Six Sigma: The Solution to Improving the Quality of Services Offered by the Gauteng Shared Services Centre (GCCS)

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CONFIDENTIALITY CLAUSE

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Due to the strategic importance of this research it would be appreciated if the contents remain confidential and not be circulated for a period of five years

Sincerely

pp **Mahendira Viranna**

DECLARATION

This research has not been previously accepted for any degree and is not being currently submitted for any degree.

" **Signed**.....

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Date.....15/03/07.....

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Abstract

"We fail more often not because we fail to solve the problem we face but because we fail to face the right problem." (Russell L. Ackoff)

Although centralisation of support functions causes initial cost savings, benefits may not improve unless there is continuous enhancement of product offerings and service quality. Commonly tension arises between the shared services centre and the business units, and this is exacerbated when business units do not understand the level of service they receive, or the service centres do not understand the level of quality they offer. This ultimately leads to confusion, lowered morale and loss of workers.

Six Sigma is a business strategy and a systematic methodology, use of which leads to breakthrough in profitability through quantum gains in product / service quality, customer satisfaction and productivity. The concept of implementing Six Sigma was pioneered at Motorola in the 1980's and the objective was to reduce the number of defects to as few as 3.4 parts per million opportunities. For effective implementation of Six Sigma projects in organisations, one must understand the critical success factors that will make the application successful.

This dissertation attempts to understand the underlying principles of Six Sigma and its applicability to the Gauteng Shared Services Centre, in order to achieve quantum gains in service quality, customer satisfaction and productivity.

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List of Abbreviations

BPR – Business Process Re-engineering

Bu – Business Unit

DMAIC – Define, Measure, Analyse, Improve, and Control

GPG – Gauteng Provincial Government

GSSC – Gauteng Shared Services Centre

PDSA – Plan, Do, Study, Act

CTQ – Critical to Quality

DPMO – Defects per Million Opportunities

VOC – Voice of the Customer

SSU – Shared Services Unit

TQM – Total Quality Management

CHAPTER ONE
Introduction

1.1 Introduction

Shared Services Centres have become an integral part of organisations, both in the Public and Private sectors. The major justification for their introduction is that theoretically, they should increase service quality and reduce operating costs, whilst also allowing the organisation more time to focus on strategic issues.

These were the exact sentiments of the Gauteng Provincial Government, when they gave their approval for the set-up of the Gauteng Shared Services Centre (GSSC) in September 2002. The idea was to consolidate the Provincial Governments expenditure in Auditing, Human Resource, Procurement, Finance and Technology Support Services and invest these resources into a Shared Service Centre that would benefit the whole Province.

Although these steps were in keeping with global / international practices, the GSSC since its formation has faced many challenges. By the end of the 2004, Gauteng Provincial Government was of the belief, that they were not realising the cost savings and the improvement in services, which a Shared Services Centre aims to accomplish.

1.2 A Background of the Gauteng Shared Service Centre

The GSSC has completed its second year of operational existence, with its main function of providing back-office support services to the Gauteng Provincial Government (GPG). It has been a watershed period that has witnessed the GSSC's transition from a start-up division to one providing value-added transversal services to the eleven GPG Departments, with an headcount of over 120 000 employees.

The GSSC delivers a comprehensive set of HR, Procurement, Technology Support Services (TSS) and Internal Audit Services to the Province. The following is an extract from Gauteng Government MEC, Paul Mashatile's, 2004/2005-budget speech regarding the GSSC "Service Level Agreement (SLA) targets continue to be our measure of service delivery and we continually strive to meet these, despite the challenges we face. We have embarked on a major drive to give service delivery feedback to our key clients and to obtain their direct response and input regarding their experiences of the services delivered by the GSSC. This is

resulting in the deepening of the GSSC-Client relationships and this focuses every-one on the important tasks at hand.

The GSSC is a strategic asset of the Province and is well poised to play a pivotal role during the coming year. We look forward to being the 'service provider of choice to the GPG as we continually seek to improve the operational performance and to find innovative solutions to meet our clients' business needs.

For the 2004/5 financial year, the GSSC has budgeted R47,6 billion. This budget has been split between the key service areas, namely Finance Services, Gauteng Audit Services, Human Resource Services, Procurement Services and Technology Support Services."
The objectives of the five service areas is detailed below and was obtained from the GSSC Annual Report, 2004/2005, as well as from the GSSC's website, www.gssc.gpg.gov.za

1.2.1 Gauteng Audit Services (GAS)

The strategic objectives of Gauteng Audit Services Department is to provide world-class service in corporate governance, integrated risk management processes and best practices, in order to maintain an efficient and effective internal control environment. GAS aims to provide a full range of Internal Audit Services, to all GPG Departments. These services are: -

- **Risk and Compliance Audit**
  - Evaluates the department's control environment and makes performance improvement recommendations thereon.
  - Evaluates the department's level of compliance with legislation, regulations, plans and procedures.
- **Forensic Audit**
  - Assists the Accounting Officers in discharging their responsibility of actively preventing, detecting and investigating fraud, as required by Section 38 of the Public Finance Act.
- **Computer Audit**
  - Evaluates the department's general computer environment, specific applications and new systems being developed.
- **Performance Audit**
  - Assists managers to asses the effectiveness, efficiency and the economic viability of any specific system or project.

- Implements Control Self Assessment throughout the province.

1.2.2 Human Resources Services

The strategic objectives of the GSSC's Human Resource Services Department are to: -

- To render a responsive and cost effective recruitment processing service to the Gauteng Province
- To administer all HR conditions of service timeously and accurately.
- To provide a personalised HR administration service to the GPG senior management.
- To provide specialised HR consulting services, which include:-
  - A Provincial Employee Assistance Program
  - Training Programmes for generic skills development
  - HR and Organisational Development
  - Organisational Design and Work Evaluation
  - Policy Planning and HR Communication
  - HR Intelligence
  - Labour Relations and support
- To establish the benchmark for HR services in the public service. This will include the effective utilisation of technology to render services, enhancing perceived value in HR services and offering best practice systems and frameworks for application across the Province.

1.2.3 Procurement Services

The strategic objectives of GSSC's Procurement Services Department are to: -

- To standardise the procurement processes so that satisfactory delivery of goods and services is ensured to the GPG Departments
- To support good governance by building a purchasing organisation that is based on teamwork, performance, flexibility, formal processes, social consciousness, value for money and customer satisfaction.
- To migrate to current world class technologies that would facilitate processes and vastly improve management of inventories.
- To position all GSSC procurement professionals as thought leaders in the field of socially responsible public sector procurement.

- To develop and maintain 'World-Class Cycle Times' and the completion of all procurement activities effectively, efficiently and timeously.
- To actively pursue BEE collaborative efforts and to exceed any regulatory spending targets in this arena.
- To discourage ineffective manual processes and embrace appropriate technologies that enable better demand management and purchasing practices.
- To use up-to-date and reliable systems that will provide management with the information required in order to drive continuous improvement.

1.2.4 Finance Services

The strategic objectives of the GSSC's Finance Services Department is to continuously improve the quality of services to the public sector and GPG by providing enterprise-wide effective transversal services. These services include: -

- Cashbook Services – To provide timeous bank reconciliation services, effective accounting for cash-related transactions and timeous detection of cheque and Electronic Banking Fraud (EBT) fraud.
- General Accounting Services – To provide effective and sound financial accounting for the GPG
- Accounts Payable (Expenditure) – To make the GPG a client of choice by making sure that the creditors are paid in accordance with the negotiated payment terms using best practices and maintaining a high level of customer satisfaction.
- Debt Management – To achieve the collection requirements in terms of phasing out legacy debt over a three-year period and minimising the inflow of new debt.
- Salary Administration – To administer the GPG payroll using best practices for all bonafide GPG employees.
- BAS and PERSAL System Support – To maintain all financial transversal systems and support all GPG end-users.
- Quality control and systems – To enable the GPG to improve general financial management.

1.2.5 Technology Support Services

The strategic objectives of the Technology Support Services are to: -

- To develop a GPG-wide enterprise architectural framework in conjunction with the departmental CIO's through a governance structure and process.

- To provide a flexible and adaptable IT infrastructure that meets the business needs of the GPG.
- To provide unified and consistent programme management methodology and project office through a centrally co-ordinated Programme Management Office.
- To increase IT capacity in the Province by training employees on the essential technologies required within the GPG and executing a learnership programme.
- To develop an application framework that allows for the co-existence of transversal systems and new Enterprising Planning and Resource (ERP) system for the GPG.

1.3 Motivation for Research

This study will specifically suggest that a Shared Services Centre will have to continuously improve itself, for it to establish itself as part of a positive culture within an organisation. The adoption of Six Sigma Methodology by the GSSC will help it realise this goal.

1.4 Value of the Study

In South Africa the majority of the populace live in abject poverty. The needs of our people are great, but the amount of money available for service delivery is often inadequate. This study will prove that by implementing the Six Sigma methodology at the GSSC, the organisation will overcome its current challenges. It is then hoped that a successful GSSC, will then inspire other Provinces to set-up similar Shared Service Centres. The resulting savings and improvement in the quality of services across the country can then be diverted to poverty alleviation.

1.5 The Research Process

1.5.1 The Research Problem

Many initiatives have been undertaken to improve the way business is conducted. These may bring about incremental changes to the shared services unit but not necessarily to the overall delight of the customer. Service deliverables continues to be unpredictable and inconsistent with a plethora of errors and rework. Thus, the problem statement is defined as:

"The poor quality of services offered by the GSSC does not justify their existence."

The impact of poor quality is: -

- costs are increased through mistakes and rework.
- conflicts arise between business units and the GSSC.
- vendors suspend services, thus, ruining the company's image/reputation.
- negative impact on the value chain (ripple effect of errors).

1.5.2 The Research Question

The research question formulated from the problem statement as defined, reads as follows:

"Can Six Sigma provide an overall solution to improving the quality of services offered by the GSSC?"

1.5.3 The Investigative Questions

The investigative questions formulated from the problem statement and supporting the research question can be defined as: -

- **Can Six Sigma facilitate a quality paradigm shift in the GSSC?**
- **What are the problems being experienced by the Business Units?**
- **What will be the ideal plan for the implementation of Six Sigma?**

1.6 The Research Design Methodology

This study was conducted at the Gauteng Shared Services Centre and at the various Strategic Business Units of the Province that utilises the services of the GSSC.

Table 1.1 Research Design and Methodology

Primary Research	Secondary Research
• Questionnaires were distributed to the business units.	• Intensive searches of Library databases and the Internet. • Review of studies conducted at organisations that have implemented shared services.

1.7 Ethical Considerations

The general ethical issue here is that the research design should not subject the research population to embarrassment or any other material disadvantage. Consent from individual participants was ensured. Ethical issues further look at the implications for the negotiations

of access to the organisation, employees and the collection of data (Saunders *et al.,* 2003). An authorisation letter for data collection was presented to the GSSC to do the research. Consequently the permission to collect data was granted by GSSC management.

1.8 Limitations of the Project

The questions of the survey were confined to questions other than those relating to an understanding of the Six Sigma concept. This was deliberately done because it is a comprehensive philosophy that requires time to understand. Also, establishing the actual level of sigma at which the current processes are operating is complex and requires time and money, thus inferences were made from the customer feedback to that of related sigma levels.

1.9 Key Research Objectives

The main objective of the research is to understand the problems that are being experienced by the Gauteng Shared Service Centre, thereby providing a tool that will enable the GSSC to deliver their services at the highest quality level.

1.10 Chapters and Content Analysis

The following is a brief overview of the six chapters in this dissertation: -

CHAPTER 1 - Introduction

A brief history of the GSSC is given and issues related to the problems it experiences are stated. The Six Sigma methodology is then introduced as a solution to them. Based on these problems faced by the GSSC, the research question is formulated and the investigative questions are identified. The chapter concludes with a chapter and content analysis.

CHAPTER 2 – Literature Review

In this chapter, the key principles of Six Sigma and a Shared Services Centre are analysed. Firstly, the methodology pertaining to Six Sigma will be discussed with reference to the DMAIC improvement model. Secondly, the Shared Services Centre is analysed, focussing on the different SSC models, their advantages and their risks.

CHAPTER 3 – Implementation of Six Sigma at the GSSC

In this chapter, the critical success factors for the implementation of Six Sigma at the GSSC are discussed.

CHAPTER 4 – Research Methodology

In this chapter, the data gathering method is discussed, followed by a description of the population and the sample selection.

CHAPTER 5 – Presentation and Discussion

In this chapter the research question and the investigative questions are discussed. An evaluation and discussion of the results from the survey is then made.

CHAPTER 6 – Recommendations and Conclusion

In this chapter a conclusion of the research findings are made, with emphasis on the implementation plan for Six Sigma at the GSSC.

1.11 Conclusion

The key problems that face the GSSC are introduced and the Six Sigma methodology is offered as the solution to them. These problems assisted in defining the problem statement and the associated research question. Further, from the research question, the investigative questions are formulated. The chapter concludes with a chapter and content analysis of the research paper. In Chapter 2 a detailed literature review of the Six Sigma Methodology and the functional evolution of Shared Service Centres will be conducted.

CHAPTER TWO
Literature Review

2.1 Introduction

Firstly, a thorough literature review of the Six Sigma Methodology is undertaken. Then the review focuses on the activities, implementation models and risks associated with Shared Service Centres. The review also provides a background of the GSSC and the functions of its strategic business units.

2.2 Literature Review of Six Sigma

The concept of production is "The judicious allocation of resources to transform inputs to outputs while maximising flow and value to the customer" (Clough and Sears, 1994).

Viewing production as the flow of materials and information has led to the principle of waste elimination, which was Ohno's number one enemy (Howell, 1999). In fact, Ohno named seven sources of waste in the production process and tirelessly worked on eliminating them. The basic tenet was that removal of waste would result in better workflow (Wormack and Jones, 2000).

A principle associated with waste removal is variability reduction (Berteslen and Koskela, 2002). This means that unreliable workflow is indirectly caused by variability stemming from single or multiple causes that need to be targeted separately or collectively. In the construction industry variability includes late delivery of material and equipment, design errors, change orders, equipment breakdowns, tool malfunctions, improper crew utilisation, labour strikes, environmental effects, poorly designed production systems, accidents and physical demands of work (Abdelhamid and Everett, 2002).

While variability has a myriad of causes it manifests itself in the form of poor workflow reliability between production processes. The effects of variability on workflow reliability are mitigated by the use of surge piles, plan buffers, and/or flexible capacity (Ballard and Howell, 1994). These approaches are attempts to combat the effects of variability and not to eliminate variability altogether.

Schonberger (1986) emphatically states that "variability is the universal enemy" and that reducing variability increases predictability and reduces cycle times. Koskela (2002) adds

that reducing process variability will also increase customer satisfaction and decrease the volume of non value-adding activities.

The elimination or, more realistically, the reduction of variability requires the identification and removal of the root causes of variability. Koskela (2002), mentions that implementing standard procedures is one strategy for reducing variability in conversion and flow processes. He also mentions Shingo's "poka-yoke" or mistake-proofing devices and techniques as another strategy for reducing variability. Koskela (2002) also states that statisticians have been battling variability through statistical quality control theory and techniques. This latter strategy has been reinvigorated in the industrial and business sectors through the Six Sigma approach developed by Motorola.

Six Sigma is a statistically based methodology that provides a structured framework for organising and implementing strategic product and process variability.

2.2.1 What is Six Sigma?

In 1985, Bill Smith of Motorola developed an approach to achieve near-perfection in manufacturing called Six Sigma (Breyfogle, Cupello and Meadows, 2001). Six Sigma refers to a body of statistical and process-based (e.g., process mapping, value stream mapping, etc.) methodologies and techniques used as part of a structured approach for solving production and business process problems plagued with variability in execution (Harry and Schroeder, 2000, Pande, Newman and Cavanaugh, 2000). Some researchers believe that Motorola developed Six Sigma in an effort to revive the zero defect approach Philip Crosby (one of the leaders of quality movement) (Behara et al., 1995). Today, Six Sigma has become a way of life in many other manufacturing organisations (e.g., General Electric, Allied Signal, Ford, and Eastman Kodak) as well as in the service industry (Breyfogle, 2003).

The following definition, suggested by Linderman et al., (2003), embodies the concepts and principles underlying Six Sigma: -

> **"Six Sigma is an organised and systematic method for strategic process improvement and new product and service development that relies on**

statistical methods and the scientific method to achieve dramatic reductions in customer defined rates."

The above definition supports the statement of Snee (2002) that Six Sigma is a business approach that seeks to find and eliminate the causes of mistakes or defects in business processes by focusing on outputs that are of critical importance to customers. He further states that, as a result of enhanced process performance, customer satisfaction is improved and the bottom line is impacted through costs savings and increased revenue. Six Sigma is a strategic approach that works across all processes, products, company functions and industries.

While the definition may seem generic for any process improvement initiative, the focus on defect rates is what makes it unique. The defect rates, defined by an internal or external customer, are caused by product and/or process variability. Reducing variability has been advocated by many of the quality movement leaders such as Deming, Conway, Juran, Crosby, Taguchi, and Shingo (Breyfogle, 2003). Thus, Six Sigma emphasises both identifying and avoiding variation. But what also makes Six Sigma unique is the explicit recognition of the correlation among the number of defects, wasted operating costs and the level of customer satisfaction.

2.2.2 Statistical Definition of Six Sigma

Sigma, **s**, is a letter of the Greek alphabet used by statisticians to denote the standard deviation of a set of data. The standard deviation (sigma) is invariably associated with the calculation of the mean (average) value for a particular set of data. Reporting sigma with the mean gives an indication of how all the data points vary from the mean. Sigma has been used as a measure that reflects the ability of a company to manufacture a product or provide a service within prescribed specification limits (or zero defects).

Understanding the statistical origins of the Six Sigma methodology requires an understanding of variability and the characteristics of normal distribution, which represents many data sets in real life. The unit measurement of sigma is the number of defects per million opportunities. In an ideal world, production output would have no defects. In practice, errors

do occur during production - the highest attainable quality level is six sigma or 3.4 defects per million opportunities.

The following equation and conversion table below describes the process to calculate sigma variation.: -

Equation…

$$\frac{\text{No. of units Processed} \times \text{No. of Potential defects per Unit} \times 1000\,000}{\text{Number of Actual Defects per unit}} = \text{(Number of defects per million operations)}$$

Source: Erwin, Jane "Achieving Total Customer Satisfaction through Six Sigma" Quality Digest (July 2001)

Table 2.1 Conversion Table to Calculate Sigma Variation

Sigma Level	Number of Defects
Six Sigma	3.4 Defects per Million
Five Sigma	230 Defects per Million
Four Sigma	6210 Defects per Million
Three Sigma	66800 Defects per Million
Two Sigma	308000 Defects per Million
One Sigma	690000 Defects per Million

Source: Erwin, Jane "Achieving Total Customer Satisfaction through Six Sigma" Quality Digest (July 2001)

To better appreciate the magnitude of the difference between the different sigma levels, the following spelling mistakes are provided as an example (Breyfogle 2001).

