Middle Management perceptions of the Six Sigma methodology

Ioannis Anastasios Tziatas

A project report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2005

ABSTRACT

In today's competitive market, organisations strive to maximise profits. Many tools are used in an attempt to achieve this, one of which is Six Sigma. The purpose of this research has been to investigate the perceived view of middle managers on Six Sigma.

An extensive literature survey was carried out on the subject. Qualitative research was conducted to investigate how South African managers view Six Sigma.

The results suggest that for the participating organisations, the perceptions of local managers do not differ from views expressed in overseas literature. The main findings of the research were that managers define or view Six Sigma in many different ways. In addition they do see value in applying Six Sigma in a wide range of applications, and that for it to succeed, support is required from both senior management and the people implementing it.

The findings can be a useful summary for managers executing Six Sigma initiatives.

DECLARATION

I, Ioannis Anastasios Tziatas declare that this project report is my own, unaided work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

_____

Ioannis Anastasios Tziatas

14-Aug-05

DEDICATION

This Project Report is dedicated to my Family for their infinite patience and support during the period of my studies

ACKNOWLEDGEMENTS

I wish to thank the following, without whose help and support this report would not have been possible:

- My supervisor, Mr Mike Pycraft for his assistance in the preparation of this project report.
- Honeywell Southern Africa, who sponsored my studies.

Special thanks to all those individuals who gave their time, attention and provided their valuable inputs for this project report.

CONTENTS

Page No.

LIST OF TABLES

LIST OF APPENDICES

Page No.

1 INTRODUCTION

1.1 Context of the Study

Large corporations are generally always looking to improve their performance to stay competitive in the ever-increasing global market (Harry & Schroeder, 2000; Hammer, 2002 and Lucas, 2002).

Six Sigma is considered as one tool to improve performance. The application of the Six Sigma methodology is said to improve delivery of products/services and eliminate defects (Harry & Schroeder, 2000 and Pande, Neuman & Cavanaugh, 2002).

Average companies operate at three sigma, companies operating below this usually fail, and ones operating above three sigma are star performers (Harry & Schroeder, 2000). Thus, corporations and businesses are now looking at this set of tools to improve and leapfrog the competition (Hammer, 2002), and reduce scrap and re-work (Smith, 2002).

Within South Africa, Six Sigma is growing in popularity and application.

1.2 Problem Statement

The purpose of this study is to investigate the *perceptions of South African middle managers on the results of the Six Sigma methodology in improving performance.* In reviewing relevant literature in the South African context, the researcher could find no academic research in this area. The type of research chosen was exploratory in nature.

1.2.1 Sub problems

The following are considered as sub problems

The First Sub Problem

- To determine whether middle managers understand what the Six Sigma methodology is about.

The Second Sub Problem

- To determine middle managers perceptions on the effects that Six Sigma has on performance, operational and/or financial.

The Third Sub Problem

- To determine middle managers perceptions on the obstacles to the implementation of Six Sigma.

1.3 Delimitations

The companies considered were those, which have implemented Six Sigma programmes.

The study is concerned with perceptions of people and as such will not contain or analyse financial, operational, or other such data.

1.4 Significance of the Study

The significance of the study is that there is no known academic research in this area within the South African context. This study is a first attempt at analysing the Six Sigma methodology and implementation in South Africa.

In addition, the results would be a useful summary for managers who are considering the use of Six Sigma in their company.

For companies already implementing Six Sigma, the results would be a useful summary for managers who need some verification on the validity of their actions.

1.5 Assumptions

The researcher is making the following assumptions:

- Six Sigma can be effectively applied to a variety of processes and services (not only manufacturing processes).
- Six Sigma can improve any delivery process when applied correctly.

2 LITERATURE REVIEW

The first part of the review will focus on the history and reasons for Six Sigma. Thereafter, a discussion on the statistical significance of Six Sigma is followed by the most popular approaches to the Six Sigma methodology. Implementation considerations are discussed, and finally the benefits that Six Sigma can provide.

2.1 The Birth of Six Sigma

Six Sigma was "invented" by Motorola in the early eighties (Harry & Schroeder, 2000 and Pyzdek, 2001) when the company was struggling against superior performance by Japanese firms (Erwin & Douglas, 1999). What Motorola did was redefine what constitutes an acceptable level of manufacturing defects. The current benchmarks of the time were measured in % (i.e. parts per 100). Motorola redefined defects in terms of parts per million or parts per billion. The aim of the Six Sigma methodology was to reduce quality costs (Antony & Coronado, 2002).

To achieve performance that was orders of magnitude better than the current standards, Motorola realised that simple process improvements would not enable this. Processes and products had to be re-designed from scratch (Antony & Coronado, 2002).

2.2 Definition of Six Sigma

Sigma refers to the statistical unit of measurement, which measures the dispersion of a population. It is denoted by the Greek letter σ, and is defined as the positive square root of the population variance (Pyzdek, 2001:633 and Lind, Mason & Marchal, 2000:87). The variance is a measure of variability of observations based upon the mean of the squared deviation from the arithmetic mean (Pyzdek, 2001:634 and Lind *et al*, 2000:87).

Six Sigma is defined as “a way to measure the probability that companies can produce any given unit of a product (or service) with only 3.4 defects per million units of operation” (Fontenot, Behara & Gresham, 1994:73). Snee (1999:100) defines Six Sigma as “a business improvement approach that seeks to find and eliminate causes of mistakes or defects in business processes by focusing on outputs that are of critical importance to customers”. Similarity, Blakeslee (1999:78) states that Six Sigma “is a high performance data driven approach to analysing the root causes of business problems and solving them”.

A similar definition is given by Neuscheler-Fritsch & Norris (2001:39) who propose that “it’s a disciplined approach that helps organizations consistently meet customer requirements and drive continuous improvement through process focused management”.

Lucas (2002:27) suggests, “fundamentally Six Sigma is a methodology for disciplined quality improvement”. He goes on to assert that a Six Sigma programme combined together with existing quality systems gives companies almost all the elements of a Total Quality Management (TQM) system.

An alternative definition is given by Voelkel (2002:98) where he states that “Six Sigma blends correct management, financial and methodological elements to make improvements to processes and products in ways that surpass other approaches”.

A broader definition is offered by Hammer (2002:29), who states, “Six Sigma has become a code name for a set of methodologies and techniques used to improve quality and reduce costs”. He goes on to state that the most widely used methodology is known as DMAIC (Define, Measure, Analyse, Improve and Control).

Six Sigma is often misunderstood as it’s name refers to a statistical measure, but is far more than a simple statistical definition (Maguire, 1999:29).

Practically all this translates to a set of methodologies that aim to reduce variability in processes and products. By reducing the variability, companies

can improve what they deliver, and minimise defects (Naumann & Hoisington, 2001).

2.3 What does Six Sigma Mean Arithmetically

The definition of σ was given in section 2.2. Looking at the two-tailed normal distribution, a value of three Sigma indicates that 99.74% of all samples will be within the three sigma level (Lind *et al*, 2000). However, as the sigma level goes up, the values that one deals with become very small. The measure of Defects Per Million Opportunities (DPMO) is used to simplify calculations (Gnibus, 2000 and Lucas, 2002). A defect is defined as anything resulting in customer dissatisfaction (Snee, 1999) or product defect (Antony & Coronado, 2002) or a measure of the frequency that an event does not meet customer expectation (Breyfogle III & Meadows, 2001).

When one measures variability in a process, population means vary by a certain amount (Naumann & Hoisington, 2001). This value was calculated by Motorola and found to be in the region of 1.5 sigma (Blakeslee, 1999; Naumann & Hoisington, 2001 and Lucas, 2002). Table 1 shows the number of defects per million opportunities for both the absolute sigma values as well as the shifted sigma values. The conservative case is always considered for the shifted sigma values and is defined as *Actual Sigma – 1.5*.

Table 1: Number of Defects (parts per million)

Sigma Value	**DPMO (no shift)**	**DPMO (1.5σ Shift)**
3	2 700	66 803
4	63	6 200
5	0.57	233
6	0.002	3.4

Source: Gnibus, 2000:81

However, there is considerable debate on how the figure of 1.5σ is arrived to, or selected (Gnibus, 2000), as well as the actual number of DPMO for the

various sigma levels within the literature. The sigma shift of 1.5 is generally accepted in most cases as was defined by Motorola (Gnibus ,2000 and Lucas, 2002). The differences in the DMPO numbers is due to the selection of the one tail approximation which differs from the correct two tail value (Lucas, 2002). Differences are evident for all sigma levels less than 3.5 (Lucas, 2002).

For the purposes of this research, the numbers shown in Table 1 will be considered adequate.

2.4 The Six Sigma Methodology

Initially the Six Sigma methodology evolved within the manufacturing industries (Motorola), and was designed to improve manufacturing processes and eliminate defects in hardware products. However, as the methodologies matured, Six Sigma has been applied in improving services (Breyfogle III & Meadows, 2001), customer satisfaction (Fontenot *et al*, 1994; Erwin & Douglas, 1999 and Harry, 2000), financial reporting (Faltin & Faltin, 2003), medical services environments (Benedetto, 2003) as well as combined with process management to boost operating results (Hammer, 2002).

The most well known methodology for Six Sigma is known as DMAIC (Define, Measure, Analyse, Improve and Control). This is described in various articles (Blakeslee, 1999; Harrold, 1999; Neuscheler-Fritsch & Norris, 2001; Pearson, 2001; Pande, Neuman & Cavanagh, 2002; Lynch, Bertolino & Cloutier, 2003 and Lynch & Cloutier, 2003).

2.4.1 Define

Arguably, the most important part of the process is the Define stage (Lynch *et al*, 2003). This is where a Six Sigma project starts. The define stage determines the scope (Lynch *et al*, 2003). It is essentially a definition of a project (Pande *et al,* 2002), which includes a business case, problem and goal statement, constraints and assumptions. In summary these are usually (Pande *et al*, 2002):

- define opportunity;
- identify customer requirements; and
- identify and document the process.

2.4.2 Measure

Once a Six Sigma project has been defined, the appropriate measures must be defined (Kendall & Fulenwider, 2000; Breyfogle III & Meadows, 2001 and Pearson, 2001). Measures are critical in defining how progress and benefits are to be monitored.

Six Sigma's measure phase involves more than just measuring a value and assigning a number. It includes a complete evaluation of key process variables (Pearson, 2001).

The following issues need to be addressed (Pande *et al*, 2002):

- observe the process first, then measure (i.e. understand the process);
- difference between continuous (for example time, height, sound level) and discrete measures (for example different types of vehicles); and
- measure for a reason, do not collect useless data.

2.4.3 Analyse

The analyse phase includes all the statistical tools such as statistical quality control (SQC) and statistical process control (SPC) (Harrold, 1999 and Naumann & Hoisington, 2001). For a discussion of the tools used, refer to Naumann & Hoisington (2001), Pyzdek (2001) and Pande *et al* (2002).

2.4.4 Improve

The Improve phase aims to fix what is wrong with the process under investigation. Usually, if many problems were identified during the analyse stage, there are many options can be used to improve performance (Hammer, 2002; Nave, 2002 and Pande *et al,* 2002).

The Improve phase includes identifying process changes synthesising a solution that can be implemented, and finally implementing the solution (Nave, 2002 and Pande *et al*, 2002).

2.4.5 Control

This is the continuing monitoring of the solution using the metrics defined in the Measure phase. It is the sustaining portion of the Six Sigma methodology (Nave, 2002), where the process is monitored to assure no unexpected changes occur.

According to Pande *et al*, control has four parts:

- discipline, to maintain a stable and predictable process;
- documenting the improvement;
- keeping score: establishing ongoing process measures to help maintain and manage the process over time;
- going the next step: building a process management plan, to be proactive and be prepared for problems.

2.5 Implementing Six Sigma Projects

Six Sigma implementation is performed as a series of projects. Statistical tools together with quality processes are applied to process improvement projects (Snee, 1999). The project is defined and scoped during the define phase, discussed in 2.4.1.

Usually implementation is top down, with the CEO or executive management being the driving force (Gross, 2001; Hahn, 2002 and Lucas, 2002). Without executive support, Six Sigma projects usually fail (Blakeslee, 1999; Neuscheler-Fritsch & Norris, 2001; Sandholm & Sorqvist, 2002 and Smith, 2002). The project leader is called a Black Belt (BB), and projects should ideally be completed in around 3 months (Lucas, 2002). Black Belts are trained in the Six Sigma methodology, which includes issues in leadership as well as advanced statistical techniques (Cochrane & Gupta, 2002).

Project implementers, or team members, are referred to as Green Belts (GB), and they do not spend all their time on projects (Lucas, 2002). Training of GB's is similar to BB's but for less time.

