the environment (Gear, 2012:26). Rampele (2012:20) therefore calls for research expertise in order to come up with remedies for down-scaling the current environmental challenges.(Hai 2010:36). The

company under study trades with the Eastern and Western world, and as such, trends in the global market environment affect its productivity and sales.

2.1 Quality Initiatives

Kelemen (2003:88) illustrates quality as a process culminating in continuous improvements. Important techniques include Six Sigma, Total Quality Management (TQM) and aligning the firm with the International Organisation of Standards (ISO) requirements (Antony and Preece 2002:3; Naidu, 2007:18-41; Basu, 2011). Retaining a skilled worker is dependent on whether the person is talented and possesses needed skills (*Skilled South African finding jobs*, 2013). The standards specify quality in the operations but also the necessity to improve safety (RIOS, 2006; ISRI Safety Report 2007). The 2011 Snake Analogy Safety Strategy (SASS) was devised on the snake analogy by Anglocoal in order to deal appropriately with health and safety as well as quality in the metal, non-metal and mineral industries (What is biting us 2011).

Any firm's productivity or performance can be measured, not only through the assessment of its financial output or profit, but also through the measurement of value-adding activities, inputs and other indicators, i.e. Balance Score Card, Performance Measurement and Cost of Quality (Basu 2011). According to Stamatis (2002:5), an innovative approach to quality system implementation is necessary for a company to sustain productivity. A new approach in metal products would integrate waste management and the Life Cycle Assessment (LCA) in order to come up with environmentally friendly operations (Christensen 2011). Gear (2012) contends that, although it is almost impossible to make a mine "environment friendly", it is imperative to cautiously manage the mining, and metal recycling activities and control the impact to the environment.

2.2 Quality Theories Discussed

There are many quality theories (Basu 2011; Bicheno 2004). For the purpose of this article, a few fall within the ambit of this research. These include the Ishikawa diagram, Deming's 14 Points (including the Plan, Do, Check and Act (PDCA) cycle) and 7 Deadly diseases, and the Just-in-Time (JIT) system. Kelemen (2003) studies quality theories and highlights the role played by

quality gurus. Wang, Shamma and Hung (2009) studied the metal recycling industry and looked at the challenges it faces. Besterfield (2009) discusses the Ishikawa diagram which is also called the fishbone technique because of its resemblance to the 'fish backbone'. This technique is used for brainstorming aimed at problem solving. Certain bones identify the causes while others identify the effects. The Ishikawa technique is known to be easy and simple to use. Shapiro (2007) addressed quality in the context of the supply chain, and Naidu (2007) adds a local perspective to quality studies. Lavie (2006) revisits the importance of IT towards quality. His findings are relevant during the 4th industrial revolution.

Zylstra (2006) elaborates on JIT theory. In the context of the scrap metal industry, metals should not be stockpiled and subject to the volatility of price in the market but rather be acquired when needed. Zylstra (2006) is consistent with Brookes (2009) on price volatility. Rijnen (2008) elaborates on the effect of the cost of quality. Only safety stock should be allowed so as to avoid loss due to prices dropping internationally. Evans and Dean (2003: 79) studied Deming's 14 Points and 7 deadly diseases. Of importance to this article is the PDCA cycle, also known as Plan, Do, Study, Act (PDSA) cycle. It is suggested that this cycle will improve the proactivity of the company involved. Apart from the quality theories, applicable to the research were the following techniques: The Institute of Scrap Recycling Industry (ISRI) and its Recycling Institute Operations Standards (RIOS); the Safety, Environmental, Corporate governance, Quality, HIV/AIDS management (SECQA model) and the Snake Analogy Safety Strategy (SASS) devised as a result of Health and Safety training for operations' workers in 2011 (Singh 2006; Scrap Specifications Circular 2008; Seggie 2010; ISRI Safety Report 2007). The above techniques teach the importance of integrating health and safety as well as quality in order to be effective and efficient in the operations.

2.3 The benefits to quality initiatives

The Recycling Industry Operational Standards (RIOS 2006:1-3), as the first management system standard designed exclusively for the scrap recycling industry, emphasise the following benefits of quality improvement:

- Decreasing environmental expenses;

- Increasing products sales;
- Enhancing consumers' confidence and satisfaction;
- Lowering health and safety expenses;
- Improving relations with sister organisations, legislators and regulators;
- Boasting efficiency and profitability; and
- Gaining a competitive advantage.

Grobler *et al.* (2006:21) maintain that improved quality means survival of a business. Amidst the crisis and the economic recession, competition will increase and only metal firms with quality products will thrive. According to Rijnens (2008:9), in a less than favourable economic situation, organisations need to ensure that quality and affordability balance. This results in greater satisfaction to workers, and motivates them to achieve excellence (Antony and Preece 2002:5; Basu 2011). However, it is not always easy to carry out improvement initiatives. There are often hindrances such as problems with metal grading, weighbridge control, metal theft, competition and metal price increases that the recycling firm needs to surmount almost on a regular basis.

