University of Southern Queensland
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A Quality Assurance System at the Land Survey and Mapping Unit (Malta)

A dissertation submitted by

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Abstract

The developments in the modern working life are pushing the market to adjust to the rapidly changing requirements. The ever-increasing demands of the market are causing changes of the organisational structures and conditions. To meet the demands of a modern working environment, commitment from management and co-workers in an empowered organisation, are needed. This leads to a need for reduced managerial control and empowered, autonomous co-workers.

The main purpose of this dissertation is to contribute to a leadership that is better adapted to the modern working environment and supports management and co-workers commitment. The research approach looked at the experience of the author and colleagues, collecting information on current work practices through interviews and a questionnaire and analysing the results to develop appropriate conclusions and recommendations.

Any issues raised during the interviews and responses from the questionnaire that appeared to identify limitations on the work practices and services offered by the Land Survey and Mapping Unit, were investigated to determine if the limitations could be reduced or removed. This information was then compared with the academic and professional literature to guide the Unit, to consider the impact on the Unit and to measure the role quality in the Unit and consider the implementation of a Quality Assurance System.

The analysis demonstrated that it is feasible for the Land Survey and Mapping Unit to implement a quality assurance system. However the issues of either implementing a quality assurance system designed to suit the needs and requirements of the Unit or following the route of ISO standards and other acceptable international standards is not so evident. While there appear to be a number of limitations to implementation, they are within the control of the Unit.

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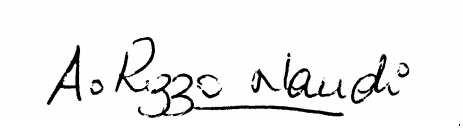

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Chapter 1

1 Introduction

The concept of this dissertation originated from the experiences of the author as a staff member at the Land Survey and Mapping Unit within the Malta Environment and Planning Authority (MEPA). This chapter serves as an introduction to the dissertation. The chapter includes eight sections which cover the background of the research, the research problem, the project objectives, scope of project, structure of dissertation, an organisation overview which explains and describes the organisation in which the Land Survey and Mapping Unit operates, together with a short history of the Unit. The last section is the conclusion.

1.1 Background

An organisation's strategies, innovations, and well planned activities will lead to sustainable competitive advantage and hence improve on product and business performance. As organisations are constantly exploring new ways to improve on products and service, they are looking for new ideas and solutions. This line of

thinking is sustained by Peters (1999) who states that "If we can figure out the most efficient way to produce a product or service, and stop wasting time, materials, replacing broken-down goods or delivering unsatisfactory services – we will be more successful." This dissertation addresses the topic of quality assurance, reviews how the Unit can attempt to implement it by focusing on the achievement of better products and service, and hence satisfaction of clients.

Quality Assurance is recognised internationally as a very effective technique for improving the products and services provided to clients, while maintaining a cost effective approach doing right things right first time. Quality Assurance transmits confidence to customers that their expectations of a quality product are continuously met. Collins (1994) has quoted the following definition of quality assurance, which says: "Quality Assurance (QA) is the implementation of processes which aim to ensure that concern for quality is designed and built into product/service. It implies commitment by the organisation to a systematic approach to the pursuit of quality, demonstrated by an explicit statement of policy, setting out expectations and standards. Systematic and comprehensive arrangements to ensure that the required standards are achieved will be evident throughout organisational procedures and will include processes for verification and feedback" (Department of Health, London 1991). This is a very interesting definition as it puts together the processes of a Quality Assurance System.

Quality is what makes the customer come back. "Quality to a great degree is what the customer says it is" (Peters, 1999). Organisations should not stop striving for quality, as the quality of today might not be the quality of tomorrow. The road to quality is long and interminable. Procedures and work instructions have to be constantly reviewed. This is emphasised by Peters (1999) who states that "Although Quality Assurance is essentially about doing the same things over and over again as efficiently and cost-effective as possible, the principle which drives effective quality assurance is continual questioning".

To ensure effective implementation of a Quality Assurance System the current work procedures must be constructively analysed. This must determine the critical factors that can affect the implementation and to identify any shortfalls in the system.

1.2 Research Problem

The project will identify a quality assurance implementation plan for the Land Survey and Mapping Unit. The Unit has been operating for many years now, without clear procedures for quality control and hence quality assurance. No apparent effort has until now been put in the planning of a Quality Assurance System.

From this the author derives the following hypothesis:

The Land Survey and Mapping Unit lacks an appropriate Quality Assurance System to deliver products and service demanded by its clients.

1.3 Project Aim

The aim of this project is to develop a Quality Assurance System for the Land Survey and Mapping Unit, Malta. By doing so, one hopes that this project will help management in implementing a Quality Assurance System as designed in this document. Information on quality assurance is dealt with thoroughly to better inform management on what it takes to implement such a system. Various issues have to be in place to contribute for the build up of an implementation.

1.4 Project Objectives

The project objectives were:

1. Describe and define the current system.
2. Analyse the system with a view to make improvements.
3. Evaluate current tools.
4. Research alternative tools.
5. Cost-benefit analysis.
6. Recommendations.

1.5 Scope of Project

The scope of work undertaken in this study is based on work experience at the Unit. The Unit has passed through unpleasant experiences of rework. The Unit has over the years collected and created a plethora of data. This information is not being kept under a controlled environment. No proper filing system exists. A lot of information is being created without proper quality control measures being adopted. Lack of

communication in the Unit persists. Every member of the staff seems independent of any system. No proper records of projects are kept.

1.6 Structure of the Dissertation

In addition to this introductory chapter, this dissertation consists of six chapters (figure 1.1). Chapter two provides a detailed review of the current literature and practices concerning quality. Chapter three discusses the research methodology used in this study. Chapter four is a presentation of findings. The data in this chapter is presented by charts. Chapter five is an analysis and discussion of the results originating from Chapter four. Chapter six provides the recommendations put forward by the author. The recommendations were built on the analysis described in Chapter five. In Chapter seven the author came to various conclusions and suggested further research.

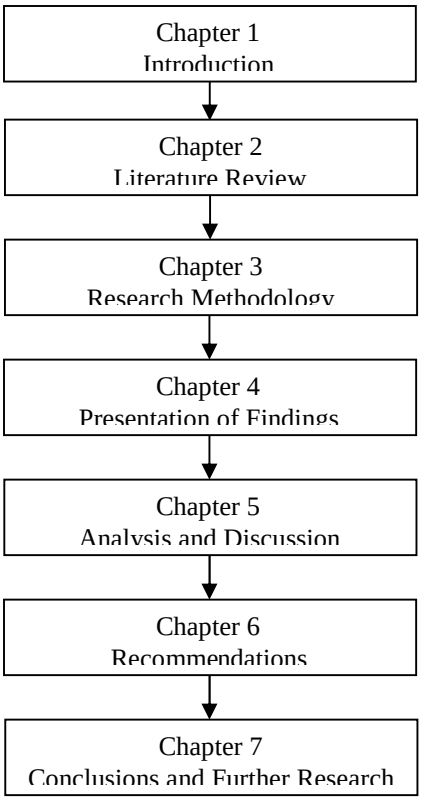

Figure 1.1 Structure of dissertation

1.7 Organisation Overview

In the late eighties the Maltese Public Works Department (PWD) set up the Town Planning Section to address the ever increasing amount of building applications. To better see the needs of development and environment, the Planning Authority (PA) was set up in 1992. The Planning Authority was made up of the then Town Planning Section personnel. The Planning Authority took on the task of drawing up the Structure Plan for the Maltese Islands. The Land Survey Section and the Mapping Section within the Public Works Department were transferred to the Planning Authority.

In 2002 the Environment Protection Department was integrated with the Planning Authority and thus a new authority was born. This new authority is known as the Malta Environment and Planning Authority (MEPA).

MEPA is mainly a service organisation subsidised by the government since the revenue generated from the development applications and other services does not cover its expenditure. The revenue generated from development infringement fines, is passed on to the Roads Directorate of the Malta Transport Authority towards the construction of new roads.

1.7.1 Aims and Functions of the Authority

The aims and functions of the Planning Authority, as outlined in the Development Planning Act, 1992 are (Planning Authority annual report 1994):

1. The promotion of proper land development, both public and private, and the control of such development in accordance with approved policies and plans.
2. For these purposes, the Authority is responsible for:
    a) The preparation and maintenance of the development plans, that is to say the Structure Plan and the supplementary planning documents, including any other matter ancillary, incidental or conductive thereto;
    b) the conduct of consultations with departments, private organisations and other persons relating to planning.
3. In the execution of its functions under the Act, the Authority shall have and may exercise all or any one or more of the powers vested in it or entrusted to it by the Act.
4. Subject to retaining overall control and supervision, and otherwise observing the provisions of the Act, the authority may delegate any one or more of its functions or powers under the Act under such conditions as it may deem appropriate.
5. The Authority may also exercise all powers of control as may from time to time be delegated to it by any department or agency of Government.

1.7.2 Vision Statement

"Our aim is to pass onto our children a better country than we inherited. It is for this very reason that we compare our environment to a treasure, something we place our energies in, to protect, care for and improve. The environment encompasses all - nature, cultural and architectural heritage, towns and villages, the countryside, the seas and air. We believe that together we should carefully plan so that our heritage, this gem which we treasure, will not fade away.

The Malta Environment & Planning Authority is committed to ensure that land use and the protection of the environment meet the needs of today's society and future communities. We are working to ensure a quality of life that will be in harmony with our natural, cultural and built environment. In so doing we are seeking to implement sustainable development that safeguards the environment" (www.mepa.org.mt).

1.7.3 Mission Statement

"To achieve the vision that we have set for Malta, we need to work carefully, responsibly and with a dedicated service so that together, with everyone's contribution, we will reach our attainable goal. We believe that it is only by implementing these principles in every process and decision that we can attain the best social, economic and cultural results for our country. This we cannot and do not wish to do alone, we are here to listen, understand and give the necessary support to those initiatives

that are fostered by individuals or the community. In this way, everyone will be contributing towards enhancing this awareness and we will be in a better position to anticipate tomorrow's opportunities, today" (www.mepa.org.mt).

1.7.4 Mapping Unit (MU)

The Mapping Unit was set up in 1989 as the National Mapping Agency of Malta. The Mapping Unit was set up within the Maltese Public Works Department. The continuous developments that had a significant effect on the shape of the land, contributed to the setting up of the Mapping Unit. The necessity of new topographic surveys of the Maltese Islands was being felt everyday. At the time, the last survey conducted for the 1:2500 scale survey sheets was completed in 1968, while that of the 1:25000 scale map in 1962 and then revised in 1984.

In 1988 the Public Works Department commissioned a foreign company to run a set of aerial photographs. The photographs were taken at scales of 1:6000 and 1:15000. The 1:6000 scale photographs were used to digitise the 1:1000 base map, while the 1:15000 scale photographs were used to digitise the 1:2500 base map. The 1:2500 base map was digitised by the foreign company and all the editing of the raw data was undertaken by the Mapping Unit. The 1:1000 large scale base map is being digitised by the Unit.

In 1992, the Government of Malta set-up the Planning Authority, which hence became the Malta Environment and Planning Authority (MEPA). The Mapping Unit was transferred from the Public Works Department to the then Planning Authority.

1.7.5 Services offered by the Mapping Unit

The primary functions of the Mapping Unit are: mapping, geodetic surveying and geographical information systems. The Mapping Unit offers various mapping services. The Unit provides data in topographic and digital formats.