Another resource usually available to Six Sigma implementation teams is a Master Black Belt (MBB), which is a BB with extensive Six Sigma project experience (Lucas, 2002). MBB's generally have knowledge of advanced tools, business and leadership training and teaching experience. MBB's primarily train and mentor BB's (Lucas, 2002), as well as lead the high risk, high payout large projects (Lynch *et al,* 2003).

2.6 Implementation Considerations

Implementing Six Sigma involves a co-ordinated effort. In addition to committed leadership (Blakeslee, 1999; Gross, 2001; Hahn, 2002; Lucas, 2002 and Sandholm & Sorqvist, 2002), Six Sigma efforts must be integrated with existing initiatives, business strategy, and key performance measures (Blakeslee, 1999 and Sandholm & Sorqvist, 2002). Six Sigma is not a quick fix (Treichler, Carmichael, Kusmanoff, Lewis & Berthiez, 2002). It requires structured and consistent planning and training (Snee, 2000 and Treichler *et al,* 2002), integration into existing initiatives (Blakeslee, 1999; Hammer, 2002; Lucas, 2002 and Treichler *et al*, 2002) and linking incentives to Six Sigma (Neuscheler-Fritsch & Norris, 2001 and Treichler *et al*, 2002). To avoid failure, business culture must be aligned with its strategy (Lapin, 2004).

In order for companies to gain Six Sigma capability a structured series of actions and plans have to be put in place (Gross, 2001 and Hahn, 2002) which can enable them to achieve this.

The question remains as to why does one need Six Sigma. Nohira, Joyce & Robertson (2003) describe how companies can beat their peers in performance by excelling using the "4+2" formula (Nohira *et al*, 2003). The company must excel in four primary management practices. In order to excel in the management practices, many tools are available, one of which is Six Sigma. Haikonen, Savolainen, & Järvinen, (2004) explore the use of Six Sigma as a method for developing continuous improvement capability in a company.

2.7 Propositions

The propositions as developed from the literature survey related to the research problem are presented here. Refer to APPENDIX 1 for the consistency matrix.

2.7.1 Defining Six Sigma

Proposition 1: There is a lack of agreement between respondents on the precise definition of Six Sigma.

2.7.2 Benefits/Effects of Six Sigma

Proposition 2: Six Sigma does improve the bottom line, when applied correctly.

2.7.3 Implementation of Six Sigma

Proposition 3: Organisations do have, or can gain the capability to implement Six Sigma projects.

Proposition 4: Respondents rate top management commitment and involvement as vital to the success of Six Sigma implementation.

3 RESEARCH METHODOLOGY

This research is concerned with measuring perceptions around Six Sigma. The study is therefore descriptive, and exploratory in nature. This precludes the acquisition of statistically defensible evidence in terms of financial and other data. The intention is to broadly assess the degree of understanding that each respondent exhibits in the issues involved.

Data was collected with a single method. An in depth interview was conducted with all willing participants. A questionnaire was prepared as a guideline for the interviewer and used as a supporting mechanism.

3.1 The Questionnaire

The questionnaire was sub-divided into two sections. The first section recorded company demographics and the number of Six Sigma projects that the company was undertaking.

The second section contained a prompt for each question that was asked to each respondent. Under each prompt, a number of additional prompts were included to aid the discussion in the event that the interviewee responded with a monosyllable answer and/or did not elaborate on his answer.

For the questionnaire, see APPENDIX 2.

3.2 The In-Depth Interview

The advantages of in-depth qualitative research on relatively small samples are well documented in the social science literature when the intention is to generate information about complex situations which cannot be accessed using quantitative survey questionnaires (Miles & Huberman, 1994:1 and Leedy & Ormrod, 2001:102).

Company managers who are responsible for Six Sigma programme implementation were interviewed using in-depth interviews. These interviews covered the rationale behind the programme development and what factors the managers consider to be important. Why these factors are seen to be important were compared with what has been found in the literature review.

Opinions and attitudes towards Six Sigma programmes within business operations that were evaluated will include:

- what exactly the meaning or definition of Six Sigma is;
- application of Six Sigma in different areas, for example services or manufacturing;
- the acquisition or building of capabilities to implement Six Sigma programmes;
- the perceived benefits that Six Sigma brings to the company, financial or otherwise; and
- the support of senior management in implementing Six Sigma.

3.3 Population

The research population comprises of all companies operating in South Africa that are busy or have implemented Six Sigma programmes. It includes companies that are South African owned (local concerns), as well as companies that have a branch operating in South Africa, but are headquartered elsewhere.

3.4 Sample

The sample is a selection of companies mostly based in the Gauteng and Natal regions. The sample was essentially a convenience sample of companies that

are involved with Six Sigma projects. Initially a sample size of between 5 to 10 companies was targeted.

The sample was identified with the help of a Six Sigma black belt and the South African Six Sigma User group, who have knowledge of companies implementing Six Sigma projects. The companies were approached, and those who agreed formed part of the survey. Representatives of these companies (middle managers) were interviewed.

In terms of the sample, a mix was attempted in terms of *experience*. Companies that have been implementing programmes for several years, as well as ones that are just embarking on the process were selected.

The six candidates shown in Table 2 were originally identified for interviews.

Table 2: Target Sample of Companies to be interviewed.

Company Name	**Industry**
Cummins Diesel	Industrial Manufacturing
Dow Agro Sciences	Industrial Chemicals/Farming
Robor Metals	Industrial Manufacturing
Medscheme	Medical/Services
SA Breweries	Manufacturing
Nedcor	Banking

3.5 Data Collection

The companies identified in the sampling process were contacted. The Six Sigma owner or driver was the contact point for each company. Contact was by telephone and or e-mail, and the interested participants were then sent e-mail with a follow-up letter inviting them to participate in the study with an explanation of the purpose of the study. Refer to APPENDIX 4 for the introductory letter. An appointment was set up for the in-depth interviews with those consenting to participate in the research.

Focused interviews with middle management using a structured interview schedule were carried out. All information volunteered by participants was used for analysis. Perceptions of the Six Sigma programmes were probed and attitudes towards the existing programmes were analysed.

All interviews were conducted telephonically. The interviews were taped when the interviewee gave permission. Taped interviews were then transcribed. If this was not possible, extensive notes were made directly after the interview to record in as much detail as possible the salient points made during the interview.

The interviews were based around four central questions as per the interview schedule. The interview schedule is shown in APPENDIX 2.

3.6 Reliability and Validity

"In a qualitative study, the interpretation of the data will inevitably be influenced by the researcher's biases and values to some extent, reflecting the notion *of researcher as instrument*" (Leedy & Ormrod, 2001:162). In this research, an attempt was made to reduce bias by following a fixed interview schedule.

In the following sections, the issues of validity and reliability are discussed.

3.6.1 External validity

External validity is concerned with the ability of the research to be generalised across companies (Easterby-Smith, Thorpe & Lowe, 2002:135). In this study, the sample is not random, so generalising findings to the whole population will not be possible.

3.6.2 Internal validity

Internal validity is concerned with content of the survey instrument (Easterby-Smith *et al,* 2002:135). The data collated must accurately describe the

problem. One should be able to accurately draw conclusions from the study. To test for internal validity, a pilot study was conducted to test the interview schedule. A certified Six Sigma black belt reviewed the interview schedule and this was modified based on the comments received. For the pilot questionnaire and comments on this, refer to APPENDIX 3.

3.6.3 Reliability

Reliability examines how consistent results are within a study. It is primarily a matter of stability (Easterby-Smith *et al,* 2002:135). For this study, there was no reliability testing.

3.7 Pilot Test

A brief pilot test was conducted to check the qualitative interview schedule as recommended by Leedy & Ormrod (2001). This was used to test the validity of the interview structure developed for this specific purpose.

The original interview structure and comments received are included in APPENDIX 3.

3.8 Data Analysis

3.8.1 Quantitative data

Although the interview schedule includes a demographics section, this was purely for information purposes. No quantitative analysis was performed on the data collected.

3.8.2 Qualitative data

The qualitative study forms the primary part of the methodology employed, and the in-depth interview data was analysed for content. Each response was

recorded, and grouped according to common themes (Leedy & Ormrod, 2001:154). Any patterns or trends that the data reflect were grouped together. These groups were interpreted and reported on, in as complete and unbiased way as possible. The results were then associated to the propositions. These results either supported or confirmed the propositions derived from the literature review.

Creswell's data analysis spiral was be used as described in Leedy & Ormrod (2001: 161). The following steps were taken:

1. The data was organised into a computer database, broken down into sentences or units.

2. The data was perused several times in order to get a larger picture. Possible categories and interpretations were noted.

3. General categories, themes or groupings were noted as well as sub-themes or categories where they emerged. This indicated patterns or "what the data means".

4. Data was then integrated and summarised. The categories were organised to relate back to propositions.

4 ANALYSIS OF RESULTS

The detailed results from the interviews are presented in APPENDIX 5. In this chapter the results are analysed according to the main themes of the research.

Each interview was transcribed, and key comments and sentences extracted from the body of the interview/transcription. These were then inserted into a database, and grouped according to the following:

- proposition;
- theme within proposition;
- sub-theme within proposition; and
- interviewee.

4.1 Sample Details

The sample of twelve respondents was chosen based on inputs provided by the Six Sigma User Group of South Africa. Although middle management respondents were targeted, a fairly wide range of positions were interviewed. The key criteria in choosing a respondent was that the company was or had implemented a Six Sigma programme and the respondent had indeed been involved or responsible for Six Sigma projects.

Table 3 lists the companies that the respondents worked for, as well as the number of interviewees.

Table 3: Companies and Respondents

Company	**Business**	**Number of Respondents**
Robor Tube	Engineering/Manufacturing	1
Medscheme	Services/Financial	3
SA Breweries	Food & Beverages	2
Dunlop SA	Manufacturing	2
De Beers	Mining	1
Dow Agro Sciences	Agricultural Chemicals	1
BHP Billiton	Mining	2

The participation of the respondents was voluntary, and it should be noted that the companies that participated had all implemented some Six Sigma projects. Several companies that were contacted declined to participate. Reasons given ranged from the fact that people were too busy, to that Six Sigma did not really get off the ground in the company.

Table 4 shows the position held by each respondent within their respective organisations.

Table 4: Respondents and their respective positions

Respondent	Position	Responsible for
1	Managing Director of Plant	Production Plant
2	Senior Financial Manager	Financial Manager
3	Manager – Customer Services	Call centre support
4	Manager – Assessing Department	Mail room, data capturing, intervention department, order department, control department.
5	Managing Director of Plant	Production Plant
6	Engineering Stores team leader	Engineering stores
7	Manager of Strategic Projects	Manager for strategic projects implementation
8	Manager of Special Projects	Manager for special projects implementation
9	Plant Manager	Production Plant
10	3rd Party manufacturing leader	Leader for outsourcing activities
11	Supervisor, Business Improvement projects department	Supervision of Six Sigma implementations
12	Superintendent for Business Improvement department	Supervision of Six Sigma implementations

From Table 4 it can be seen that interviewees held different positions in the organisational hierarchy, from team lead to managing director of plants.

For this sample, the different areas that Six Sigma had been applied ranged from improving customer service in a call centre to increasing production in process plants. Table 5 summarises the type of projects undertaken within each industry, the application, as well as whether it is a current or future initiative.

Table 5: Six Sigma projects undertaken by sample interviewed

Industry	Application	Description	Time
Manufacturing	Production	Increase production throughput	Current
Manufacturing	Logistics supply	Improve supply of raw materials	Current
Manufacturing	Sales	Determine product price elasticity	Future
Manufacturing	Production	Improve production/eliminate waste	Current
Services	Credit control	Improve processes	Current
Services	Customer care	Improve processes	Current
Services	Call centre	Improve processes/response time	Current
Food & Beverage	Production	Increase production throughput	Current
Food & Beverage	Production	Improve efficiencies	Current
Food & Beverage	Services	Reduce warehouse stock	Current
Mining	Production	Increase production and quality	Current
Mining	Production	Risk mitigation	Current
Mining	Production	Health, Safety & Environmental	Current
Mining	Services	Improve HR processes	Future
Chemicals	Production	Improve production throughput	Current
Chemicals	Supply chain	Optimise supply chain	Future
Chemicals	Marketing	Investigate product performance in marketplace	Future

4.2 Selecting the Themes and Sub Themes

The themes and sub themes were selected based on keywords or meaning, identified within the transcripts. The keywords (or meaning) were identified as they kept on appearing in the various responses. There is meaning around each keyword and or phrase containing the keyword. Themes were identified,

and within theses themes, meaning was then encapsulated in a sub-theme. The process was iterative, and the final themes and sub-themes were developed after several iterations of re-work.

For each proposition, several themes emerged. These are shown in Table 6.