2.4 Drawbacks to quality initiatives

The lack of official guidelines for metal recycling trading in KZN is a drawback (Christie 2010:1-2). There is a negative connotation attached to terminologies such as waste and scrap, so much so that it becomes most appropriate to use the concept "secondary metal product" instead of metal waste and scrap. However, it remains to be seen, whether organisations will buy into this idea. Juran contends that, at different levels, people speak different languages (Evans and Dean 2003:54-55). The lack of infrastructure, machinery, insufficient cash or cash equivalents, flaws in the system, lesser demand for scrap, as well as an alarming shortage of skills, are a set of drawbacks that small and medium enterprises (SME) will have to surmount. These challenges are better understood through the 7 deadly diseases identified and described by Dr. Deming (OmniLingua 2004:3-4).

The last economic downturn has been the first recession in 17 years which saw South Africa losing almost 900 000 jobs. However, most economic indicators show that South Africa, and, without any doubt, KwaZulu-Natal (KZN), coped with the economic slow-down, and managed to create some jobs (Zuma 2010).

There is a need to place the scrap recycling industry at the centre of a job creation strategy (Ndwandwe, 2012:23), in line with what Americans do. Facts from the industry reveal:

- 33% of the US aluminium supply comes from recycled materials;
- 2 out of 3 pounds of steel made in the US are manufactured using ferrous scrap;
- Recycling one ton of aluminium saves up to 8 tons of bauxite ore and 44 megawatt hours of electricity;
- More than 150 million metric tons of scrap are processed annually; and
- 44 million metric tons of scrap are exported to 153 countries annually (How scrap recycling protects the environment while providing “green jobs” for Americans 2009).

2.5 Quality improvement tools

There are various quality measurement and improvement tools. The overlapping character of these tools makes it difficult to categorise, but they include SWOT-analysis, JIT, SIGMA etc. (Nankana 2005:268; Johnson, Scholes and Whittington 2006:137-150; Nankana 2005:4; Shapiro, 2007:445; Scrap Specifications Circular, 2008:1-121; Singh, 2006:213). The 2011 Snake Analogy Safety Strategy (SASS) is but another tool which helps to identify safety hazards, reduce risks and provide education on the matter. These tools may enhance productivity.

3. Methodology

A case study approach was followed which enabled greater insight and understanding of the dynamics of the studied environment (Maree 2007:76). A

multi-method approach was used to gather data. This approach enabled the researcher to garner both qualitative and quantitative data for analysis (Bennett 2003:57). A questionnaire, an observation checklist, and an interview schedule, were used as instruments for data collection. In order to minimise interviewee bias and the limitation of memory recall, Van de Ven and Poole (2005:1377-1404) and Lavie (2006:153-174), suggest “to triangulate the interview data with secondary sources such as annual reports, press releases and published newspaper articles”. Depending on the situation, either explorative or descriptive methods were used to address quality initiatives.

Population details of operations’ workers were obtained from the company’s register. The register indicated a population size of 70 in the operations, i.e., 59 operations workers and 11 people at operations management level. Operations management included 8 managers and 3 supervisors. As the target population of 70 respondents was small, it became appropriate to do a census study. A total of 68 people returned questionnaires. The response rate was 97%.

Two questionnaires were designed and administered to the respondents in the metal recycling company under investigation; one to the operations’ workers and the other to the operations’ management in the company. Likert scale type questions were predominantly asked. Likert scale is a representation of research participants’ attitudes vis-à-vis a topic. 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 since all managers and supervisors were well versed in English. Operations workers were assisted by supervisors when the need arose. This allowed the language barrier to be overcome. The questions were composed to accommodate the different categories of respondents (consisting of managers and operations’ workers), except the section that required biographical and open-ended information.

Systematic observations were used to collect data in the yard at least an hour a day during the course of the study, and interviews were conducted with the workers and management. Regular visits were made to the yard to gather first-hand information from the operations’ workers. Machine operators as well as those who worked on non-metal or mineral products were observed. A diary

was used to record information on operators' duties and scrap recycling. This approach was useful in observing the behaviour and skills of manual workers, particularly with regards to safety.

The purpose of the interviews was to collect information from experts in the field and from employees who had more than 15 years of experience in the metal recycling operations. This useful information supplemented the literature review findings.

Appointments were secured before the unstructured interviews were conducted. Responses from the interviews were recorded in a notebook. A pilot study was conducted where the English version of the questionnaire was administered to the operations' management. There was no difficulty relating to ambiguity and readability of the questionnaire, except it was shortened to avoid repeated questions and for effective time management.

4. Results and Discussion

The data collected from the responses were analysed with the Predictive Analytical Software (PASW) version 18.0. The findings demonstrate that seldom are women employed in a risky environment such as the metal recycling operations. Table 1 displays a large proportion of males among the management (97.8%) with only 2.2% being women. The metal recycling industry is male-dominated and, this is not in keeping with the 50/50 representation policy between males and females which South Africa advocates. This dominance of males could also be explained by the hazards and the risks found in this industry. This situation suggests the need to empower women in this industry through ongoing training and exposure.