- Sigma Level one: 170 misspelled words per page in a book.
- Sigma Level two: 25 misspelled words per page in a book.
- Sigma Level three: 1.5 misspelled words per page in a book.
- Sigma Level four: 1 misspelled word per 30 pages in a book.
- Sigma Level five: 1 misspelled word in a set of encyclopaedias.
- Sigma Level six: 1 misspelled word in all the books in a small library.

On average, most US manufacturing and service industry firms rate between three to four sigma. Companies operating at six-sigma level in the short term and the 4.5-sigma level for the long term are considered to be 'best in class'.

2.2.3 Six Sigma and Variability

Deming, (1986), the father and creator of Total Quality Management (TQM), stressed that, because all things vary, statistical methods are required to control quality or defect rates. Deming, (1986) stated: "Statistical Control does not imply absence of defective items. It is a state of random variation, in which the limits of variation are predictable."

Deming, (1986) further defined two kinds of variation: common cause and special cause variation (also known as chance and assignable variation, or chronic and sporadic variation). The former is an inherently random source of variation and addressing it involves a major change in the basic process and operating procedures. The later is an unusual but controllable source of variation that requires a correction to bring the process or procedures back to their normal levels.

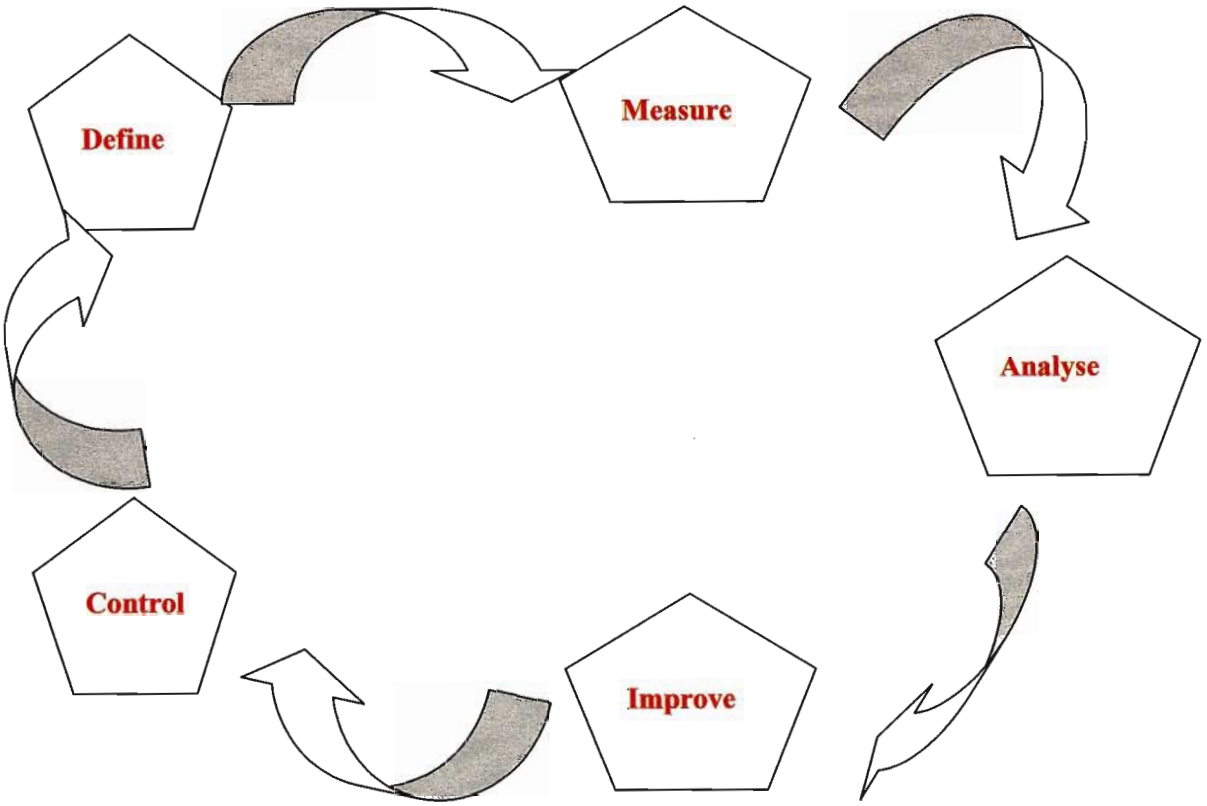
2.2.4 Six Sigma Framework

The framework commonly used to achieve Six Sigma goals is **DMAIC (Define, Measure, Analyse, Improve, and Control).** In its formative years, the DMAIC was practised and perfected on performance improvement initiatives directed at existing processes that resulted in manufacturing defects. Today, the methodology is used for many business processes that fail to meet customer requirements.

The DMAIC approach involves (Harry and Schroeder, 2000):

1. **D**efining and understanding the problem being addressed by identifying the critical customer requirements and key factors affecting the process output;
2. **M**easuring relevant data to the problem primarily through Six Sigma metrics;
3. **A**nalysing, using statistical quality control tools, the production or business process associated with the problem to identify the root causes;
4. **I**mproving the process using alternatives derived in the analysis phase;
5. **C**ontrolling and monitoring the process using statistical process control to sustain the gains and improvements.

Figure 2.1 DMAIC Flow Diagram



Source: Http://www.qpr.com/sixsigma/moreabout SixSigma.html

The approach is based on a scientific method utilising statistical thinking and methods. Statistical thinking is fundamental to the approach, which focuses on the processes used to serve customers, reducing defects by reducing variation, improvement as the goal, and is action orientated (Snee, 2000). Walter Shewhart's view is that "the long-range contributions of statistics depends not so much on getting a lot of highly trained statisticians into the industry as it does in creating a statistically minded generation of physicists, chemists, engineers and others who will in anyway have a hand in developing and directing the production processes of tomorrow." (Shewhart, 1939).

2.2.5 Six Sigma and other Quality Improvement Philosophies

"The U.S. quality movement faces a new set of challenges. We need to overcome the confusion of terms and apparent competing approaches (TQM, ISO9000, Business Process Re-engineering")" (Malcolm Baldridge Award, 1995).

Al Dabar, (1999), asserts "the main philosophy of Total Quality Management (TQM) is preventing problems rather than eliminating them after they happen. TQM is a way of doing

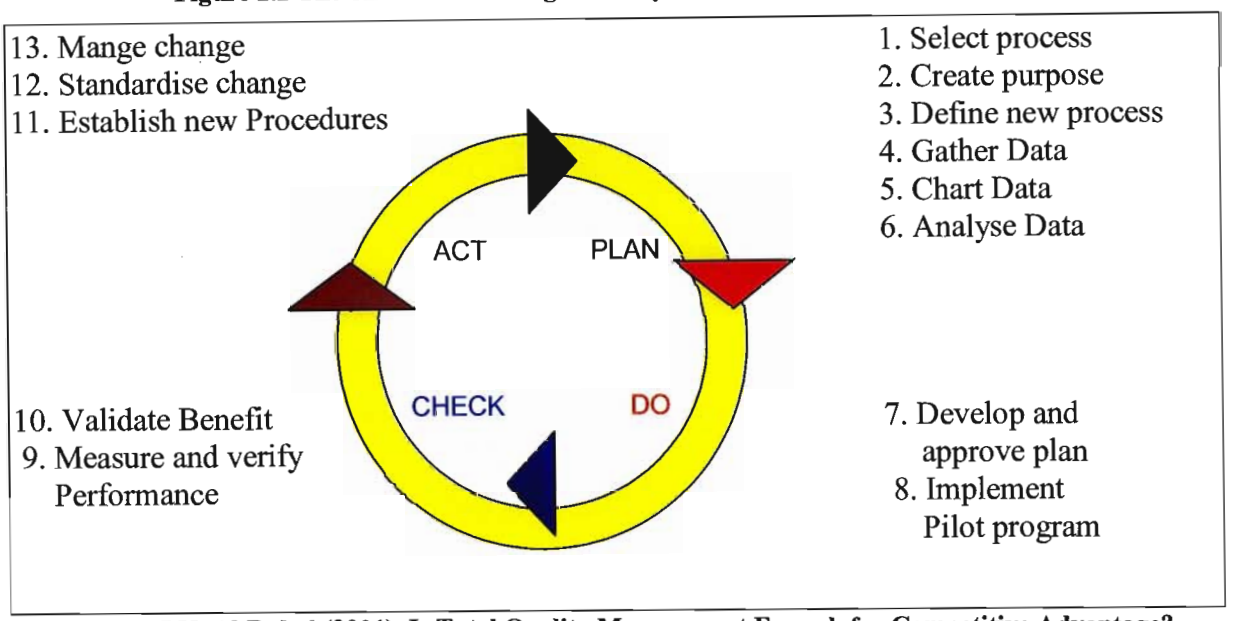
business that creates an environment that responds quickly to clients' changing requirements. In TQM, all members of an organisation need to understand their value and role, both as customer and as suppliers to every customer and supplier with whom they interact, inside and outside the organisation. Work regarding quality improvement is continuing. TQM focuses on continuous improvement of processes in order to improve every facet of an organisation. Each process, whether it is operational, administrative, interdepartmental, or interpersonal, is continually refined and improved. Since TQM focuses on improving the process, output from these processes usually meets or exceeds a client's expectations. This differs from quality control, which depends on inspecting for mistakes and defects at the end of the process, rather than building quality into the process during design and implementation. Thus TQM is process-focused rather than outcome-focused. Dean and Evans (1994) state: "Total quality – a comprehensive, organisation-wide effort to improve the quality of products and services – applies not only to large manufacturers such as Xerox. All organisations- large and small, manufacturing and service, profit and not-for-profit – can benefit from applying the principles of total quality."

The objective of TQM is the continuous improvement of processes, achieved through a shift in focus from outcomes (or products) to the processes that produce them. TQM achieves its objective through data collection and analysis, flow charts, cause and effect diagrams, and other tools, which are used to understand and improve processes.

TQM has taken on many meanings but, simply put, TQM is a management approach to long-term success through customer satisfaction. TQM is based on the participation of all members of an organisation in improving processes, products, services, and the culture in which they work. TQM benefits all organisational members and society. The methods for implementing this approach are found in the teachings of such quality leaders as Philip B. Crosby, W.Edwards Deming, Armand V. Feigenbaum, Kaoru Ishikawa, and J.M. Juran.
TQM is participative management style that stresses total staff commitment to 'customer satisfaction' TQM is an integrated management system for creating and implementing a continuous improvement process – eventually producing results that exceed customer expectations. It is based on the assumption that 90 percent of problems are a result of process and, not of employees' errors.

A widely known element of TQM is W. Edward's Deming's Plan-Do-Study-Act (PDSA) problem-solving cycle, which according to Marta Mooney has become the cornerstone of the TQM movement. Mooney asserts that Deming's formula is "firmly grounded in proven management principles that trace their roots to Frederick Taylor." The following figure depicts the PDSA model, originally called PDCA by Shewhart.

Figure 2.2 The Shewhart-Deming PDSA cycle for learning and improvement



Source: J.K. Al-Dabal (2001), Is Total Quality Management Enough for Competitive Advantage?

Hammer and Champy (1993), the fathers of process, defined Business Process Re-Engineering (BPR) as "the fundamental rethink and radical redesign of business process to achieve dramatic improvement in critical, contemporary measures of performance such as cost, quality service and speed"

Thus, reengineering entails inventing radically different processes in order to comply with customer needs.

On the other hand, Talwar (1993) defined business reengineering, or corporate transformation, as an approach to achieving radical improvements in customer service and business efficiency. He further indicated that this approach involves a strategy-driven, top down reappraisal and redesign of the total business. The essential thing is that their approaches have different characteristics in terms of the degree of change (radical or incremental), the scope of the exercise and the focus of attention.

Similarly, there are many definitions of business process but this one of Harrington (1991) seems most appropriate "A process is any activity or group of activities that takes an input, adds value to it and provides an output to an internal or external customer".

The business concept of "process" has become a revolutionary concept capable of transforming the ways in which a company achieves and sustains competitive advantage.

TQM is often referred to as any allocation of changes, techniques or programmes that management choose to institute improvement. Total conveys the notion that all employees throughout every function and level of the organisation should pursue quality. Quality applies to every aspect of an organisation. It begins with the strategic management process and extends through all its processes. It focuses on continuous improvement.

Consequently, TQM is as much about the quality process as it is about the quality results or products or services. Successful TQM has as its goal successful customer value.

Six-Sigma provides a structured and systematic means of encouraging process and product improvement. TQM can be regarded as a management system consisting of values, methodologies and tools that aim to improve customer satisfaction with a reduced amount of resources, covering values such as:-

- top Management commitment
- focus on customers
- let everybody be committed
- focus on processes
- base decisions on facts
- improve continuously

These values contribute to the creation of an organisational culture. To attain this, the values have to be supported, systematically and continuously, by suitable methodologies and tools. An organisational value of focusing on processes can be established through the use of Process Management. Methodology tools such as process maps and control charts are needed to map and control processes. Process Management defines the essential elements in the Customer – Supplier chain in order to identify the opportunities critical to quality (CTQ).

Process Management also forms the foundation for improvement and breakthrough. In building or transforming an organisational culture one must identify those values that one desires.

Methodologies are chosen to support those values and finally tools supporting those methodologies. Methodologies supporting several values are important to the success of TQM. Six Sigma also illustrates that the management system is dynamic. New methodologies and new tools will appear and be developed and Six Sigma is an excellent example of this.

The most common mischaracterisation of Six Sigma is that it is "TQM on steroids" and that it is nothing new. Breyfogle et al., (2001) quote Tom Pyzdek as saying: "Six Sigma is such a drastic extension of the old idea of statistical quality control as to be an entirely different subject. In short, Six Sigma is entirely new way to manage an organisation. Six Sigma is not primarily a technical program; it's a management development program".

It can, therefore, be said that Six Sigma is a methodology for rather than an alternative to TQM, in much the same way as business process re-engineering launched in the 1990s by Hammer and Champy.

2.2.6 Customer Service Satisfaction

When discussing customer service and/or satisfaction, one talks about creativity. Creativity allows one to handle or diffuse problems at hand or later on in the process of conducting the everyday business. One needs to talk about how, or rather what does the organisation have to do to gain not only the sale but also the loyalty of the customer. It is imperative to know the payoff of the transaction both in the short term and long term. "We want to know what our customers want. We want to know if our customers are satisfied" (S Hutchins, 1989). Satisfaction means that what we delivered to the customer met the customer's approval. We want to know if our customers are delighted and willing to come back.

As important as delightfulness is, it is sometimes minimised or even totally disregarded. At this point we fail. Some of the issues that will guarantee failure in sales, satisfaction, and loyalty are presented here.

- employees must adhere to a rigid chain of command.

- employees are closely supervised
- conflict - in whatever form - is not allowed
- rewards are based on carrot and stick principles
- wrong objectives are measured.

The importance of the quality activity within the organisation has been evolving along with the importance of the customer.

Marketing has traditionally claimed jurisdiction over the activities directed at acquiring and retaining customers. The roles of the quality function and marketing function are overlapping and complementary. Quality is the primary driver in the effort to get new customers and keeping existing customers. Thomas Pyzdek (1999) says "TQM merely represents the quality profession discovering principles which the marketing profession knew long ago. What is new about TQM is the convergence of quality principles and marketing principles. TQM represents a perspective of the organisation that combines cause (process management for quality) and effect (product quality, customer satisfaction)."

Edosomwan (1993) defines a customer – and market driven enterprise as one that is committed to providing excellent quality and competitive products and services to satisfy the needs and wants of a well-defined market segment. This approach is in contrast to that of the traditional organisation, as shown below: -

Table 2.2 Traditional organisations vs. Customer- Driven organisations

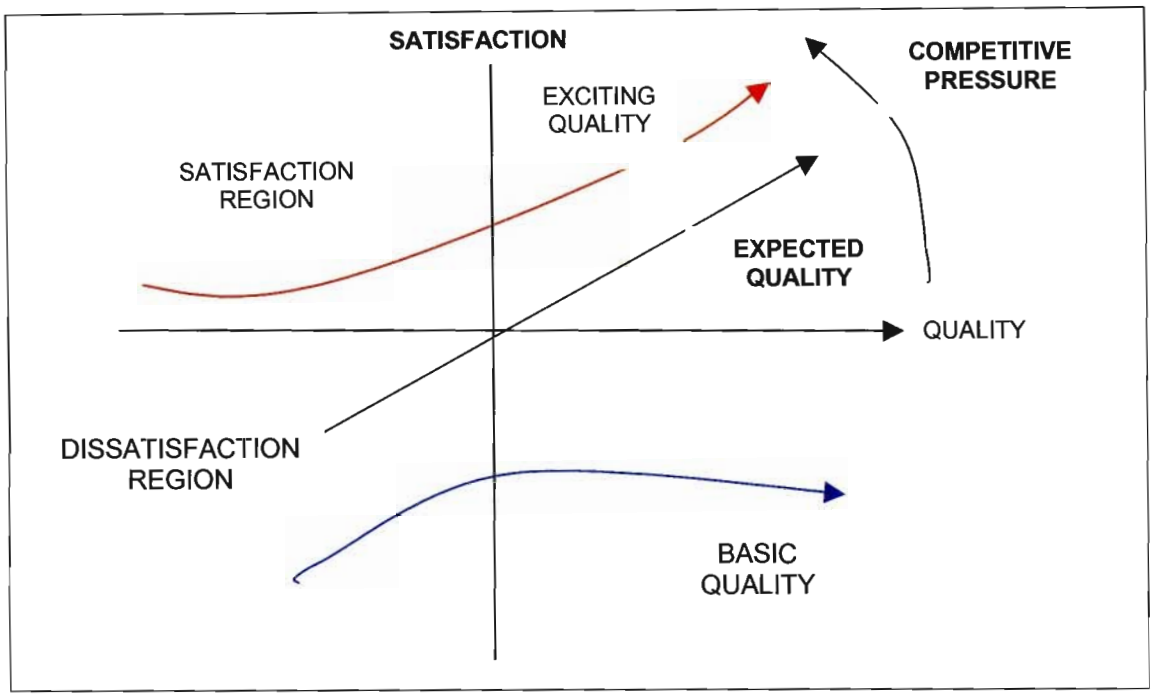
	TRADITIONAL ORGAINSATION	CUSTOMER-DRIVEN ORGANISATION
Product and service planning	Short-term focus. Reactionary management. Management by objectives planning process.	Long term focus. Prevention based management. Customer driven strategic.
Measure of Performance	Bottom line financial results. Quick return on investment.	Customer satisfaction, Market Share. Long term profitability. Quality orientation. Total productivity.