Products and services of the Mapping Unit include the following:

i. Scale maps and digital products make up the largest part of business at the Mapping Unit.
ii. The Unit recoups some of the operating costs through sales of products, services and copyright licences.
iii. The products supplied by the Unit help to support a vast range of business and public sector services, environmental organisations and the emergency services.
iv. The Mapping Unit maintains and updates the base map.
v. The Mapping Unit maintains the levelling network of the Islands of Malta.
vi. It is now an established procedure that all surveys done by the Land Survey Unit teams are referenced to a National Co-ordinate framework. This allows consistent grid referencing between aerial mapping, ground survey and

related datasets. To achieve this objective, the Mapping Unit team provides UTM co-ordinates on an average of two traverse points for each survey.

vii. Considerable progress has also been made with the development of Geographical Information Systems (GIS). The Unit manages the GIS of the Malta Planning and Environment Authority.

1.7.6 Mapping Unit Clients

The Mapping Unit clients are: Government Departments, Authorities, Corporations, Local Councils, architects, brokers and the everyday individuals who need a site plan when applying for a building permit. The University of Malta is also a regular client of the Mapping Unit. The Mapping Unit also provides services to other Units within the Malta Environment and Planning Authority.

The Unit undertook a major exercise in 1995 for the Department of Statistics in relation to the Census. The project involved the preparation of maps for each of the enumerated districts within each Local Council area and the design of routes for the enumeration within each district. The Department of Statistics has once again entrusted the Unit to produce route maps for Census 2005. The Unit also produced other thematic maps for internal requirements.

The Mapping Unit is in the process of digitising a parcel map for the Lands Department. This digital map will eventually replace the analog paper map currently used by the Lands Department.

In the Geodetic Surveying area, Global Positioning System (GPS) surveys have been provided to meet internal and external requirements.

1.7.7 Land Survey Unit (LSU)

As with the Mapping Unit, the Land Survey Unit also used to make part of the Public Works Department. The Land Survey Unit is made up of two sections, namely the Setting-Out and Engineering Surveys section and the Topographic Surveys section. The Land Survey Unit is officially responsible for interpreting and setting-out of scheme alignment and street formation levels for new developments covered by a valid development permit. Surveying is usually involved in the initial phase of most projects, therefore the accuracy and care with which data is collected largely determines the efficiency and results of subsequent work. The Land Survey Unit collects data which is later forwarded to the Mapping Department whereby the data is processed for the final product.

In recent years the Land Survey Unit has adopted a more commercial approach mentality when quoting and charging for services. This has played justice on the Unit's services and helped raise additional revenue.

1.7.8 Land Survey Unit Clients

The clients of the Land Survey Unit are: government entities, mainly the Roads Directorate of the Malta Transport Authority (ADT) and the Housing Authority; private architects; the general public who require setting-out of scheme alignments and road formation levels; and other MEPA internal units.

1.7.9 Land Survey and Mapping Unit

The Land Survey Unit and the Mapping Unit have been recently amalgamated to form one Unit, namely, the Land Survey and Mapping Unit. This has been done with a view to reduce duplication of works and sharing of personnel.

1.7.10 Staff Development within the Unit

As with other Units within MEPA, staff development is of great importance. Over the years a number of initiatives have been taken, including specific training in Geographical Information Systems, the application of the WGS 84 Coordinate System, middle management, and the use of office automation products. Some staff members of the Unit had obtained a Higher Certificate in Geomatics. The Higher Certificate in Geomatics course was run by the University of Malta in conjunction with Nottingham Trent University. Mapping Unit personnel have also attended short courses at Ordnance Survey (UK) and IGN France. A Photogrammetric training and consultancy visit from Ordnance Survey (UK) had also provided specialised input on photogrammetric operations. Land Survey Unit staff had received training in modern survey techniques from Ordnance Survey (UK).

1.8 Summary

Having identified the research problem and introduced the topic and the Unit on which this study is based, the next chapter will set the foundations for better understanding of the topic discussed in this dissertation. This after having done a review of academic and professional literature.

Chapter 2

Literature Review

2.1 Introduction

During the last few years, many organisational changes were made by organisations based on a number of new management concepts. Quality assurance is one of these concepts. Quality assurance is concerned with quality planning and defect prevention through systems and documented processes throughout the supply chain (Garvin, 1998, Jabnoun, 2002). A quality assurance has to be built on good foundations of written quality documentation, systematic quality procedures and empowerment.

The increased need for higher quality, flexibility and shorter lead-times means that all employees have to co-operate to reach goals and all the time improving on products and processes. This makes the organisation more dependent on employees' commitment and motivation.

There are two main approaches to quality, namely quality assurance and total quality management (Moreno-Lonzo and Peris, 1998). The purpose of quality assurance is the conformance of products, services and processes with given requirements and standards (Moreno-Lonzo and Peris, 1998).

Quality assurance (QA) is the collective term for planned, formalised activities intended to provide confidence that the output will meet required quality levels. In addition to in-process activities, quality assurance includes an array of activities external to the process; including, of course, activities undertaken to determine customer needs (Johnson, 1993). Collins (1994) defines quality assurance as the systematic approach to the pursuit of quality.

2.2 Quality Assurance

The major differences between the quality assurance (QA) and total quality management (TQM) control processes lie in their respective focuses. While the QA control process focuses on conformance, the TQM process focuses on customer satisfaction and improvement (Jabnoun, 2002).

In his paper "*Control processes for total quality management and quality assurance*", Naceur Jabnoun (2002), proposes the following quality assurance process: setting the standards; providing the input that will enable workers to conform with standards; measuring performance; analysis of the performance data; and taking corrective action. Jabnoun mentions also the proposed steps to be taken for total quality management which are more in number then those for quality assurance. Jabnoun proposes the following control steps: the standards have to be

clarified; the necessary input should be provided by management; a continuous search for new ways of improving the performance and its standards should be established; the needs of customers must be continuously monitored through various methods; checking performance and output; take corrective action; check for improvement and changes in customer needs; and repeat the TQM process. The paper concludes by comparing the differences between the QA and TQM processes. According to Jabnoun, while QA control focuses on conformance, TQM focuses on customer satisfaction and continuous improvement. While the nature of QA is static or dynamic, that of TQM is dynamic. The management role in QA is to establish documented systems, provide training and resources, and to supervise employees. The management role in TQM is to empower employees by infusing TQM values and providing resources, know-how, systems, and delegating authority. The employees' role in QA is to conform to documented standards, while the employees' role in TQM is to participate in setting standards, searching for new improvement, checking performance and correcting actions. The main enabler of QA control is the systems' and process documentation. The main enabler in a TQM is the TQM cultural values.

Total Quality Management (TQM) started in the United States of America (USA) in the early 1980s when Hewlett-Packard criticised US chip manufacturers for poor product quality when compared with their Japanese competitors (Talha, 2004). Mohammad Talha (2004), in his paper "*Total quality management (TQM): an overview*", says that product quality has become a key factor in determining a firm's

success or failure in the global marketplace. Progress in technology and hence manufacturing techniques have made it possible for organisations to achieve very high standards of product quality. As time goes by more and more organisations are building their competitive approach to product quality. In this paper Talha explains ISO 9000 and says that ISO standards are an extension of TQM that consists of a series of various quality standards for products and services. Talha continues to say, "all elements of ISO 9000 can be of great assistance in helping an organisation improve quality and the process cycle of their industry. It is important to avoid equating quality improvement with quality assurance. Quality assurance is a system of activities designed to ensure production that meets pre-established requirements while quality improvement refers to all efforts directed to increase effectiveness and efficiency in meeting accepted customer expectations (Talha, 2004). Organisations who have practiced quality assurance and quality improvement, adopted an integrated approach commonly referred to total quality management (TQM).

Peters (1999), discusses service quality and total quality management as an organisation's quality approach, designed to add value to customers. Peters, starts the paper by asking, "What do we mean by total service quality management (TSQM)? He then says that total service quality management (TSQM) and total quality management (TQM) are not the same, even though related. The paper continues by discussing the roots of quality assurance and total quality management. Quality to a great degree is what the customer says it is (Peters, 1999). The customers will indicate if they are happy with the product or service. Happy

customers will always come back and will recommend the product or service to others. Quality can be measured by observing these situations. Quality of a product is complimented by quality of service. Quality is about efficiency. If we can figure out the most efficient way to produce a product or service, and stop wasting time, materials, replacing broken-down goods or delivering unsatisfactory services, we will be more successful (Peters, 1999).

Dawes (1997), considers the nature of quality assurance and its implications within a multidisciplinary private practice of construction industry design consultants, namely Building Design Partnership (BDP). BDP is the largest such practice in the UK, with approximately eight hundred staff and five UK offices, with further offices in London, France, and Germany (Dawes S, 1997). Dawes reviews the integration of the practice's information services department into the quality assurance system. She states that a management system on good foundations of written quality statements and procedures can only be an advantage. She continues to say "But it is not the job of QA to dictate or change the shape of a company, only to improve where improvement is required, unless of course, complete restructuring is needed, in which case QA can also be used to great advantage." The author stresses the continuing benefits gained by the organisation, including an approach of total involvement and communal responsibility across the practice. The author concludes that the decision to introduce quality assurance is a sound management system. This will prevent provision of poor quality goods and services and eliminate mistakes.

2.3 East and West

Dahlgaard *et al.* (1998) compare quality management practices in manufacturing companies in the East and the West. They use data collected through a postal questionnaire survey as part of the Quality and Economic Development (QED) project (Dahlgaard et al.., 1992). This survey has been conducted in fifteen countries around the world. This paper uses the data collected from three countries in the East, namely Japan, Korea and Taiwan and compares these with the data collected from four countries in the West, namely Denmark, Finland, Sweden and Australia. The paper starts by describing the research methodology utilised. This is followed by the main section of the paper in which quality management practices are compared between the Eastern and Western countries. The final section of the paper draws some conclusions from the results presented and makes suggestions for future work in relation to comparing the East with the West. The survey clearly shows that "Japanese organisations have the highest rate of widespread employee participation in regularly scheduled meetings about quality".

Adebanjo D. and Kehoe D. (1999), present the findings of a study into problems associated with cultural development in UK-based manufacturing organisations. The paper states that although the British organisations are aware of total quality and its importance, unfortunately the rate of improvement is slow. Seven dimensions of quality culture were identified and researched for an evaluation of cultural problems. These were: senior management leadership; employee involvement and empowerment; teamwork; customer focus; partnership with suppliers; effect of chief

executive; open corporate culture. The results of the analysis as shown in this paper show that the British organisations are not using the full potential of the above mentioned dimensions. This survey confirms what Dahlgaard *et al*. (1999) had said in their survey, that European organisations do not involve strongly their employees in quality assurance matters. In fact a study by the Quality Institute reported by Howe *et al.* (1993) showed that employee empowerment levels are below average (Adebanjo D and Kehoe D, 1998).

The paper then specifies the research methodology used which was specifically aimed at bringing out information directly from manufacturing organisations. The quality culture questionnaire was sent to six hundred and thirty organisations. The total quality (TQ) sample targeted those organisations adopting or implementing TQ. The non- TQ sample targeted those organisations registered to ISO 9000 standards and not expected to be highly quality developed or implementing TQ.