Table 6: Propositions and Major Themes

Proposition	**Theme**
1. There is a lack of agreement between respondents on the precise definition of Six Sigma	What is Six Sigma
	Where is Six Sigma used
2. Six Sigma does improve the bottom line, when applied correctly	Financial Benefits
	Soft Benefits
	Competitor Advantage
3. Organisations do have, or can gain the capability to implement Six Sigma projects	Organisational Support
	Resources
4. Respondents rate top management commitment and involvement as vital to the success of Six Sigma implementation	Ownership
	Management Support

The selection of the themes and sub-themes took several iterations and re-work.

For proposition 1, initially one obvious theme emerged, "*What is Six Sigma"*. However, there were too many sub-themes emerging under the one theme. In order to make sense of the multitude of sub-themes, a second theme was considered. To identify a second theme, all the responses received were scrutinised again, and two broad categories of responses were identified. When asked this question, interviewees answered in two parts, what they considered Six Sigma to be, as well as where they are applying it. Therefore, a second theme, "*Where is Six Sigma used*", was added.

For proposition 2, the two themes immediately apparent were the "*Financial Benefits*", and "*Soft Benefits*". However, there were sufficient discussions related to what the competition is doing in terms of performance and the use of Six Sigma to consider a separate theme. Therefore, an additional theme, called "*Competitor advantage*", was created to summarise these responses. Discussions revolving around how the respondent's company is using Six Sigma to either negate competitor advantage or leapfrog the competition were included here.

For Proposition 3, two themes emerge. To support and grow Six Sigma, interviewees stated the necessary requirements, which fall under one of the two themes either a "*Resource*", or general "*Organisational Support*". Resources are items such as time and money, whereas organisational support encompasses issues such as employee perceptions, and support from various departments and/or management.

For Proposition 4, two broad theme categories were identified based on the wording of the proposition, "*Involvement*" and "*Commitment*". Interviewees feedback was categorised based on these two themes.

4.3 Defining Six Sigma

In terms of the definition of Six Sigma, a wide range of responses was elicited. In general, interviewees considered Six Sigma to be many things. The following themes and sub-themes were extracted out of the data when the following question was asked:

"*In your view, how would you define Six Sigma. What is six sigma?*"

Table 7 summarises how the interviewees view Six Sigma.

Table 7: Themes and sub-themes related to Proposition 1

Theme	**Sub-Theme**	**# Interviewees**
What is Six Sigma	A management tool	3
	A management approach	5
	A methodology	11
	A mindset	2
	A change enabler	2
Where is it used	Improvement Enabler	9
	Change Enabler	3
	People Development tool	1

From Table 7, it can be seen that there are two main themes and several sub-themes related to what Six Sigma is. Almost every respondent had a different phrase to describe Six Sigma. Interviewees answered the question in two ways. Firstly, they tried to define what Six Sigma which the researcher correlated to the theme "*What is Six Sigma*". In addition, as part of their answers, interviewees also noted how it is being used, which was correlated to the theme "*Where is it used*".

The bulk of the interviewees consider Six Sigma as a methodology. However, the two unusual items that stand out are that Six Sigma is a mindset, as well as a change enabler. Although few respondents mentioned these two items, they do re-appear under another proposition in further discussions. Note that each respondent did not limit himself/herself to one definition of Six Sigma.

In terms of where Six Sigma is used, almost every respondent listed items that are related to improvement in their processes and procedures. Items mostly mentioned were cost and waste reductions, efficiency improvements, and quality improvements.

Again, two interesting sub-themes identified in the "*Where is it used*" theme, are the use as a change enabler and as a people development tool. These sub-themes also re-appear under another proposition in further discussions.

4.4 Benefits of Six Sigma

In terms of benefits, the following broad question was asked to the interviewees:

"*Please describe the benefits that you have derived from the implementation of Six Sigma. Include financial, and other perceived non financial benefits.*"

Table 8 summarises the responses of interviewees to the benefits question.

Table 8: Themes and sub-themes related to Proposition 2

Theme	**Sub-Theme**	**# Interviewees**
Financial Benefits	Financial gain	12
	RISK	1
Soft Benefits	Improved Processes	9
	People Development	9
	Improved Perceptions	3
Competitor Advantage	Competition	5
	Financial	4
	Improved Processes	3

In all cases, the driving factor for most Six Sigma projects was financial gain. The theme "*Financial Benefits*" encapsulates these responses. All interviewees highlighted the financial benefits of the Six Sigma methodology. Although not all projects did show a direct financial gain, indirectly items such as staff reductions or the same staff handling more work efficiently were the outcomes. On the downside, there is risk involved with implementing Six Sigma, as it

requires considerable resources and not all problems can be solved in this manner.

Items that were not financially defensible were categorised under the "*Soft Benefits*" theme. In terms of soft benefits, several sub-themes become apparent as shown in Table 8. Most interviewees noted improvements in various areas of their operations such as increase in quality, speed, and better understanding of their process. These replies are listed under "*Improved Processes*".

Another sub-theme that emerges is the "*People Development*" factor. This is primarily due to additional training, and the use of cross-functional teams. Responses related to a mind-shift change and cultural elements are included in the people development sub-theme.

A third sub-theme, "*Improved Perceptions*", is related to customer feedback and perceptions. Some interviewees stated that customer perceptions improved since the introduction of some of the Six Sigma projects.

The third theme, "*Competitor Advantage*", is related to what the competition is doing. Here, three sub-themes emerged. The first sub-theme, "*Competition*", relates to the responses that mention how the competition is using Six Sigma. The second sub-theme, "*Financial*" relates to responses that mention losses or gains against the competition. Finally, responses that articulate advantages that the company has gained from Six Sigma over the competition are grouped under sub-theme "*Competitor Advantage*". It must be noted that the more senior interviewees in terms of their position in the company mentioned the advantages and/or disadvantages they had over their competitors.

4.5 Gaining Six Sigma Capability

In terms of gaining capability, the following broad question was asked to the interviewees:

"*How did the company build capability to implement Six Sigma Projects?*"

Table 9 lists how the interviewees view the capability of their company in implementing Six Sigma projects.

Table 9: Themes and sub-themes related to Proposition 3

Theme	**Sub-Theme**	**# Interviewees**
Resources	External Intervention	4
	Feedback	5
	Time	7
	Training	12
Organisational Support	Employee Perceptions	6
	Management Support	8

Two main themes emerged, "*Resources*" and "*Organisational Support*". In order get Six Sigma going, significant investment in time and money is required. Building capability in most cases started with the hiring of an external consultant to give the initial training and mentoring (*External Intervention*). The other sub-themes that were identified relate to involving the employees on the shop floor. Firstly, there is an issue with time. People are required to spend time on Six Sigma over and above their normal job functions. Secondly, the training aspect was also highlighted as a key factor in building capability. Finally, in order to encompass a larger number of employees and secure their involvement and support, constant feedback and communication is required.

In terms of "*Organisational Support*", sub-themes emerged that were related to people behaviour. Two sub-themes could be identified, one encompassing the feelings of the employees, and one encompassing the actions of management. Sub-theme "*Employee Perceptions*" emerged as an important aspect in terms of gaining capability. Good employee perceptions and attitude towards Six Sigma contributed towards getting Six Sigma supported in the organisation. The other sub-theme, "*Management Support*" encapsulates responses that are

related to how management is supporting the organisation in the Six Sigma initiative.

4.6 Senior Management Support to Implementing Six Sigma

In terms of support by senior management for the Six Sigma initiatives, the following broad question was asked to the interviewees:

"*In your opinion, does senior management adequately understand and support the Six Sigma* initiative?"

Table 10 lists how the interviewees view the involvement and support of their top management in implementing Six Sigma projects.

Table 10: Themes and sub-themes related to Proposition 4

Theme	**Sub-Theme**	**# Interviewees**
Involvement	Participation	7
	Training/Understanding	12
Commitment	Authority Delegation	9
	Management Support	11
	Resources Availability	7
	Incentives	4

The two main themes that emerged are related directly to the two concepts contained in the proposition, commitment and involvement. For senior management involvement, two sub-themes emerged, "*Participation*" and "*Training/Understanding*". Senior management show support by participating in the initiative via meetings, presentations or active involvement. In addition, senior management show involvement by getting to understand what Six Sigma is all about by attending various training courses.

In terms of "*Commitment*", several sub-themes emerged. The sub-theme mentioned most was general "*Management Support*". This is general support by senior management.

The second sub-theme that emerged is "*Authority Delegation*", whereby senior management give the necessary authority to the implementers to successfully initiate and complete Six Sigma projects. Implementers, who are often middle managers, drive the projects with the necessary authority .

The other sub-theme that emerged is "*Resource Availability*", whereby management make the necessary resources available for the execution and completion of Six Sigma projects. Resources are primarily time and money.

Finally, a sub-theme relating to incentives that are given to senior management emerged. In some cases, incentives are seen as a mechanism in order for them to gain ownership for the successful implementation of Six Sigma projects.

5 INTERPRETATION OF RESULTS

This chapter focuses on the meaning of the results in terms of the propositions and the concepts established from the literature review.

5.1 The Definition of Six Sigma

Two main themes emerged from the analysis of the results regarding the perceived definition or meaning of Six Sigma. Interviewees define Six Sigma in two ways, "*what is it?*" and "*where is it used?*" In terms of what Six Sigma is, five sub themes emerged. The most cited definition was that it is a methodology (see Table 7). Responses such as "Basically a methodology and a set of tools that go with it" and "It is a methodology and management approach" were typical answers. However, a key point here is that most interviewees did not present only one definition. Each interviewee tried to define Six Sigma with several different definitions.

Table 11 shows that most interviewees had two or three different definitions for Six Sigma.

In addition to this, most interviewees also tried to define Six Sigma in terms of how it is implemented or used in their company. The interviewees stated the areas where Six Sigma had been implemented or what problems they tried to solve using Six Sigma. In most cases, the reason to use Six Sigma was for enabling improvements in a wide range of applications (see Table 5). Interestingly, two respondents highlighted Six Sigma as a Change Enabler with responses such as "One of many ways of tackling change" and "It is a change in the work and personal environment".

Table 11: Interviewees and definitions of Six Sigma

Interviewee	Different definitions for Six Sigma
1	2
2	3
3	2
4	3
5	1
6	2
7	1
8	2
9	1
10	3
11	4
12	1

The multiple definitions as well as the attempt by interviewees to define Six Sigma in terms of how it is implemented seems to support the uncertainty on what exactly is Six Sigma.

On this basis, it is concluded that there appears to be sufficient support for Proposition 1, since there was no agreement of the interviewees on what exactly Six Sigma is.

5.2 The Benefits of Six Sigma

All interviewees considered the application of Six Sigma beneficial to the organisation. All respondents highlighted measurable financial gains in projects that had been undertaken. One interviewee did however stress the element of risk in undertaking a Six Sigma initiative. The statements made were “Very expensive” and “Not all problems can be solved with Six Sigma”. Therefore,

there needs to be careful evaluation of firstly whether a company needs to start a Six Sigma initiative, as well as what projects are undertaken.

In addition to this, several other non-financial benefits were also noted by the interviewees. These are encapsulated in the themes "*Soft Benefits*" and "*Competitor Advantage*". Soft benefits are considered as benefits where hard financial data is not available or calculable, but improvements in performance and behaviour are evident and observable. The benefits mentioned are primarily in the areas of developing people and their skills, as well as better processes in executing the business.

The people development issue is not surprising, as usually significant investment is made in training. Several interviewees made comments such as "Better training of employees on the job" in support of this. Interestingly, several interviewees explained how Six Sigma was used as a change agent with comments such as "Change peoples mindsets", "Mind shift change" and "No cultural change - rather elements of behaviour changing".

Improved processes also are as a result of investing time and money in optimising the operation via a Six Sigma project. "People working smarter" and "Systematic method to reduce problems re-occurring" were some of the responses.

Finally, another soft benefit mentioned by some interviewees is the improved perceptions external customers and employees have of the operation or service that is provided.

Interviewees did see benefits from the implementation of Six Sigma when asked how they compared to the competition. Here perceived benefits were mostly "soft" as there was no financial data collated or available. Statements such as "it is a way to be ahead of the competition" or "only keeping up with the competition" were made. One interviewee specifically stated that "Year 2004 was the year company lost least number of members" since the introduction of Six Sigma.

It is concluded that there is good support for Proposition 2, since without exception, all the interviewees agreed that their companies had benefited from Six Sigma.

5.3 Gaining Six Sigma Capability

In order to build capability, significant investment in training and time had to be made by the company. The interviewees all agreed that the company had successfully gained capability to implement Six Sigma. This is to be expected from the sample, as all interviewees worked for companies that were successful in implementing Six Sigma. Note that no respondents from companies that failed with Six Sigma participated in the study.

In terms of training, all companies had processes in place for the preparation of the Black Belt mentors as well as the implementers (Green Belts). Typically, training for the Black Belts was given by an external consultancy. Green Belt training was either performed internal to the company or by external consultants.