Attitude towards Customers	Customers are irrational and a pain. Customers are a bottleneck to profitability. Hostile and careless. "Take it or leave it" attitude.	Voice of the customer is important. Professional treatment and attention to customers is required. Courteous and responsive. Empathy and respectful attitude.
Quality of products	Provided according to organisational requirements.	Provided according to customer requirements and needs.
Marketing Focus	Seller's market. Careless about lost customers through customer satisfaction.	Increased market share and financial growth achieved.
Process Management approach	Focus on error and defect detection.	Focus on error and defect prevention.
Product and service delivery attitude	It is OK for customers to wait for products and services.	It is best to provide fast time –to market products and services.
People orientation	People are the source of problems and are burdens on the organisation.	People are an organisation's greatest resource.
Basis for decision making	Product driven. Management by opinion.	Customer driven Management by data.
Improvement Strategy	Crisis management. Management by fear and intimidation.	Continuous process improvement. Total process management.
Mode of operation	Career driven and independent work. Customers, suppliers and process owners have nothing in common.	Management supported improvement. Teamwork between suppliers, process owners and customers.

Source: Six Sigma Handbook (Thomas Pyzdek)

According to Thomas Pyzdek (1999), customers seldom spark true innovation (for example, they are usually unaware of state of the art developments), but their input is extremely valuable. Obtaining valid customer input is a science in itself. Market research firms use scientific methods such as critical incident analysis, and surveys to identify the "voice of the customer." Noritaki Kano developed the model set out below of the relationship between customer satisfaction and quality.

Figure 2.3 Kano Model,



Souce: Thomas Pydek, 1999 The Complete Guide to Six Sigma p143

The Kano model shows that there is a basic level of quality that customers assume the product will have. For example, all cars have windows and tyres. If asked, customers do not even mention the basic quality items, they take them for granted. However, if this quality level isn't met, the customer will be dissatisfied. Providing the basic quality is not enough to create a satisfied customer. The expected quality line represents those expectations which customers explicitly consider, for example, the length of time-spent waiting in line at a checkout counter. The model shows that customers will be dissatisfied if their quality expectations are not met; satisfaction increases as more expectations are met.

The exciting quality curve lies entirely in the satisfaction region. This is the effect of innovation. Exciting quality represents unexpected quality items; the customer receives more

than expected. For example, Cadillac pioneered a system where the headlights stay on long enough for the owner to walk safely to the door.
Competitive pressure will constantly raise customer expectations. Today's exciting quality is tomorrow's basic quality. Firms seeking to lead the market must innovate constantly. Conversely, firms that seek to offer standard quality must constantly research customer expectations to determine the currently accepted quality levels.

Thomas Pyzdek, (1999) together with other authors, believes that even Six Sigma does not go far enough. In fact, even zero defects falls short. Defining quality as only the lack of non-conforming product reflects a limited view of quality. Motorola never intended to define quality as merely the absence of defects; however some have misinterpreted the Six Sigma programme in this way. He further states that Six Sigma only addresses half of the Kano Model. By focusing on customer expectations and prevention of non-conformance and defects, Six Sigma addresses the portion of the Kano model on and below the line labelled: "Expected Quality". While there is nothing wrong with improving these aspects of business performance, they will not ensure that the organisation remains viable in the long term. Long term success requires that the organisation innovate. Innovation is the result of creative activity, not analysis. Creativity is not something that can be done 'by the numbers'. In fact, excessive attention to rigorous process such as Six Sigma can detract from creative activities if not handled carefully.

2.3 Literature Review of Shared Services Centre

"A definition of a Shared Services Centre is an independent organisation or Business Unit created to provide non-core, non strategic, but essential services to client groups within a company."

(Hollard & Davis Management Consultants)

"A Shared Services Centre is an independent organisational entity that provides well-defined support services to a Business Unit in an organisation."

(AndersonConsulting)

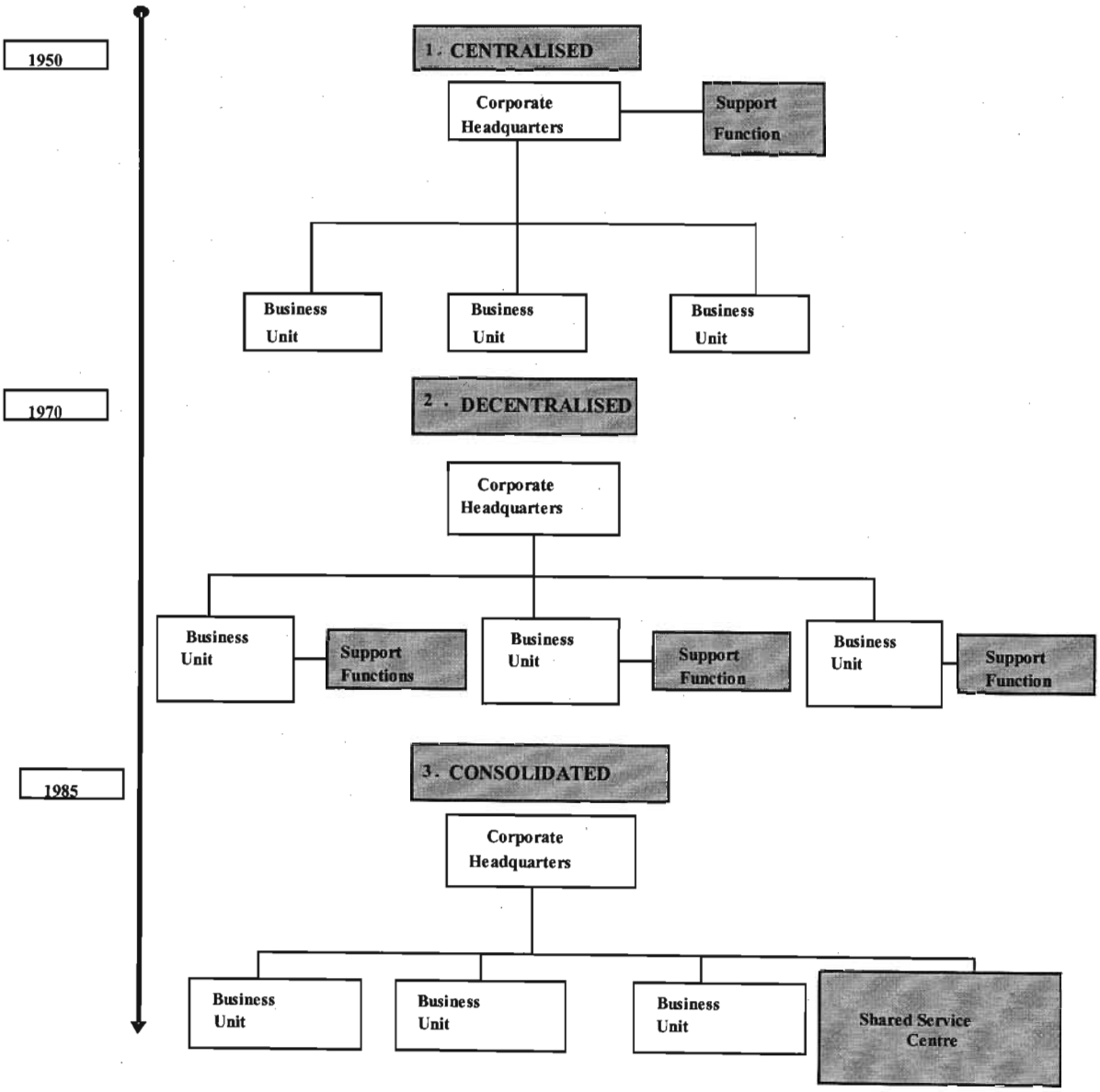
"Shared services mean internal outsourcing. It is the term used for standardisation, re-engineering and consolidation of non-core functions within a company."

(Shared Services and Outsourcing Network.com)

2.3.1 Evolution of Support Function Administration

In an effort to reduce costs associated with necessary functions, companies are consolidating their support functions into shared services. The structural evolution of support function administration is depicted below.

Figures 2.4 Structural evolution of support function administration.



Source: Corporate Strategy Board (1998). Research paper, Functional Unit Strategic Planning

Support functions within corporations have evolved considerably from the 1950s to the present .The three principle support function structures are highlighted in the table below:

Table 2.3 Characteristics, Advantages and Disadvantages of the 3 support function structures.

Support Func.	Characteristics	Advantages	Disadvantages
Centralised Support Functions (1950s, 1960s)	Support functions centrally located at corporate headquarters Functions responsible solely to corporate management	Imposes standardised services from a central source on multiple business units	Perceived to be unresponsive to the needs of line management and individual business units Provides potentially generic services
Decentralised Support Functions (1970s,1980s)	Support functions co-located at individual business units. Functions responsible primarily to business-unit management	Provides services carefully tailored to individual business needs.	Allows for redundancy of multiple business units Non-standardisation of services may result in inefficient services to external customers maintaining relations with multiple business units.

Support Func.	Characteristics	Advantages	Disadvantages
Consolidated Support Functions (1980s,1990s)	Support function consolidated in one location; manifested in either of the two models defined below: ***Outsourcing***-retention of an external vendor to supply a service or process previously supplied by an internal component of an organisation ***Shared Services***-services used across a company and consolidated within one autonomous staff support unit operating as an internal vendor/ consultant with the option of marketing services externally	Reduces cost of administration due to greater economies of scale. Allows for some standardisation of services across the parent organisation. Delivers services from a central location accessible to multiple business units Provides carefully tailored services to individual business units as customers Facilitates strategic approach to services delivery through acceptance of the line as customer; allows line to concentrate on strategic issues.	Very difficult to reverse course and revert to in sourcing by either disbanding a shared service centre or terminate a vendor relationship Very high level of precision needed in planning and implementation to ensure success.

Source: Corporate Strategy Board (1998) Research Paper, The Corporate Centre: Business and Functional – Unit Relationships.

As the burden of support services delivery planning shifts from line management, shared services shoulder the burden of a high level of planning to ensure success. Shared Services must, therefore, develop processes of high quality to meet the needs of their "Customer"

effectively. Otherwise, business units will purchase necessary services from external vendors.

The Gauteng Shared Services Centre (GSSC) was created in September 2002. Functions such as Audit Services, Human Resource Services, Procurement Services, Finance Services and Technology Services were previously performed by the individual business units, (Marketing Division, Human Resources Division and IT Division). Now these functions have been removed from line and consolidated into the GSSC.

(Lustig, 2000) states that during the 1980s American companies began to decentralise support staff in response to perceptions that support functions had become detached from the needs of the business units and the ultimate end customer. Functions once centralised at corporate level, such as human resources, sales and marketing, information systems, accounting, legal, and purchasing, were integrated into the individual business units where they were needed and where they would be focused and accountable.

The research document (Corporate Executive Board, 1997) further states that this trend tended to create within corporations virtually autonomous fiefdoms - scattered empires in which there was considerable duplication of efforts, resulting in enormous waste and redundancies in manpower, technology, facilities and contracts. Today the need to eliminate such redundancies is exacerbated by global competition and shareholder activism. Companies are increasingly turning to shared service centre organisational models to combine the economies of centralisation with superior service, customisation and focus associated with decentralisation.

Shared services tend to include discrete functions, such as information systems, human resources and finance. Within these functions, they tend to focus on transactional areas, such as payroll processing, data systems entry, accounts payable and benefits claims processing.

2.3.2 Definition of a Shared Service Centre

A Shared Services Centre is defined as a separate department/division within an organisation that provides internal support services for other business units. Common management practices are concentrated into one business unit, called a shared service centre-focused entirely on delivering services to internal customers with the highest value at the lowest cost.

The structures create cost economies coupled with accountability within the organisation, an arrangement that is more effective than having multiple points of responsibility and varied management practices (Corporate Executive Board. 1999)

2.3.3Activities of Shared Service Units

Shared services typically are non-core activities that can create economies of scope and scale that are conducted centrally. Functions such as human resources, information systems, finance, marketing and accounting often fall into this category. An organisation called Global Connection performed an independent on-line survey of more than 50 firms in January 1999, which showed the activities that are most frequently included in shared service centres

Table 2.4 Activities in Shared Service Centres

Activity	Percentage Providing the service
Accounts payable	Between 50% & 60%
Travel Expenses	Between 40% & 50%
Payroll	Between 40% & 45%
Financial Analysis	Between 35% & 40%
Accounts Receivable	Between 35% & 40%
Purchasing	Between 30% & 35%
Tax Services	Between 35% & 40%
Credit and Collections	Between 35% & 40%
IT Operations	Between 30% & 35%
HR Consulting	Between 25% & 30%
Compensation and Benefits	Between 20% & 25%
Facilities Management	Between 20% & 25%
External Reporting	Between 20% & 25%
IT Development	Between 30% & 35%
Health and Safety	Between 25% & 30%
Pensions Administration	Between 20% & 25%
Legal	Between 20% & 25%
Public Affairs	Between 20% & 25%
Logistics Support	Between 15% & 20%
Other Unspecified Services	Between 45% & 50%

Source: Corporate Strategy Board (1998), Research Paper, Shared Service Centres

2.3.4 Implementation Models

Each Shared Service Centre (SSC) is unique due to the company's circumstances. Centres can vary as to the activities included, the method of billing, the use of external providers for business-unit support services, the provision of services for external buyers and other factors. There are basically three major SSC implementation models (Corporate Executive Board, 1998), and these are listed below: -

- **Conservative Model** – By implementing this model, a company standardises its support functions while maintaining them under corporate control.

- **Moderate Model** – In this model, a company aggressively reduces operating costs by benchmarking its Shared Services Centre against external service providers and allowing business units to employ external providers.

- **Aggressive Model** – In this model, a company creates a separate business unit to provide shared services to internal as well as external customers.

The following table describes these models and their key attributes.

Table 2.5 Shared Service Implementation Models

Model	Characteristic	Principle
Conservative Model	**Usage**-Business units are required to use the Shared Service Centre (SSC) for all support services. **Pricing**-Business units pay a flat rate for services, or corporate centre funds. **Customer Base** – SSC operates as a corporate entity serving internal customers only.	A company may implement the Conservative Model in an attempt to centralise and standardise support functions while maintaining complete control over them at the corporate centre.

Moderate Model	**Usage** - Business units are permitted to outsource services to an external producer. **Pricing** - Business units pay the actual costs of services rendered or similar fees. **Customer Base** - SSC is a corporate entity serving internal customers only.	Companies that want to achieve significant cost savings implement the Moderate Model and allow the shared service centre to compete with external support providers, either explicitly or through benchmarking.
Aggressive Model	**Usage** - Business units within the company use the most efficient producer, either the SSC or an external provider. **Pricing** - Business units pay the actual cost of services rendered. **Customer Base** - SSC is a separate business unit serving internal and external customers equally.	A company may ensure the market competitiveness of its shared service centre by allowing it to serve external customers and operate as its own business.

Source: Corporate Strategy Board (1998), Research Paper, Shared Service Centres

2.3.5 Advantages of Shared Service Centres

The three main advantages of shared services are the increased service quality, reduced operating costs and more time for strategic planning (Lustig, 2000). These are further elaborated below: -

- *Increased Service Quality*

  As support functions are centralised, employees that originally served individual business units began to serve the entire organisation. They specialise in providing a particular service for the entire company. This increases the quality of their work. In theory, the quality of shared services is constantly improving due to the centre's customer-focus and motivation from the marketplace to increase service quality continuously.

- *Reduced Operating Costs*

  Centralisation in support functions help achieve economies of scale and scope. Standardisation, where applicable, further reduces costs. Finally, competition from

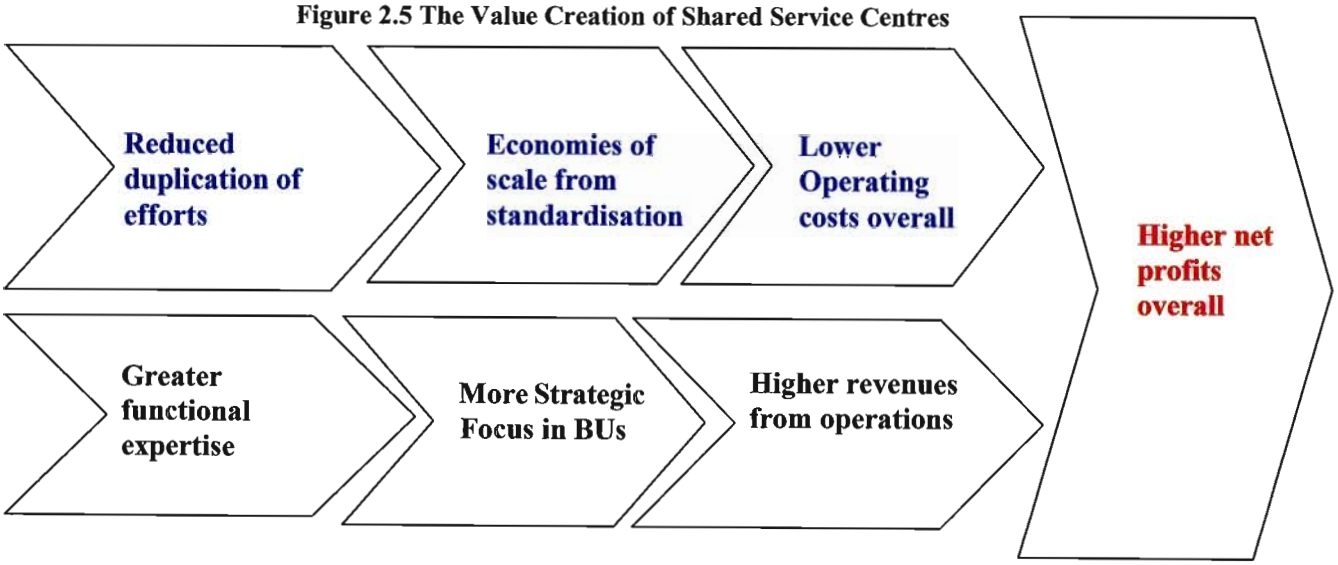
external providers motivates the shared service centre to improve its process and product offerings continuously, thus allowing business units to receive the same services at lower prices or better service for the same price, whether from the shares services centre or from an external provider.

- *More time for focus on strategic issues*

  As argued by Quinn, Thomas, and Penny, in the *Harvard Business Review* (1990), businesses can increase their profitability by outsourcing all non-core support services to specialists. A shared service centre houses such specialised employees in an internal organisation. By shifting all support-function decision making to service centre, business-unit executives can concentrate on strategic issues.