2.4 ISO 9000 Standards

ISO 9000 standards provide an opportunity to evaluate a supplier's goods and services consistently and uniformly regardless of where the supplier is located (Motwani J *et al*., 1994, Lofgren, 1991). Motwani J. et al. (1996) state that "to ensure a place in the emerging market, given today's competitive environment, industries must achieve internationally accepted quality levels." This article gives an overview of ISO 9000 and compares ISO 9000 with equivalent national standards developed in other countries. The second part of the article consists of a description

of the ISO certification process. In this section the authors point out the conflicting views as regards the role of the auditors. According to the authors, Benson (1991) and Spizizen (1992) agree that the closing comments from the auditor should include recommended corrective steps that the company should pursue. They then continue by saying that Sprow (1992), on the other hand, states that the auditor should not indicate corrective action to the audited company. Rather, they should report only the findings. In the third part of the article, the authors examine the benefits, criticisms and misconceptions of obtaining ISO 9000. One of the benefits mentioned in this section is employee empowerment, which is considered to be cost saving. ISO 9000 is then criticised, as it is not seen to address the subject of continuous improvement. Another criticism of the ISO 9000 is the preparation costs for certification process. Lofgren (1991) states that the benefits clearly outweigh the costs in preparation for an audit (Motwani J *et al*., 1994). Probably the biggest misconception about ISO lies in the belief that it is a European standard. European countries and the United States were involved in the developing of the International Standards Organisation, so it is not solely a European idea (Motwani J. *et al*., 1994). The article concludes by discussing how a large US manufacturing organisation achieved its ISO 9000 certification.

On 15 December 2000, the European Committee for Standardisation approved the ISO 9000 : 2000 series of standards. This new series of standards made the 1994 version of standards obsolete. Certified organisations had till December 2003 to make the transition to the revised standards. This “new and improved” version of

ISO 9000 is aimed at making the standard, *inter alia*, much more user-friendly for current users and more attractive to potential users (Douglas *et al*. 2003). In their paper "*The case for ISO 9000,*" Douglas *et al*. (2003) review the arguments in favour or against the ISO 9000 and examine the perceived advantages and disadvantages of implementing it. The authors report the results of a survey of over one hundred quality professionals of ISO 9000 certified organisations and who mange ISO 9000 quality system on a daily basis. Where as in the past surveys were conducted using contributions from quality professionals who did not manage the ISO 9000 quality system on a daily basis, this paper aims to remedy this anomaly. The survey concludes that the majority of quality professionals are happy with the way ISO 9000 contributes to quality improvement, minimising past criticisms of the standard. These results can be very helpful to those organisations currently in the process of deciding whether to implement it or not.

The ISO 9000 standard has had a great impact on manufacturing and service industries by helping to establish the framework required for effective and efficient quality assurance and quality management systems (Bhuiyan and Alam, 2004 Bhuiyan *et al.* (2005), present the findings of a case study conducted at a small North American manufacturing company that has spent close to one year working on implementing the ISO 9000 standard. Numerous studies have been undertaken on the experiences of ISO 9000 implementation globally, and they show that quality improvement initiatives such as ISO 9000, while successful in many respects, can also be accompanied by major roadblocks (Bhuiyan and Alam, 2004).

V.N. McLachlan (1996) opens his paper *"In praise of ISO 9000"*, identifies criticisms that were pointed out in other articles on the ISO 9000 standards. In general the main criticisms were: it is too expensive; it does not address the needs of small businesses; it is unduly biased towards manufacturing; is irrelevant; and you can still make and sell rubbish. The response of McLachlan (1996) to these criticisms is: "it is cheaper than total quality (TQ); the standard can easily be implemented for small businesses, although nothing is ever perfect, and "continuous improvement" in standards should be pursued; true – it needs changing and is being changed; rubbish!; there are many product-specific standards and it was not intended that ISO would duplicate these." The author then continues by advising what an organisation should do to implement total quality. According to McLachlan the organisation must: motivate and empower staff; encourage creativity, originality and development; embrace continuous improvement; not set targets. McLachlan then finishes by mentioning the minimum criteria for the implementation of ISO 9000.

2.5 Digital Preservation

In recent years many organisations in the UK and others worldwide have invested heavily in the digital preservation of data. Williamson (2004), considers the quality assurance issues that must be considered at each stage of the digitisation process to maximise the return on this investment, and achieve the goals of digital preservation. "The goal of digital preservation is to maintain the ability to display, retrieve, and use digital collections in the face of rapidly changing technological and organisational infrastructures and elements" (Cornell University Library, 2003).

Appropriate quality assurance measures in the process of digital preservation, is vital for continuous long-term access of digital data, and to justify the investment being made in digital preservation. In this paper Williamson discusses the four stages of quality assurance within the digitising process suggested in the UK by the Joint Information Systems Committee (JISC) QA Focus, and identifies issues to be considered at each stage.

2.6 Empowerment

Every organisation is rich in talent, and the value of the gold we mine is in the team of people we lead (Scarnati, 2002). Teamwork and empowerment are essential elements of quality (Scarnati, 2001). Quality means doing the right things right, doing the right things effectively, and taking the right measurements to ensure excellence of the product or service (Scarnati, 2002). Product improvement is defined as "the participatory process empowering all employees with the opportunity to join in the planning implementation process" (Scarnati 2002). The paper discusses the quality characteristics of leadership that are necessary in a quality organisation. It explains the development of a quality system and quality principles and how they relate to empowerment. Quality is described as the result of teamwork and group activities. The paper depicts delegating and accepting responsibility as a quality that promotes and supports leadership. The paper also discusses various existing standards for quality.

Roth (1997), compares the organisation improvement effort in two organisations, namely Ames Rubber and International Paper. Ames Rubber adopted a partial empowerment whilst International Rubber empowered fully its employees. In this paper Roth, points out that although it is possible to achieve positive results by partial empowerment, results take longer to materialise and might even differ from the organisation's original objectives. Full empowerment attitude is obviously more likely to achieve the organisation's objectives, and is easier and cheaper to implement. Roth believes that many are adopting partial empowerment, so consequently only partial results are being achieved.

Fleming (1995), describes the use of multidisciplinary project teams in audit planning, process and outcome. Audit can be an activity that causes anxiety to staff. Many perceive it to be a manager's tool for fault finding or an activity owned by doctors to analyse their activities in a peer group setting with results only available to the clinicians (Fleming, 1995). The audit surveys mentioned in this paper were conducted in health institutions. Fleming rightly so says that by involving staff in audit planning, they can learn the difficulties and also the rewards in surveying their service. Audit can be used as an educational tool.

2.7 Total Quality Management

Peters (1999), discusses service quality and total quality management as a business strategy designed to add value to customers. It begins by discussing the roots of quality assurance and total quality management. Quality management revolves

around two ideas on how to provide a product or a service efficiently. The first idea concerns the customers. If we can figure out what it is our customers like, and deliver it the same every time, our customers will come back to us, tell others about us, and we will become more successful (Peters, 1999). The second idea is about efficiency. If we can figure out the most efficient way to produce a product or service, and stop wasting time, materials, replacing broken-down goods or delivering unsatisfactory services, we will be more successful (Peters, 1999). The author also says that quality assurance has to be more than just efficiency and doing things the same every time. It has to be about effectiveness too, which means changing and developing and continually improving.

A major problem for many companies is how to maintain the momentum of their quality initiatives, and how to ensure that they become embedded within the organisations' culture (Knights D, McCabe D, 1996). The paper presents the results of a case study based research survey conducted during the years 1993 to 1995. The commitment of senior mangers has been described as the most important determinant of successful TQ implementation and its absence is a prime reason why TQ fails (Morgan and Murgatroyd, 1994, Adebanjo and Kehoe, 1998). Nakamura (1992) also stated that it is clear that unless senior management is fully committed to the idea of real improvement in quality, exercises leadership and devotes time, energy and resources to this objective, it would be impossible to motivate the rest of the organisation (Adebanjo and Kehoe, 1998). Knights and McCabe (1996) confirm this line of thinking and say that it is not enough for management to venture on

problem solving, employees education development or attend quality steering committees in order to introduce quality initiatives successfully. They conclude that quality initiatives must be managed.

2.8 Conclusion

Quality Assurance promotes prevention through providing the systems of inputs that guide the employees to work through processes respecting specified standards as set by the organisation. In doing so, they have to methodically follow procedures and instructions. Quality Assurance requires constant performance analysis to detect special causes of variation.

Reviewing these papers the authors' views are consistent as regards the concepts of a quality assurance system. No quality assurance system can work without the full cooperation of management in adopting a total quality management system. Empowerment has to be given much thought and should be taken seriously as the employees play an important role in a quality assurance system. Everyone involved in such a system should be well instructed as to how the system works, and have a clear idea of what his/her role is within the same system. The process of quality improvement is an infinite journey.

Chapter 3

Research Methodology

3.1 Introduction

This chapter presents the hypothesis and the research methodology underlying this study. It discusses the research procedure used as well as the rationale behind the choice of research instruments. The research approach to this project was based upon interviews and a questionnaire to selected staff of the Unit.

3.1.1 Hypothesis

So far the findings in the literature review show that a Quality Assurance System is a continuous strive towards quality improvement. The findings also show that the quality system has to be backed by management and the total cooperation of the staff. Also rigorous procedures have to be followed.

From this the author derives the following hypothesis:

The Land Survey and Mapping Unit lacks an appropriate Quality Assurance System to deliver products and service demanded by its clients.

The following chapters of the dissertation will seek to prove or disprove this hypothesis. They will also aim to determine whether there are means within the Unit to set up such a Quality Assurance System.

3.2 Qualitative vs. Quantitative Research

Quantitative methods have been described as "an array of interpretive techniques which seek to describe, decode, translate, and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world" (Van Maanen, 1983). On the other hand qualitative research has been described to be "a multi-method focus, involving an interpretive, naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (Denzin *et al.*, 1994).

Qualitative research is often associated with spoken or written anecdotal data, or with the observation of behaviour, as opposed to the collection and quantification of measurable data.

3.2.1 Interviews

Interviewing a selection of professional staff (professional grades escalate from ‘A’ to ‘E’) and technical staff (technical grades escalate from ‘1’ to ‘8’) within the Unit seemed to offer an appropriate balance between getting a wider viewpoint of the issues being studied, while attempting a deeper more complex understanding of these issues than would be given by using quantitative methods of data collection, such as questionnaires.

The interviews were aimed at staff from various departments within the Unit who are informed on quality assurance. The persons interviewed occupy posts of technical grade ‘6’ (technical grades escalate from ‘1’ to ‘8’) and professional grades ‘A’ to ‘D’ (professional grades escalate from ‘A’ to ‘E’). The aim of the interviews was to probe the interviewees to answer questions such as those presented in Appendix B. The answers to these questions gave the author a better perspective of the current situation at the Land Survey and Mapping Unit.

3.2.2 Questionnaire

An eleven question questionnaire (Appendix C) was distributed to those staff members not reached by interview. The questionnaire was designed to gather information of opinions on the implementation of a Quality Assurance System. The first question asked was to see if the staff had knowledge of quality assurance. Though this might seem an obvious question, it had to be asked as it gave a clear indication in which direction the questionnaire was going to take. The questionnaire

was emailed and attached as a document. The email contained a definition on quality assurance with the intention to put the staff in the right direction. Members of the staff who wished to delve deeper into the subject, had the facility to search for information on the web. A “no” answer to the first question would gauge the knowledge of quality assurance among the staff. The frequency of this answer would give indications of difficulties to be encountered whilst setting up the system.