Time is always at a premium and several interviewees indicated that this is a constraint in terms of actually implementing projects. Conflicting demands in terms of current work responsibilities and Six Sigma project implementation often resulted in Six Sigma projects being neglected or delayed. Comments such as “people availability a major constraint” and “currently there is a resource issue - not enough implementers” indicate that there are resource constraints.

Most respondents also mentioned that in order to keep the initiative going constant feedback and communication was required in all levels of the organisation. For the implementers it was important to have regular feedback sessions to top management to assess progress “Hold regular meetings in local forum”. For the rest of the organisation it was important to communicate what Six Sigma is all about, and give a basic level of education to the employees “Workshops & presentations to keep people on board”. This was in

order to secure support from the people on the floor involved with the Six Sigma projects.

Another important aspect highlighted by the interviewees is that for Six Sigma to succeed, there needs to be support from both top management as well as the people on the lower ranks. Support from top management is discussed in the following section. For the rest of the organisation, employee support is perceived as important for the success of Six Sigma projects. Comments such as “Employee buy-in is good” and “Employees have good attitude to Six Sigma projects” are an indicator to this. In several cases the Six Sigma initiative initially was not received well by employees. It was perceived as a threat to their jobs, with comments such as “People had the perception of this being a job cutting exercise” and “Failures elsewhere built a bad perception of Six Sigma”. In such cases perceptions slowly changed once the initiative started showing benefits and improvements.

In several cases, the company was undergoing an organisational change to better accommodate the Six Sigma initiative. Dedicated structures were set up, and resources were allocated to this function. In terms of building capability, this was a step in totally integrating the Six Sigma initiative within the organisation and not handling it as an add-on.

It is concluded that there is support for Proposition 3 by the sample interviewed. In all cases interviewees believed that they could run and maintain the Six Sigma initiative. However, it must be stressed that the sample did not include companies that had problematic Six Sigma initiatives or at worst, failed initiatives.

5.4 Top Management and Success of Six Sigma

In support of Proposition 4, most of the interviewees expressed the view that senior management was committed as well as involved in the Six Sigma initiative. In one case the Six Sigma initiative did not succeed until new senior management came in and started supporting it.

Involvement was expressed in two ways, by participating in the process, as well as getting training and understanding. The most discussed point was that senior management is actively involved with the initiative via getting to understand what Six Sigma is. The primary mechanism for this was training. The other way senior managers get involved is via direct participation in meetings and feedback sessions. The fact that senior managers get involved directly with the monitoring of the initiative was perceived as an important aspect in the success of Six Sigma. In one case, senior managers are also responsible for implementing their own projects as Green Belts.

Interviewees perceive senior management commitment in terms of general support to the initiative. General comments such as “Management provides good support”, “CEO supports and understands” and “Senior management is responsible for success or failure” indicate that interviewees believe that senior managers are committed to the Six Sigma initiative. In one case, the Six Sigma initiative has become part of the corporate strategy, whereby success or failure directly falls under the responsibility of senior management. Interestingly, one interviewee revealed that initially there was not good support from all the senior management commenting, “Initially Senior Management was not supportive”. This changed when positive results from Six Sigma projects started coming in. In addition, the fact that peer companies also were aggressively driving Six Sigma reinforced their commitment. In another case, the Six Sigma initiative did not start from top management, and was unsuccessful because of the lack of support. When a new management team took over, adequate support was given, and the initiative took off.

In order to be able to implement Six Sigma, most interviewees stated that they had been delegated the authority to take appropriate actions and decisions. In their view, this was also an important item in terms of commitment. A typical comment in this regard was “The authority is given to do the projects”.

Another important aspect to senior management commitment was the supply of resources to support the initiative. Most of the interviewees answered that in general they did not have an issue with getting the right resources. In some cases, the Six Sigma requirements are discussed in the executive committee

meetings. Comments such as “Sufficient tools are given to implement successfully”, and “Senior management provide resources when required” were made by most interviewees .

In addition to the abovementioned, two of the companies also have, or are in the process of setting up an incentive scheme for the success of Six Sigma. This is an attempt to ensure senior management performance.

For the sample interviewed, there is support for Proposition 4 as, without exception, all interviewees declared that their senior management is both involved and committed to the Six Sigma initiative.

6 CONCLUSIONS AND RECOMMENDATIONS

The research set out to examine middle management perceptions of the Six Sigma methodology. This chapter concludes the report by focusing on the extent, to which the study's objectives were met, the highlights of the results, and the direction for additional future research in this field of study.

This research was an exploratory study. The objectives as set out in section 1.4 were dealt with. Managers implementing or considering the implementation of Six Sigma in their companies can use the results found here for confirmation of some of their actions. The following limitations must be borne in mind when reading the report. The companies that participated had been successful in the implementation of Six Sigma. So any conclusions related to what needs to be done, can only be related to what *successful* companies are doing. No conclusions can be drawn on what must be done to avoid failure. Although some of the actions for success are apparent, these are by no means the only items that management have to deal with. No comment can be made on what *unsuccessful* companies did, or did not do, to fail. It must be noted that companies that had not succeeded declined to participate.

6.1 Conclusions and Recommendations to Management

From the study undertaken, there is support for Proposition 1. The meaning Six Sigma has to different implementers and companies is not the same. This stems from the wide range of applications of Six Sigma (Fontenot *et al*, 1994; Erwin & Douglas, 1999; Harry, 2000; Breyfogle III & Meadows, 2001; Hammer, 2002; Benedetto, 2003 and Faltin & Faltin, 2003). Six Sigma applications and implementations range from improving production processes to changing people attitudes and culture. Each initiative or implementation is aimed at a specific goal. The goal is not the same for all companies and individuals. The implementers view the Six Sigma initiative differently, and as such, define Six Sigma in different ways.

Within each manager's environment, there is good understanding of what Six Sigma is. Within the context of each application, each respondent did have an understanding of what the objective of Six Sigma was, and how it was being implemented in their organisation. To answer the first sub-problem, middle managers do understand what the Six Sigma methodology is about.

So why would a company embark on an initiative such as Six Sigma. In the current marketplace, companies and businesses strive to be more profitable (Harry & Schroeder, 2000; Hammer, 2002; Lucas, 2002 and Haikonen *et al,* 2004). As a result, all activities undertaken are aimed at improving the business in one way or another. Embarking on any initiative must show a sustainable profit, a gain, or an advantage in some way. In many cases, such gains or advantages are not easily measurable. For Six Sigma initiatives, there is support by the participants for Proposition 2. Six Sigma does improve the bottom line when applied correctly. Apart from the measurable financial benefit the company or business gains, many benefits cannot be directly measured in monetary terms. Issues such as training, and attitude towards the business does improve efficiencies and ultimately profits. Such benefits are classified as "soft benefits" in this research.

It must be noted that Six Sigma does not come for free, as significant investments in training, setting up appropriate structures, and time have to be made (Snee, 2000 and Treichler *et al*, 2002). The allocation of significant resources is required to embark on such an initiative (Blakeslee, 1999; Hahn, 2001; Gross 2002; Hammer, 2002; Lucas, 2002 and Treichler *et al*, 2002). The trade-off between costs and rewards has to be estimated and justified before embarking on such an initiative. In terms of this research, only one participant mentioned the associated risk in the initial investment to start Six Sigma up.

In addition to the investments in training and setting up of appropriate structures, the initiative must be part of the larger company objectives or strategy (Blakeslee, 1999; Hammer, 2002; Lucas, 2002 and Treichler *et al*, 2002). Organisations can gain and maintain capability in Six Sigma (Hahn, 2001 and Gross, 2002) if certain prerequisites are met. Some of these are discussed in the preceding paragraph. For the participating companies, senior

management created the prerequisites for the correct implementation environment. Among the prerequisites that were discussed by the participants was training, management support, and support from the organisation and employees. One item that was not implemented in all participating organisations but mentioned by most was the issue of incentives coupled to Six Sigma performance. Neuscheler-Fritsch & Norris (2001) and Treichler *et al* (2002) discuss this as an important consideration for Six Sigma capability. It can be concluded from this study that, there is sufficient support for Proposition 3 by the respondents. Companies can gain capability with the appropriate support from senior management and the organisation in general.

For an organisation to gain capability, the Six Sigma initiative must be driven from the top (Gross, 2001; Hahn, 2002 and Lucas, 2002). This was also the single most important observation by most participants in terms of senior management support. Senior management must be involved and committed (Blakeslee, 1999; Gross, 2001; Hahn, 2002; Lucas, 2002 and Sandholm & Sorqvist, 2002) to the success of the initiative. Involvement is expressed in various ways in the different organisations. Typically, some of the key elements for involvement by senior management include getting training, regular feedback from projects, and going on road shows for Six Sigma. Commitment was expressed as providing the appropriate resources such as training to the implementers, as well as allocating time for project execution. In this study, there was support for Proposition 4. Top management commitment and involvement is vital for Six Sigma implementation success.

For managers who are in the process of implementing, or considering implementing Six Sigma, some or all of the prerequisites as discussed in the preceding paragraphs, should be addressed adequately. However, these prerequisites may not be the only items that must be addressed. In order to maximise their possibility of success, managers responsible for implementing Six Sigma initiatives should also seek to speak to managers in other companies implementing similar programs. Both successful and unsuccessful companies can be approached to exchange information and learn. Forums

also exist for such interfacing and exchange of ideas, via regular meetings and conferences.

6.2 Recommendations for Further Research

This study did not explore in detail all of the issues raised by the respondents. There is scope for further studies on these. One of the issues that was discussed was the cultural aspects of organisational acceptance. What makes employees accept or reject an initiative such as Six Sigma. What one should note is that Six Sigma usually results in higher efficiencies when applied correctly. Hence, there is a danger of job reductions. Therefore, what is the incentive of the general workforce to accept and embrace Six Sigma.

Another possible area for further study is to examine reasons for failure. This study did not include any companies with failed Six Sigma initiatives. The question that needs to be asked is what can cause a company to fail, and what makes a company successful. Possible outcomes of such research would be the possible actions that need to be taken in order to avoid failure.

LIST OF REFERENCES

Antony, J. & Coronado, R.B. (2002): Design for six sigma, *Elektron*, 19(10), 17-19.

Benedetto, A.R. (2003): Adapting manufacturing-based six sigma methodology to the service environment of a radiology film library, *Journal of Healthcare Management*, 48(4), 263-280.

Blakeslee Jr., J.A. (1999): Implementing the six sigma solution, *Quality Progress*, 32(7), 77-85.

Breyfogle III, F.W. & Meadows, B. (2001): Bottom line success with six sigma, *Quality Progress*, 34(5), 101-104.

Cochrane, D. & Gupta, P. (2002): ASQ's black belt certification – A personal experience, *Quality Progress*, 35(5), 33-38.

Easterby-Smith, M., Thorpe, R. & Lowe, A. (2002): *Management Research*, second edition, London: SAGE Publications.

Erwin, J. & Douglas P.C. (1999): Six sigma focuses on total customer satisfaction, *Management Today*, 15(5), 45-48.

Faltin, D.M. & Faltin, F.W. (2003): Toe the line: No more WorldComs, *Quality Progress*, 36(1), 29-35.

Fontenot, G., Behara, R. & Gresham, A. (1994): Six sigma in customer satisfaction, *Quality Progress*, 27(12), 73-76.

Gnibus, R. (2000): Six sigma's missing link, *Quality Progress*, 33(11), 77-83.

Gross, J.M. (2001): A road map to six sigma quality, *Quality Progress*, 34(11), 24-27.

Hahn, G.J. (2002): 20 key lessons learned, *Six Sigma Forum Magazine*, 1(5), 28-34.

Hammer, M. (2002): Process management and the future of six sigma, *MIT Sloan Management Review*, 43(2), 26-32.

Harry, M.J. (2000): The quality twilight zone, *Quality Progress*, 33(2), 68-71.

Harry, M. & Schroeder, R. (2000): *Six Sigma, The breakthrough management strategy revolutionizing the world's top corporations*, first edition, New York: Currency.

Harrold, D. (1999): Optimise existing processes to achieve six sigma capability, *Control Engineering*, 46(3), 87-103.

Haikonen, A., Savolainen, T. & Järvinen, P. (2004): Exploring Six Sigma and CI capability development: preliminary case study findings on management role, *Journal of Manufacturing Technology Management*, 15(4), 369-378.

Kendall, J. & Fulenwider, D.O. (2000): Six sigma, E-commerce pose new challenges, *Quality Progress*, 33(7), 31-37.

Lapin, D. (2004): Culture: from inhibitor of growth to driver of competitive advantage, *Management Today*, 20(8), 12-14.

Leedy, P.D. & Ormrod, J.E. (2001): *Practical research: Planning and design*, seventh edition, Upper Saddle River, New Jersey: Merrill Prentice Hall.

Lind, D.A., Mason, R.D. & Marchal W.G. (2000): *Basic Statistics for business and economics*, third edition, Singapore: McGraw-Hill.

Lucas, J.M. (2002): The essential six sigma, *Quality Progress*, 35(1), 27-31.