The following graphic illustrates how shared service centres create value: -

Figure 2.5 The Value Creation of Shared Service Centres



Source: Corporate Strategy Board (1999), Research Paper, Shared Service Centres.

2.3.6 Risks Associated with Shared Service Units

(Lustig, 2000) emphasises that companies with shared services centres face several challenges for the success of the centres. These are set out below: -

- **Unsustainability of Benefits -** Although centralisation of support functions causes initial cost savings, these benefits may not improve unless incentives are in place for the employees to continuously enhance product offerings and service quality.

- **Tension between business units and service centre** - Commonly tension arises between the shared service centre and the business units, and this is exacerbated when business units do not understand the level of service they receive or service centres do not charge costs back to the appropriate source.

- **Disruption in Operation** - The short–term implementation process can disrupt business processes and lead to human resource concerns such as lowered morale, confusion and loss of workers.

2.4 Conclusion

Six Sigma is a business strategy and a systematic methodology, use of which leads to a breakthrough in profitability through quantum gains in product/service quality, customer satisfaction and productivity.

Functions of a Shared Services Centre are more important to the success of most organisations today, than they have ever been before. Shared Service units influence how the organisation manages its human capital (personnel), financial capital and technology. These are the three most important components of an organisation today.

For effective implementation of Six Sigma, one must understand the critical success factors (CSF's) that will ensure the successf of the application. This will be discussed in Chapter 3

CHAPTER THREE
The Implementation of Six Sigma in the GSSC

3.1 Introduction

Jack Welch, CEO General Electric, is quoted "Boundarylessness defines the way we behave; Six Sigma defines the way we work. Six Sigma Quality 2000 will be the biggest, the most personally rewarding and, in the end, the most profitable undertaking in our history." (Conlin, 1998).

Although Six Sigma was originally developed by Motorola in the 1980s, many other world-class organisations have derived benefits from the implementation of the Six Sigma philosophy. Those benefits are tabled below.

Table 3.1 Benefits realised from implementing Six Sigma

Company	Industry	Benefits
General Electric	Diversified Products	$5 billion by 2000 (since 1996)
Toshiba	Technology	$1.16 billion in 2000/2001
American Express	Financial Services	$2.5 Billion in 1999
Ford	Automotive	$475 Million in 2001
Dow	Chemicals	$1.5 Billion (EBIT) by 2003
Johnson & Johnson	Energy & Utilities	$3 Billion since 1995
Motorola	Technology	$1.5 Billion in 1999
Noranda	Mining & Materials	$34 Million in 2000

Source: IQPC Six Sigma Conference South Africa 2003

Key ingredients are those that are essential to the success of the implementation of any quality improvement initiatives. The identification of such factors will encourage their consideration when companies are developing an appropriate implementation plan (Mann and Kehoe, 1995). Henderson and Evans, (2000) have identified the key components of successful Six Sigma implementation, such as upper management support, organisational infrastructure, training, application of statistical tools and link to human resources-based actions (e.g. bonuses and promotions.)

3.2 Strong Leadership and Top Management Commitment

A popular Six Sigma saying "Driving Shareholder value is what executives get rewarded for" (Quinn, 2000).

Any successful initiative like Six Sigma requires top management involvement and the provision of appropriate resources and training (Halliday, 2001). Many previous quality initiatives, such as TQM, have been faced with a major difficulty, which has been the leadership attitude of "Do as I say...not as I do". Some initiatives also faded out because the company leaders lost focus (Pande, 2000). In order to overcome this problem, company leaders have to ensure that the Six Sigma initiative is a momentum for process improvement and hence it must be sustained over the long term. The underlying principles of Six Sigma must be taught to senior managers within the organisation. Jack Welch, the CEO of GE, has strongly influenced and enabled the restructuring of the business organisation and changed the attitude of the employees towards Six Sigma (Henderson & Evans, 2000).

Good support from top management is imperative in the restructuring of the organisation and achieving the cultural change and motivation of employees towards quality and the Six Sigma strategy to the business. The leaders have to be strong advocates of Six Sigma. Eagerness and enthusiasm shown by the leaders can go a long way in gaining the support of the employees. Without the continuous support and commitment from top management, the true importance of the initiative will be in doubt and the energy behind it will be weakened (Pande et al., 2000)

3.3 Cultural Change

The successful introduction of Six Sigma requires adjustments to the culture of the organisation and a change in the mindset of its employees. Employees have to be motivated towards the introduction and development of the Six Sigma programme through various reward and recognition schemes. There can also be a problem of employees dismissing Six Sigma as the latest fad or hype. To overcome this problem and also to allay the fears that employees may have, there has to be early and effective communication to all employees on the why and how of Six Sigma.

Eckes (2000) identifies four different factors of resistance, which are:

- ***Technical*** – frequently people find difficulties in understanding statistics within the Six Sigma programme. Education and involvement is needed.
- ***Political*** – it is based on seeking the solution to be implemented in the face of a loss, real or imagined. The strategy to avoid this is to create the need for change and then showing how change can be beneficial for them.
- ***Individual*** – it consists of employees who are highly stressed as a result of personal problems. The strategy could be to try to reduce stress by diminishing the workload.
- ***Organisational*** – this occurs when an entire organisation is committed to certain beliefs, which are usually instituted and communicated by the management. Reluctance to change can be diminished by communicating to the managers the benefits of the initiative.

The employees at GE were very uneasy at first at the thought of having to learn statistics. This was due to the misconception that Six Sigma is essentially a statistical toolset. Today Six Sigma within GE Is the way employees do their job in everyday life and it is nothing more than the mindset of people with the ultimate goal of "doing things right the first time." The success of an organisation in both the local and overseas markets depends heavily on the culture of that particular organisation (Sohal, 1998). Six Sigma initiatives require the right mindset and attitude of the people working within the organisation at all levels. The people within the organisation must be informed and be aware of the need for change. Companies that have been successful in managing change have identified that the best way to tackle resistance to change is through increased and sustained communication, motivation and education. Peter Senge (1990) introduced the idea of the "Learning Organisation". He says that for big companies to change, people need to stop thinking like mechanics and to start acting like gardeners.

With a true cultural revolution in an organisation come two basic fears on an individual level: fear of change and fear of not achieving the new standard. To overcome the fear of change in any environment, the people involved must understand the need for change. It would be ideal to create a communication plan that would address why Six Sigma is important, and how the methodology of Six Sigma works in organisations (Hendricks and Kelbaugh, 1998) It is also essential to restructure the organisation to drive the culture and make Six Sigma a part of everyday life. After the implementation of Six Sigma projects, it

is best to publish the results, but these should not be restricted to success stories but also admit and communicate stumbling blocks. This will help other projects in the pipeline to avoid the same mistakes and learn from them.

3.4 Organisation Infrastructure

In addition to top management, there also needs to be an effective organisational infrastructure in place to support the Six Sigma introduction and development programme within any organisation. The employees in an organisation practising Six Sigma are generally highly trained, have undergone rigorous statistical training, and lead teams in identifying, executing and managing Six Sigma projects. In many multinational corporations (such as GE, Motorola and Honeywell), Six Sigma initiatives are led by the CEO or vice-president, who is considered as the Six Sigma champion. This will be followed by the formation of master black belts, black belts, green belts and other team members who are individuals who support specific projects (Harry and Schroeder, 2000). Apart from the belt system, the Six Sigma program also requires project sponsors (or champions in some organisations) who provide guidance to the project team and find and negotiate resources and budget for the project. The timing and readiness of the organisation is also important. This is because the Six Sigma effort requires a great deal of resources such as staff commitment, top management commitment, time, energy and costs.

3.5 Training

It is critical to "communicate the 'why' and 'how' of Six Sigma as early as possible, and provide the opportunity to people to improve their comfort level through training classes" (Hendricricks and Kelbaugh, 1998) before unleashing the employees into the world of Six Sigma. There is usually a hierarchy of expertise, which is identified by the "black belt system". Within GE, the black belt system is fundamentally divided into the groups listed below (Henderson and Evans, 2000)

- ***Champions*** – fully trained business leaders promoting and leading the Six Sigma deployment in significant or critical areas of the business.
- ***Master Black Belts*** – fully trained quality leaders responsible for Six Sigma strategy, training, mentoring, deployment and results.
- ***Black Belts*** – fully trained experts leading improvement teams across the business.
- ***Green Belts*** - individuals trained in Six Sigma supporting Six Sigma projects.

- ***Team members*** – individuals supporting specific projects in their areas.

The black belt system ensures that everyone in the organisation is speaking the same language. This makes the setting up and execution of Six Sigma projects much easier throughout the organisation. The curriculum in the belt system varies from organisation to organisation and consultant to consultant; however, it needs to be provided by identifying the key roles of people directly involved in applying Six Sigma. The training for becoming a black belt within Motorola is a minimum of one year. In order to be accredited to black belt, candidates must complete an application form to demonstrate how they have met the requirements in both the training and practice of Six Sigma (Ingle and Roe, 2001). In GE the length is approximately 16-20 weeks. Qualification as a black belt is very important when employees are being considered for promotion.

Another important by-product of such company-wide training is that it fosters a culture where the ownership of quality is viewed as the responsibility of the entire organisation and not just the quality department (Hoerl, 1998). Although investment in training is a key factor, in order for people to use the knowledge successfully, it is important for the training to be structured in such a way that it is relevant to employees' everyday jobs. The best way to achieve this is to provide 'hands on' learning so that people can put key concepts and skills into immediate practice. Moreover, the examples and exercises used in the training have to reflect the needs and challenges faced by the particular business.

3.6 Understanding the Six Sigma Methodology, Tools, Techniques and Metrics

A healthy portion of the Six Sigma Training involves learning of the theory and the principles behind the methodology, i.e., the DMAIC cycle. The elements of the DMAIC cycle are explained below (Antony and Bhaiji, 2002)

3.6.1 Define Phase - This phase involves these points.

- Who are the customers and what are their needs and expectations?
- Understand the customer's critical to quality (CTQ) needs and expectations and transform them into project CTQ's.
- Develop a project team charter (who is doing what, determine project goals, what are the key deliverables, benefits of doing the project and cost issues?)

- Gather data from customers to understand exactly what they want (use of customer surveys, benchmarking data and Quality Function Deployment)
- What is the process? Use tools such as high level process mapping to map out core processes.

3.6.2 Measure Phase - This phase involves these points.

- How is the process measured and how is it performing?
- Decide what to measure and how does one measure it?
- Measure current performance of the process (Throughput yield, DPMO and Capability)
- Is there a capable measurement system?
- What is the variability contributed by the measurement system to the total variation?

3.6.3 Analysis Phase - This phase involves these points.

- How can the causes of defects or failures be removed?
- Identify the key variables, which cause the problems.
- Document solution statements.
- Test solutions and measure results.

3.6.4 Control Phase - This phase involves these points.

- How can the improvements be maintained or sustained?
- Document the new methods.
- Select and establish standard measures to monitor performance.

During the training, employees identify three groups of tools and techniques, which are divided into these categories (Henderson and Evans, 2000): -

- team tools – responsible grid, threat versus opportunity matrix, action workouts;
- process improvement tools/techniques – brainstorming, Pareto analysis, process mapping, cause and effect analysis, Design of experiments;
- statistical tools – hypothesis tests (t-test, F- test, Chi squared test), scatter plots, control charts and regression analysis.

For many Six Sigma projects, simple tools or quality tools are generally more than enough to tackle the problem at hand. However, for greater breakthrough improvements in business processes, certain advanced statistical tools and techniques (such as design of experiments, statistical process control, regression analysis and analysis of variance) are needed.

In addition, there has to be a clear set of metrics that are used to measure process performance against customer requirements. Examples of metrics include defect rate, cost of poor quality and throughput yield. Accurate data are also required for analysing potential root causes and to support the team's decisions.

3.7 Project Management Skills

Projects are the bridge between planning and doing (Pydex, 2001). Frank Gryna makes the following observations about projects (Gryna, 1988): -

- A project, which is agreed upon, is a legitimate project. This legitimacy puts the project on the official priority list. It helps to secure the needed budget, facilities, and personnel. It also helps those guiding the project to secure attendance at scheduled meetings, to acquire requested data and to secure permission to conduct experiments.
- The project provides a forum of converting an atmosphere of defensiveness or blame into one of constructive action
- Participation in a project increases the likelihood that the participant will act on the findings.
- All breakthroughs are achieved project by project, and in no other way.

As Six Sigma is a project -driven methodology, it is good practice for the team members to have project management skills to meet the various deadlines or milestones during the course of the project (Antony and Banuelas, 2001). Most of the projects on Six Sigma fail due to poor project management skills, setting and keeping ground rules, determining the meeting's roles and responsibilities (Eckes, 2000).

3.8 Project Prioritisation and Selecting, Reviews and Tracking

There have to be proper criteria for the selection and prioritisation of projects. Poorly selected and defined projects lead to delayed results and also a great deal frustration. Pande

et al., (2000) provide three generic categories of project selection criteria. These are set out below: -

3.8.1 Business benefits criteria

- Impact on meeting external customer requirements
- Financial impact
- Impact on core competencies.
- Urgency

3.8.2 Feasibility criteria

- Resources required
- Complexity issues
- Expertise available and required
- Likelihood of success within a reasonable timeframe

3.8.3 Organisational impact criteria

- Cross-functional benefits
- Learning benefits, i.e. new knowledge gained about the business, customer and process

Projects reviews must be conducted on a regularly scheduled basis to drive the projects to a successful completion and closure. Review process would enable the black belts and green belts to follow the Six Sigma methodology correctly. Six Sigma champions should use the project review process to understand what the black belts and green belts see as barriers to the progress of their projects. It is good practice to have a project tracking system to track all projects, which are submitted for consideration, accepted for implementation, in progress and completed.

For many organisations, financial returns to the bottom-line are the main criterion. Therefore the projects should be selected in such a way that they are closely tied to the business objectives of the organisation (Ingle and Roe, 2001). The scope and the lead-time of projects are crucial during the early stages of the Six Sigma effort. Many complex projects require long-term efforts and huge investment leading to long lead times for

payoffs. This can sometimes be frustrating and may discourage many people in organisations. Hence it is imperative to keep projects small and focused so that they are meaningful and manageable.

3.9 Linking Six Sigma to business strategy

Six Sigma cannot be treated as yet another stand-alone activity It requires adherence to a whole philosophy rather than just the usage of a few tools and techniques of quality improvement (Dale, 2000). It needs to be clear how Six Sigma projects and other activities link to customers, core processes and competitiveness (Pande et al, 2000). Since the goal of every organisation is to make profits, Six Sigma projects make business processes profitable, while combating variability that leads to high scrap rate, high re work rate and low productivity. In every single project, the link between the project objective and business strategy should be identified.

3.10 Linking Six Sigma to the Customer

A key element of the success of the Six Sigma programme is its ability to link to the customers. Projects should begin by determination of customer requirements (Harry and Schroeder 2000). However Pande et al., (2000) argue that before customer needs can be met successfully, there has to be a good understanding of the organisation and its linkage to various business activities. The process of linking Six Sigma to the customer can therefore be divided into two main steps: -

- identifying the core processes, defining the key outputs of these processes and defining the key customers that they serve.
- identifying and defining the customer needs and requirements.

The first step is based on Porter's concepts of value chains (Porter, 1985), which aims at representing the organisation as a collection of activities. Core processes are usually chains of tasks involving departments and functions that deliver the products and services to the customer. Core processes are supported by a number of enabling processes that provide vital inputs to the value-generating activities. Therefore the companies first need to identify, define and prioritise their core business processes. The next stage would then be to define the key outputs from the core processes and the key customers that these outputs serve. Using this information, process maps can be produced for each of the core processes

and how they interconnect. This creates a better understanding of the business and its interdependencies.

Having defined the core processes, the next step is to define the customer requirements. The organisation needs to recognise the fact that the needs, demands and attitudes of customers change over time. The organisation therefore needs to prioritise projects that enhance the ability to meet the customer's needs. In line with the data–driven philosophy of Six Sigma, the business needs to a "Voice of the Customer" (VOC) system to gather customer data. This VOC system becomes valuable only if the data is analysed and acted upon. The insight gained from this data can be used to establish guidelines for performance and customer satisfaction. The data can also be used to analyse and prioritise customer requirements and hence link these to the company strategy.

An important issue here is the selection of critical-to-quality characteristics (CTQs). These CTQ's must be identified quantitatively in the starting phase of the Six Sigma methodology. Quality function deployment is a powerful technique for understanding the needs and expectations of customers and translating them into design or engineering requirements.

3.11 Linking Six Sigma to Human Resources

Human resources-based actions need to be put into effect to promote desired behaviour and results. Some studies show that 61 percent of the top performing companies, link their rewards to their business strategies, while lower performing companies create minimal linkage (Harry and Schroeder, 2000). Across all GE businesses no one will be promoted without the full Sigma training and completed project. This in itself is an impressive behaviour driver (Hendricks and Kelbauch, 1998). Moreover, Jack Welch of GE required the black belt managing the project to prove that the problems were fixed permanently (Conlin, 1998).

3.12 Linking Six Sigma to Suppliers

Many organisations that implement Six Sigma find it beneficial to extend the application of Six Sigma principles to management of their supply chain. The concept that "everybody plays" created special challenges for General Electric Appliances (GEA). A company cannot be a Six Sigma company without its suppliers participating in the culture change

(Hendricks and Kelbauch, 1998). The key element in the successful integration of suppliers into Six Sigma is obtaining support from the highest levels of management in the supplier firm. Under Six Sigma philosophy, one way to reduce variability is to have few suppliers with high performance capability levels (Pande et al, 2000).

3.13 IT Infrastructure

Six Sigma is about change and change requires action from top management. Purposeful and useful action cannot occur without a system to monitor and control it. Hence Six Sigma implementation requires an IT system to receive, organise and help translate this information into effective decisions for the organisation. For such a system to be active and functional, it requires an underlying IT infrastructure. The following are some of the main roles an effective IT system would require to fulfil (Kendall and Fulenwider, 2000).

- Support the collection of data from the process.
- Provide a means of effective communication and sharing of data/information across the organisation.
- Provide an easily accessible database holding information regarding all ongoing and completed Six Sigma projects.
- Provide an interactive training tool for employees to learn Six Sigma methodology and the tools within the methodology foe problem solving-activities.
- Provide on-line coaching for Six Sigma tools and techniques.
- Provide software packages to assist with the selection and prioritisation of projects.