Even though the author is a staff member at the Unit, the activity to gather information by interview techniques was severely limited by available time and by the availability of selected staff. Therefore the author also had to develop a questionnaire that was to the point and short so that the respondents did not think of it as “another survey to fill in”.

This questionnaire was designed to answer questions and get a feedback from staff members. The questionnaire was sent to persons occupying technical grades ‘5’ to ‘7’ (technical grades escalate from ‘1’ to ‘8’).

The questions the author wanted answered were the following:

1. How many members of the staff are familiar with Quality Assurance?
2. What knowledge is there of Quality Assurance amongst the staff of the Unit?
3. Is there enough culture within the Unit staff to set up a System?

4. Is the staff ready for change?
5. Does the staff agree with the implementation of a Quality Assurance System?
6. Is the staff willing to participate in the process?
7. Is the staff ready for all the documentation that comes with a Quality Assurance System?
8. Does the staff agree with the amount of documentation?
9. Would the staff agree were the Unit to implement ISO standards?

A pilot test of the questionnaire was carried out amongst personnel who where employed within the Land Survey and Mapping Unit for over five years and considered as knowledgeable on the subject. These came back with various positive suggestions, such that questions were changed from a simple yes/no answer which led the respondent nowhere, to those that asked the respondents to choose possible answers from a given choice using the Likert scale. The questionnaire was created in Microsoft Word format, with fields available for the respondents to include their comments.

3.3 Survey

The pilot interviews were carried out before June. The approximate duration of the interviews was less than an hour. During the course of this survey there were interviewees who were interviewed more than once. At this stage the author found much appreciated cooperation from all the interviewees.

3.4 Ethical Issues

The interviewees were given ample information on the project to make sure that they understood the nature of the project, the objective of the research and the benefits to the author.

High standards of honesty and confidentiality have been maintained by the author. The privacy and the anonymity of the respondents and their department will be maintained. It is assumed that the respondents have provided honest and accurate answers.

3.5 Conclusion

This chapter has described the methodological issues related to the research study undertaken. Notwithstanding limitations, the interviews and the questionnaire were a successful medium for gathering qualitative and quantitative information. The next chapter collates these results for analysis.

Chapter 4

Presentation of Findings

4.1 Introduction

This chapter will only present the findings of the interviews and questionnaire carried out. The results are presented in a way that maintains the privacy of the individual respondents. The main objectives of the interviews and questionnaire were clearly to identify the potentiality of setting up a quality assurance system at the Land Survey and Mapping Unit. In doing so the current situation had to be examined to identify the main issues and hence put forward recommendations that fully address the main areas of concern.

4.2 Research Sample

The interviews and questionnaire were held with twenty staff members of the Land Survey and Mapping Unit. The twenty staff members occupy posts within all the

departments of the Unit. Four of the interviewees occupy a professional grade whilst the others occupy a technical grade.

4.3 Knowledge of a Quality Assurance System

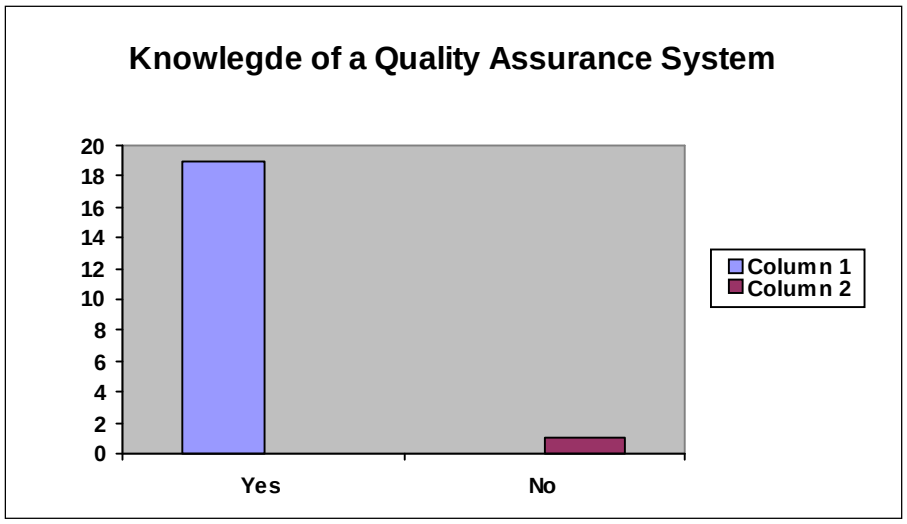

Figure 4.3.1 Knowledge of a Quality Assurance System

The respondents were asked if they knew what a quality assurance system is. Ninety five percent have replied 'yes'.

4.3.2 What does it entail to set up a System?

The respondents who answered this question were also asked what it entails to set up a system. A respondent commented that it is a continuous improved system to the existing by the introduction of appropriate checking procedures, and that the quality validation of the data are made clear to the user. Respondents were of the opinion that setting up a system means to promote an organisational culture in which high

standards of integrity are expected. Respondents also commented that setting up a system means identifying work processes. Other respondents commented that it involves identifying and documenting standards for the processes/products. A respondent even commented that the appropriate study has to be done before spending precious time and money for the setting up of a system, which might not perform to the desired results after all that effort.

4.4 Documentation

The respondents were asked to give their opinion on the increase in paper work a system brings with it. Respondents commented that with today's technology use of paper work can be brought down to a minimum. In their opinion the available digital recording media supersedes the normal paper work. Many respondents just commented 'yes it will mean an increase in paper work'. Respondents agreed that it is definitely an increase in paper work, however in hindsight everything needs to be documented.

4.5 Work Procedures and Instructions

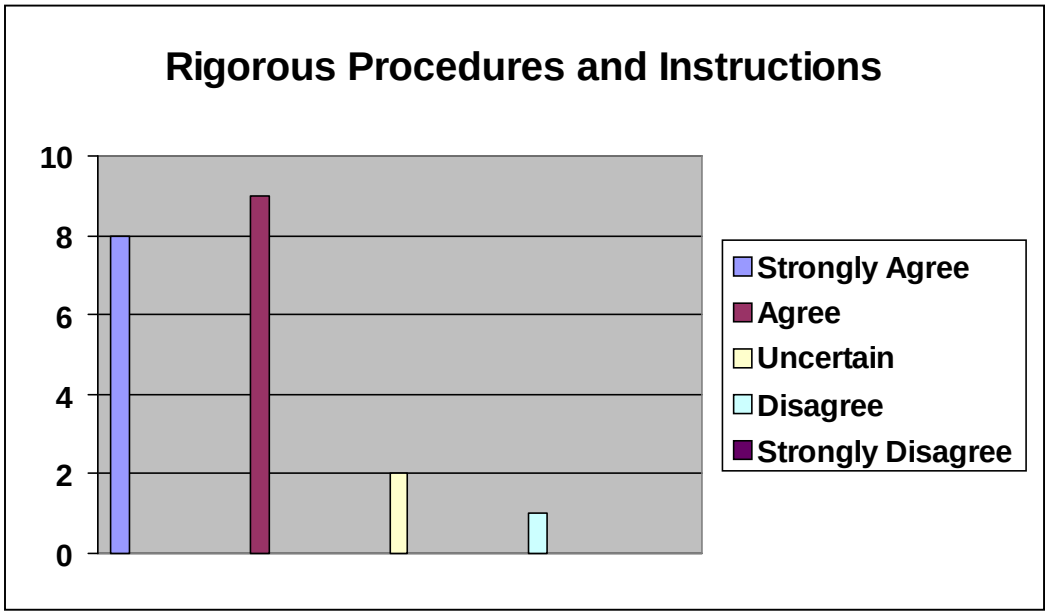

Figure 4.5.1 Rigorous Procedures and Instructions

A Quality Assurance system means following rigorous work procedures and work instructions. Eight respondents 'strongly agree' while nine respondents 'agree.' Apart from two respondents who were uncertain, all but one agree with this statement.

4.5.2 Comments

A respondent commented that following rigorous work procedures and work instructions is good but at the end of the day one must also be practical. Other respondents commented that it is true that rigorous procedures and instructions have

to be followed, but it is also true that this will guarantee that work is done in a correct manner throughout the process.

4.6 Empowerment

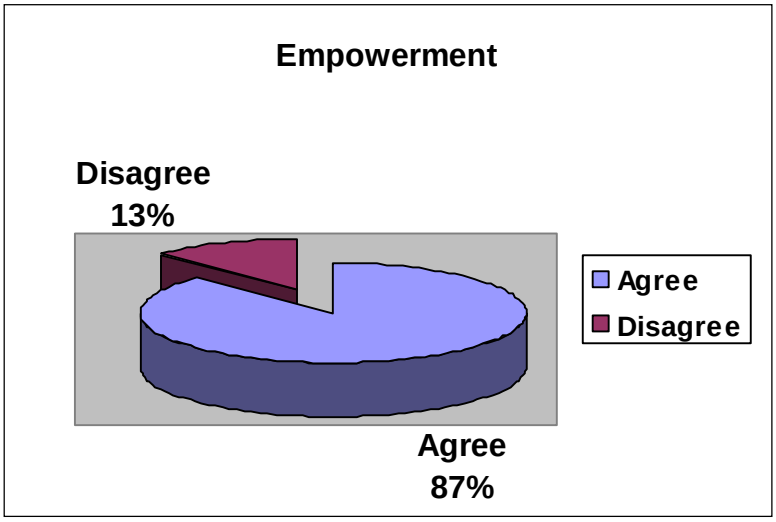

Figure 4.6.1 Empowerment

The question asking if a Quality Assurance System promotes empowerment, received a general response agreeing that it does promote empowerment. Eight seven percent have agreed while the rest disagreed.

4.6.2 Comments

A respondent commented that the statement “a quality assurance promotes empowerment” is subjective as it depends on the employee’s perception. Respondents stated that that a quality assurance system should promote empowerment since if applied correctly the employee should feel more confident

and have an influence on the service the employee provides. A respondent commented that a quality assurance would ensure that staff will know what to do in most situations. It provides 'power' and responsibility to all staff ensuring that a quality product/service is produced. It will also mean that staff will have a sense of 'ownership' of processes, possibly improve staff development and satisfaction.

4.7 Quality at the Workplace

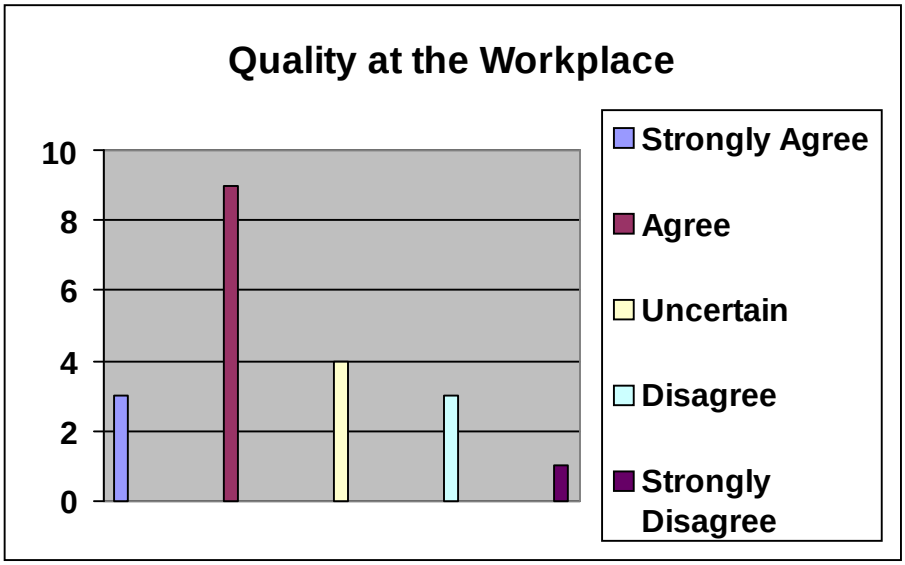

Figure 4.7.1 Quality at the Workplace

The replies to the question if a Quality Assurance System would bring quality at the workplace show that the respondents have a mixed feeling on this matter. Those that either 'strongly agree' or just 'agree' count thirteen in all. The 'uncertain', 'disagree', and 'strongly disagree' make up the rest of the interviewees that is seven.