Lynch, D.P., Bertolino, S. & Cloutier, E. (2003): How to scope DMAIC projects, *Quality Progress*, 36(1), 37-41.

Lynch, D.P. & Cloutier, T. (2003): 5 steps to success, *Six Sigma Forum Magazine*, 2(2), 27-33.

Maguire, M. (1999): Cowboy quality, *Quality Progress*, 32(10), 27-34.

Miles, M.B. & Huberman, A.M. (1994): *Qualitative data analysis: an expanded sourcebook,* 2nd Edition, Thousand Oaks: SAGE Publications.

Naumann, E. & Hoisington S.H. (2001): *Customer Centered Six Sigma*, first edition, Milwaukee: ASQ Quality Press.

Nave, D. (2002): How to compare six sigma, lean and the theory of constraints, *Quality Progress*, 35(3), 73-78.

Neuscheler-Fritsch, D. & Norris, R. (2001): Capturing financial benefits from six sigma, *Quality Progress*, 34(5), 39-44.

Nohira, N., Joyce, W. & Roberson, B. (2003): What really works, *Harvard Business Review*, 81(7), 43-52.

Pande, P.S., Neuman, R.P. & Cavanagh, R.R. (2002): *The Six Sigma way team fieldbook*, first edition, New York: McGraw-Hill.

Pearson, T.A. (2001): Measure for six sigma success, *Quality Progress*, 34(2), 35-40.

Pyzdek, T. (2001): *The Six Sigma handbook*, first edition, New York: McGraw-Hill.

Sandholm, L. & Sorqvist, L. (2002): 12 Requirements for six sigma success, *Six Sigma Forum Magazine*, 1(11), 17-22.

Smith, L.R. (2002): Are your champions doing a good job? *Six Sigma Forum Magazine*, 1(8), 38-43.

Snee, R.D. (1999): Why should statisticians pay attention to six sigma? *Quality Progress*, 32(9),100-103.

Snee, R. D. (2000): Six sigma improves both statistical training and processes, *Quality Progress*, 33(10), 68-72.

Treichler, D., Carmichael, R., Kusmanoff, A., Lewis, J. & Berthiez, G. (2002): Design for six sigma: 15 lessons learned, *Quality Progress*, 35(1), 33-42.

Voelkel, J.G. (2002): Something's Missing, *Quality Progress*, 35(5), 98-101.

BIBLIOGRAPHY

Antony, J., Escamilla, J. L. & Caine, P. (2003): Lean Sigma, *The IEEE Manufacturing Engineer*, 82(2), 40-42.

Benedetto, A. R. (2003): Adapting manufacturing-based six sigma methodology to the service environment of a radiology film library, *Journal of Healthcare Management*, 48(4), 263-280.

Breyfogle, III F. W. (2002): Golf and six sigma, *Quality Progress*, 35(11), 83-85.

Dasgupta, T. (2003): Using the six-sigma metric to measure and improve the performance of a supply chain, *Total Quality Management*, 14(3), 355-366.

DeFeo, J.A. (2001): The tip of the iceberg, *Quality Progress*, 34(5), 29-37.

Erwin, J. (1998): Changing company culture, *AFSM International: The Professional Journal*, 23(4), 22-27.

Garvin, D.A. (1993): Building a Learning Organisation, *Harvard Business Review*, 71(4), 78-91.

Hahn, G.J., Doganaskoy, N. & Stanard, C. (2001): Statistical Tools for Six Sigma, *Quality Progress*, 34(9), 78-82.

Harry, M.J. (2000): Abatement of business risk is key to six sigma, *Quality Progress*, 33(7), 72-76.

Harry, M.J. (2000): Six sigma focuses on improvement rates, *Quality Progress*, 33(6), 76-80.

Harry, M.J. (2000): Questions lead, answers follow, *Quality Progress*, 33(5), 76-80.

Hill, W.J. & Kearney, W. (2003): The Honeywell Experience, *Six Sigma Forum Magazine*, 2(2), 34-37.

Huber, C. & Launsby, R. (2002): Straight Talk on DFSS, *Six Sigma Forum Magazine*, 1(8), 20-25.

Mader, D.P. (2002): Design for Six Sigma, *Quality Progress*, 35(7), 82-86.

Ograjenšek, I. & Thyregod, P. (2004): Qualitative Vs. Quantitative Methods, *Quality Progress*, 37(1), 82-85.

Page Cooper, N. & Noonan P. (2003): Do teams and six sigma go together? *Quality Progress*, 36(6), 25-28.

Smith, B. (2003): Lean and six sigma – A one-two punch, *Quality Progress*, 36(4), 37-41.

Snee, R. (2001): Dealing with the Achilles' Heel of six sigma initiatives, *Quality Progress*, 34(3), 66-72.

Watson, G.H. (2002): Selling Six Sigma To Upper Management, *Six Sigma Forum Magazine*, 1(8), 26-37.

APPENDIX 1: CONSISTENCY MATRIX

Research Problem: The purpose of this study is to identify whether or not South African middle managers consider the application of Six Sigma beneficial within their organisations and to explore the problems and/or successes experienced during the implementation of the technologies.

Sub problem	Proposition number	Proposition	Source of proposition	Source of data	Analysis
To determine whether middle managers understand what the Six Sigma methodology is about.	1	There is a lack of agreement between respondents on the precise definition of Six Sigma.	Fontenot, Behara & Gresham (1994:73); Snee (1999:100); Blakeslee (1999:78); Neuscheler-Fritsch and Norris (2001:39); Lucas (2002:27); Voelkel (2002:98); Hammer (2002:29); Maguire (1999:29)	In depth interview. Question: In your view, how would you define six sigma. What is six sigma?	1. Data entered into database 2. Perused for preliminary interpretations 3. Sorted into groups or themes and sub-themes 4. Try to find meaning 5. Synthesised findings related back to proposition and theory
To determine middle managers perceptions on the effects that Six Sigma has on performance, operational and/or financial.	2	Six Sigma does improve the bottom line, when applied correctly.	Breyfogle III & Meadows (2001); Harry (2000); Erwin & Douglas (1999); Fontenot *et al* (1994); Faltin & Faltin (2003); Hammer (2002)	In depth interview, questionnaire Question: Please describe the benefits that you have derived from the implementation of Six Sigma. Include financial, and other	1. Data entered into database 2. Perused for preliminary interpretations 3. Sorted into groups or themes and sub-themes 4. Try to find meaning 5. Synthesised findings related back to proposition and theory
To determine middle managers perceptions on the obstacles to implementation of Six Sigma.	3	Organisations do have, or can gain the capability to implement Six Sigma projects.	Blakeslee (1999); Treichler et. al (2002); Lucas (2002); Hammer (2002); Gross (2002); Hahn (2001)	In depth interview Question: How did the company build capability to implement Six Sigma Projects?	1. Data entered into database 2. Perused for preliminary interpretations 3. Sorted into groups or themes and sub-themes 4. Try to find meaning 5. Synthesised findings related back to proposition and theory

Research Problem: The purpose of this study is to identify whether or not South African middle managers consider the application of Six Sigma beneficial within their organisations and to explore the problems and/or successes experienced during the implementation of the technologies.					
Sub problem	**Proposition number**	**Proposition**	**Source of proposition**	**Source of data**	**Analysis**
To determine middle managers perceptions on the obstacles to implementation of Six Sigma.	4	Respondents rate top management commitment and involvement as vital to the success of Six Sigma implementation.	Lucas (2002); Sandholm & Sorqvist (2002); Smith (2002); Neuscheler-Fritsch & Norris (2001); Blakeslee (1999); Hahn (2002); Gross (2001)	In depth interview Question: In your opinion, does senior management adequately understand and support the Six Sigma initiative?	1. Data entered into database 2. Perused for preliminary interpretations 3. Sorted into groups or themes and sub-themes 4. Try to find meaning 5. Synthesised findings related back to proposition and theory

APPENDIX 2: QUESTIONNAIRE

Questionnaire to respondents that are being interviewed:

Section A - General

Type of Interview	Personal/Telecon				
Name of Company:					
Business or output of company					
Name of Respondent					
Position Held					
Responsible for					
Approximate annual turnover	Less than R 1m	R1m - R10m	R10m - R50m	R50m - R100m	Greater than R100m
Approximate number of employees in company:	Less than 50	50 - 100	100 - 250	250 - 500	Greater than 500
Number of Employees that have been trained on Six Sigma	Less than 10	10 - 25	25 – 50	50 - 100	Greater than 100
Number of Green Belts in company:	Less than 10	10 - 25	25 – 50	50 - 100	Greater than 100

Number of Black Belts in company:	Number
Number of Six Sigma projects that have been implemented and completed in the company:	Number
Number of Six Sigma projects that have been implemented and completed under your influence/department:	Number
Number of Six Sigma projects that are currently underway in the company:	Number
Number of Six Sigma projects that are currently underway under your influence/department:	Number
Duration of the Green Belt training Programme (Days):	Number

Areas where Six Sigma Programmes have been implemented (Please state number or projects):	Services (Number)	Manufacturing (Number)	Customer Satisfaction (Number)	Financials (Reporting & other) (Number)	Other?	

(Proposition 1)

- In your view, how would you define six sigma. What is six sigma?

Additional Prompts

  - In your opinion, what exactly is Six Sigma (Is it a methodology, mathematical solution, management approach, others???)
  - Would you consider Six Sigma to be a mathematical technique, or a system/process
  - Describe you understanding of the mathematical concept of Six Sigma
  - Would you consider Six Sigma to be an approach to solving inefficiency problems?
  - Would you consider Six Sigma to be a process/quality/TQM/? initiative?

(Proposition 2)

- Please describe the benefits that you have derived from the implementation of Six Sigma. Include financial, and other perceived non financial benefits.

Additional prompts

  - Are financial benefits readily measurable?
  - What skills do you include in the Six Sigma teams to quantify benefits? (Accountants?)
  - Describe the “soft” benefits that you have reaped from Six Sigma implementations.

- What non-financial advantage has the implementation of six sigma given you?

(Proposition 3)

- How did the company build capability to implement Six Sigma Projects?

Additional Prompts

- In your opinion, has there been enough training for people to implement Six Sigma projects?
- In your opinion, is the training adequate in standard and/or duration?
- In your opinion, does the company/department have the capability to implement Six Sigma projects?
- In your opinion, are there enough trained employees to be able to successfully implement Six Sigma projects?
- In your opinion, is there enough support within the company/department from senior Six Sigma implementers (Black Belts and others?)
- In your opinion, can you build capability in this company?

(Proposition 4)

- In your opinion, does senior management adequately understand and support the Six Sigma initiative? (Senior manager is defined as someone such as an MD)

Additional Prompts

- Are senior managers involved, and how

- Have they received training, how much
- Does your senior management get involved in the Six Sigma programmes? If so how do they get involved?
- In you opinion, does senior management understand what Six Sigma is all about?
- In your opinion, does senior management provide you or the implementers with the necessary tools to implement Six Sigma?
- In your opinion, does senior management provide you with the necessary authority/responsibility to implement Six Sigma?

APPENDIX 3: ORIGINAL QUESTIONNAIRE

Comments received are included in ***bold italics***

Middle Management Perceptions on the Benefits of the Six Sigma Methodology – Questionnaire

Questionnaire to respondents that are being interviewed:

Section A - General

Type of Interview	Personal/Telecon				
Name of Company:					
Business or output of company					
Name of Respondent					
Position Held					
Responsible for					
Approximate annual turnover	Less than R 1m	R1m - R10m	R10m - R50m	R50m - R100m	Greater than R100m
Approximate number of employees in company:	Less than 50	50 - 100	100 - 250	250 - 500	Greater than 500
Number of Employees that have been trained on Six Sigma	Less than 10	10 - 25	25 – 50	50 - 100	Greater than 100

Number of Green Belts in company:	Less than 10	10 - 25	25 – 50	50 - 100	Greater than 100

Number of Black Belts in company:	Number
Number of Six Sigma initiatives that have been implemented and completed in the company:	Number
Number of Six Sigma initiatives that have been implemented and completed under your influence/department:	Number
Number of Six Sigma initiatives that are currently underway in the company:	Number
Number of Six Sigma initiatives that are currently underway under your influence/department:	Number
Duration of the Green Belt training Programme (Days):	Number

"Be careful of confusing initiatives with projects, 6sigma is an initiative that relies on many projects"

Areas where Six Sigma Programmes have been implemented (Please state number or initiatives):	Services (Number)	Manufacturing (Number)	Customer Satisfaction (Number)	Financials (Reporting & other) (Number)	Other?	