3.14 Conclusion

Crucial to any strategy, is the manner in which that strategy is implemented. Failure to adhere to the above critical success factors will ultimately lead to the collapse of the Six Sigma initiative with extensive losses in cost and time. In Chapter 4 the Research Methodology is discussed.

CHAPTER FOUR

Research Methodology

4.1 Introduction

Hussey and Hussey, (1991) state that although research is central to both business and academic matters; there is no consensus in literature on how it should be defined.

However, there appears to be agreement on certain issues: -

- Research is a process of enquiry and investigation.
- It is systematic and methodical.
- Research increases knowledge.

The purpose of research can be summarised as follows: -

- to review and synthesise existing knowledge
- to investigate some existing situation or problem
- to provide solutions to a problem
- to explore and analyse more general issues
- to construct or create a new procedure or system
- to explain a new phenomenon
- to generate new knowledge
- a combination of any of the above.

An essential element in the research process is the gathering of data. The data gathered for the purposes of this research aims to gain an understanding of the quality of services offered by the GSSC.

4.2 Method used for data gathering

Often data gathered in the social sciences, marketing, medicines, and business, relative to attitudes, emotions, personalities, and descriptions of people's environment s involves the use of Likert-type scales. The invention of the Likert scale is attributable to Renis Likert (1931), who describes this technique for the assessments of attitude.

McIver and Carmines, (1981) describe the Likert scale as follows, "A set of items, composed of approximately an equal number of favourable and unfavourable statements concerning the attitude object, is given to a group of subjects. They are asked to respond to each statement in

terms of their own degree of agreement or disagreement. Typically, they are instructed to select one of five responses: strongly agree, agree undecided, disagree, or strongly disagree. The specific responses to the item are combined so that individuals with the most favourable attitudes have the highest scores while individuals with the least favourable (or unfavourable) attitudes will have the lowest scores. While not all summated scales are created according to Likert's specific procedures, all such scales share the basic logic associated with the Likert scale".

Spector, (1992) identified four characteristics, which make a scale a summated rating scale. First, a scale must contain multiple items. The use of summated in the name implies multiple items will be combined or summed.

Secondly, each individual item must measure something, which has an underlying, quantitative measurement continuum. In other words, it measures a property of something, which can vary quantitatively rather than qualitatively. An attitude for example, can vary from being favourable to being very unfavourable.

Thirdly, each item has no "right" answer, which makes the summated rating scale different from a multiple-choice test. Thus, summated rating scales cannot be used to test for knowledge or ability. Finally, each item in a scale is a statement, and respondents are asked to provide a rating for each statement. This involves asking subjects to indicate which of several response choices best reflects their response to the item.

Table 4.1 The Likert Scale used for the customer feedback survey at GSSC

Questions 1 – 4 and questions 8-9	**Questions 4 -7**
Greatly exceeds expectations	Strongly agree
Exceeds expectations	Agree
Meets expectations	Unsure
Mostly meets expectations	Disagree
Does not meet expectations	Strongly disagree

4.3 Population Description

The population to which the survey relates to are employees within GPG specifically those employees who interact with the GSSC. These employees are considered to be internal customers of the GSS, which provides the GPG business units with the following services: -

- Audit Services
- Human Resource Services
- Procurement Services
- Finance Services
- Technology Services

4.4 Sample Selection

Employees from the various GPG business units who interact regularly with the GSSC were randomly selected. Questionnaires were e-mailed to such employees requesting their responses. The subjects chosen ranged from senior managers, middle managers, team leaders and administration assistants.

4.5 Compilation of the Questionnaire

The questionnaire was designed as a document that would be used in an internal customer feedback survey. Many such questionnaires from different organisations were researched and finally the questionnaire from Standard Bank South Africa was chosen as most pertinent to this research project.

The main objective of the research is to understand the problems that are being experienced by the Gauteng Shared Service Centre, thereby, providing a tool that will enable the business unit to deliver their services at the highest quality level.

The reason for choosing Standard Bank Internal Customer Survey Questionnaire is that it is an organisation that consistently prides itself as being South Africa's leading bank for the last few decades. It has achieved this by constantly looking at itself from within and making the necessary changes that allows the organisation to grow from strength to strength. One of the instruments Standard Bank uses to achieve this success is to gather data using its internal customer survey questionnaire. This data then forms the basis for its strategic planning, that ensures Standard Bank maintains its position as South Africa's leading bank.

4.6 Validity and Reliability of the Questionnaire.

A copy of the Customer Feedback Survey Form, used in this research project, can been found in Appendix A and a copy of the Standard Bank Internal Customer Survey Questionnaire can be found in Appendix F. Although the questions in both instruments were identical, the format of the questionnaire used in this research was changed to make the instrument more user friendly, thus raising questions with regards to its validity and reliability.

To address these issues a pilot test of the questionnaire was conducted with eight GPG managers. The summary of the results of the pilot test can be found in Appendix K and was used in the validity and reliability testing of the questionnaire.

4.6.1 Reliability Testing

Cronbach's alpha measures how well a set of items (or variables) measures a single one-dimensional latent construct. Cronbach's alpha is a coefficient of reliability (or consistency). The formula for the standardized Cronbach's alpha is: -

$$a = n1 * \text{r-bar} / [1 + (n1 - 1) * \text{r-bar}]$$

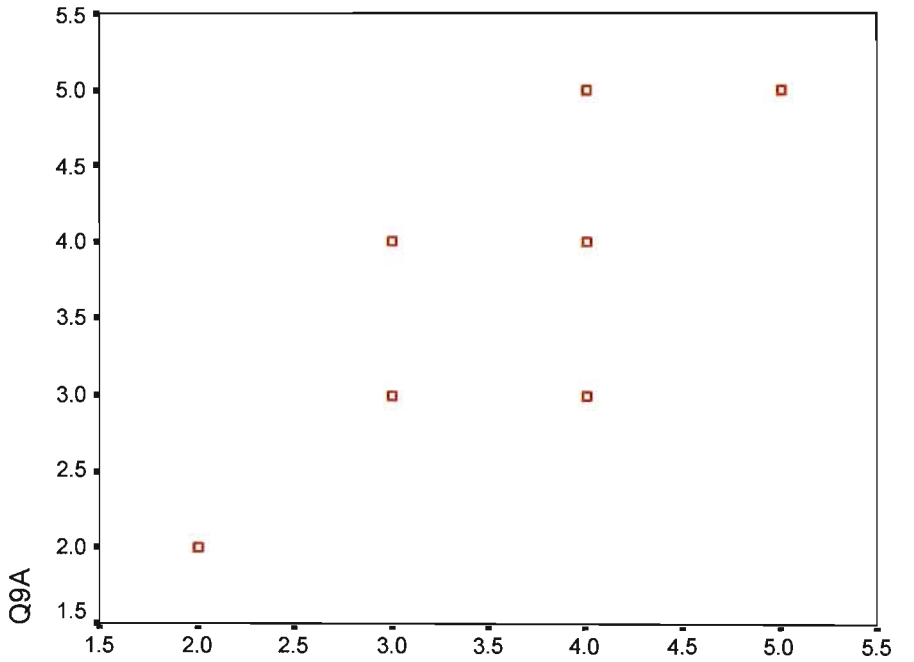
Here n_1 is equal to the number of items (19) and r-bar is the average inter-item correlation among the items. For the pilot questionnaire sent to the Gauteng Shared Services Centre the value of alpha is found to be 0.948, which is considerably larger than the value of 0.80 which is considered "acceptable" in most Social Science applications (Cronbach, 1951).

4.6.2 Validity Testing

The validity of a questionnaire is defined as its ability to measure and describe what it is supposed to measure and describe. For example: -

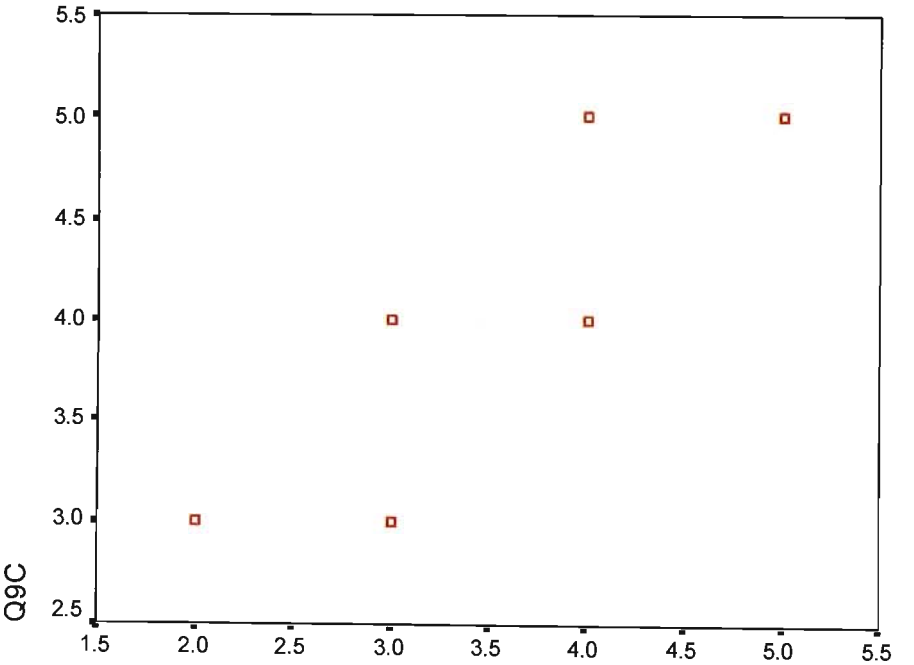
The response to question 2b (relationship with GSSC team) should measure the same thing as that to question 9a (pleasant to deal with) and question 9c (listening to your problems/ queries). The plots and Spearman rank correlation coefficients for describing these relationships are shown below.

Figure 4.1 Scatter plot of 2b versus 9a



Rho = 0.630

Figure 4.2 Scatter plot of 2b versus 9c



rho = 0.759

In both these cases there is a moderate positive linear relationship between the responses to the question. Therefore they appear to measure the same thing to a certain extent.
Reliability and validity calculations for the Standard Bank questionnaire can only be carried out when data on responses to the questions are available.

4.7 Ethical Considerations

The general ethical issue here is that the research design should not subject the research population to embarrassment or any other material disadvantage. Consent from individual participants was ensured. Ethical issues further look at the implications for the negotiations of access to the organisation, employees and the collection of data (Saunders *et al.,* 2003. An authorisation letter for data collection was drafted and presented to the GSSC to grant permission to do the research. Consequently the permission to collect data was granted by GSSC management.

4.8 Limitations

The questions of the survey were confined to questions other than those relating to an understanding of the Six Sigma concept. This was deliberately done because it is a comprehensive philosophy, which requires time to understand. Also, establishing the actual level of sigma at which the current processes are operating is complex and requires time and money, thus inferences were made from the customer feedback to which of related sigma levels.

4.9 Conclusion

The research design of the study has been clearly stated in this chapter, where various ways of data collection and analysis have been identified. More on how the research was analysed is specified in the following chapter. Chapter 5 also presents the research results and discussion for GSSC.

Chapter 5

Presentation and Discussion

5.1 Introduction

This chapter presents and discusses the research results and based on the findings, recommendations are made to the GSSC accordingly.

Table 5.1 The mean score of the questions the respondents were required to answer

Survey Questions	Mean	Std. Deviation
5) The GSSC is providing you with services you need.	3.41	1.14
7) The guidelines and instructions provided by the GSSC are clear.	3.59	0.96
2b) Rate your relationship with their team	3.64	0.73
9a) Are GSSC staff pleasant to deal with	3.68	0.78
2c) Rate the value of their service	3.95	0.90
6) The service are provided in accordance to the SLA	4.00	0.98
9c) Are GSSC staff listening to your problems/queries	4.00	0.69
1) Given your recent experience with the GSSC, how would your rate their overall performance.	4.09	0.81
9f) Are the GSSC staff able to solve problems for you	4.14	0.71
9d) Are GSSC staff understanding your problems / queries	4.18	0.73
3b) Do GSSC staff act professionally	4.27	0.83
9e) Are GSSC staff acting on your queries	4.32	0.78
3c) Does the GSSC staff inspire trust	4.32	0.95
2a) Rate the delivery of service	4.32	0.84
8) Taking everything into consideration, how would you rate the GSSC in terms of customer service.	4.36	0.79
3a) Is the GSSC easy to do business with	4.41	0.73
4) How would you rate the GSSC's performance in dealing with your queries	4.50	0.51
9b) Are the GSSC staff taking the initiative to improve customer service	4.55	0.67
3d) Does the GSSC keep you informed about future changes	4.73	0.70
Overall Average	4.13	0.80

5.2 Overview

The overall average of 4.13 indicates that the quality of services of the GSSC lies somewhere between mostly meets customer requirements and does not meet customer requirements. The low standard deviation of 0.80 reveals that all the respondents, on average, shares the similar view.

5.2.1 Analysis of Raw Data

Question 3d has the highest mean, whereby 18 (82%) respondents states that the GSSC does not keep them informed of future changes. If Business Units are uninformed of future changes, this may lead to confusion as to the expectations, and thus results in conflict.

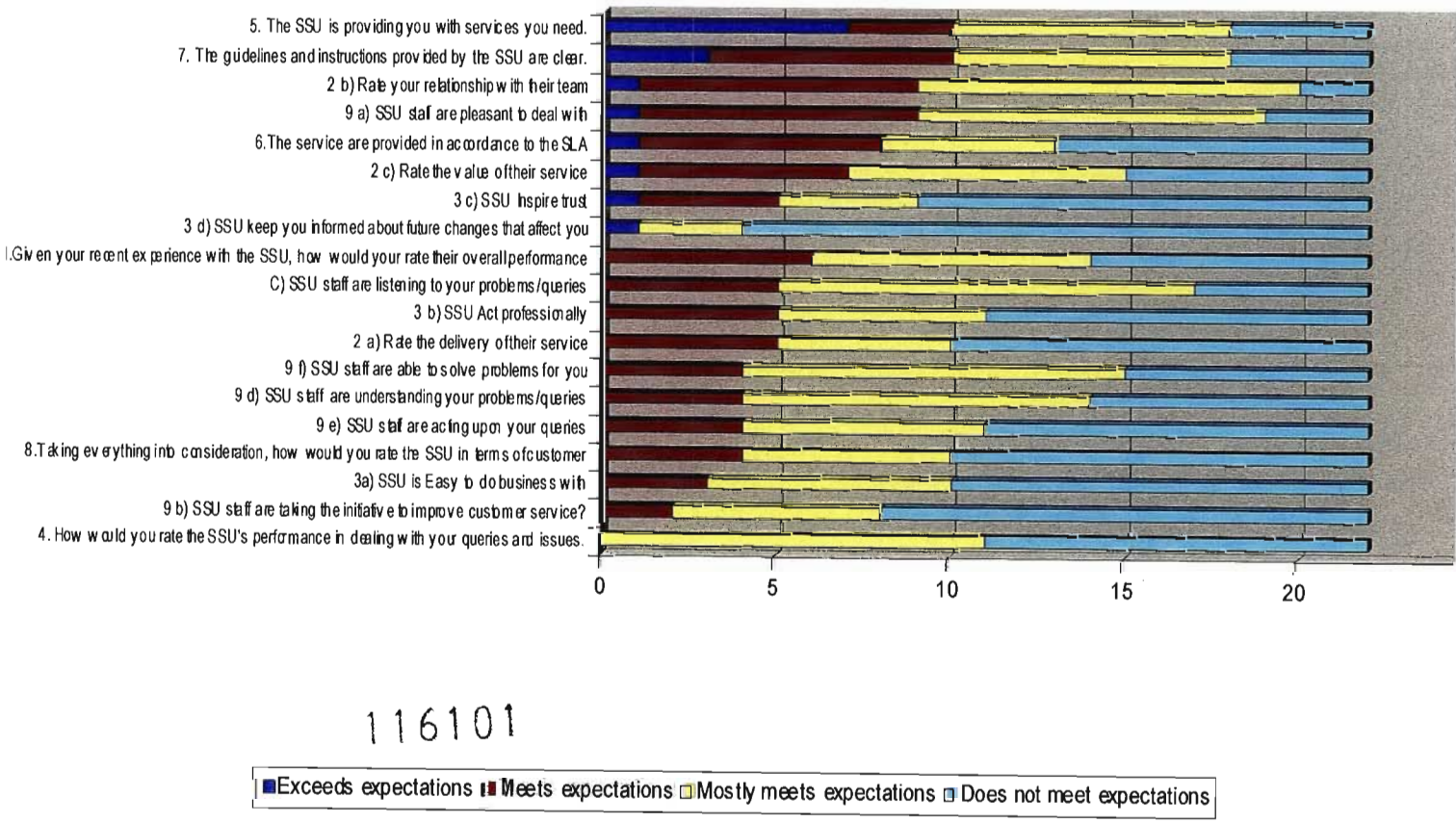
Questions 9b and 4 are high means with 14 and 11 respondents respectively indicating that the GSSC does not meet their requirements and 6 and 11 respondents respectively, indicating

that the GSSC mostly meets expectations in terms of the GSSC dealing with queries and GSSC staff not taking the initiative to improve customer services.

Queries are important input into a process driven culture. It serves as vital information for process improvement initiatives to occur. If not dealt in that light, it is lost opportunity for continuous improvement. Whilst the GSSC staff are unable to take the initiative to improve customer services just reinforces the preceding statement. Continuous improvement stems from taking initiative.

The lowest mean is recorded by question 5 (3.41). This lies between unsure and disagreement with the GSSC providing the business units with the services they require. The number of respondents, which indicated so, is 11 (50%) however taking respondents, which strongly disagree, increases that percentage to 68%. Although this the lowest mean, it is still noted as being bad. One of the objectives of the GSSC is to provide services of value, which are required by the Business Units. By not doing so, does not justify their existence.

Figure 5.1 Frequency Distribution



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The above graphical representation reflects the frequency of the respondents to each of the questions, which were opposed.

It can be noted that none of the respondents have indicated that the GSSC greatly exceeds expectations i.e. they are not delighted with the quality of the services which the GSSC is offering. Six Sigma is a philosophy, which emphasises on delighting the customer. A very few respondents indicates that the GSSC exceeds expectations. Majority of the respondents' attitude lies between mostly meets expectations and does not meet expectations.

5.2.2 Data analysis of customer feedback survey

In questions 1 to 4 and 8 and 9 customers were asked to rate various service aspects on an expectations scale (Does not meet expectations, Mostly meets expectations, Meets expectations, Exceeds expectations, Greatly exceeds expectations) with codes 1 to 5 allocated to responses. In questions 5 to 7 customers are asked to respond to statements on a five point Likert scale (Strongly disagree, Disagree, Unsure, Agree, Strongly agree) with codes 1 to 5 allocated to responses. The rating of the i th customer will be dented by the symbol x_i , i = 1, 2, . . . , 22. The norm for being reasonably satisfied is Exceeds expectations or better (rating of 4 or 5) in the case of responses on the expectations scale and Agree or better (rating of 4 or 5) on the Likert scale. The hypotheses of reasonable satisfaction to be tested for each question is

H_0 : Average rating = 4 versus
H_1 : Average rating < 4.