The Broad-Based Black Economic Empowerment (BBBEE), though not the only policy, could be used for this purpose. Only a proportion of management (8.7%) were older than 50 while the majority were younger. A total of 41.3% were between 17-30 years old, 34.8% were between 31-40 years old and 13.0% were between 41-50 years old.

Table 1: Biographical detail of operations' workers

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

4.1 Biographical data of operations' management

According to Table 2, of the male respondents, a total of 27.3% fell under 36-46 years' age group. The smallest number (9.1%) was found in the 47-57 years' age group. Again, a large proportion of males are employed in managerial positions in the recycling industry (72.7%) whereas only 27.3% of respondents were women. It appears that the 50/50 ruling party principle did not pay off in this industry.

A total of 18.2% of males were between the ages of 25-35 years old. While men's scores continued to vary across the age group, the proportion of women seemed to maintain the status quo. At the age of above 57 years old, only men were found to work in managerial positions.

Table 2: Biographical details of operations' management

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

4.2 Discussions on quality initiatives

The frequency distribution of aspects relating to gender and age (years) is indicated in Table 3. The findings correlate with the biographical data. The secondary metal industry is male-dominated. Again, more needs to be done to boost employees' confidence to follow the required specifications.

Table 3 shows that the metal recycling industry is male-dominated. A total of 97.8% of the respondents were males. Women represented only 2.2% of the respondents. In order to encourage women to take up employment in the metal recycling industry, the issues of hazards and safety need to be addressed.

Table 3: Frequency distribution with gender as factor

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

Table 4 shows that the majority of operations' workers in the metal recycling industry are young. A total of 78.3% of the respondents fell in the age group of 17-40 years old. With 8.7 % of respondents falling in the age group of over 50, the company needs to put in place skills passing initiatives for capacity replacement.

Table 4: Frequency distribution with age as a factor

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 17-30	20	40	43.5	43.5
31-40	16	32	34.8	78.3
41-50	6	12.2	13.0	91.3
>50	4	8.2	8.7	100.0
Total Missing System	46	93.9	100.0	
Total	3	6.1		

Table 5 indicates the priorities in the company that was investigated. A total of 34.7% of respondents disagreed with the statement: "The company prioritises training for safety and quality issues", against only 18.4% who strongly agreed. This indicates that much still needs to be done. A total of 32.6% of the respondents agreed about training for safety and/or quality being a priority in the company. With a cumulative 54.2% of the respondents disagreeing with the statement, the situation is critical.

The company needs to opt for a paradigm shift to ensure safety as a priority. The company however strives to meet the specifications in terms of quality.

Table 5: The company prioritizes training for safety and/or quality

	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 Missing System Total	48	98.0	100.0	
	1	2.0		
	49	100		

A total of 59% of respondents that is 49.9% and 12.2% in Table 6 testified that standards are met as they bale secondary metal products. These findings also implied that Hard Melting Steel (HMS), Light Melting Steel (LMS) and mineral products such as copper, aluminium and zinc meet quality requirements.

Table 6: 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 7 indicates the marketability of secondary metal products of quality. A total of 75.5% of the respondents' state that quality products sell faster. In order

to gain a competitive advantage and make considerable profits, quality enhancement is paramount.

Table 7: Quality enhancement contributes to products' sale

	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 8 addresses the issue of global economic crisis. While the developed world continues to suffer from the recession, Africa in general, and South Africa in particular, copes with the aftermath of the economic meltdown. A total of 79.6% of the respondents, that is 34.7% and 44.9% in Table 8, are of the opinion that the global economic slowdown has been contained in the company at the time of the research study. Efforts to contain the effects of the crisis necessitated cooperation with the public sector.

Table 8: The Company has 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	6.1
Neither agree nor disagree	4	8.2	8.2	12.2
Agree	17	34.7	34.7	20.4
Strongly Agree	22	44.9	44.9	55.1
Total	49	100.0	100.0	100.0

Cash flow problems were highlighted by both management and manual workers. This situation explains the disruptions that were experienced in the production process. The lack of stock and equipment hampered productivity. Table 9 addresses the need to have liquidity at hand in order to ensure smooth operations and as a result increase quality output.

Table 9: Sufficient financial resources needed 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	

Figure 2 demonstrates that the company needs to prioritise health, safety and quality. More than half of the respondents (53.1%) did not feel that the company prioritized safety and quality issues, whilst 32.7% felt that the company did so. This finding is consistent with Singh (2006:213) that safety and quality, as well as other management systems, have an impact when they are integrated. Seggie (2010:26) supports the changing of company culture into one of coaching and training.