"The issue of CAW is relevant here , is the person Capable , Able and willing to answer this, they honestly might not know the answer"

Section B – Definition of Six Sigma

- Definitions of six sigma. What is six sigma? (Proposition 1)
    - In your opinion, what exactly is Six Sigma (Is it a methodology, mathematical solution, management approach, others???)
    - Would you consider Six Sigma to be a mathematical technique, or a system/process ***"is this not redundant as you asked this in the previous Q"***
    - Describe you understanding of the mathematical concept of Six Sigma
    - Would you consider Six Sigma to be an approach to solving inefficiency problems?
    - Would you consider Six Sigma to be a process/quality/TQM/? initiative?

Section C – Application/Implementation of Six Sigma to the business

- Areas of application (Proposition 2)
    - Where have you, or are you applying Six Sigma within the business?
    - Are you planning to apply Six Sigma it to other areas, and what would those be?
    - In what areas has the application of Six Sigma been most successful?
    - Have you abandoned application of Six Sigma in certain areas, what are there areas?

"Can you also capture reason for failure and reason for success, this could be useful as a roll up in stating what seems to be the formula for success vs formula for failure"

- Methodologies Used
    - What methodologies are you using in your Six Sigma implementations? ***"There is really only 1 core methodology which is DMAIC, we get some variation RDMAICR (includes recognize and realize phas) and DMADV which is same as DFSS"***
    - Which parts of the Define/Measure/Analyse/Improve/Control (DMAIC) do you use? ***"You probably need to ask which tools are most frequently used as DMAIC is the framework and is always used***
    - Do you use other methodologies? ***"I would guess that here you are talking about LEAN or TQM ??"***
- Capability building within the company. (Proposition 3)
    - In your opinion, has there been enough training for people to implement Six Sigma projects?
    - In your opinion, is the training adequate in standard and/or duration?
    - In your opinion, does the company/department have the capability to implement Six Sigma projects?
    - In your opinion, are there enough trained employees to be able to successfully implement Six Sigma projects? ***"Redundancy is this not the same as the first q?"***

- In your opinion, is there enough support within the company/department from senior Six Sigma implementers (Black Belts and others?)
- In your opinion, can you build capability in this company?

Section D – Benefits and Obstacles

- Does six sigma bring financial benefits? (Proposition 5)
  - Where have you been able to measure **financial** benefits
  - How have these benefits been measured/ascertained? (i.e. did you involve the financial people, measurements, other methods?)
  - In your opinion, are financial benefits measurable? ***"By definition Finances are measurable, perhaps you need to rephrase and ask the ease with which they could identify then accurately quantify the benefits, perhaps the "soft" benefits is a good item such as improved customer or employee satisfaction, growth initiatives improved STRAP objectives etc"***
- Does six sigma give a competitive advantage? (Proposition 6)
  - What do you mean by competitive advantage (speed, cost, efficiency, error and/or rework reduction ….) ***"Hmm difficult cos each company competes by being best at 1 thing and at benchmark on other two perspectives"***
  - Where would you consider that you have gained a competitive advantage.
  - Do your competitors also use/implement Six Sigma?
  - In your opinion, where do you think you have gained an advantage over your competitors by implementing Six Sigma

- Senior Management involvement & support (Proposition 7)
    - Does your senior management get involved in the Six Sigma programmes? If so how do they get involved?
    - In you opinion, does senior management understand what Six Sigma is all about?
    - In your opinion, does senior management provide you or the implementers with the necessary tools to implement Six Sigma?
    - In your opinion, does senior management provide you with the necessary authority/responsibility to implement Six Sigma?
- Other obstacles
    - In your opinion, what is the biggest obstacle in implementing Six Sigma in your company/department?

APPENDIX 4: LETTER OF INTRODUCTION

Dear Sir/Madam

Your company is currently busy with implementing or has implemented Six Sigma programmes. I would like to take up some of your time to acquire your thoughts on this matter.

I am currently busy with research being conducted as part of an MBA project report. The study is titled:

"Middle Management perceptions on the Six Sigma Methodology"

The purpose of this study is to investigate the perceptions of South African middle managers on the results of the Six Sigma methodology in improving performance. I am trying to identify whether or not South African middle managers consider the application of Six Sigma beneficial within their organisations and to explore the problems and/or successes experienced during the implementation of the technologies. In reviewing relevant literature in the South African context, I could find no academic research in this area of research.

It would be greatly appreciated if you can set aside some time to share your thoughts and experiences on this matter. As a token of my appreciation, a summary of the results will be made available to you. The results would be a useful summary for managers who are considering the use of six sigma. The results would also be a useful summary for managers who are implementing six sigma, and need verification on the validity of their actions.

Individual responses will be confidential, and will not be released to anyone for any purpose.

Thank you in advance for your participation

Regards

John Tziatas

APPENDIX 5: SUMMARY OF RESULTS

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
1	What is Six Sigma	Management Tool	1	MD	One of many tools in a toolbox	1	
1	Where is it Used	Change Enabler	1	MD	One of many ways of tackling change	1	2
1	Where is it Used	Improvement Enabler	1	MD	One of many ways of tackling improvement	1	2
1	Where is it Used	Improvement Enabler	1	MD	Very Suitable for solving repeating problems	1	2
1	Where is it Used	Improvement Enabler	1	MD	Solve problems - not a quick fix	1	2
1	Where is it Used	People Development	1	MD	Development of the process of contributing & thinking	1	2
1	What is Six Sigma	Methodology	1	MD	Basically a methodology and a set of tools that go with it	1	
2	Financial Benefits	Financial	1	MD	Financial benefits that are measurable	2	
2	Financial Benefits	Financial	1	MD	Establish Baseline before & measure after	2	
2	Financial Benefits	Financial	1	MD	Include an outsider (such as an accountant) to vet the results	2	
2	Financial Benefits	Financial	1	MD	Quantification is not always easy. Six Sigma is not always the only factor causing changes	2	
2	Soft Benefits	People Development	1	MD	People Development	2	
2	Soft Benefits	People Development	1	MD	Personal development of employees - Interfacing to other employees	2	
2	Soft Benefits	People Development	1	MD	Personal development of employees - Exposure to other technologies	2	
3	Resources	External Bootstrap	1	MD	Started training by bringing in external BB		
3	Resources	Feedback	1	MD	Hold regular meetings in local forum		
3	Resources	Training	1	MD	Regular training to keep people up to speed	3	
3	Resources	Time	1	MD	Allow for time for people to do the work correctly/adequately	3	
4	Commitment	Mngmt Support	1	MD	CEO supports and understands		
4	Involvement	Training/Understanding	1	MD	Board of directors has done GB training		

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
4	Involvement	Training/Understanding	1	MD	Top management do not understand 6S as well as the lower levels	1	
4	Commitment	Resources	1	MD	Top management does not realize that 6S work is over & above the normal work	3	
4	Commitment	Resources	1	MD	Top management gives correct tools for the job		
4	Commitment	Incentive	1	MD	Top management gives incentive for this.		
2	Competitor Advantage	Competition	1	MD	It is a road to an outcome	2	
2	Competitor Advantage	Process	1	MD	Perfect test for/of awareness and problem solving	2	
2	Competitor Advantage	Process	1	MD	Not a be-all and end-all - only component of TQM	2	
2	Financial Benefits	RISK	1	MD	Very Expensive	2	3
2	Financial Benefits	RISK	1	MD	Not all problems can be solved with 6S	2	3
2	Financial Benefits	RISK	1	MD	Drawback of Six Sigma is that it is a very slow process		
1	What is Six Sigma	Management Tool	2	Senior FM	Management tool to assist in improving quality	1	
1	What is Six Sigma	Management Tool	2	Senior FM	Management tool to assist in improving an area and result in significant financial gain	1	
1	What is Six Sigma	Mindset	2	Senior FM	More than a methodology - Mindset	1	
1	What is Six Sigma	Methodology	2	Senior FM	Highlights inefficiencies and provides a framework for resolving them - Both a quality and process initiative	1	
2	Financial Benefits	Financial	2	Senior FM	Financial benefits are readily measured	2	
2	Financial Benefits	Financial	2	Senior FM	Each project has a financial representative,	2	
2	Financial Benefits	Financial	2	Senior FM	Large savings in Credit control department (measurable)	2	
2	Soft Benefits	Improved processes	2	Senior FM	Use less staff, can reallocate them to other activities	2	
2	Soft Benefits	Perceptions	2	Senior FM	Improved customer service, improved trustee perceptions	2	
3	Resources	Training	2	Senior FM	Lot's of training for all roles in 6S	3	
3	Resources	Time	2	Senior FM	More than 10 projects implemented, so company has built capability	3	1
3	Organizational Support	Employee Perception	2	Senior FM	Employees have good attitude to 6S projects	3	
4	Involvement	Participation	2	Senior FM	CEO and MD actively involved		

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
4	Commitment	Resources	2	Senior FM	Resource allocation and project measurements discussed at EXCO meetings		
4	Involvement	Training/Understanding	2	Senior FM	Senior Management Understand concept	1	
4	Involvement	Training/Understanding	2	Senior FM	Not sure of actual training undertaken by management		
4	Commitment	Resources	2	Senior FM	Sufficient tools given to implement successfully		
4	Commitment	Authority Delegation	2	Senior FM	Sufficient authority/responsibility given to implement successfully		
4	Commitment	Incentive	2	Senior FM	No incentives given yet - Defined for 6S successes	3	
2	Competitor Advantage	Process	2	Senior FM	Have become more efficient	2	
2	Competitor Advantage	Process	2	Senior FM	More price competitive & faster by eliminating rework	2	
2	Competitor Advantage	Process	2	Senior FM	Improved customer service	2	
1	Where is it Used	Customer Service	3	Dept Mngr	It is the Voice of Customer (VOC)	1	
1	What is Six Sigma	Methodology	3	Dept Mngr	It is a method to solve problems	1	
1	What is Six Sigma	Methodology	3	Dept Mngr	A method for Streamlining processes	1	
1	What is Six Sigma	Methodology	3	Dept Mngr	A method for improving efficiencies	1	
1	What is Six Sigma	Management Tool	3	Dept Mngr	A management system to achieve cultural change	1	
2	Financial Benefits	Financial	3	Dept Mngr	Less agents (people) with the same/better service	2	
2	Soft Benefits	Perceptions	3	Dept Mngr	Customer satisfaction has gone up.	2	
2	Soft Benefits	Improved processes	3	Dept Mngr	Resolve most queries (up to 90%) on 1st contact	2	
3	Resources	Training	3	Dept Mngr	Road shows and explanation of concept		
3	Organisational Support	Employee Perception	3	Dept Mngr	People had/have perception of this being a job cutting exercise	3	
3	Resources	Training	3	Dept Mngr	Training good for BB GB's and process owners	3	1
3	Resources	Feedback	3	Dept Mngr	Staff is informed		
3	Organisational Support	Mngmt Support	3	Dept Mngr	Support from BB is good, actively involved		
4	Involvement	Training/Understanding	3	Dept Mngr	Senior manager is 6S champion - Support good	1	
4	Commitment	Mngmt Support	3	Dept Mngr	New senior management (CEO - COO) and high on their agenda		
4	Commitment	Mngmt Support	3	Dept Mngr	Senior management aggressively driving this.		