4.7.2 Comments

A respondent commented that rather than quality at the workplace, a quality assurance system would increase quality in the product. Another respondent commented that a quality assurance system on its own does not necessarily mean quality improvement, however it has an implicit and indirect effect on quality at work since the staff have to be more accountable to the service they are providing.

4.8 Should the Unit implement a Quality Assurance System?

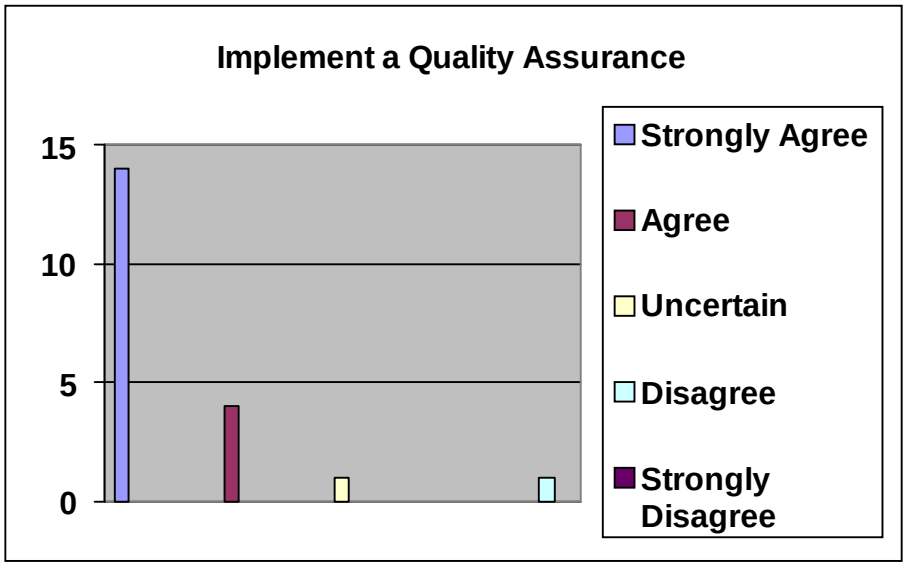

Figure 4.8.1 Implementation of a Quality Assurance System

Fourteen respondents 'strongly agree' that the Unit should implement a quality assurance system. Four respondents 'agree' while one is 'uncertain'. One respondent replied 'strongly disagree.'

4.8.2 Comments

Respondents commented that if the Unit wants to provide its clients with a good product and service, it should implement a quality assurance system. They continued saying that quality control will be performed consistently at all stages and it will be a corporate quality control. Respondents commented that the system would create a more organised working culture within the Unit. A respondent commented that the implementation would mean an incredible increase in work.

4.9 Will it entail much change?

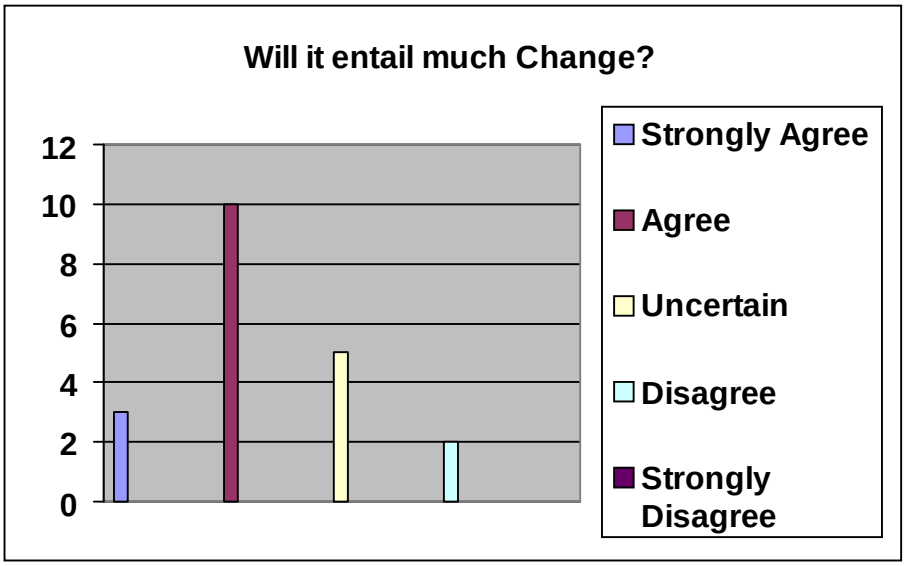

Figure 4.9.1 Change

This question concerned if the implementation of a Quality Assurance System would entail much change to the current system. Three respondents 'strongly agree' while ten 'agree'. Five respondents are uncertain and another two 'disagree'.

4.9.2 Comments

Respondents commented that the implementation of a quality assurance system will entail much change. Respondents mentioned that it would develop better Unit communication. It will bring better management sponsorship and commitment. Respondents commented that the implementation of a quality assurance would mean the identification of processes and process owners. This will also mean implementation of monitoring systems.

4.10 Is there need for Change?

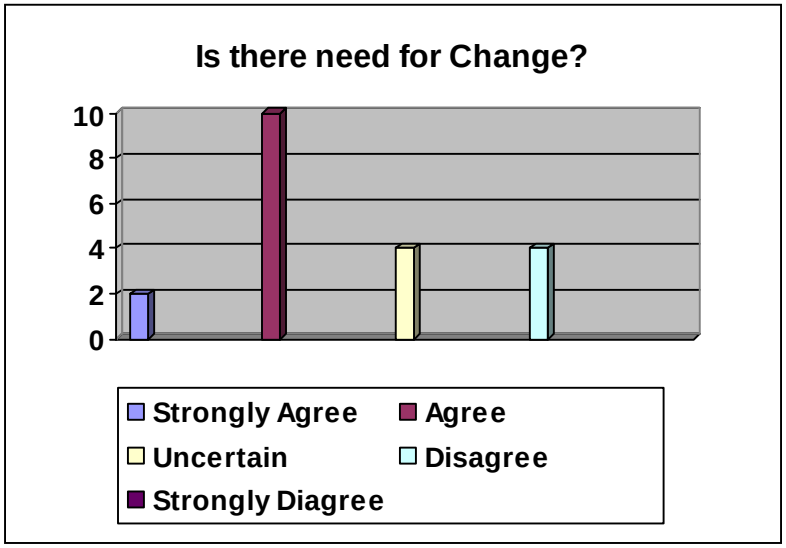

Figure 4.10.1 Need for Change

In this question the respondents were asked if there is need for change. Two respondents declared that they 'strongly agree' that there is need for change. Another ten responded that they 'agree'. There were four uncertain replies and another four 'disagree'.

4.10.2 Comments

Respondents commented that there is need for change as currently there are no system processes a quality system in place. Others commented that there is need for change to improve the product or service provided and to stay abreast with the continuous developments in the discipline. Respondents also commented that rather need for change, there was need to continue building on the current system.

4.11 A Quality Assurance System based on ISO standards

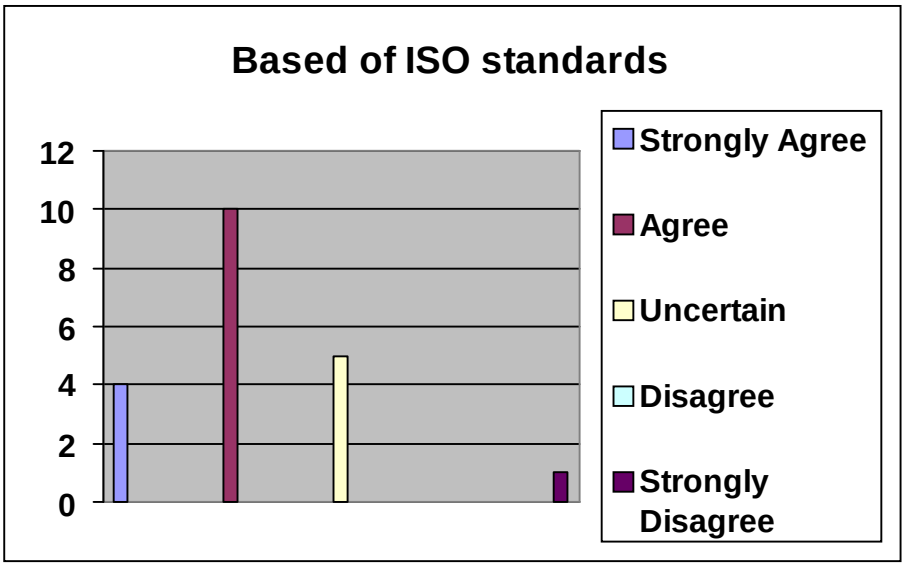

Figure 4.11.1 A Quality Assurance System based on ISO standards

Four respondents chose the 'strongly agree' reply, while another ten respondents chose the 'agree' reply. There were five respondents who are uncertain. One respondent strongly disagrees that the quality assurance system should be based on ISO standards.

4.11.2 Comments

A respondent commented that the Unit should indeed base its quality assurance system on accepted international standards. These do not necessary need to be ISO standards. Another respondent commented that rather building a quality system on ISO standards, the Unit should build on standards that suit the needs of the Unit. Other respondents commented that they are not familiar enough with ISO standards to pass a judgement.

4.12 Implementation of ISO Standards

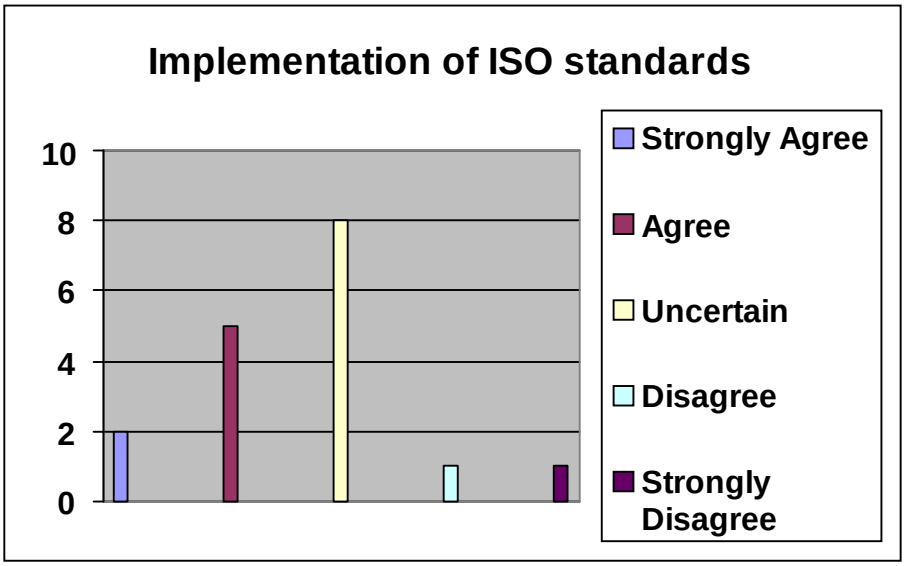

Figure 4.12.1 ISO standards

Uncertainty prevailed in these replies. Two respondents 'strongly agree' while five just 'agree'. There were eight 'uncertain' responses. There was one 'disagree' response and another 'strongly disagree' response.