Figure 2: Quality and Safety

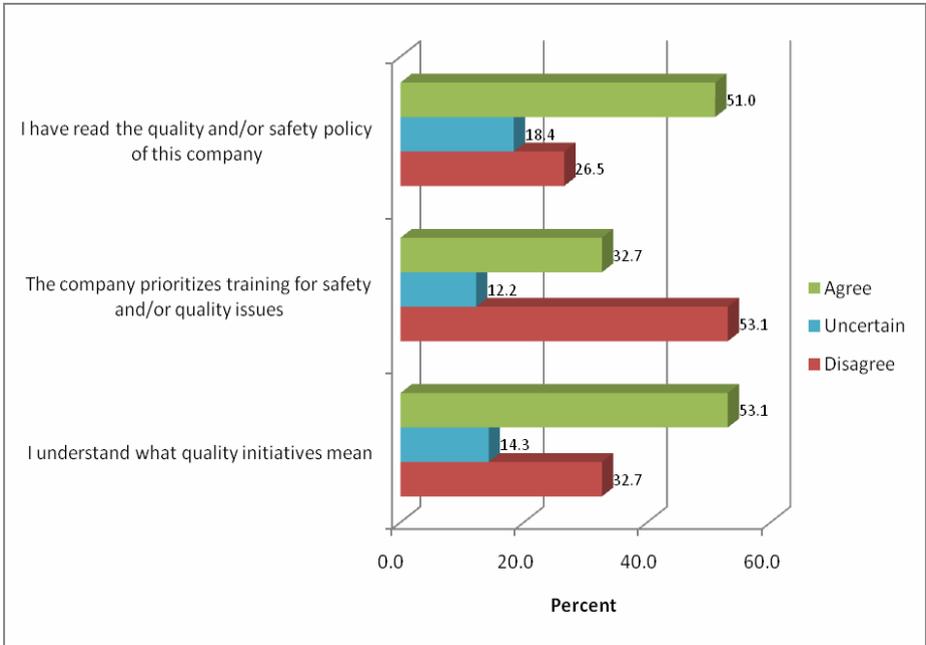


Figure 2 shows the results on the quality of products. It is evident that the company produced metal and non-metal products. A clean and orderly environment is always required (Wang, Shammas and Hung 2009:4).

Figure 3 looks at another aspect.

Figure 3: Product Quality

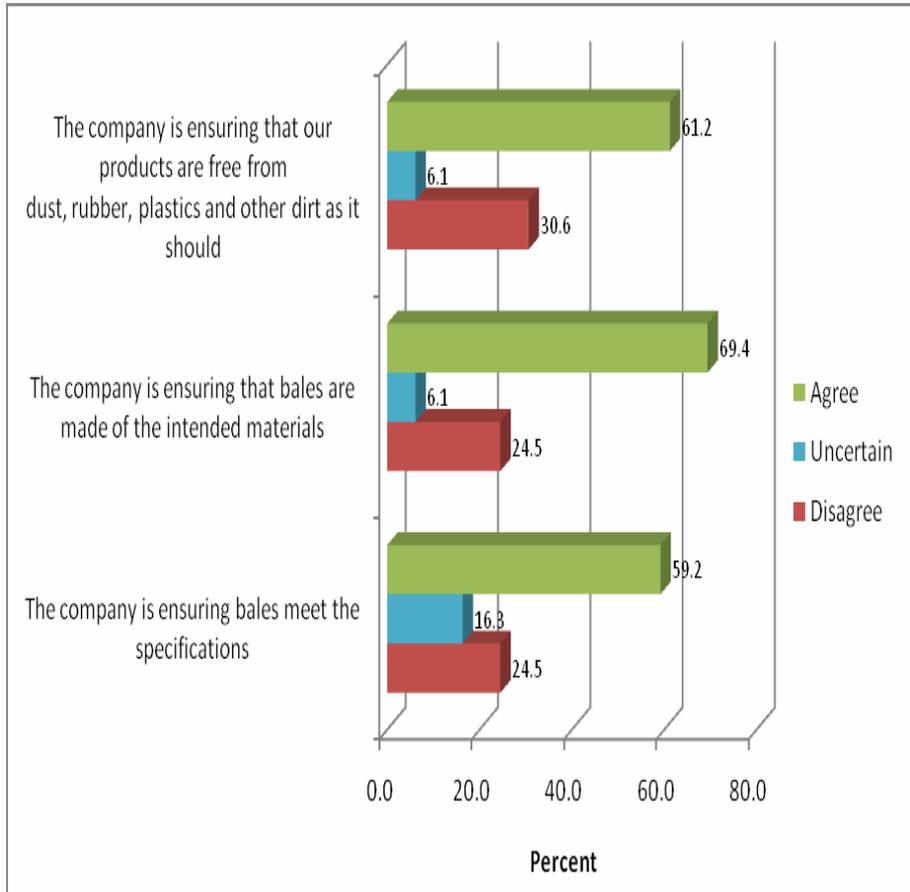


Figure 3 shows results on financial matters. The figure illustrates that the company survived the economic recession. A total of 79.6% of the respondents are of the opinion that the company has successfully contained the impact of the global economic recession. A futuristic approach to the containment of the aftermath should now be prioritized.