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
2	Soft Benefits	Improved processes	3	Dept Mngr	Speed and quality has improved	2	
2	Competitor Advantage	Financial	3	Dept Mngr	Company has lost business due to past inefficiencies & latest start of 6S	2	
1	What is Six Sigma	Management approach	4	Dept Mngr	Management Approach	1	
1	What is Six Sigma	Methodology	4	Dept Mngr	A mechanism to save money for the company	1	
1	What is Six Sigma	Methodology	4	Dept Mngr	A mechanism to do things better and more efficiently	1	
1	Where is it Used	Improvement Enabler	4	Dept Mngr	A quality initiative	1	2
1	What is Six Sigma	Change Enabler	4	Dept Mngr	It is a change in the work environment	1	
1	What is Six Sigma	Change Enabler	4	Dept Mngr	It is a change in the personal environment	1	
2	Financial Benefits	Financial	4	Dept Mngr	Staff reduction	2	
2	Financial Benefits	Financial	4	Dept Mngr	more output by less people	2	
2	Financial Benefits	Financial	4	Dept Mngr	less errors committed	2	
2	Soft Benefits	People Development	4	Dept Mngr	Better training of employees on their job	2	
2	Soft Benefits	Improved processes	4	Dept Mngr	Changes in the system (processes)	2	
2	Soft Benefits	Improved processes	4	Dept Mngr	People working smarter	2	
2	Soft Benefits	Improved processes	4	Dept Mngr	Employees are improving themselves, can now see the errors they make	2	
2	Soft Benefits	People Development	4	Dept Mngr	Mind shift change	2	
2	Soft Benefits	People Development	4	Dept Mngr	Training needs have been better identified	2	
2	Soft Benefits	People Development	4	Dept Mngr	Cross functional teams - all departments usually involved	2	
2	Financial Benefits	People Development	4	Dept Mngr	Include financial people in the team	2	
2	Financial Benefits	People Development	4	Dept Mngr	Include the departmental head	2	
2	Financial Benefits	People Development	4	Dept Mngr	include financial director in team	2	
3	Resources	?	4	Dept Mngr	Capability built from within		
3	Resources	Training	4	Dept Mngr	Enough trained people - GB's		
3	Organisational Support	Employee Perception	4	Dept Mngr	Employee buy-in is good	3	
3	Resources	Feedback	4	Dept Mngr	Workshops & presentations to keep people on board		
4	Involvement	Participation	4	Dept Mngr	Management very involved		
4	Involvement	Participation	4	Dept Mngr	Manager sits in 6S team		
4	Involvement	Training/Understanding	4	Dept Mngr	Managers not GB or BB		

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
4	Involvement	Training/Understanding	4	Dept Mngr	Senior BB also a senior Manager (GM)		
4	Commitment	Mngmt Support	4	Dept Mngr	Management provides good support		
2	Soft Benefits	Perceptions	4	Dept Mngr	Evidence shows service has dramatically increased	2	
2	Competitor Advantage	Financial	4	Dept Mngr	Year 2004 was the year company lost least number of members	2	
2	Soft Benefits	Perceptions	4	Dept Mngr	Major client very impressed	2	
1	What is Six Sigma	Management approach	5	MD Alrode Brewery	Management process for solving problems	1	
1	What is Six Sigma	Management approach	5	MD Alrode Brewery	Management process for creating value	1	
1	Where is it Used	Improvement Enabler	5	MD Alrode Brewery	Focus on problems that are business goals, identify gap and apply this as problem	1	2
1	Where is it Used	Improvement Enabler	5	MD Alrode Brewery	80% are quality initiatives (manufacturing)	1	2
1	Where is it Used	Improvement Enabler	5	MD Alrode Brewery	20% are directly cost related	1	2
1	Where is it Used	Improvement Enabler	5	MD Alrode Brewery	Quality can be extrapolated to a cost saving	1	
2	Financial Benefits	Financial	5	MD Alrode Brewery	Financial cost reductions achieved	2	
2	Soft Benefits	Improved processes	5	MD Alrode Brewery	Increase of product quality	2	
2	Soft Benefits	People Development	5	MD Alrode Brewery	Cross functional teams perused	2	
2	Soft Benefits	Improved processes	5	MD Alrode Brewery	Issues resolved quicker	2	
2	Soft Benefits	Improved processes	5	MD Alrode Brewery	Issues resolved permanently	2	
2	Soft Benefits	People Development	5	MD Alrode Brewery	No cultural change - rather elements of behaviour changing	2	
2	Soft Benefits	People Development	5	MD Alrode Brewery	Increased confidence	2	
2	Soft Benefits	People Development	5	MD Alrode Brewery	Increased open mindedness	2	
2	Soft Benefits	Improved processes	5	MD Alrode Brewery	Decisions Fact based	2	
3	Resources	Training	5	MD Alrode Brewery	Substantial investment in training - 1yr	3	1
3	Organisational Support	Mngmt Support	5	MD Alrode Brewery	Changes in organisational structures to accommodate 6S	3	
3	Resources	Training	5	MD Alrode Brewery	GB training is a good overview, people get appreciation of technology		
3	Resources	Training	5	MD Alrode Brewery	GB training is a good overview, people become accountable		
3	Resources	Training	5	MD Alrode Brewery	Require money for training	3	
3	Resources	Time	5	MD Alrode Brewery	Peoples time an issue	3	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
3	Resources	Time	5	MD Alrode Brewery	Support from BB is good		
3	Organisational Support	Mngmt Support	5	MD Alrode Brewery	Support from other departments good (finance or marketing)		
3	?	Customer	5	MD Alrode Brewery	Support from customers is good		
4	Commitment	Mngmt Support	5	MD Alrode Brewery	Senior management does support 6S		
4	Commitment	Mngmt Support	5	MD Alrode Brewery	6S Part of approved strategy programme		
4	Commitment	Mngmt Support	5	MD Alrode Brewery	Senior management are responsible for success or failure		
4	Involvement	Training/Understanding	5	MD Alrode Brewery	Senior management also attended GB training	1	
4	Commitment	Authority Delegation	5	MD Alrode Brewery	Responsible people for implementation have necessary authority to implement Six Sigma		
2	Competitor Advantage	Financial	5	MD Alrode Brewery	Company is ahead of competition - Using Six Sigma to "stretch" lead	2	
1	What is Six Sigma	Methodology	6	Stores team leader	Process or statistical approach to solving problems	1	
1	What is Six Sigma	Management approach	6	Stores team leader	It is like a strategic approach, not based on gut feel but on facts	1	
1	What is Six Sigma	Methodology	6	Stores team leader	Approach to solving inefficiencies	1	
1	Where is it Used	Improvement Enabler	6	Stores team leader	If applied properly, one can add a quality aspect to it (Data quality is also a quality improvement)	1	
2	Financial Benefits	Financial	6	Stores team leader	Financial benefit = reduction in stores stock (1Mil)	2	
2	Soft Benefits	Teamwork	6	Stores team leader	Teamwork has improved	2	
2	Soft Benefits	People Development	6	Stores team leader	Responsibility - Environment of business has become the peoples, they own the problem	2	
2	Soft Benefits	People Development	6	Stores team leader	"Auto mode" of operation, team takes initiative	2	
2	Soft Benefits	People Development	6	Stores team leader	Morale of team better	2	
2	Soft Benefits	Improved processes	6	Stores team leader	Stores layout better, much easier to use	2	
2	Soft Benefits	Improved processes	6	Stores team leader	Data quality has improved, queries diminished from 2-3 per week to one very couple of months	2	
2	Soft Benefits	People Development	6	Stores team leader	Given the authority to make changes	2	
3	Resources	Training	6	Stores team leader	Training provided from "above"	3	1
3	Organisational Support	Mngmt Support	6	Stores team leader	Not enough support from senior management	3	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
3	Resources	Time	6	Stores team leader	BB support is good.		
3	Resources	Training	6	Stores team leader	GB training not enough course too compressed 3 days instead of 4	3	1
3	Resources	Feedback	6	Stores team leader	Other team members exposed via presentations		
4	Involvement	Training/Understanding	6	Stores team leader	Senior management has pretty good idea of 6S	1	
4	Involvement	Participation	6	Stores team leader	MD has an idea, only visited once	3	
4	Commitment	Mngmt Support	6	Stores team leader	Issue resolution is done via BB & not management directly		
4	Commitment	Authority Delegation	6	Stores team leader	Has been give the responsibility, but authority not fully available		
4	Commitment	Authority Delegation	6	Stores team leader	There has been improvement, but there is no free reign	3	
1	What is Six Sigma	Methodology	7	Strategic Projects Mngr	A structured way of making continuous business improvement	1	
1	What is Six Sigma	Methodology	7	Strategic Projects Mngr	It is a methodology and management approach	1	
1	What is Six Sigma	Methodology	7	Strategic Projects Mngr	It is a process to solve inefficiencies	1	
1	Where is it Used	Improvement Enabler	7	Strategic Projects Mngr	It is not a self standing quality initiative	1	
2	Financial Benefits	Financial	7	Strategic Projects Mngr	Reductions of material usage	2	
2	Financial Benefits	Financial	7	Strategic Projects Mngr	Reductions in rejects	2	
2	Financial Benefits	Financial	7	Strategic Projects Mngr	Reductions in waste	2	
2	Soft Benefits	Improved processes	7	Strategic Projects Mngr	Improve quality	2	
2	Soft Benefits	Improved processes	7	Strategic Projects Mngr	Understand process much better	2	
2	Soft Benefits	Improved processes	7	Strategic Projects Mngr	Systematic method to reduce problems re-occurring	2	
2	Soft Benefits	People Development	7	Strategic Projects Mngr	Change agent - Change peoples mindsets	2	
2	Soft Benefits	People Development	7	Strategic Projects Mngr	Training tool for new employees - Teaching them how to solve problems in structured manner	2	
3	Resources	External Bootstrap	7	Strategic Projects Mngr	Initially got outside consultant		
3	Resources	Training	7	Strategic Projects Mngr	Training of employees		
3	Resources	Feedback	7	Strategic Projects Mngr	Requires constant mentoring	3	
3	Resources	Feedback	7	Strategic Projects Mngr	Requires constant feedback to force mentoring issue and keep focus	3	
4	Commitment	Mngmt Support	7	Strategic Projects Mngr	Initially Senior Management was not supportive - Only 1 manager	3	
4	Commitment	Mngmt Support	7	Strategic Projects Mngr	Support is now increasing as results are coming in		
4	Commitment	Mngmt Support	7	Strategic Projects Mngr	Support is now increasing due to others doing the same		