4.12.2 Comments

Here many respondents replied that they could not commit themselves, as they do not really know what it entails to implement ISO standards. A respondent commented that the implementation of ISO is not required for the guarantee of quality and that the ISO route is not necessarily the most suitable for the Unit. A respondent commented that implementing ISO is complex and expensive. Another respondent commented that implementing ISO means that the system is kept in a dynamic mode and periodic checks would ensure that the initial efforts are maintained throughout.

4.13 Management Support

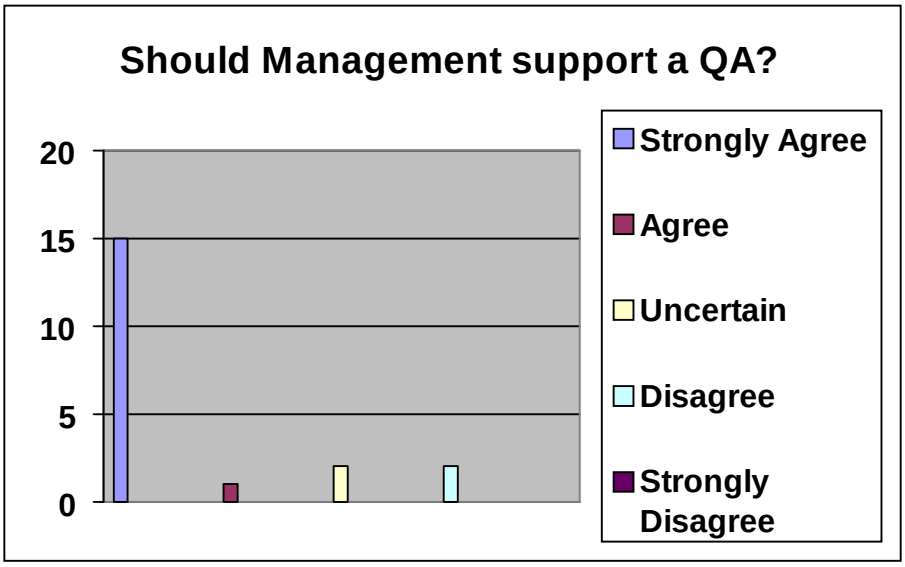

Figure 4.13.1 Management Support

Fifteen respondents replied that they 'strongly agree'. One respondent replied just 'agree' while two replied 'uncertain' and another two replied 'disagree'.

4.13.2 Comments

Respondents have commented that without management support any attempt to introduce and maintain a quality assurance system would fail. Other respondents have added that management sponsorship is a necessary component to the success of a quality assurance system. A respondent commented that the management rather than just supporting the system, management should play the leading role. Respondents are also of the opinion that the management should communicate efficiently to avoid misunderstandings.

4.14 Research Limitations

Some interviewees and respondents were sceptical as to the way they had to reply to the author who is a colleague of theirs. Due to the nature of information they have all asked to stay anonymous. This made it more difficult to the author as interviews had to be held, out of office**.**

4.15 Conclusion

This chapter has highlighted the findings of the interviews and questionnaires by the twenty respondents participating in this study. The interviews and the questionnaire responses have furnished the author with a good selection of both quantitative and qualitative information upon which to build a constructive analysis. The following chapter will seek to analyse the findings.

Chapter 5

Analysis and Discussion

5.1 Introduction

The purpose of this chapter is to analyse the results of the interviews and questionnaires, whilst the evidence and data collected will enable the author to judge whether the hypothesis has been proved or not.

The interviews and questionnaires were held with members of the Unit staff. The Unit is not large as regards number of staff, so it has to be acknowledged that although nearly all the staff members were in one way or another contacted, the sample size is relatively small.

5.2 Knowledge of Quality Assurance

Question one received identical responses, that is all the respondents knew what quality assurance is. As a continuation of question one, the respondents were then asked if they know what it entails to set up a quality system. This question was asked as it will further gauge the knowledge of quality assurance amongst the staff. It was expected that staff who know what quality assurance is about, were to give an ample answer to certify that they know what they are talking about and what it really entails. Brief vague answers show the scarcity of knowledge of the respondent.

5.3 Setting up a Quality Assurance

On the contrary to the first part of this question where the answers were identical, this part of the question offered a variety of replies. There were respondents who gave ample and viable answers, whilst others gave short and very general answers. The most helpful replies came from respondents occupying a professional grade. The contents of the replies show that there is knowledge of a Quality Assurance System amongst the professional grade. A respondent said that one of the initial stages in setting up a Quality Assurance System is to identify the work processes and document standards for the processes while instilling a quality culture within the Unit. This can be linked to the quality assurance process as proposed by Jabnoun (2002) in chapter two that is: “setting standards; providing the input that will enable workers to conform to standards; measuring performance; analysis of the performance data; and taking corrective action.”

Respondents have mentioned the initial expense required to set up the system. A respondent even remarked that a thorough cost benefit analysis be performed to see if the price of quality is worth all the expense. It is the author's opinion that all the effort spent in the setting up of a Quality Assurance System will pay off at the end.

5.4 Documentation

Documentation is a very important component of a Quality Assurance System and a much-discussed issue. An appropriate system is a three-tier documentation that is a quality manual, written procedures and written instructions. These documents include forms, reports, check sheets, work orders, bills of materials, purchase orders, tests, reviews, surveys, audits, etc (Bhuiyan *et al*, 2004).

This question stated that a Quality Assurance means documenting everything that is increase in paperwork. The respondents were asked to comment on this. All the twenty respondents agreed with the statement but were sceptical as to the amount of paperwork that has to be done. They saw this as an extra effort in duties, whilst others viewed it as loss of working time. Two of the respondents commented that with the technology today a lot of paperwork could be avoided. The respondent believes that digital files can be more easily and rapidly accessible than hard copy documents. This opinion agrees with that given in Chapter two by Williamson (2004) who quoted "the goal of digital preservation is to maintain the ability to display, retrieve, and use digital collections in the face of rapidly changing

technological and organisational infrastructures and elements" (Cornell University Library, 2003).

It can be said that whilst quality is about prevention and that time and money spent at this stage can save much more in the future, respondents were reticent in following the procedure. Furthermore the department risked not having hard copies of all the documentation whilst it is a must in a Quality Assurance System. It is the author's opinion that new recruits, and thus new to the work procedures should find documentation available to assist them in their duties.

5.5 Procedures and Work Instructions

Another question was a statement saying that quality assurance means following rigorous work procedures and work instructions. The respondents were asked if they agree with this statement and to add further comments. Procedures are concise documents describing the work process, the responsibility for key activities, checking processes to be undertaken and performance criteria. Work instructions are a detailed document describing work processes on how to undertake a particular activity.

Unanimously all the respondents agreed with the statement. However various different comments were submitted. It has been noted that although not documented, certain procedures are continuously followed. Respondents even said that during the designing stage of the system there could be areas where

improvement in current work procedures is required. This implies that certain procedures do exist. It is the author's opinion that documenting these procedures will be an asset to the Unit. This can confirm what has been stated in Chapter two where Dawes (1997) states that "a management system on good foundations of written quality statements and procedures can only be an advantage." Others commented that there might not be the need to follow procedures and instructions rigorously. They continued saying that practicality should prevail. If practicality means taking shortcuts, this tends to be dangerous as the system might break at this point. Respondents were of the opinion that there was no need for routine work to be documented. It is the author's opinion that if one were to take short cuts in documentation of procedures, this would undermine the Quality Assurance System and possibly contribute to it not being effective.

5.6 Empowerment

In this question the respondents were told that a Quality Assurance System promotes empowerment. They were asked whether they agree or not, and to add comments to sustain their choice. Nearly all agreed that QA promotes empowerment. This sustains what has been quoted in Chapter 2, that is "Teamwork and empowerment are essential elements of quality" (Scarnati, 2001). There are those who disagree and others who are not sure. Empowerment has to have the commitment of the staff members. A few have stressed that it is true that QA promotes empowerment, but the staff have to be committed to cooperate. Respondents rightly so pointed out that empowerment will also mean that the staff will have a sense of 'ownership' of the

process, possibly improve staff development, satisfaction and product improvement. These thoughts can be linked to Scarnati's (200) thoughts, who defined product improvement to be "the participatory process empowering all employees with the opportunity to join in the planning implementation process." The staff occupying a professional grade has agreed that the staff should and must be empowered and guided accordingly in the work processes, which is in line with Scarnati's (2002) opinion that "Every organisation is rich in talent, and the value of the gold we mine is in the team of people we lead".

5.7 Implementation

The respondents were asked if they agree with the implementation of a quality Assurance System and to comment on their choice. The response (18 respondents) to this question was a clear 'yes'. Their comments varied, but were all valid. Everyone has mentioned one or more components that make up a Quality Assurance System. A respondent has tabulated the comments as follows: improved quality in product/service; better customer satisfaction; better understanding of the process and responsibilities; and reduction of waste. Improved quality in product or service and better customer satisfaction are related. This reflects Ishikawa's (1985) theory that "quality assurance means to ensure quality in a product so that a customer can buy it with confidence and use it for a long period of time with confidence and satisfaction." This reply was one of the most common amongst all the replies. Others have added that the implementation would bring with it better understanding of the processes following specified standard requirements. This proves the theory

mentioned in Chapter two, which said that "the purpose of quality assurance is the conformance of products, services and processes with given requirements and standards" (Moreno-Lonzo *et al.*, 1998). Other comments were that implementation would bring with it better quality at work and empowerment. It is apparent that respondents wish to be involved in the setting and implementation of the Quality Assurance System.

5.8 Will it entail much change?

Many believe that it will bring change. The respondents were given Likert scale choice to select from. Still a few took the liberty of adding comments to sustain their choice. In Chapter two, Dawes (1997) was quoted as saying "but it is not the job of QA to dictate or change the shape of a company, only to improve where improvement is required, unless of course, complete restructuring is needed, in which case QA can also be used to great advantage." It is the author's opinion that Dawes's (1997) statement subdues the impact of a newly implemented quality assurance to an organisation. As the respondents added in their comments, a quality assurance would bring better Unit communication; management commitment; identification of processes and process owners; implementation of monitoring systems; and staff participation. When the respondents put these comments forward, it may be said that there are no foundations for a Quality Assurance System.

5.9 Is there need for Change?

Unanimously all the respondents have agreed that there is a need for change. Many have said that this would be a change in the right direction. If the respondents agreed that there is need for change, this implies that they are conveying a message to the management. Is the management performance failing? Is effective teamwork lacking? Do effective organisation structures and systems exist? Is the morale of the Unit low? It is the author's opinion that from the comments of the respondents, something is lacking in the Unit and a change is needed. Change is only possible with the support from the management. Change can motivate people to tougher yet realistic goals. Respondents have pointed out that communication is lacking. Management tend to treat subordinates autocratically, issuing orders but allowing no discussion. It is also the author's opinion that when one evaluates the comments made by the respondents, these imply that the Unit staff are ready for change. It is not clear though what kind of change they are ready for.