Figure 4: Financial Outputs

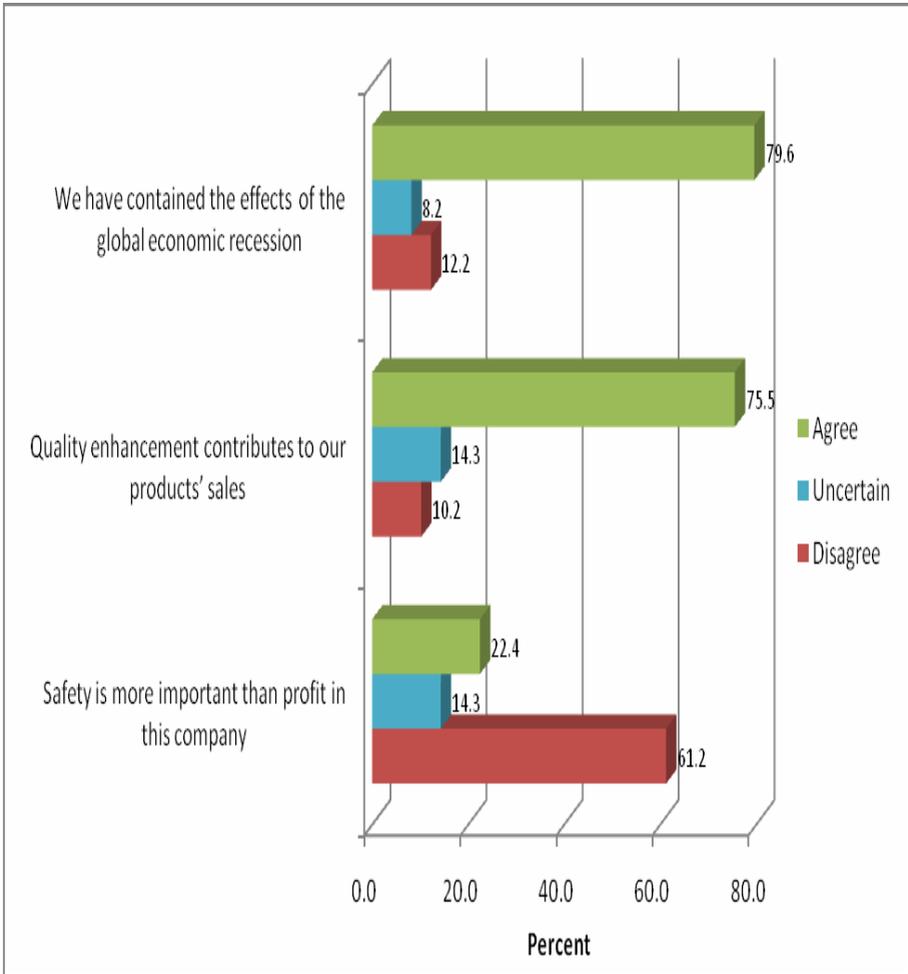
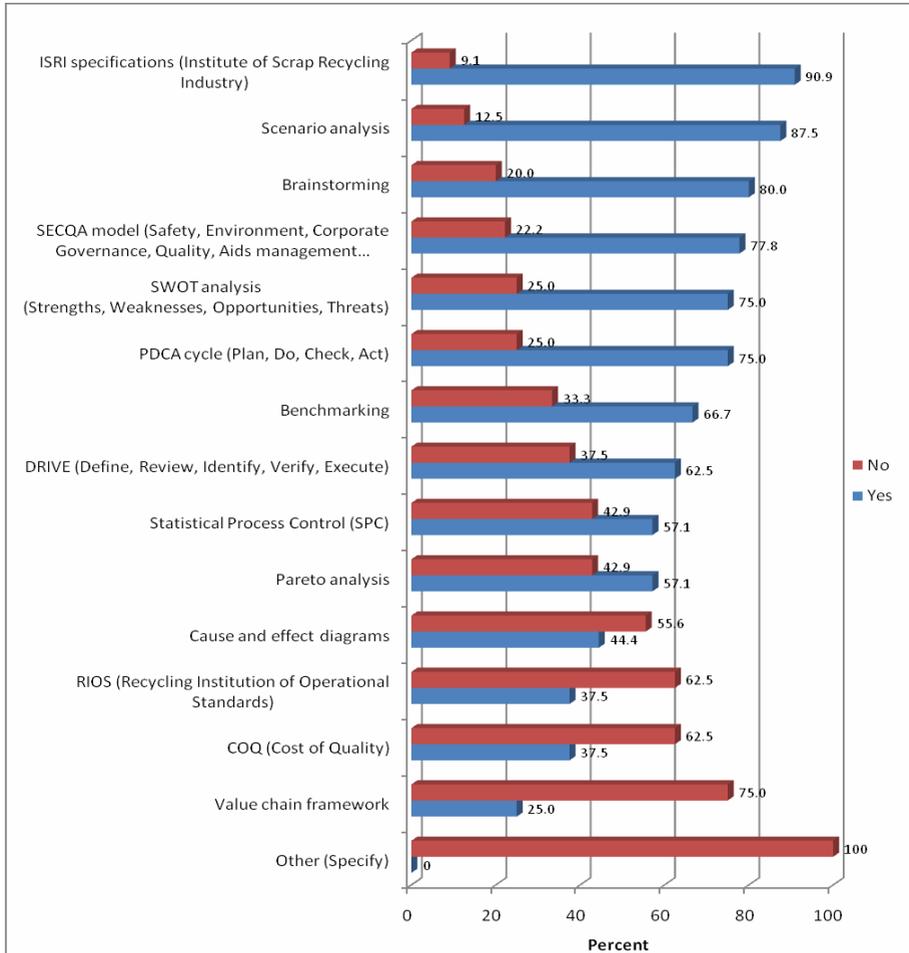