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
4	Involvement	Training/Understanding	7	Strategic Projects Mngr	Some senior people have received training	1	
4	Involvement	Participation	7	Strategic Projects Mngr	Senior management was receiving report feedback on projects		
4	Involvement	Participation	7	Strategic Projects Mngr	Senior management is now actively setting up meetings (tour) with responsible people		
4	Commitment	Resources	7	Strategic Projects Mngr	No issue in general in getting the right tools for the job		
4	Commitment	Authority Delegation	7	Strategic Projects Mngr	Has the necessary authority to implement		
2	Competitor Advantage	Competition	7	Strategic Projects Mngr	All competitors are doing it	2	
2	Competitor Advantage	Competition	7	Strategic Projects Mngr	There is no special advantage against competitors, only keeping up to pace	2	
2	Competitor Advantage	Competition	7	Strategic Projects Mngr	Without 6S would have been "poorer" in way things are done	2	
2	Competitor Advantage	Competition	7	Strategic Projects Mngr	Without it would have been less prepared to handle the future	2	
1	Where is it Used	Improvement Enabler	8	Strategic Projects Mngr	Reduction of variation	1	2
1	Where is it Used	Improvement Enabler	8	Strategic Projects Mngr	Elimination of waste	1	2
1	What is Six Sigma	Management approach	8	Strategic Projects Mngr	More of a management approach	1	
1	What is Six Sigma	Methodology	8	Strategic Projects Mngr	Could be a quality initiative, as it reduces variability/waste	1	2
2	Financial Benefits	Financial	8	Strategic Projects Mngr	Material reduction	2	
2	Financial Benefits	Financial	8	Strategic Projects Mngr	Reduce consumptions	2	
2	Financial Benefits	Financial	8	Strategic Projects Mngr	Efficiency gains on machinery - Higher throughput	2	
2	Soft Benefits	People Development	8	Strategic Projects Mngr	Shop floor buy-in, operators perform better	2	
2	Soft Benefits	People Development	8	Strategic Projects Mngr	People Development	2	
2	Soft Benefits	People Development	8	Strategic Projects Mngr	Cross functional teams - Cross pollination	2	
3	Organisational Support	Mngmt Support	8	Strategic Projects Mngr	Started with company directors, then cascaded down		
3	Resources	Training	8	Strategic Projects Mngr	Implemented "Champion Training"		
3	Resources	Training	8	Strategic Projects Mngr	Implemented Green Belt training		
3	Resources	Time	8	Strategic Projects Mngr	Training has been enough in general		
3	Resources	Training	8	Strategic Projects Mngr	More training on Junior Management level may be required	3	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
3	Resources	Time	8	Strategic Projects Mngr	People availability a major constraint	3	
4	Commitment	Mngmt Support	8	Strategic Projects Mngr	Support from senior management is generally good		
4	Involvement	Training/Understanding	8	Strategic Projects Mngr	Senior management (manufacturing) does understand Six Sigma	1	
4	Involvement	Participation	8	Strategic Projects Mngr	Senior management is directly involved in meetings		
4	Involvement	Participation	8	Strategic Projects Mngr	CEO is starting to get involved with monthly presentations		
4	Commitment	Authority Delegation	8	Strategic Projects Mngr	Has the necessary authority to implement projects		
4	Commitment	Resources	8	Strategic Projects Mngr	Finance is provided to implement projects		
2	Competitor Advantage	Competition	8	Strategic Projects Mngr	Ultimately hopes Six Sigma is getting company ahead of competitors	2	
1	What is Six Sigma	Methodology	9	Plant Mngr	Disciplined Methodology	1	
1	Where is it Used	Improvement Enabler	9	Plant Mngr	Reduce variability	1	
1	Where is it Used	Improvement Enabler	9	Plant Mngr	Improve quality	1	
1	Where is it Used	Improvement Enabler	9	Plant Mngr	Reduce Scrap	1	
1	Where is it Used	Improvement Enabler	9	Plant Mngr	Reduce rework	1	
1	Where is it Used	Change Enabler	9	Plant Mngr	Change Culture	1	
2	Financial Benefits	Financial	9	Plant Mngr	Maximise production	2	
2	Financial Benefits	Financial	9	Plant Mngr	Improve quality	2	
2	Financial Benefits	Financial	9	Plant Mngr	Benefits easily measured	2	
2	Financial Benefits	People Development	9	Plant Mngr	Include Production accountant in team - cross functional team	2	
2	Soft Benefits	Improved processes	9	Plant Mngr	Projects are RISK orientated - Reduce RISK	2	
2	Soft Benefits	People Development	9	Plant Mngr	Attempting Culture change	2	
2	Soft Benefits	People Development	9	Plant Mngr	Common language	2	
2	Soft Benefits	Improved processes	9	Plant Mngr	Decisions Fact based	2	
2	Soft Benefits	Improved processes	9	Plant Mngr	Understand process much better	2	
2	Soft Benefits	Improved processes	9	Plant Mngr	As company gets more involved, new opportunities seen	2	
2	Soft Benefits	Improved processes	9	Plant Mngr	Will be used for performance measurement	2	
2	Soft Benefits	Improved processes	9	Plant Mngr	Measure how company conforms to strategy	2	
2	Financial Benefits	Financial	9	Plant Mngr	Will be used to compare different plants	2	
2	Financial Benefits	Improved processes	9	Plant Mngr	Improve reliability	2	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
2	Soft Benefits	People Development	9	Plant Mngr	Change culture	2	
3	Organisational Support	Mngmt Support	9	Plant Mngr	Was very difficult to build capability	3	
3	Organisational Support	Mngmt Support	9	Plant Mngr	Senior management was not supportive	3	
3	Organisational Support	Mngmt Support	9	Plant Mngr	Implementation success depends on senior managers - cannot be driven from bottom up	3	
3	Organisational Support	Employee Perception	9	Plant Mngr	Failures elsewhere built a bad perception of Six Sigma	3	
3	Organisational Support	Mngmt Support	9	Plant Mngr	New GM and EXCO have changed things dramatically for the better - Supportive	3	
3	Resources	Training	9	Plant Mngr	Big investment to train		
3	Organisational Support	Mngmt Support	9	Plant Mngr	Support within dept is good		
3	Organisational Support	Mngmt Support	9	Plant Mngr	Support from other departments non-existent		
3	Organisational Support	Employee Perception	9	Plant Mngr	Change management required to implement, lots of resistance	3	
3	Resources	Training	9	Plant Mngr	Not enough people to implement	3	
3	Resources	Training	9	Plant Mngr	Not enough external trainers available	3	
4	Commitment	Mngmt Support	9	Plant Mngr	Initially no support	3	
4	Involvement	Training/Understanding	9	Plant Mngr	Initially no understanding	3	
4	Involvement	Training/Understanding	9	Plant Mngr	Initially no knowledge	3	
4	Commitment	Mngmt Support	9	Plant Mngr	New senior management (GM) and high on their agenda	3	
4	Commitment	Authority Delegation	9	Plant Mngr	Currently has the necessary responsibility & Authority	3	
4	Commitment	Resources	9	Plant Mngr	Currently has the necessary tools to implement	3	
4	Commitment	Mngmt Support	9	Plant Mngr	In the past could only implement TQM, as this is all old management could understand	3	
4	Commitment	Mngmt Support	9	Plant Mngr	No mechanism to reward people	3	
4	Commitment	Mngmt Support	9	Plant Mngr	Trying to change culture by changing metrics	3	
1	What is Six Sigma	Improvement Enabler	10	3rd Party Manufacturing leader	Systematic and rigorous system for problem solving	1	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
1	What is Six Sigma	Improvement Enabler	10	3rd Party Manufacturing leader	Systematic and rigorous system for streamlining processes	1	
1	What is Six Sigma	Methodology	10	3rd Party Manufacturing leader	It is more than a methodology	1	
1	What is Six Sigma	Methodology	10	3rd Party Manufacturing leader	The methodology provides the tools	1	
1	What is Six Sigma	Improvement Enabler	10	3rd Party Manufacturing leader	Creates focus	1	
1	What is Six Sigma	Change Enabler	10	3rd Party Manufacturing leader	Change behaviour of people	1	
1	Where is it Used	Improvement Enabler	10	3rd Party Manufacturing leader	Reduce Manufacturing Variability	1	
1	Where is it Used	Improvement Enabler	10	3rd Party Manufacturing leader	Increase efficiencies	1	
1	Where is it Used	Improvement Enabler	10	3rd Party Manufacturing leader	Increase production output	1	
2	Financial Benefits	Financial	10	3rd Party Manufacturing leader	Increase output	2	
2	Financial Benefits	Financial	10	3rd Party Manufacturing leader	Cost saving in terms of less people doing more	2	
2	Soft Benefits	People Development	10	3rd Party Manufacturing leader	Cross functional teams	2	
2	Financial Benefits	Financial	10	3rd Party Manufacturing leader	Adds lots of value	2	
3	Resources	External Bootstrap	10	3rd Party Manufacturing leader	External Training for BB	3	
3	Resources	Time	10	3rd Party Manufacturing leader	Currently there is a resource issue - not enough implementers	3	
3	Resources	Training	10	3rd Party Manufacturing leader	New people being trained	3	
3	Resources	Time	10	3rd Party Manufacturing leader	Initially had enough resources, but lost due to resignations and movement	3	
3	Organisational Support	Mngmt Support	10	3rd Party Manufacturing leader	Support from senior management is generally good	3	
3	Organisational Support	Mngmt Support	10	3rd Party Manufacturing leader	Senior management provide resources when required	3	
3	Organisational Support	Mngmt Support	10	3rd Party Manufacturing leader	Employee performance appraisal tied to Six Sigma performance	3	
3	Organisational Support	Employee Perception	10	3rd Party Manufacturing leader	Initially there was lots of resistance to Six Sigma - Seen as a threat.	3	
4	Involvement	Training/Understanding	10	3rd Party Manufacturing leader	Senior management fully understand Six Sigma	3	
4	Commitment	Incentive	10	3rd Party Manufacturing leader	Six Sigma is part of senior management performance plan	3	
4	Commitment	Mngmt Support	10	3rd Party Manufacturing leader	Support from senior management is good	3	
4	Commitment	Resources	10	3rd Party Manufacturing leader	Senior management provide resources when required	3	
4	Commitment	Authority Delegation	10	3rd Party Manufacturing leader	Senior management delegate authority when required	3	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
4	Involvement	Training/Understanding	10	3rd Party Manufacturing leader	Most of senior management has undergone GB training	3	
4	Involvement	Participation	10	3rd Party Manufacturing leader	Some senior management are running their own Six Sigma projects	3	
4	Involvement	Participation	10	3rd Party Manufacturing leader	Weekly report back on projects progress	3	
4	Commitment	Mngmt Support	10	3rd Party Manufacturing leader	Needs to start from TOP down	3	
2	Competitor Advantage	Process	10	3rd Party Manufacturing leader	Beating competitor benchmarks	2	
2	Competitor Advantage	Competition	10	3rd Party Manufacturing leader	None of the competitors are implementing (as far as is known)	2	
1	What is Six Sigma	Methodology	11	Business Improvement	It is a methodology of how people think and act	1	
1	What is Six Sigma	Methodology	11	Business Improvement	It is an alignment to reach goals	1	
1	What is Six Sigma	Mindset	11	Business Improvement	A way of thinking	1	
1	What is Six Sigma	Management approach	11	Business Improvement	Also a management approach	1	
1	What is Six Sigma	Management Tool	11	Business Improvement	It is a tool to solve problems	1	
2	Financial Benefits	Financial	11	Business Improvement	Financial benefits not easily defined	2	
2	Financial Benefits	Financial	11	Business Improvement	Measured on project by project basis	2	
2	Financial Benefits	Financial	11	Business Improvement	Overall EBIT not improving	2	
2	Soft Benefits	People Development	11	Business Improvement	Mixed team - financial rep on team	2	
2	Financial Benefits	Financial	11	Business Improvement	Health Safety & Environment projects have no financial benefits	2	
2	Soft Benefits	Improved processes	11	Business Improvement	There are no forma procedures to identify soft benefits	2	
2	Financial Benefits	Financial	11	Business Improvement	Financial benefit model developed be each implementation team	2	
2	Financial Benefits	Financial	11	Business Improvement	Financial benefit vetted by Financial Manager	2	
2	Financial Benefits	Financial	11	Business Improvement	Benefits captured in benefits capture system	2	
2	Soft Benefits	Improved processes	11	Business Improvement	HS&E projects have no financial benefits	2	
3	Resources	Training	11	Business Improvement	Training programme is very structured	3	
3	Resources	Training	11	Business Improvement	Company has target of 1 BB/100 employees	3	
3	Organisational Support	Mngmt Support	11	Business Improvement	Internal support is good	3	
3	Resources	Time	11	Business Improvement	Not enough people to implement	3	
4	Commitment	Mngmt Support	11	Business Improvement	MD supports and understands concept	3	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
4	Involvement	Participation	11	Business Improvement	Senior management has set high standards	3	
4	Involvement	Participation	11	Business Improvement	Require top management support for success	3	
4	Commitment	Mngmt Support	11	Business Improvement	Top down approach required	3	
4	Commitment	Incentive	11	Business Improvement	Bonus scheme attached with success of Six Sigma	3	
4	Involvement	Participation	11	Business Improvement	Every 3 months have feedback on EXCO for group of companies	3	
4	Commitment	Resources	11	Business Improvement	Resources are allocated as required	3	
4	Commitment	Authority Delegation	11	Business Improvement	The authority is given to do the projects	3	
2	Competitor Advantage	Financial	11	Business Improvement	EBIT not as good as competitors	2	
1	What is Six Sigma	Methodology	12	Business Excellence Supt	An all encompassing process	1	
1	Where is it Used	Improvement Enabler	12	Business Excellence Supt	Improve process	1	
1	Where is it Used	Improvement Enabler	12	Business Excellence Supt	Increase throughput	1	
1	Where is it Used	Change Enabler	12	Business Excellence Supt	Change supplier agreements based on project	1	
1	Where is it Used	Improvement Enabler	12	Business Excellence Supt	Increase availability	1	
2	Financial Benefits	Financial	12	Business Excellence Supt	Financials are measurable	2	
2	Financial Benefits	Financial	12	Business Excellence Supt	Financials are usually conservative	2	
2	Financial Benefits	Financial	12	Business Excellence Supt	Financials are sometimes not easy to measure	2	
2	Financial Benefits	Financial	12	Business Excellence Supt	Sometimes benefits cannot be claimed, as other factors could contribute, e.g. more focus on problem	2	
2	Financial Benefits	People Development	12	Business Excellence Supt	Benefits signoff requires team to signoff	2	
2	Soft Benefits	People Development	12	Business Excellence Supt	Six Sigma has become a way of life	2	
2	Soft Benefits	Improved processes	12	Business Excellence Supt	All problem solving processes follow the methodology	2	
2	Soft Benefits	Improved processes	12	Business Excellence Supt	Have become very thorough	2	
2	Soft Benefits	People Development	12	Business Excellence Supt	There has been a culture change	2	
2	Soft Benefits	Improved processes	12	Business Excellence Supt	A tool to fix problems permanently	2	
3	Resources	External Bootstrap	12	Business Excellence Supt	Started off as part of holding company roll-out. Forced upon by them	3	
3	Resources	Training	12	Business Excellence Supt	Building capacity with formal training plan	3	
3	Organisational Support	Employee Perception	12	Business Excellence Supt	Plant people are starting to demand training	3	

Prpstn #	Theme	Sub-Theme	Resp #	Position	Comment/Sentence	SubProblem	Sub Problem
3	Organisational Support	Employee Perception	12	Business Excellence Supt	Being driven bottom up	3	
3	Resources	Time	12	Business Excellence Supt	Not at full capability, need more people	3	
3	Organisational Support	Mngmt Support	12	Business Excellence Supt	Being driven TOP down	3	
3	Organisational Support	Mngmt Support	12	Business Excellence Supt	MD not trained yet	3	
3	Organisational Support	Employee Perception	12	Business Excellence Supt	Most successes have been where people have accepted Six Sigma		
3	Organisational Support	Employee Perception	12	Business Excellence Supt	Projects cannot be sustained if people do not buy-in		
4	Commitment	Mngmt Support	12	Business Excellence Supt	New MD is very supportive	3	
4	Commitment	Mngmt Support	12	Business Excellence Supt	Old management did not support	3	
4	Commitment	Mngmt Support	12	Business Excellence Supt	All HOD's have Key performance Indicator tied to Six Sigma	3	
4	Involvement	Training/Understanding	12	Business Excellence Supt	New MD is Black Belt	3	
4	Involvement	Training/Understanding	12	Business Excellence Supt	HOD's in process of getting training	3	
4	Commitment	Authority Delegation	12	Business Excellence Supt	Have the authority to implement Six Sigma		
2	Competitor Advantage	Competition	12	Business Excellence Supt	Six Sigma gives company chance to improve		
2	Competitor Advantage	Competition	12	Business Excellence Supt	Without improvement, will slowly die		