5.10 ISO Standards

When asked if the QA system should be built around ISO Standards, many (14 respondents) have responded 'yes'. The reason behind this decision was that ISO is an accepted international standard. One respondent said that the system does not need to be built on ISO standards, but rather standards specifically designed for the needs and requirements of the Unit. This is in line with Dawes's (1997) theory that "above all quality assurance must be employed to create effective management systems to fit the body involved".

The respondents were even asked if they agree if the Unit were to implement ISO Standards. Many have responded in the negative for the simple reason that they do not know what it takes to implement ISO. A few though have said 'yes' as this would mean having a watchdog looking over.

5.11 Management

It is evident from the replies that the respondents are expecting a total management support for the implementation of the Quality Assurance System. A respondent commented that maintaining quality is interesting but it all depends on management commitment.

5.12 Conclusion

The discussion in this chapter has drawn together the interviews and questionnaire results and other information to measure the current situation at the Unit. Both the questionnaire and the interviews have produced valid information for the author to be able to make recommendations.

Very often during interviews the interviewees had to be probed as the forthcoming responses were brief. The author had to feed the information to the interviewee. The questions put forward by the author were designed to elicit answers pertinent to the research hypothesis. Being an experienced staff member at the Unit, the author made his utmost to avoid communicating personal views so as not to transmit his personal influence and bias.

Quality assurance is so much more than has been revealed in the comments of the respondents. There was no mention of continuing professional development for the management and staff. Management must be the first to get education on quality systems, as Crosby (1984) said " the purpose of executive education is to help senior people understand their role in causing problems and then causing improvements in the quality process". For the system to work efficiently the staff have to be continuously trained to keep in touch with new processes and techniques that might be introduced from time to time. Training is one of the major prerequisites in the implementation of a Quality Assurance System.

The respondents failed to mention auditing of the system, which will take place in intervals as established by the organisation. Auditing will measure the efficiency of the Quality Assurance System. Any non-conformance practice will be identified and recommendations for improvement will be put forward.

Communication is another quality component that seems to be missing in the Unit. Eyre (1982) has outlined the importance of communication like this " Effective communication is a valid tool of management because without it all attempts to carry on the activities of an organisation must fail. Without communication nothing can happen: no instructions can be given, no orders taken, no contact made with superiors or subordinates and no information provided or received". More than one respondent has identified the importance for better communication. This implies that there is lack of communication at the Unit.

The respondents have identified empowerment as giving the staff a more participating role in the processes. Two respondents commented that empowerment would further motivate the staff. Another respondent said that it is true that empowerment would give the staff a more participating role, but then continues to add that the staff must be prepared to participate. This is implying that the staff have to be committed for a system to work. When evaluating these comments, it is the author's opinion that the staff is lacking motivation.

There is a general understanding that following in the footsteps of ISO standards, is a move in the right direction. All the respondents know that the ISO standards are recognised internationally. So the standards must be good! However saying that the standards are good is one thing, while implementing them is another thing. The majority of the respondents did not want to commit themselves saying that the Unit should apply for ISO. They all admitted that they do not know enough to decide objectively. Two respondents did however say that they agree with implementing ISO. When interviewed, indications were clear that they had done some in-depth study. Another respondent replied that the Unit should not implement ISO. When this respondent was later interviewed, it was apparent that the reply was based on accurate study.

Health and safety is another issue which was not mentioned by any of the interviewees or respondents. A quality assurance also means quality at the workplace and health and safety is at the top of the list. The interviewees had to be

probed on health and safety issues. It can be said that there is no health and safety plan active at the Unit.

The management role in the implementation of a Quality Assurance System is imperative. It is clear from the replies that the respondents are expecting a management commitment during the whole process.

Chapter 6

Recommendations

6.1 Introduction

In this chapter, a set of recommendations will be given to help the Unit venture into quality in a uniform manner. The recommendations include the processes that have to be followed before and while implementing quality assurance system. The recommendations are supported by explanations of the processes.

6.2 Management Responsibilities and Commitment

The research findings in Section 4.13 show that the employees are expecting a reasonable amount of effort from the management. Setting up a quality assurance system requires significant effort and commitment and has to be sustained by the management. Therefore it is believed that management responsibilities should promote commitment to quality, providing adequate resources and support to the implementation of the quality system, and ensuring that all employees are well

aware of the quality system and the quality commitment and are efficiently working through the processes of the system appropriate to their tasks. It should also provide the staff with the quality assurance project plans. The management has the responsibilities to define the quality aims, the objectives of the system and the activities they are responsible for. The management has to be well educated and informed on the quality system to be able to transmit the principles to their sub-ordinates. It is the author's opinion that management must be prepared to handle resistance to change. It is also recommended that management should communicate better the intensions and transmit motivation across the board.

6.2.1 Employee Commitment

As mentioned in the research analysis (Section 5.12) the staff have to be committed to the system. It is very difficult today that an organisation can excel unless each employee is committed to the organisation's objectives and works as an effective team member. Commitment promotes the loyalty of the staff towards the organisation. Commitment refers to the employee's emotional attachment to, integrate with, and involvement in the organisation. As defined by Mowdray *et al* (1982) Wild (2003), commitment consists of three components: an identification with the goals and values of the organisation; a desire to belong to the organisation; and a willingness to display effort on behalf of the organisation. It is not enough for the organisation to have employees who come to work faithfully everyday and do their jobs independently. Employees now have to get involved more than ever while working in teams and have to prove their worth.

It is the author's opinion that one of the key components for an organisation to survive is to maintain and improve on the organisation's facility to use resources effectively and efficiently. The author also believes that the employment of good workers is thus critical, but even greater significance is the organisation's ability to create a committed workforce. The management has to understand the concept of commitment, the importance employee commitment, and the components affecting it and how the organisation should build employee commitment.

6.2.2 Communication

The research analysis (Section 5.12) indicates that communication in the Unit is lacking. A successful organisation recognises the importance of the employees as individuals in contributing to its success. One of the ways in which the employees may be more involved and made to feel a part of a successful organisation is by communicating information to them regularly. This is linked to Chapter 5 analysis and discussion where Eyre (1982) was quoted to say that "Without communication nothing can happen: no instructions can be given, no orders taken, no contact made with superiors or subordinates and no information provided or received". Only by communicating effectively and understandably can any project of any kind be planned, organised and satisfactorily carried out.

It is the author's opinion that the work force can benefit from being kept informed, which in turn benefits the employer. It is believed that in many organisations the work force discover information about what is happening through indirect channels

such as: trade unions; the grapevine; and newspaper stories. Many organisations rely on the unions to inform the work force of any change in the organisation structure. This could mean changes in organisation policy, working conditions and practices. The trade union will definitely convey its own interpretation on the facts. The management should take the opportunity to put forward its side of the story.

Information through the grapevine is information acquired from one person to another by word of mouth. Information through the grapevine travels fast, and just as much it is received with great interest, it is eagerly passed on. The work force is always seeking information, and when this information does not come from accurate sources through the right channels, the grapevine will flourish. Members of management tend to feed information to the grapevine to gauge the reactions of the work force. One of the great problems of the grapevine is the way the facts are twisted as the information is being disseminated.

Newspaper stories that are more likely to attract the attention of the workforce are reports on investment plans, major contracts and threats of redundancies. News good or bad should always be fed by the employing organisation. If the news is good it would hurt the work force to learn that it got the news at the same time and same source as the outsider. This definitely does not create a feeling of belonging to the organisation. If the news is bad then it makes it even worse to learn of it in this way.

In many organisations vertical communication follows a downward flow. Decisions are made at the top levels of management and instructions are passed down the line until they reach the level at which action has to be taken. With this line of thinking, instructions given out in these organisations are to be carried out, not explained or questioned. Upward flow of communications exists as a response to questions put from above. In this aspect things are changing considerably. The workforce is fully aware that decisions made by the management can affect their employment or their working conditions. They therefore claim the right to be heard before decisions are put into affect. Hence a two-way vertical communication has developed and organisations are offering opportunities for upward flow of communications to counter the customary downward flow.

The need for effective co-operation and co-ordination between various units within an organisation demands a high level of communication between them, and is fulfilled by creating an efficient horizontal face-to-face communications network. Horizontal face-to-face communication is the most direct communicating approach. This direct approach gives the communicators the facility to determine if the message was properly conveyed and understood. The communicator can ask questions and verify responses, to clarify meanings. A probable disadvantage of the face-to-face communication is that the spoken word can be less accurate than the written word.

It is the author's believe that written communications play an important role in management communication. These communications have the advantage of being more carefully checked for accuracy than formal or informal conversations. Many individuals tend to understand better what they read than what they hear.

Communication has a price tag attached to it. The time taken to prepare and present the information has to be considered. The time lost by the work force to attend informative meetings must also be taken into consideration, just as well as any additional costs incurred in travelling to meetings.

The benefits of communicating are not always so obvious but the cost of lack of communication can be greater.

6.2.3 Motivation

As the research findings and analysis indicate (Section 5.12) that the staff at the Unit is lacking motivation. Management in most organisations worry about motivation. Keeping the staff motivated has become a major task. Seminars on the subject are often organised. Audiotapes, videotapes, counselling and other supportive media are in distribution. Many might ask why the staff has to be motivated along the way, since they were all motivated and full of energy when they were hired. Their attitude was good, they listened and worked diligently. They handled the situation in a very serious manner. They looked at the company in a very positive manner. However e few months or years later things can change and the positive attitude will soon diminish. It is believed that this attitude is triggered off by the daily operating

practices of the organisation. Crosby (1984) said, “Employees are turned off to the company through the normal operating practices of the organisation. The thoughtless, irritating, unconcerned way they are dealt with is what does it”. It must be said that many a time the employees feel neglected and that they are nothing but instruments in the hands of a heartless organisation. Their opinion does not count. Various situations can be the cause of such feelings. A fine example of what causes de-motivation is the performance review. No matter how well the performance review is designed, it always tends to flow in one direction. The employees might not be happy with the people performing the review. It is the author’s opinion that management has to work on keeping the staff motivated to mellow the resistance to change that there might be.

6.2.4 Resistance to Change

It must be said that it is no hidden agenda that a quality assurance system brings change in the work environment. This change can bring anxiety amongst the workers of any organisation. The workers will accept or reject the change depending on how it will affect them. Many workers believe that the change would impose extra duties and thus would contemplate to defeat the system. Resistance could be due to the lack of training and understanding as to how the quality system would benefit the Unit. It is recommended that the management should present the new methodology to the workers as a tool to help them do their work better. The management can give the workers the opportunity to participate in the process of defining and describing quality controls. It is the author’s opinion that when a

quality system is fully operational, the workers would have the opportunity to demonstrate objectively that they have performed their task in an efficient manner.

6.3 Quality System implementation Plan

Every project is unique and requires a customised design and a quality assurance system merits no less. The author is therefore proposing the following implementation plan.

A quality system implementation plan should include the following:

6.3.1 Current Work Procedures Analysis

The first step in the implementation plan is to analyse the current work practices. This analysis should indicate any shortfalls in the current system. The quality system will be built on the outcome of this analysis.

6.3.2 Management and the Quality System

At this stage the management team must be well informed on the importance of the quality system. The management will have understood what the system is and what it entails to set it up.

6.3.3 Quality System Team

The quality system team is formed. This team will be responsible for the setting up of the system. The team should be made up of a quality assurance officer and members of the staff who will eventually be participating in the quality audits.