Figure 4 informs that the company contained the global economic crisis effects at that time and adheres to the Institute of Scrap Recycling Industries (ISRI) specifications. It also indicates that quality goes hand- in-hand with sales. Safety was found to be more important than profit. Due to the nature of the business, an emphasis was placed more on certain methods than others.

Figure 5: Responses to Techniques Used

As it transpires from Figure 5, a total of 90.9% of respondents agreed to have used the ISRI specifications in the business, whereas only 57.1% answered yes to using the Pareto analysis before. Apart from the ISRI specifications above, the following tools were mostly used in the decision-making process: Scenario analysis (by 87.5% respondents); and Brainstorming (by 80% respondents). It is still unsure why the Cost of quality (COQ) and the Value chain framework scored very low. A total of 37% decision-makers used COQ and only 25% used the Value chain framework.

A total of 62.5% of operations’ management attested that they do not use the RIOS model, despite the fact that the RIOS and the ISRI belong together. This finding demonstrates the unsuitability of certain decision-makers who are not aware of the company’s strategic move. Moreover, this finding shows those areas where management needs training. Figure 6 presents the comments of operations’ managers.

In Figure 6, operations’ decision-makers are of the view that the company’s cash flow must be improved. 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.

Figure 6: Comments by managers

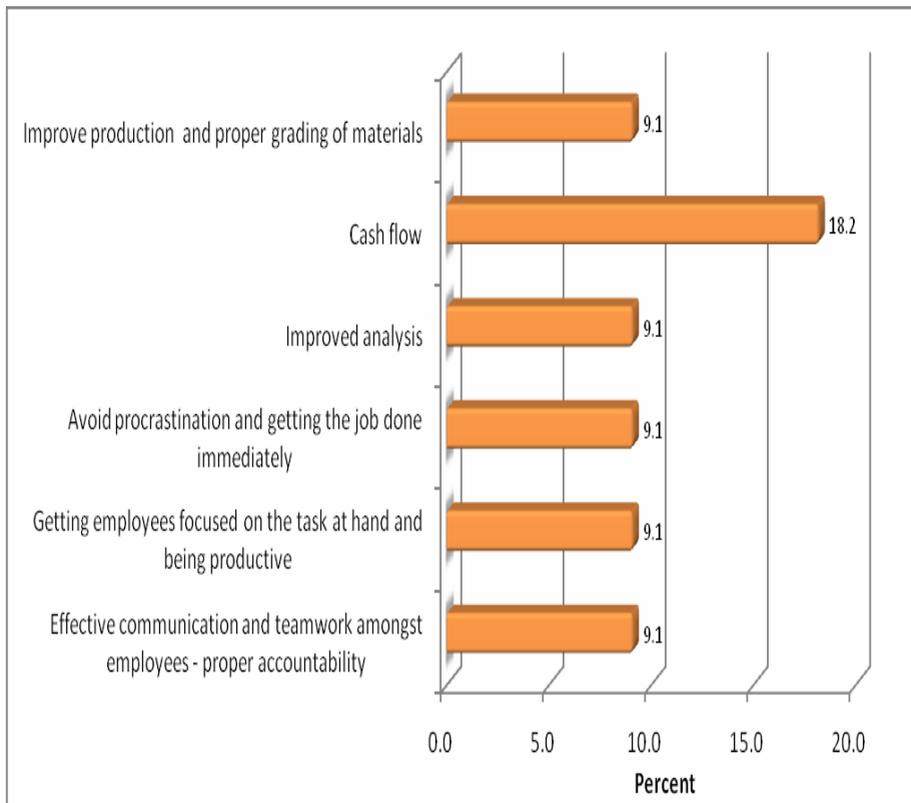
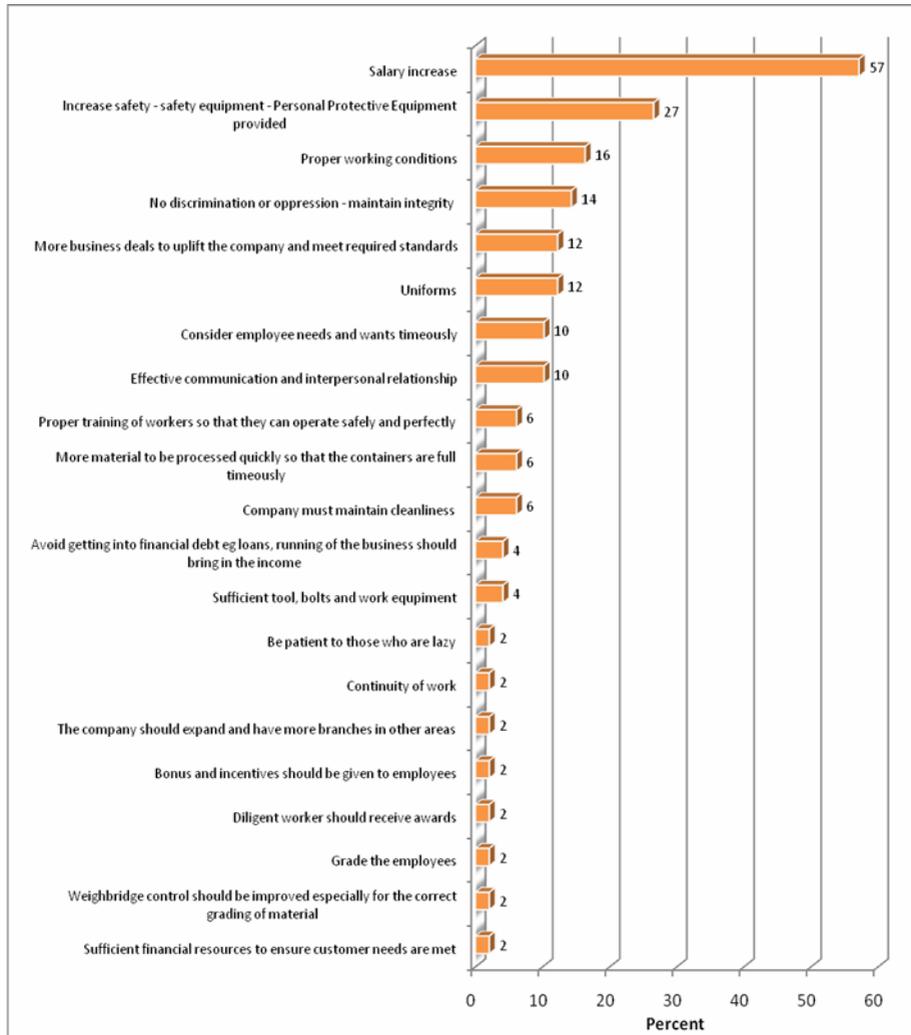


Figure 6 identifies the drawbacks to quality initiatives. The most pressing statement was regarding salaries (57%). The finding on salaries is probably due to the disparity between the huge earnings of management and the very low wages given to operations' manual workers. Drawbacks are identified in the Figure below. Zondo (2005) found that gain-sharing increases employees' motivation.

Figure 7: Identification of drawbacks to quality initiatives



Zondo (2005:13) established that gain sharing enhances employees' effective participation in problem solving and puts a smile on their faces. This is consistent with the findings in the Figure 7. Table 10 presents the hypothesis testing for a number of quality tools.