A rejection of H_0 will mean that the level of satisfaction of the customers is below the reasonable satisfaction norm.

The test for the response to each question was performed by using the following Wilcoxon Signed Rank statistic (T) with ties taken into account.

$T = S\,(n-1)^{1/2} / (n\,V - S^2)^{1/2}$, where

$S = \sum t_i^{+} - n(n+1)/4$,

t_i^{+} is the rank $|x_i - 4|$ arising from the i th positive difference,

n = 22 is the number of respondents,

$V = [\, n\,(n+1)\,(2n+1) - 0.5 \sum t_i\,(t_i+1)\,(t_i-1)\,] /24$ and

t_i is the number of tied ranks in the i th tied group.

It has been shown by Conover, (1973) that when H_0 is true the distribution of T for n > 20 can be well approximated by a t-distribution with n-1 degrees of freedom. The detailed calculations of the various tests are shown in the Appendix H. The results of the tests are summarized in the table below.

Table 5.2 Summary of the results of the Signed Rank tests

Question	Issue	T	p-value
1	Performance	1.136	0.866
2a	Service delivery	2.088	0.975
2b	Relationship	-0.913	0.186
2c	Value of service	0.477	0.681
3a	Easy to do business	3.336	0.998
3b	Professionalism	1.957	0.968
3c	Trust	1.911	0.965
3d	Keep you informed	5.614	1
4	Queries and issues	9.582	1
5	Provides service you need	-1.431	0.084*
6	Service level agreement	0.334	0.629
7	Guidelines clear	-1.152	0.131
8	Overall rating	2.633	0.992
9a	Pleasant to deal with	-0.776	0.223
9b	Taking initiative	4.608	1
9c	Listen to problems	1.328	0.901
9d	Understand problems	2.194	0.980
9e	Act upon queries	2.509	0.990
9f	Solve problems	2.104	0.976

Result significant at the 10% level of significance

5.2.3 Six Sigma Level

Attaching sigma levels to the satisfaction index, such as the following: -

Table 5.3 Sigma Level at Satisfaction Level

Scale	Customer satisfaction criteria	Sigma Level
1	Greatly exceeds expectation (delightful customer)	Between 5 and 6 sigma
2	Exceeds expectations	Between 4 & 5 sigma
3	Meets expectations	Between 3 & 4 sigma
4	Mostly meets expectations	Between 2 & 3 Sigma
5	Does not meet expectations	Between 1 & 2 sigma

The overall average of 4.13 indicates that the quality of services of the GSSC falls between a sigma level of 2 and 3. Therefore, the defects of the GSSC lies somewhere between 66800 and 308000 defects per million opportunities. The defect rate is high, thus something must be done to lower the defect rate in order to improve the levels of service being offered.

5.3 Summary of Results

The above findings are in line with the findings by the Corporate Strategy board, that there are risks associated with the establishment of a Shared Services Unit, namely: -

- Shared Service Units may cause initial cost savings, these benefits may not improve unless incentives are in place for the employees to continuously enhance product offerings and service quality.
- Commonly tension arises between the Shared Service Centre and the business units; this is exacerbated when business units do not understand the level of service they receive of the shared service centres.

Thus the findings from the survey do support the hypothesis that the: -

"The poor quality of services offered by the Gauteng Shared Services Centre does not justify their existence."

5.4 Conclusion

In order to justify the existence of the Shared Service Centre, it is imperative that the expected level of service is known and continually improved to ensure that the customer is receiving consistent and predictable service. Surveys of this nature must be done consistently to ensure that the customer's voice is heard as this provides a vital source of information for continuous process improvement.

Meeting the customer's requirement is not enough; exceeding the customer's requirements (delighting customers) is expected in the modern era. Thus Six Sigma is an improvement strategy, which is a process by itself that needs to be followed to achieve successful results.

An immediate plan of action is required to address the issues facing the GSSC in order to the expectations of the business units and perhaps exceed them. This will be discussed in Chapter 6, together with the papers conclusion.

CHAPTER 6

Recommendations and Conclusions

6.1 Introduction

There is an increasing amount of pressure on organisations to meet stringent quality and delivery specifications at lower prices. Strategic process improvements are needed to increase profit margins, whilst also meeting the demands of customers. However, organisations often possess a fire-fighting mentality, becoming overwhelmed with the day-to-day activities and losing sight of what needs to be done to make process-focused improvements or systematic changes, in order to thrive over the "long haul". Organisations often consistently incur significant costs due to poor quality, which are never documented and therefore never understood.

Six Sigma, if implemented successfully, is a strategic business improvement approach, which seeks to increase both customer satisfaction and an organisation's financial health through systematic process change. The implementation process offers a road map for combining the wisdom of the organisation and the data to create information, which can lead to significant new opportunities and the reduction of fire fighting. The long-term process-focused strategy facilitates companies in identifying and understanding critical business processes so that they become more proactive, as well as productive.

6.2 Recommendations

The recommendations that are going to be made to the GSSC are based on the Research Question and the three Investigative Questions. The paper's research question is: -

"Can Six Sigma provide an overall solution to improving the quality of services offered by the Gauteng Shared Services Centre".

The Investigative Questions are as follows: -

- **Can Six Sigma facilitate a quality paradigm shift in the GSSC?**
- **What are the problems being faced by the Business Units?**
- **What will be ideal plan for the implementation of Six Sigma?**

6.2.1 Recommendations Based on the Research Question

It is evident from the results that the business units are not receiving the quality of services they are expecting. The fact that Six Sigma is a philosophy, which focuses on customer

expectations and prevention of non-conformance and defects, makes this the ideal improvement programme for the GSSC.

Although new technology was introduced in the environment together with scanning systems, Information technology alone will not bring about a change in the quality of services being offered. What is required is a holistic approach, which will bring about a paradigm shift to achieve quantum gains as apposed to incremental changes in the operations. Six Sigma is the kind of philosophy, which combines the power of people, process and technology to attain the highest levels of service quality.

The objective of implementing Six Sigma would be to achieve a "delighted customer". Firmly understanding the key ingredients for the successful implementation together with an understanding of the DMAIC process of Six Sigma will produce the solution, which will result in a delighted customer.

6.2.2 Recommendations Based on the Investigative Question

6.2.2.1Can Six Sigma Facilitate a quality paradigm shift in the GSSC?

A shift in paradigm requires adjustments to the culture of the organisational unit and a dramatic change of the mindset of the employees. The survey results indicate that (question 9 average is 4.13 and a standard deviation of 0.73) the staff of the GSSC is not performing at the required levels.

Employees have to be motivated towards the introduction and development of the Six Sigma programme through various reward and recognition schemes. There can also be a problem of employees dismissing Six Sigma as the latest fad or hype. To overcome this problem and also to allay the fears, which employees may have, there has to be early and effective communication to all employees on the why and how of Six Sigma.

The four different factors of resistance, are: -

- ***Technical*** – frequently people find difficulties in understanding statistics within Six Sigma program. Education and involvement is needed.
- ***Political*** – it is based on seeking the solution to be implemented as a loss, real or imagined. The strategy to avoid this is creating the need for change and then showing how change can be beneficial for them.

- ***Individual*** – it consists of employees who are highly stressed as a result of personal problems. The strategy could be to try to reduce stress with a less workload.
- ***Organisational*** – this occurs when an entire organisation is committed to certain beliefs, which are usually instituted and communicated by the management. Reluctance to change can be diminished by communicating to the managers the benefits of the initiative.

With a true cultural revolution in an organisation come two basic fears on an individual level: fear of change and fear of not achieving the new standard. To overcome fear of change in any environment, the people involved must understand the need for change. It would be ideal to create a communication plan, which would address why Six Sigma is important, and how the methodology of Six Sigma works in organisations.

It is also essential to restructure the organisation to drive the culture and make Six Sigma a part of everyday life. After implementation of Six Sigma projects, it is best to publish results, but these should not be restricted to just success stories but also admit and communicate stumbling blocks. This will help other projects in the pipeline to avoid the same mistakes and learn from them.

Good support from top management is imperative in the restructuring of the organisational unit and achieving the cultural change and motivation of employees towards quality and Six Sigma strategy to the business. The leaders have to be strong advocates of Six Sigma. Eagerness and enthusiasm shown by the leaders can go a long way in getting the rest of the employees on board. Without continuous support and commitment from top management, the true importance of the imitative will be in doubt and the energy behind it will be weakened.

6.2.1.2 What are the problems being experienced by the Business Units.

Questions 5, 6 and 7 reveals, that there is no clarity with regard to the service offerings, levels of expectancy and guidelines. There is a relationship between the survey results, which reflected poor quality to that of the personal experiences of this researcher.
The author experienced several problems, which are set out below.

- Their services can be summarised as not being consistent and predictable.
- There was no involvement in the construction of the Service Level Agreement.

- No reconciliation were performed.
- There was difficulty in retrieving documents.
- Staff lacked the knowledge of the end-to-end process.
- There was confusion as to who does what.
- BU administration staff must complete manual tracking of documents.
- Delays occurred in the notification of problems.
- Morale of staff was low (staff just want to get out of that working environment).
- People were told of their changes, rather than involving the customer.
- There was huge backlogs at year–end.
- Staff have to provide statistics which have no value (e.g. number of invoices processed, total value of invoices processed).

The GSSC and the BU's of the GPG operate as stand-alone units with little or no shared commitment and directives and the required levels of service delivery and expectancy levels. This should be the objective of top management and is lacking at the GSSC. Thus each business unit behaves independently and each blames the other, resulting in low levels of customer satisfaction.

The key success factors of the Six Sigma programme are: -

- contribution of Top Management
- organisational culture, i.e. the strategic fit of GSSC in achieving the organisations mission and objectives.
- a rigorous adoption of a process culture (through training) whilst encouraging staff to challenge current procedures and practices
- partnering with customers and suppliers
- staff involvement in strategy coupled with rewards and incentives.

These can greatly improve the level and quality of customer satisfaction, reaching the expected target of 'delighted customer' each and every time, thus attaining the six-sigma level.

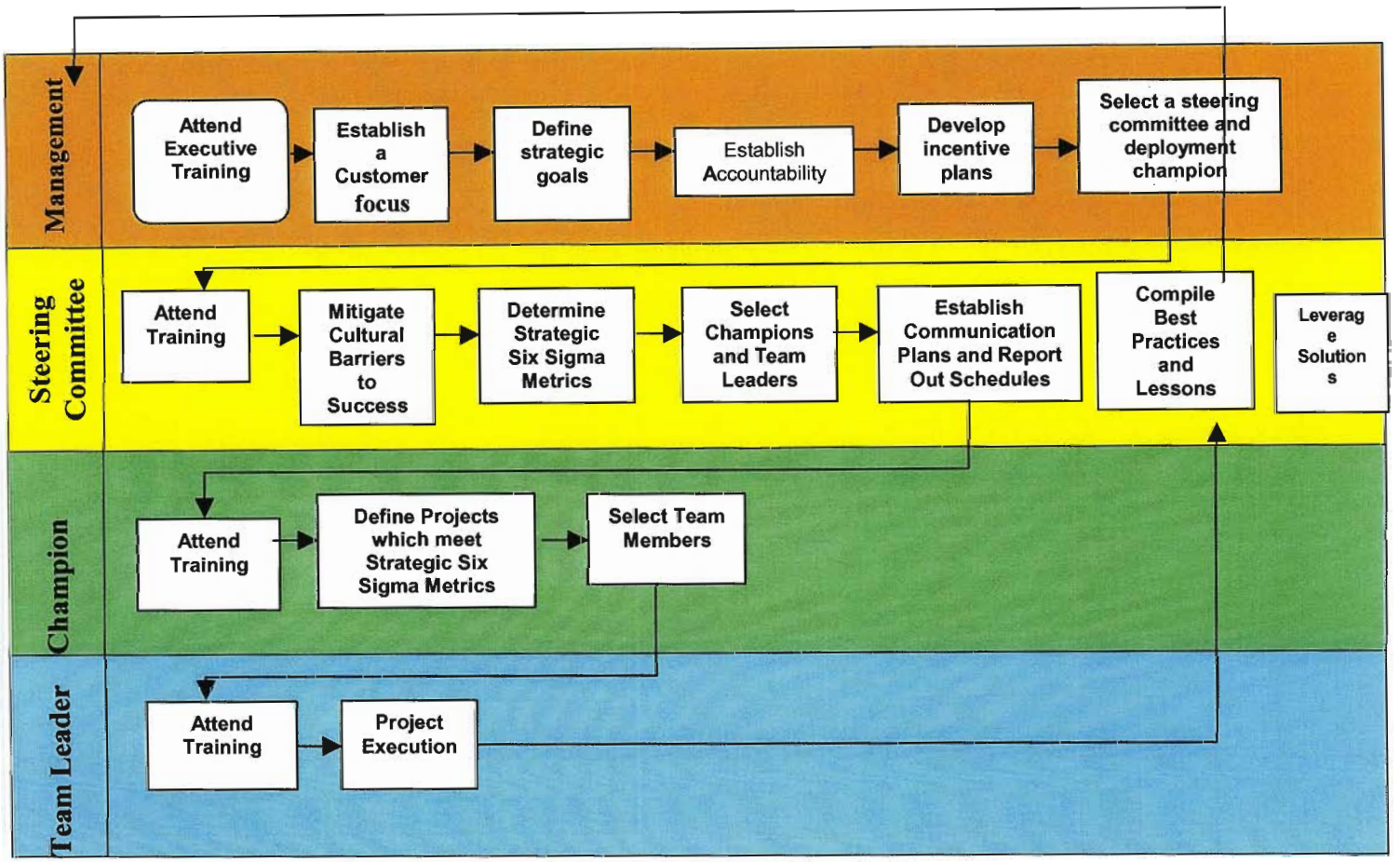
6.2.2.3 What will be the Ideal Plan for the Implementation of Six Sigma?

Implementation of Six Sigma is a process on its own thus there must be a proper plan of action to ensure that the philosophy is well implemented.

Six Sigma can be a great success or an expensive failure, depending on how it is implemented. Successful implementation should be viewed an ongoing process of infusing the Six Sigma methodology into the organisation's culture, so that employees use Six Sigma techniques when they approach their every day work.

The implementation process, as illustrated in Figure 6.1, requires advance work to develop awareness and generate support before projects are started.

Figure 6.1: The Implementation Process



STEP 1: Executive level training

The process of implementing Six Sigma begins with the training of executive leaders. It is not enough for executives to support Six Sigma; they must lead the strategy. Senior managers, who write memos on the importance of quality but still drive through volume-based metrics, will not gain success with projects aimed at achieving bottom line benefits and improve quality. A project to increase quality in an organisation will not succeed if volume is the only measure and rewarded

accordingly. Six Sigma must be viewed as a method of meeting strategic goals; these goals need to be measurable and must have the focus of executive management.

STEP 2: Establish a customer focus mindset

Establishing a Customer Focus Mindset within an organisation goes hand in hand with senior management leadership when creating a successful Six Sigma business strategy to a process improvement team's true success. Therefore, evaluating customers' perceptions of quality should be at the forefront of the implementation process.

Customers choose suppliers with the highest cost benefit ratio. Every complaint from a customer should be viewed as an opportunity for growth and a spotlight on areas needing process improvement focus. The key to success in this initial step is to make it easy for the customers' comments to be heard.

The needs of the customer are dynamic. Features, which were once considered 'delighters', become qualities that are now expected. Organisations believe they understand what is important to their customers and are sometimes surprised when they actually spend the time quantifying the real needs of customers.

Learning through customer feedback of what works and what does not, will help to establish a mindset of continual process improvement within an organisation. Jack Welch, CEO of GE and the most visible advocate of Six Sigma, himself has been quoted to say that a business strategy alone will not generate higher quality throughout an organisation.

STEP 3: Define strategic goals

Goals without a road map can be detrimental. Asking the right question means defining the strategic goals of the organisation. It requires communicating to employees what is strategic and why, and following up those statements with executive focus and metrics.

It is the job of executives and the steering committee to integrate the voice of the customer into the strategic goals of the organisation. Much work is done before

projects are even started to transform comprehensive customer feedback and internal business goals into strategic Six Sigma goals. Six Sigma then becomes a road map to meet those goals.

Six Sigma should not replace existing organisational initiatives, but instead create an infrastructure, which offers a tactical approach to determining the best solution for a given process/situation. There has to be accountability. There must be enthusiasm. What people put into it is what they will get out of it. If they pay it "lip service," they will get mediocre results. If it is used a business strategy, it becomes a focused approach to meeting the strategic goals defined by executive management.

STEP 4: Mitigate cultural barriers to success

Every company, which takes on Six Sigma, performs a unique journey of integrating the methodology into their current culture. Implementation plans vary significantly between organisations, depending upon their distinct culture and strategic business goals, however, there are essential elements needed for this process of creating a successful infrastructure.

Launching a Six Sigma business strategy is an opportunity to assess the current culture in an organisation. Consider the following questions.

- How has the company historically dealt with change initiatives?
- Does the company make consistent changes that does not last?
- How effective are the project teams?
- Are people frequently focusing on the same problem?
- How do the employees attack problems and conduct their daily work?
- What is required within the company's culture to make continual process improvement a lasting change?
- What will prevent the company from achieving success with Six Sigma?

STEP 5: Determining strategic Six Sigma Metrics

The successful implementation of Six Sigma closely correlates with the wise application of Metrics. There is no "one size fits all" metric applicable to every project. Effective metrics are cross functional, providing a holistic view of the process

and contributing insight to the project team. Many resources can be wasted if Six Sigma metrics are not applied wisely and subsequently used to orchestrate improvement activities, 'fire-prevention' as opposed to 'fire-fighting'.

6.3 Conclusion

The purpose of this study was to assess the feasibility of Six Sigma implementation at the GSSC, as the strategy to improve its quality of services. To justify the existence of the GSSC, it is imperative that the expected level of service is known and continually improved to ensure that the customer is receiving consistent and predictable service. A comparison was made to other methodologies and we have determined that Six Sigma provided the ideal platform for achieving continuous levels of service improvement, at the GSSC.

There are key success factors for the implementation of Six Sigma. As a programme or initiative, Six Sigma risks becoming the "flavour of the month" and will not capture the buy in necessary to reap a large return in the investment in training. With this approach, employees may end up viewing Six Sigma as a programme similar to Total Quality Management (TQM) and other quality "programmes", which may have experienced limited success within the organisation.