Table 10: Hypothesis testing for the different quality tools

	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 regarding gender and the highlighted statement values, i.e., Pareto analysis (.047), value chain framework (0.35) and RIOS (.035) as well. This implies that an equal exposure to training across the age about the use of tools is ideal in such an industry. The 80/20 rule

(Pareto analysis) applies in this company. Just a handful of decision-makers account for major operations initiatives whereas the workforce follow suite.

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 plant and to getting involved with manual labour. The SWOT-analysis model could be used to identify those opportunities in the metal recycling company (Johnson, Scholes and Whittington, 2006:148). A total of 90.9% of decision-makers agreed that they use ISRI specifications. However, more awareness needs to be raised about RIOS for the benefit of the entire metal recycling industry.

5. Conclusion and Recommendations

This article reviewed the literature on quality initiatives in a metal industry. It further identified the drawbacks that hamper quality initiatives in their operations. Issues related to bad management and factors beyond the company's control, subsequent to the world's economic recession, were singled out. Descriptive as well as inferential statistics were used to analyse the findings. Based on empirical findings, practical know-how and interviews with experts in the field, it was established that quality initiatives influence positively metal recycling operations. Two models were proposed to address issues related to quality, health and safety and the overall company's system. SECQA model and SASS 2011 were identified, although not exhaustively, as a palliative strategy to gain control of the metal trading and recycling business. An innovative approach to integrated quality that takes into account technology advancement ensures a competitive advantage. The study was a case study and as such the findings should be confined to that situation, although the similarities in the metal and mineral recycling industry augurs well with conditions in sister organisations. The issue of emancipation of women in the metal and mineral recycling business was also highlighted and this proved to be necessary for a country that seeks to create more jobs to counter the effects of unemployment to the population at large.