The results of the survey reveal that the current defect rate at the GSSC is high. Meeting the customer's requirement is not enough; exceeding the customer's requirements (delighting customers) is expected in the modern era. Thus Six Sigma is an improvement strategy, which is a process by itself, that needs to be followed to achieve successful results.

In today's constantly changing market place companies, which are able to embrace change in a focused and proactive manner, are leaders in their field. Companies who not only master the technical side of Six Sigma but also overcome the cultural challenges associated with change can realise significant benefits.

Companies are embracing Six Sigma not only to reduce defects, but also as a catalyst to change the culture of their company, impacting on how employees engage in their everyday work. Utilising a Six Sigma business strategy, organisations can understand threats and recognise new opportunities for growth, not only to survive but actually to thrive within competitive environments.

Six Sigma is a long-term commitment. Treating deployment as a process allows objective analysis of all aspects of the process, including project selection and scoping. Projects should be selected to meet the goals of an organisation's business strategy. Six Sigma can then be utilised by the GSSC, as a roadmap to effectively meet those goals.

Utilising lessons learned and incorporating them into subsequent waves of an implementation plan creates a closed feedback loop and real opportunities for improvement. Deploying Six Sigma through projects can lead to dramatic benefits, if the GSSC invests the time and executive energy necessary to implement a process to create a successful Six Sigma infrastructure.

Finally, creating and implementing Six Sigma does not guarantee tangible benefits within an organisation. However, when Six Sigma is implemented wisely as a business strategy accompanied by effective metrics, the GSSC can achieve significant benefits. Through the wise implementation of Six Sigma, the success of individual projects can build upon each other, gaining the sustained attention of executive management and resulting in the progression of a corporate culture from a reactive or fire-fighting environment, to a learning organisation.

Bibliography

Abdelhamid, T.S. and Everett, J.G. (2002). "*Physical demands of construction work: A source of workflow unreliability* ". 10th Conference of the International Group for Lean Construction, Brazil.

Abdelhamid, T. S. (2003). *Six Sigma in lean construction systems: opportunities and challenges,* research paper.

Ackoff, R. L. (1974). *"Beyond Problem Solving,"* General Systems, pp 237-239.

Al Dabar,J.K. (1999). *Is Total Quality Management enough for competitive advantage?* MBA dissertation, University of Hull, U.K, pp 1-25.

Antony, J. and Banuelas, R. (2002). *"Key ingredients for the effective implementation of Six Sigma program," Measuring Business Excellence*, University of Warwick, Coventry, UK, pp 20-26.

Antony, J. and Bhaiji, M. (2002). *"Key ingredients for the successful implementation of Six Sigma program,"* University of Warwick, Coventry, UK, pp 1-9.

Antony, J. and Banuelas, R. (2001). *"A strategy for survival",* Manufacturing Engineering, Vol. 80 No. 3, pp. 119-21.

Balridge, M (1995). TQM, ISO9000 & Re-engineering, p10.

Bertselen, S. and Koskela, L (2002). "*Managing the Three Aspects of Production in Construction.*" 10th Conference of International Group for Lean Construction, Brazil.

Breyfogle, F.W., Cupello, J.M., Meadows, B (2001). *Managing Six Sigma*: A practical Guide to Understanding, Assessing and Implementing the Strategy Which Yields Bottom-Line Success. Wiley, New York, NY.

Breyfolgle, F.W. (2003). *Implementing Six Sigma.* 2nd edition, Wiley, New York, NY.

Clough, R.H. and Sears, G.A. (1994). *Construction Contracting.* Wiley, New York, NY.

Conlin, M, (1998). *"Revealed at last: the secret of Jack Welch's success",* Forbes, Vol. 61 No. 2.

Dale, B. (2000). *"Marginalisation of quality: is there a case to answer?",* The TQM Magazine, Vol. 12 No. 4, pp266-74.

Dean, J.W. & Evans, J.R. (1994). *Total Quality* , West publishing Co, St Paul.

Deming, W.E., (1986). *Out of Crisis.* MIT Centre for Advanced Engineering Study, Cambridge, MA.

Eckes, G. (2000). *Developing a Questionnaire*, Continium, London.

Edosomwan, J.A. (1993). *Customer and Market-Driven Quality Management*, Milwaukee, WI: ASQ Quality Press.

Halliday, S. (2001). *"So what exactly is Six Sigma?",* Works Management, Vol.54 No. 1 p 15.

Hammer, M. and Champy, J. (1993). *Re-engineering the Corporation*, Harper Collins, New York, NY.

Harrington, H.J. (1991). *Business Process Improvement*, McGraw-Hill, New York, NY.

Harry, M and Schroeder, R. (2000). *Six Sigma: The Breakthrough Management Strategy Revolutionizing the World's Top Corporations.* Doubleday Currency, New York, NY.

Henderson, K.M. and Evans, J.R. (2000). *"Successful implementation of Six Sigma: benchmarking General Electric Company'*, Benchmarking: An International Journal, Vol. 7 No. 4, pp 260-81.

Hendricks, C.A. and Kelbaugh, R. (1998). *"Implementing Six Sigma at GE"*, The Journal of Quality and Participation, Vol. 21 No. 4, pp. 48-53.

Hoerl, R.W. (1998). *"Six Sigma and the future of quality profession"*, IEEE Engineering Management Review, Fall, pp. 87-94.

Howell, G. (1999). *What is Lean Construction? 7th conference of the International Group for Lean Construction, California, USA.*

Howell, G. and Ballard, G. (1994). "*Lean production theory: Moving beyond 'Can-Do'*. 2nd Annual conference of International Group of Lean Construction, Santiago, Chile, pp.17-24.

Hussey, J, and Hussey, R. (1991). *Business Research, A practical guide for undergraduates and postgraduates students*, Macmillan, pp. 1-2

Hutchens, S. 1989. "*What Customers Want: Results of ASQC/Gallup Survey,"* Quality Progress, pp. 29-35.

Ingle, S. and Roe, W. (2001). *Six Sigma Black Belt Implementation*, Vol. 13, No.4, pp. 273-280.

Juran, J.M. and Gryna, F.M. (1988). *Juran's Quality Control Handbook*, McGraw-Hill, New York, pp18-19.

Kendall, J. and Fulenwider, D.O. (2000). *Six Sigma, E-commerce Pose New Challenges*, Quality Progress, July, pp. 31-37.

Koskela, L. (1992). "*Application of the New Production Philosophy to Construction".* Technical Report #72. Centre for Integrated Facility Engineering, Department of Civil Engineering, Stanford University.

Linderman, K., Schroeder, R. G., Zaheer, S. and Choo, A.S. (2003). *Six Sigma: a goal-theoretic perspective*". Journal of Operations Management, Elsavier Science, 21, 193-203.

Lustig, G. (2000). *Shared Service Centres, The Fundamentals, presentation,* Johannesburg, S.A

Mann, R. and Kehoe, D. (1995). *"Factors affecting the implementation and success of TQM"*, International Journal of Quality & Reliability Management, Vol. 12 No. 1, pp. 11-23.

McIver, J.P., & Carmines, E.G. (1981). *Unidimensional scaling*. Thousand Oaks, CA, pp. 22-23.

Pande, P.S., Newman, R.P., and Cavanagh, R.R. (2000). *The Six Sigma Way: How GE, Motorola and Other Top Companies are Horning their Performance,* McGraw-Hill Professional, New York, NY.

Porter, M. (1985). *Competitive Advantage*, The Free Press, NY.

Pyzdek, T. (2001). *The Six Sigma Handbook, A complete Guide For Greenbelts, Blackbelts, & Managers At All Levels*, McGraw-Hill, New York, NY, pp. 133-144.

Pyzdek, T. (2001). *The Six Sigma Handbook, A complete Guide For Greenbelts, Blackbelts, & Managers At All Levels*, McGraw-Hill, New York, NY, p 185.

Quinn, *D. (2000). Six Sigma Leadership Handbook, Rath and Strong, p1*

Quinn, J.B., Thomas L.D. and Penny C. P (1990), *"Beyond Products: Services-Based Strategy."* Harvard Business Review.

Saunders,M., Lewis, P., Thornhill, A. (2003) *Research Methods for Business Students, 3rd edition,* Prentice Hall, London.

Schonberger, R. J. (1986). *World Class Manufacturing*. The Free Press, New York.

Senge, P. M. *The Fifth Discipline: The Art and Practice of the Learning Organisation*, New York.

Shewhart, (1939). *Statistical Method from the Viewpoint of Quality Control,* The Graduate School, U.S. Department of Agriculture, Washington, D.C.

Snee, R. D. (1990). *"Statistical Thinking and Its Contribution to Total Quality",* The American Statistician, 44, pp. 116-121

Sohal, A. (1998). *"Assessing manufacturing/quality culture and practices in Asian Companies",* International Journal of Quality & Reliability Management, Vol. 15 No. 8/9, pp. 920-30.

Spector, P. (1992). *Summated rating scale construction.* Thousand Oaks, CA, pp.1-2.

Talwar, R. (1993), *"Business Reengineering- A strategy driven approach,"* Elsevier Science Ltd., Oxford, England.

Womack, J.P. and Jones, D.T. (1996). *Lean Thinking.* Simon and Schuster, New York, NY.

PUBLICATIONS AND REPORTS

Corporate Executive Board (1999). *Overview of Six Sigma Practices*, research document.

Corporate Executive Board (1998). *Functional Unit Strategic Planning*, research document.

Corporate Executive Board (1999). *Shared Service Centres*, research document.

Corporate Executive Board (1997). *Structures of Engineering Shared Services,* research document.

Corporate Executive Board (1997). *Structures of Engineering Shared Services*, research document.

Corporate Executive Board (1998). *The Corporate Centre: Business- and Functional-Unit Relationships*, research document.

Glossary and Tables for Statistical Quality Control (1996). Quality Press, Milwaukee, WI.

Dudley, A & Higgins, W (2003). "Targeting Top Management buy – In to drive implementation which decision-makers are well equipped for instituting the new initiatives", Six Sigma Conference, Johannesburg, South Africa

INTERNET REFERENCES

http://www.msu.edu/user/tabdelta/research.html

http://akris.com/indexicf.htm

http://www.qpr.com/sixsigma/more about SixSigma.html

http://www.coefficientsolutions.com: Centralised Control over payables and Other Best Practices.

http://qualitypress.asp.org: Customer Centred Six Sigma: Linking Customers, Process Improvement and Financial Results

http://www.eyi.com: The Ernst & Young Report on Shared Services.

http:// www.gssc.gpg.gov.za

Appendix A – Customer Feedback Survey

Gauteng Shared Services Centre

Customer Feedback Survey

Dear Participant

I, Mahendira Viranna, am currently studying for my MBA. My dissertation topic is as follows **"Six Sigma: The solution to improving the quality of services offered by the Gauteng Shared Services Centre (GSSC)"**

The objective of the survey is to obtain an understanding of the quality and type of services being offered by the GSSC.

I require you, being the customer of GSSC to spare a few moments of your time to provide your opinion of the quality and type of services provided by the GSSC.

I would appreciate your most candid assessment.

Please return the completed questionnaire to my email address below: -

mahen_viranna@hotmail.com

Gauteng Shared Services Centre

CUSTOMER FEEDBACK SURVEY

Name					
Business Unit:					
Position:					
Date:					
Overall Service					
	Greatly exceeds expectations	Exceeds expectations	Meets expectations	Mostly meets expectations	Does not meet expectations
1. Given your recent experience with the GSSC, how would you rate their performance	O	O	O	O	O
2. Given your recent experience with the GSSC, how would you rate:					
a. The delivery of their services	O	O	O	O	O
b. Your relationship with their team	O	O	O	O	O
c. The value of their services	O	O	O	O	O
3. To what extent is the GSSC:					
a. Easy to do business with?	O	O	O	O	O
b. Act professionally?	O	O	O	O	O
c. Inspire trust?	O	O	O	O	O
d. Keep you informed about future changes that affect you?	O	O	O	O	O
4. How would you rate the GSSC's performance in dealing with your queries and issues?	O	O	O	O	O
	Strongly Agree	Agree	Unsure	Disagree	Strongly disagree
5. The GSSC is providing you with the services you need.	O	O	O	O	O
6. The services are provided in accordance to the Service Level Agreement.	O	O	O	O	O
7. The guidelines and instructions provided by the GSSC are clear.	O	O	O	O	O

CUSTOMER SERVICE	Greatly exceeds expectations	Exceeds expectations	Meets expectations	Mostly meets expectations	Does not meet expectations
8. Taking everything into consideration, how would you rate the GSSC Unit in terms of customer service?	O	O	O	O	O
9. Taking everything into consideration, how would you rate GSSC staff in the following areas:					
a. Pleasant to deal with?	O	O	O	O	O
b. Taking the initiative to improve customer service?	O	O	O	O	O
c. Listening to your problems/queries?	O	O	O	O	O
d. Understanding your problems/queries?	O	O	O	O	O
e. Acting upon your queries?	O	O	O	O	O
f. Able to solve problems for you?	O	O	O	O	O

Additional Comments:

Areas of disbursements (i.e. payment and vendor management) that you think the GSSC could provide but currently do not:

Areas of disbursements (i.e. payment and vendor management) currently provided which you think could be improved:

Thank you very much for taking the time to complete this survey

APPENDIX B: Detail Survey Results																								
Survey Questions	**R 1**	**R 2**	**R 3**	**R 4**	**R 5**	**R 6**	**R 7**	**R 8**	**R 9**	**R 10**	**R 11**	**R 12**	**R 13**	**R 14**	**R 15**	**R 16**	**R 17**	**R 18**	**R 19**	**R 20**	**R 21**	**R 22**	**Means**	**Std Dev**
1.Given your recent experience with the GSSC, how would your rate their overall performance	5	5	4	4	5	5	4	5	5	4	5	4	5	3	3	3	4	3	3	4	4	3	4.09	0.81
2.Given your recent experience with the GSSC, how would you rate:																								
A) The delivery of their service	5	5	5	5	5	5	4	5	5	4	5	4	5	3	3	3	4	3	3	5	5	4	4.32	0.84
B) Your relationship with their team	2	4	3	3	5	4	4	4	4	4	5	4	4	3	3	3	3	3	3	4	4	4	3.64	0.73
C) The value of their service	4	4	5	5	5	5	4	3	5	4	5	4	5	3	3	4	4	2	3	4	3	3	3.95	0.90
3.To What extent is the GSSC:																								
A) Easy to do business with	5	5	5	5	5	5	5	5	5	4	5	4	5	3	3	4	4	3	4	4	4	5	4.41	0.73
B) Act professionally	3	5	5	5	5	5	5	5	5	4	5	5	5	3	3	4	4	3	4	3	4	4	4.27	0.83
C) Inspire trust	3	5	5	5	5	5	5	5	5	4	5	5	5	3	3	2	4	3	4	5	4	5	4.32	0.95
D) Keep you informed about future changes that affect you	5	5	4	4	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	2	5	5	4.73	0.70
4. How would you rate the GSSC's performance in dealing with your queries and issues?	4	5	4	4	5	5	5	5	5	4	5	5	4	4	5	4	4	5	4	4	5	4	4.50	0.51
5. The GSSC is providing you with services you need.	4	4	4	4	5	4	4	4	5	3	5	4	5	2	2	2	2	2	2	2	3	3	3.41	1.14
6.The service are provided in accordance to the SLA	4	5	5	5	5	5	4	5	5	3	5	4	5	3	3	3	4	3	3	3	2	4	4.00	0.98
7. The guidelines and instructions provided by the GSSC are clear.	2	5	4	4	5	3	4	5	4	3	5	4	4	3	4	3	2	3	3	2	3	4	3.59	0.96
8.Taking everything into consideration, how would you rate the GSSC in terms of customer service?	4	5	5	5	5	5	4	5	5	4	5	4	5	3	3	4	4	3	3	5	5	5	4.36	0.79
9. Considering everything, how would you rate GSSC staff in the following areas:																								
A) Pleasant to deal with	2	4	4	4	5	3	4	4	5	3	5	3	4	3	4	3	3	3	3	4	4	4	3.68	0.78
B) Initiative to improve customer service?	5	4	5	5	5	5	5	5	5	4	5	5	5	4	4	3	5	3	4	5	5	4	4.55	0.67
C) Listening to your problems/queries	3	4	4	4	5	4	4	5	4	4	5	4	4	3	3	3	4	3	4	4	5	5	4.00	0.69
D) Understanding your problems/queries	3	4	5	5	5	4	4	5	5	4	5	4	5	4	3	3	4	4	4	3	5	4	4.18	0.73
E) Acting upon your queries	3	4	5	5	5	5	4	5	5	5	5	5	4	3	3	3	4	4	4	4	5	5	4.32	0.78
F) Able to solve problems for you	4	4	4	4	5	5	4	4	5	5	5	4	4	3	3	3	4	3	4	4	5	5	4.14	0.71
																							4.13	0.80

APPENDIX C

Frequency Calculations

	Exceeds Expectations	Meets Expectations	Mostly meets Expectations	Does not meet Expectations
4. How would you rate the GSSC's performance in dealing with your queries and issues?	0	0	11	11
9 b) GSSC staff are taking the initiative to improve customer service?	0	2	6	14
3a) GSSC is easy to do business with	0	3	7	12
8.Taking everything into consideration, how would you rate the GSSC in terms of customer service?	0	4	6	12
9 e) GSSC staff are acting upon your queries	0	4	7	11
9 d) GSSC staff are understanding your problems/queries	0	4	10	8
9 f) GSSC staff are able to solve problems for you	0	4	11	7
2 a) Rate the delivery of their service	0	5	5	12
3 b) GSSC act professionally	0	5	6	11
C) GSSC staff are listening to your problems/queries	0	5	12	5
1.Given your recent experience with the GSSC, how would your rate their overall performance	0	6	8	8
3 d) GSSC keep you informed about future changes that affect you	1	0	3	18
3 c) GSSC inspire trust	1	4	4	13
2 c) Rate the value of their service	1	6	8	7
6.The service are provided in accordance to the SLA	1	7	5	9
9 a) GSSC staff are pleasant to deal with	1	8	10	3
2 b) Rate your relationship with the GSSC team	1	8	11	2
7. The guidelines and instructions provided by the GSSC are clear.	3	7	8	4
5. The GSSC is providing you with services you need.	7	3	8	4