5.1 Recommendation to the industry

The following recommendations are applicable globally to the metal recycling industry:

- Cut costs and manage the resources sparingly; Introduce quality improvement initiatives; A policy of pension funds and retirement incentives should be managed properly to ensure smooth retirement for those who are about to retire.
- Evaluate all the processes that wait for parts or departments that need materials beforehand.

5.2 Recommendations to the company

The SECQA model was devised by Dr Shalini Singh while the SASS 2011 was developed by the researcher. The last model was tried in the company and used during skills and development programmes. It proved to be of great importance to the operations in the company and helped curb the shockwaves of hazards and risk. The solution to the problems identified in the company lies in the two models, but also in the possibility to innovate, according to the needs that arise. It is also recommended that the company resumes health, safety and time management training as well as weighbridge control mechanisms, machinery and other plant, baling machine operations, sorting, cleaning as well as the grading of secondary metal products. Alleviating the impact of the recession and facing the challenges of health and safety in the operations require the efforts of all the stakeholders of the company and a zero tolerance to health and safety hazards. Quality initiatives thus have an influence on scrap metal productivity locally and even internationally. It is recommended that further research be conducted, at provincial and national level, involving many scrap recycling companies. Finally, it is recommended that the studied company uses relevant quality theories as elaborated in this article to enhance quality and safety in their operations. To that effect, the models suggested in this section will add value.

REFERENCES

- Antony, J. & Preece, D. (ed.) (2002). *Understanding, managing and implementing quality*. London: Routledge.
- Basu, R. (2011). *Fit Sigma: A lean approach to building sustainable quality beyond Six Sigma*. West Sussex: John Wiley & Sons Ltd.
- Bennett, J. (2003). *Evaluation methods in research*. New York: Continuum.
- Bicheno, J. 2004. *The new lean toolbox: towards fast, flexible flow*. 3rd.ed. Buckingham: PicisieBooks.
- 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*.
- Christensen, T.H. (Ed). (2011). *Solid Waste Technology & Management*. West Sussex: Blackwell Publishing Ltd.
- Christie, L. (2010). *Minutes of the Metal Recyclers Steering Committee meeting held on 28 January*. KZN Agriculture, Environmental Affairs and Rural Development, Durban, South Africa.
- Evans, J.R. & Dean, J.W. (2003). *Total quality, management, organization, and strategy*. Ohio: Thomson/South-Western.
- Gear, S. (2012). Going green. *Extra, 9 July: 26-27*.
- Gibbert, M. Ruigrok, W. & Wick, B. (2008). What passes as a vigorous case study? *Strategic Management Journal, 29: 1465-1474*.
- Grobler, P., Warnich, S, Carell, M.R., Elbert, N.F. & Hatfield, R.D. (2006). *Human Resource Management in South Africa*. 3rd edition, London: South-Western.
- Hai, C. (2010). *From crisis to peace: the organic vegan way is the answer*. Tapei City: Love Ocean.

How scrap recycling protects the environment while providing “green jobs” for Americans. (2009). Available at: <http://www.isri.org>. Accessed: 9 October 2009.

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

Johnson, G., Scholes, K. & Whittington, R. (2006). *Exploring corporate strategy: Text and cases*. 7th ed. London: FT Prentice.

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.

Lavie, D. (2006). Capability reconfiguring: An analysis of incumbent responses to technological change. *Academy of Management Review*, 31:153-174.

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

Naidu, P. (2007). *Employee Perception of quality at a selected company*. Unpublished MTech dissertation, Faculty of Management Sciences, Durban University of Technology, South Africa.

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

Ndwandwe, E. (2012). *Focus on big break: recycling turns garbage into business, creates jobs*. The Mercury Business Report, 30 March: 23.

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

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.

- Seggie, E. (2010). New safety programme rewards project management company. *Mining Weekly*, 16-18:26.
- Shapiro, J. F. (2007). *Modeling the supply chain*. 2nd ed. Belmont: Thomson Brooks/Cole.
- Singh, S. (2006). *An integrated approach to quality*. DTech dissertation, Faculty of Management Sciences, Durban University of Technology, Durban, South Africa.
- Skilled South African finding jobs. (2013). Airport Times, Mid- March:1.
- Stamatis, D.H. (2002). *Six sigma and beyond: Foundation of excellence performance*. Florida: St. Lucie Press.
- Van de Ven, A.H. & Poole, M.S. 2005. Alternative approaches for studying organizational change. *Organisation Studies*, 26:1377-1404.
- Wang, L.K., Shamma, N.K. & Hung, Y. (ed). (2009). *Waste treatment in the Metal Manufacturing, forming, coating and finishing industries*. London: CRC Press.
- 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.
- 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. (2010). *State of Nation's address*. Broadcast on SABC 2, 11 February, 07:30 - 07:47.