APPENDIX D

Frequency %

Questions	Exceeds Expectations Count	%	Meets Expectations Count	%	Mostly meets Expectations Count	%	Does not meet Expectations Count	%	Total Count	%
1			6	27.27	8	36.36	8	36.36	22	100
2 a)			5	22.73	5	22.73	12	54.55	22	100
2 b)	1	4.55	8	36.36	11	50.00	2	9.09	22	100
2 c)	1	4.55	6	27.27	8	36.36	7	31.82	22	100
3a)			3	13.64	7	31.82	12	54.55	22	100
3 b)			5	22.73	6	27.27	11	50.00	22	100
3 c)	1	4.55	4	18.18	4	18.18	13	59.09	22	100
3 d)	1	4.55			3	13.64	18	81.82	22	100
4					11	50.00	11	50.00	22	100
5	7	31.82	3	13.64	8	36.36	4	18.18	22	100
6	1	31.82	7	31.82	5	22.73	9	40.91	22	100
7	3	31.82	7	31.82	8	36.36	4	18.18	22	100
8		31.82	4	18.18	6	27.27	12	54.55	22	100
9 a)	1	31.82	8	36.36	10	45.45	3	13.64	22	100
9 b)		31.82	2	9.09	6	27.27	14	63.64	22	100
9c)		31.82	5	22.73	12	54.55	5	22.73	22	100
9 d)		31.82	4	18.18	10	45.45	8	36.36	22	100
9 e)		31.82	4	18.18	7	31.82	11	50.00	22	100
9 f)		31.82	4	18.18	11	50.00	7	31.82	22	100

APPENDIX E

Raw Data Of Survey Results

Questions	1	2 a	2 b	2 c	3a	3 b	3 c	3 d	4	5	6	7	8	9a	9b	9c	9 d	9 e	9 f
Respondent																			
1	5	5	2	4	5	3	3	5	4	4	4	2	4	2	5	3	3	3	4
2	5	5	4	4	5	5	5	5	5	4	5	5	5	4	4	4	4	4	4
3	4	5	3	5	5	5	5	4	4	4	5	4	5	4	5	4	5	5	4
4	4	5	3	5	5	5	5	4	4	4	5	4	5	4	5	4	5	5	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	5	5	4	5	5	5	5	5	5	4	5	3	5	3	5	4	4	5	5
7	4	4	4	4	5	5	5	5	5	4	4	4	4	4	5	4	4	4	4
8	5	5	4	3	5	5	5	5	5	4	5	5	5	4	5	5	5	5	4
9	5	5	4	5	5	5	5	5	5	5	5	4	5	5	5	4	5	5	5
10	4	4	4	4	4	4	4	4	4	3	3	3	4	3	4	4	4	5	5
11	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
12	4	4	4	4	4	5	5	5	5	4	4	4	4	3	5	4	4	5	4
13	5	5	4	5	5	5	5	5	4	5	5	4	5	4	5	4	5	4	4
14	3	3	3	3	3	3	3	5	4	2	3	3	3	3	4	3	4	3	3
15	3	3	3	3	3	3	3	5	5	2	3	4	3	4	4	3	3	3	3
16	3	3	3	4	4	4	2	5	4	2	3	3	4	3	3	3	3	3	3
17	4	4	3	4	4	4	4	5	4	2	4	2	4	3	5	4	4	4	4
18	3	3	3	2	3	3	3	5	5	2	3	3	3	3	3	3	4	4	3
19	3	3	3	3	4	4	4	5	4	2	3	3	3	3	4	4	4	4	4
20	4	5	4	4	4	3	5	2	4	2	3	2	5	4	5	4	3	4	4
21	4	5	4	3	4	4	4	5	5	3	2	3	5	4	5	5	5	5	5
22	3	4	4	3	5	4	5	5	4	3	4	4	5	4	4	5	4	5	5

Appendix F

Standard Bank South Africa
Customer Survey Feedback Questionnaire

No	Question	Greatly Exceeds expectations	Exceeds Expectations	Meets Expectations	Mostly meets Expectations	Does not meet expectations	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
1	How would you rate the SSC overall performance										
2	Given your recent experience with the SSU, how would you rate:										
2.1	Rate the delivery of their service										
2.2	Rate your relationship with their team										
2.3	Rate the value of their service										
3	To what extent:										
3.1	Is the SSU easy to do business with										
3.2	Does the SSU act professionally										
3.3	Does the SSU inspire trust										
3.3	Does the SSU staff keep you informed about future changes										
4	Rate the SSU's performance in dealing with issue and queries										
5	Is the SSU providing you with services you need										
6	Is the services provided in accordance to the SLA's										
7	The guidelines and instructions are clear										
8	Overall how would rate the SSU in terms of customer service?										
9	How would you rate SSU staff in the following areas:										
9.1	The SSU staff pleasant to deal with										
9.2	The SSU staff are taking the initiative to improve customer service										
9.3	The SSU staff are listening to your problem / queries										
9.4	The SSU staff are listening to your problems / queries										
9.5	The SSU staff are able to solve your problems for you										
9.6	The SSU staff are acting on your queries										

APPENDIX G								
Pilot Test Survey Results								
Survey Questions	**R 1**	**R 2**	**R 3**	**R 4**	**R 5**	**R 6**	**R 7**	**R 8**
1.Given your recent experience with the GSSC, how would your rate their overall performance.	3	5	4	5	4	5	4	3
2.Given your recent experience with the GSSC, how would you rate:								
A) The delivery of their service	3	5	4	5	4	5	5	3
B) Your relationship with their team	3	4	4	4	4	5	3	3
C) The value of their service	3	5	4	3	4	5	5	4
3.To What extent is the GSSC:								
A) Easy to do business with	4	5	4	5	5	5	5	4
B) Act professionally	4	5	4	5	5	5	5	4
C) Inspire trust	4	5	4	5	5	5	5	2
D) Keep you informed about future changes that affect you	5	5	4	5	5	5	4	5
4. How would you rate the GSSC's performance in dealing with your queries and issues?	4	4	4	5	5	5	4	4
5. The GSSC is providing you with services you need.	2	5	3	4	4	5	4	2
6.The service are provided in accordance to the SLA	3	5	3	5	4	5	5	3
7. The guidelines and instructions provided by the GSSC are clear.	3	4	3	5	4	5	4	3
8.Taking everything into consideration, how would you rate the GSSC in terms of customer service?	3	5	4	5	4	5	5	4
9. Considering everything, how would you rate GSSC staff in the following areas:								
A) Pleasant to deal with	3	4	3	4	4	5	4	3
B) Initiative to improve customer service?	4	5	4	5	5	5	5	3
C) Listening to your problems/queries	4	4	4	5	4	5	4	3
D) Understanding your problems/queries	4	5	4	5	4	5	5	3
E) Acting upon your queries	4	4	5	5	4	5	5	3
F) Able to solve problems for you	4	4	5	4	4	5	4	3

Appendix H:

Calculation of Normal Approximation Of Signed Rank Statistic

A) Calculation of s

Q1	Q1-4	Abs(q1-4)	Rank	Q2a	Q2a-4	abs(q2a-4)	Rank	Q2b	Q2b-4	abs(q2b-4)	Rank	q2c	q2c-4	abs(q2c-4)	Rank
5	1	1	15.5	5	1	1	14	2	-2	2	22	4	0	0	4.5
5	1	1	15.5	5	1	1	14	4	0	0	6	4	0	0	4.5
4	0	0	4.5	5	1	1	14	3	-1	1	16.5	5	1	1	15
4	0	0	4.5	5	1	1	14	3	-1	1	16.5	5	1	1	15
5	1	1		5	1	1	14	5	1	1	16.5	5	1	1	15
5	1	1	15.5	5	1	1	14	4	0	0	6	5	1	1	15
4	0	0	4.5	4	0	0	3	4	0	0	6	4	0	0	4.5
5	1	1	15.5	5	1	1	14	4	0	0	6	3	-1	1	15
5	1	1	15.5	5	1	1	14	4	0	0	6	5	1	1	15
4	0	0	4.5	4	0	0	3	4	0	0	6	4	0	0	4.5
5	1	1	15.5	5	1	1	14	5	1	1	16.5	5	1	1	15
4	0	0	4.5	4	0	0	3	4	0	0	6	4	0	0	4.5
5	1	1	15.5	5	1	1	14	4	0	0	6	5	1	1	15
3	-1	1	15.5	3	-1	1	14	3	-1	1	16.5	3	-1	1	15
3	-1	1	15.5	3	-1	1	14	3	-1	1	16.5	3	-1	1	15
3	-1	1	15.5	3	-1	1	14	3	-1	1	16.5	4	0	0	4.5
4	0	0	4.5	4	0	0	3	3	-1	1	16.5	4	0	0	4.5
3	-1	1	15.5	3	-1	1	14	3	-1	1	16.5	2	-2	2	22
3	-1	1	15.5	3	-1	1	14	3	-1	1	16.5	3	-1	1	15
4	0	0	4.5	5	1	1	14	4	0	0	6	4	0	0	4.5
4	0	0	4.5	5	1	1	14	4	0	0	6	3	-1	1	15
3	-1	1	15.5	4	0	0	3	4	0	0	6	3	-1	1	15
			93				70				154				112
S			160				183				99				141

	q3a	q3a-4	abs(q3a-4)	rank	q3b	q3b-4	abs(q3b-4)	rank	q3 c	q3c-4	abs(q3c-4)	rank	q3 d	q3d-4	abs(q3d-4)	Rank
	5	1	1	15	3	-1	1	14.5	3	-1	1	13	5	1	1	12.5
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	5	1	1	15	5	1	1	14.5	5	1	1	13	4	0	0	2
	5	1	1	15	5	1	1	14.5	5	1	1	13	4	0	0	2
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	4	0	0	4	4	0	0	3.5	4	0	0	2.5	4	0	0	2
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	4	0	0	4	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	5	1	1	15	5	1	1	14.5	5	1	1	13	5	1	1	12.5
	3	-1	1	15	3	-1	1	14.5	3	-1	1	13	5	1	1	12.5
	3	-1	1	15	3	-1	1	14.5	3	-1	1	13	5	1	1	12.5
	4	0	0	4	4	0	0	3.5	2	-2	2	22	5	1	1	12.5
	4	0	0	4	4	0	0	3.5	4	0	0	2.5	5	1	1	12.5
	3	-1	1	15	3	-1	1	14.5	3	-1	1	13	5	1	1	12.5
	4	0	0	4	4	0	0	3.5	4	0	0	2.5	5	1	1	12.5
	4	0	0	4	3	-1	1	14.5	5	1	1	13	2	-2	2	22
	4	0	0	4	4	0	0	3.5	4	0	0	2.5	5	1	1	12.5
	5	1	1	15	4	0	0	3.5	5	1	1	13	5	1	1	12.5
				45				72.5				74				22
S				208				180.5				179				231

q4	q4-4	abs(q4-4)	rank	q5	q5-4	abs(q5-4)	rank	q6	q6-4	abs(q6-4)	rank	q7	q7-4	abs(q7-4)	Rank
4	0	0	6	4	0	0	4.5	4	0	0	3	2	-2	2	21
5	1	1	17	4	0	0	4.5	5	1	1	13.5	5	1	1	14
4	0	0	6	4	0	0	4.5	5	1	1	13.5	4	0	0	4.5
4	0	0	6	4	0	0	4.5	5	1	1	13.5	4	0	0	4.5
5	1	1	17	5	1	1	12	5	1	1	13.5	5	1	1	14
5	1	1	17	4	0	0	4.5	5	1	1	13.5	3	-1	1	14
5	1	1	17	4	0	0	4.5	4	0	0	3	4	0	0	4.5
5	1	1	17	4	0	0	4.5	5	1	1	13.5	5	1	1	14
5	1	1	17	5	1	1	12	5	1	1	13.5	4	0	0	4.5
4	0	0	6	3	-1	1	12	3	-1	1	13.5	3	-1	1	14
5	1	1	17	5	1	1	12	5	1	1	13.5	5	1	1	14
5	1	1	17	4	0	0	4.5	4	0	0	3	4	0	0	4.5
4	0	0	6	5	1	1	12	5	1	1	13.5	4	0	0	4.5
4	0	0	6	2	-2	2	19	3	-1	1	13.5	3	-1	1	14
5	1	1	17	2	-2	2	19	3	-1	1	13.5	4	0	0	4.5
4	0	0	6	2	-2	2	19	3	-1	1	13.5	3	-1	1	14
4	0	0	6	2	-2	2	19	4	0	0	3	2	-2	2	21
5	1	1	17	2	-2	2	19	3	-1	1	13.5	3	-1	1	14
4	0	0	6	2	-2	2	19	3	-1	1	13.5	3	-1	1	14
4	0	0	6	2	-2	2	19	3	-1	1	13.5	2	-2	2	21
5	1	1	17	3	-1	1	12	2	-2	2	22	3	-1	1	14
4	0	0	6	3	-1	1	12	4	0	0	3	4	0	0	4.5
			0				169				116.5				161
S			253				84				136.5				92

q8	q8-4	abs(q8-4)	rank	q9a	q9a-4	abs(q9a-4)	rank	q9 b	q9b-4	abs(q9b-4)	rank	q9 c	q9c-4	abs(q9c-4)	Rank
4	0	0	3.5	2	-2	2	22	5	1	1	14.5	3	-1	1	17.5
5	1	1	14.5	4	0	0	5.5	4	0	0	3.5	4	0	0	6.5
5	1	1	14.5	4	0	0	5.5	5	1	1	14.5	4	0	0	6.5
5	1	1	14.5	4	0	0	5.5	5	1	1	14.5	4	0	0	6.5
5	1	1	14.5	5	1	1	16	5	1	1	14.5	5	1	1	17.5
5	1	1	14.5	3	-1	1	16	5	1	1	14.5	4	0	0	6.5
4	0	0	3.5	4	0	0	5.5	5	1	1	14.5	4	0	0	6.5
5	1	1	14.5	4	0	0	5.5	5	1	1	14.5	5	1	1	17.5
5	1	1	14.5	5	1	1	16	5	1	1	14.5	4	0	0	6.5
4	0	0	3.5	3	-1	1	16	4	0	0	3.5	4	0	0	6.5
5	1	1	14.5	5	1	1	16	5	1	1	14.5	5	1	1	17.5
4	0	0	3.5	3	-1	1	16	5	1	1	14.5	4	0	0	6.5
5	1	1	14.5	4	0	0	5.5	5	1	1	14.5	4	0	0	6.5
3	-1	1	14.5	3	-1	1	16	4	0	0	3.5	3	-1	1	17.5
3	-1	1	14.5	4	0	0	5.5	4	0	0	3.5	3	-1	1	17.5
4	0	0	3.5	3	-1	1	16	3	-1	1	14.5	3	-1	1	17.5
4	0	0	3.5	3	-1	1	16	5	1	1	14.5	4	0	0	6.5
3	-1	1	14.5	3	-1	1	16	3	-1	1	14.5	3	-1	1	17.5
3	-1	1	14.5	3	-1	1	16	4	0	0	3.5	4	0	0	6.5
5	1	1	14.5	4	0	0	5.5	5	1	1	14.5	4	0	0	6.5
5	1	1	14.5	4	0	0	5.5	5	1	1	14.5	5	1	1	17.5
5	1	1	14.5	4	0	0	5.5	4	0	0	3.5	5	1	1	17.5
			58				150				29				87.5
S			195				103				224				165.5

q9d	q9d-4	abs(q9d-4)	rank	q9e	q9e-4	abs(q9e-4)	rank	q9f	q9f-4	abs(q9f-4)	rank
3	-1	1	16.5	3	-1	1	15	4	0	0	6
4	0	0	5.5	4	0	0	4	4	0	0	6
5	1	1	16.5	5	1	1	15	4	0	0	6
5	1	1	16.5	5	1	1	15	4	0	0	6
5	1	1	16.5	5	1	1	15	5	1	1	17
4	0	0	5.5	5	1	1	15	5	1	1	17
4	0	0	5.5	4	0	0	4	4	0	0	6
5	1	1	16.5	5	1	1	15	4	0	0	6
5	1	1	16.5	5	1	1	15	5	1	1	17
4	0	0	5.5	5	1	1	15	5	1	1	17
5	1	1	16.5	5	1	1	15	5	1	1	17
4	0	0	5.5	5	1	1	15	4	0	0	6
5	1	1	16.5	4	0	0	4	4	0	0	6
4	0	0	5.5	3	-1	1	15	3	-1	1	17
3	-1	1	16.5	3	-1	1	15	3	-1	1	17
3	-1	1	16.5	3	-1	1	15	3	-1	1	17
4	0	0	5.5	4	0	0	4	4	0	0	6
4	0	0	5.5	4	0	0	4	3	-1	1	17
4	0	0	5.5	4	0	0	4	4	0	0	6
3	-1	1	16.5	4	0	0	4	4	0	0	6
5	1	1	16.5	5	1	1	15	5	1	1	17
4	0	0	5.5	5	1	1	15	5	1	1	17
			66				60				68
S			187				193				185

Appendix I

B) Calculation of T and p-value

variable	q1	q2a	q2b	a2c	q3a	q3b	q3c	q3d	q4	q5
s	160	183	99	141	208	180.5	179	231	253	84
mu	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5
s-mu	33.5	56.5	-27.5	14.5	81.5	54	52.5	104.5	126.5	-42.5
sq(uncorr)	22770	22770	22770	22770	22770	22770	22770	22770	22770	22770
t1	8	5	11	8	7	6	4	3	11	8
t2	14	17	10	13	15	16	17	18	11	7
t3	0	0	1	1	0	0	1	1	0	7
corr	1617	2508	1155	1344	1848	2145	2478	2919	1320	588
V	881.375	844.25	900.625	892.75	871.75	859.375	845.5	827.125	893.75	924.25
T	1.135819	2.087672	-0.91287	0.476693	3.335673	1.956932	1.911289	5.6139	9.581749	-1.43085
p-value	0.865585	0.975402	0.185836	0.680748	0.998431	0.968109	0.965144	0.999993	1	0.083594

variable	q6	q7	q8	q9a	q9b	q9c	q9d	q9e	q9f	
s	136.5	92	195	103	224	165.5	187	193	185	
mu	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	
s-mu	10	-34.5	68.5	-23.5	97.5	39	60.5	66.5	58.5	
sq(uncorr)	22770	22770	22770	22770	22770	22770	22770	22770	22770	
t1	5	8	6	10	6	12	10	7	11	
t2	16	11	16	11	16	10	12	15	11	
t3	1	3	0	1	0	0	0	0	0	
corr	2100	924	2145	1155	2145	1353	1353	1848	1320	
V	861.25	910.25	859.375	900.625	859.375	892.375	892.375	871.75	893.75	
T	0.333797	-1.15197	2.632947	-0.77595	4.608402	1.328006	2.193741	2.508669	2.103629	
p-value	0.629079	0.131139	0.992225	0.223216	0.999924	0.900785	0.980176	0.989804	0.976181	