6.3.4 Management Designate

The management should then designate one of its members to head the change. The change should be made gradually as not to create anxiety amongst the staff. All changes have to be very well and clearly explained to the staff.

6.3.5 Quality Policy Statement and Objectives

It must be said that every organisation adopting a quality assurance system should make a quality policy statement which would be a commitment of the organisation to develop, implement and maintain a quality assurance system. This would really be a public announcement of the organisation's commitment to quality. It is the author's opinion that the quality statement may include a brief statement of the organisation's goals and objectives. It can also include the policy adopted by the organisation towards quality matters. To pledge an obligation towards the satisfaction of clients, by adhering to their specific needs.

The organisation can declare its commitment to maintain a quality assurance system that complies with standards as specified by the International Standards Organisation, when the organisation feels prepared to apply.

6.3.6 Documentation

An important component in a quality assurance system is the documentation of procedures. Documentation is all the written material of a quality assurance system. It includes the quality objectives, which are what the Unit aims to achieve, the quality policy such as the Unit practices and the quality processes and procedures.

This documentation will ensure that all staff is aware of their responsibilities for each job undertaken. It is the author's opinion that the Unit should adopt a three tier documentation system, that is a quality manual, procedures documentation and work instructions documentation.

1) Quality Manual

The quality manual is an essential component of the documentation that makes up a quality system. The quality manual describes the key elements of the quality system. The quality system conforms to the guidelines of the quality manual and documentation referred to within that manual. The quality system is described in detail, along with the operating procedures and organisation structure. The quality manual should be referred to on regular basis to check if operations are conforming to the quality system rules. The quality manual can be split in two parts. Part one should contain the quality assurance policies and part two contains the methods used to implement these policies. The quality manual is constantly revised and amended. Amendment procedures are at the discretion of the organisation but the organisation should allow frequent revisions. The new or amended documents are distributed the relevant locations within the organisation. All interested parties are alerted on any amendments. Hence the superseded documents are removed from the manual. The manual must be amended and circulated in an appropriate manner to ensure that all copies are consistent. In normal practice the distribution of the manual is limited to recommended personnel only. This will safeguard the intellectual property of the organisation of which the quality manual makes part.

2) Procedures

Concise documents describing the work process, the responsibility for key activities, checking processes to be undertaken and performance criteria. Procedures will be prepared for each major work process. Certain projects require that usual quality assurance methods to be adapted. That is a specific project may require customised quality plans. These plans document the quality approach needed to finish the project. Conflict may arise between the client's requirements and the quality system of the organisation. In this case it is imperative that the method providing the highest level of quality should be used. No work should commence if no agreement on the appropriate quality work procedures has been reached.

The procedures document the various stages of processes in the making of a project. Documented procedures promote reviewing of current procedures, identifying any shortcomings in the process, such as overlapping duties and responsibilities. Procedure documentation for every project includes the objectives of the procedure, the purpose of the procedure, the process description and the aim of the process. The documentation should include any abbreviations and definitions used in the procedure. Also noted in the documentation, are the relevant data parameters in the predefined quality aims. The documented procedure should be concise as it will take too much time to write and more difficult to maintain.

The Unit should provide accessibility of procedures to every department through a master electronic file saved in a common database. The master electronic file will be maintained by the quality control officer. Operating procedures can be made available to clients for viewing on the premises only. Any requests for copies should be forwarded to top management by the quality assurance officer.

3) Work Instructions

A detailed document describing the work process, how to undertake a particular activity. Work instructions contain technical and professional knowledge. These will be referenced in the relevant procedures.

All critical activities will be undertaken or supervised by professional or technical staff with sufficient training and experience to ensure that client and statutory requirements are met. Work instructions have to be written in a clear and concise manner that the user can be able to follow at ease. Work processes which can be considered common knowledge for appropriately trained staff are not documented.

These documents are an important element on the efficiency of a quality system and the successful implementation of a project. All work instructions documentation will be reviewed by all affected staff and approved by the management of the Unit. The advantages of such documentation is that many a time only an instruction has to be changed or updated without changing anything of the main procedure.

6.3.7 Document Control

Due to the nature of services provided by the Unit, staff handles a variety of documents which are subject to change. These include survey plans, data files and quality management system documentation, such as a quality manual and supporting procedures, work instructions, and forms.

To ensure that changes to information and processes are conveyed to affected clients and staff as soon as possible, and that obsolete documentation is removed from use, all documentation will be issued and maintained in a controlled environment. All documents within the system will be uniquely identified. A controlled document will not have unauthorised additions, erasures or amendments. Uncontrolled copies of the quality system documentation will be made with the approval of the management and such copies will be clearly annotated with a unique identification mark. A list of the documents within the quality system will be kept and maintained by the quality control officer.

It is recommended that the Unit should pursue the following procedures that define the processes for document control:

i. Approving documents for competence prior to issue
ii. Updating and reviewing when required and re-issuing of approved emended documents
iii. Ensuring that changes and current revision status of documents are identified

iv. Ensuring that the current and appropriate working documents are available at point of use

v. Ensuring that documents remain legible and readily identifiable

vi. Ensuring that documents distributed externally are distributed in a controlled manner and clearly identified, and

vii. To mark and put away superseded documents to prevent accidental use

6.3.8 Training of personnel

An important step in the implementation plan is to provide training for the staff. Management has to make sure that the staff is given the necessary training to perform its tasks. The training should be designed in a way to assist the staff to integrate well into the quality system.

6.3.9 Internal Audit

It must be said that quality audits have through the years proven to be important management tools for assessing compliance and effectiveness of quality systems. Audits are essential to ensure that the Unit's quality management system is functioning as planned. Quality audits measure the actual operation of the quality assurance system as opposed to planned operation. The Unit should use quality audits in the effort to improve overall operations performance.

Quality audits are documented systems for assessing and verification of audit evidence, and evaluation of the evidence against audit criteria. Audit evidence is the

information or data collected during the audit process, while audit criteria relates to agreed on procedures, guidelines and standards. More recently quality audits have gained prominence for the evaluation of compliance with applicable quality standards, such as ISO 9000.

Quality coordinators follow a procedure in several stages to examine whether or not quality processes, resources and objectives are what they should be. Quality coordinators evaluate the compliance of quality assurance procedures and related documentation with appropriate standards and guidelines. Then they usually evaluate whether actual quality assurance performance conforms to the documented procedures, and are efficiently implemented and appropriate enough to achieve quality objectives. The frequency of measurement is usually dependent on the type of activity. Important activities within the quality assurance system are audited more frequent and more in depth than others. As procedures are constantly being checked, quality audits are a very important component within the quality assurance system.

It is recommended that the Unit quality coordinators must collect and verify audit evidence without prejudice, evaluate it against quality measuring criteria, and report their findings to the management as quickly as possible after the audit. Corrective action must be taken and reviewed during the next audit.

The staff participating in quality auditing should be trained well enough, so that when auditing the same system against identical measuring criteria, they should come up with similar conclusions. To obtain an impartial and an alternative view staff should be independent of the process being audited. However the staff conducting the quality audit should have a clear understanding of the topic being audited. This can be obtained either through training or previous work experience. A sound quality assurance system must convey confidence and awareness in all the staff participating and other interested parties. All audits and following related actions and the audit procedure itself must be clearly documented.

The analysis of the performance data will expose any shortcomings in the system and at what entity is corrective action needed if any. If the performance is not conforming to standards, corrective action is needed, while if performance is according to standards, the system should keep on working without any modification. Time frames for corrective action will be agreed on at the end of audit.

It is the author's opinion that the audit process the Unit can pursue is as follows:

i. Maintaining a schedule of audits;
ii. Planning the performance of scheduled audits;
iii. Undertaking the audit;
iv. Reporting the outcomes of the audit;

v. Taking follow-up action to ensure that corrective actions are implemented in a timely manner;

vi. Reviewing corrective actions after a period to ensure they have been effective;

vii. Using the information from the completed audits to assist in defining the need and scope for future audits.

6.4 Assessing Risks to Staff

Safety is an important issue and should be given top priority. At the Land Survey and Mapping Unit there are no safety procedures or a safety audit plan in place.

According to the Suzy Lamplugh Trust, research confirms that the greater the contact with the general public, the greater the employee risk, with some of the most vulnerable occupations being those which entail employees leaving the main office base to visit unfamiliar territory (King, S, 1994). Employees can be at risk during various situations. Working alone and after working hours can be considered to be a risk situation. Handling cash or valuable equipment can also be a hazard. Employees exercising authority can also be at risk. A workplace is considered to be any place where work is performed, or is likely to be performed by a worker, self-employed person or an employer. In the Land Survey and Mapping Unit framework this does not only cover the Unit offices, but every job site that the staff of the Unit visits. As regards the survey teams, it also includes the side of the road if that is where they are working. This is a very dangerous place and unfortunately very difficult to control. A worker may be considered to be within a workplace health and safety context even if the person is not paid for the work. A person doing work

as directed by the Unit and not being paid for it, then that person will be considered an employee.

The management and Unit staff must cooperate to implement appropriate policies and practices of health and safety on the workplace by developing safety awareness among all staff. The Unit must give adequate information and training so that the employees understand the risks, measures, procedures and policies taken to deal with them. Workers and other persons must follow appropriate instructions given by their employer for the health and safety of themselves and others. The employees should be responsible enough not to put themselves in danger, or their colleagues, or their workplace.

It is the author's opinion that the Unit should have an officer within its ranks to promote and monitor health and safety issues. This officer should be entitled to do certain things like:

i. Carry out inspections every so often as agreed with the management;
ii. Organise meetings between management, workers and unions so that safety and health rules and procedures can be agreed and followed;
iii. Review the situations leading to work injuries, illnesses caused due to unfortunate working conditions and dangerous situations.
iv. Advise the management of the findings and make recommendations resulting from the review, which can entail re-designing procedures as far as possible for safe working and operation;

v. Help resolve health and safety issues;
vi. Ensuring a satisfactory standard and good maintenance for all equipment;
vii. Report to the management any issue affecting workplace health and safety;
viii. Advice the management on their role to fix any issue affecting health and safety.

Accidents on the place of work can be the cause of lost working days and hence the cause of an extra added expense. The major source of accidents occurs during movement either at the workplace or between workplaces.

The author believes that accidents are not detrimental only to the employee but can also have repercussions on the Unit, above all economic implications as identified by Wild (1995).

According to Wild (1995), he economic implications to the employer resulting from an accident include:

i. Working time lost by the employee;
ii. Time lost by other employees who choose to or must of necessity stop work at the time of or following the accident;
iii. Time lost by supervision, management and technical staff following the accident;
iv. Proportion of the cost of employing first aid, medical staff, etc.;
v. Cost of disruption to the operation;
vi. Cost of any damage to the equipment or any cost associated with the subsequent modification of the equipment;

vii. Cost of any compensation payments or fines resulting from legal action;

viii. Coasts associated with increased insurance premiums;

ix. Reduced output from the injured employee on return to work;

x. Cost of reduced morale, increased absenteeism increased labour turnover among employees.

6.5 Quality and Teamwork

Teamwork and empowerment are essential elements of quality (Scarnati, 2001, Scarnati 2002). Quality is doing the right things right first time. The strength of the organisation is the way it leads the wealth of talent amongst its employees. The strength of the employees is the way they empower each other to form a valid team. Katzenbach and Smith (1993) studied teams that performed at a variety of levels and came up with four categories (Smith, 2000):

1. *Pseudo teams* perform below the level of the average member.
2. *Potential teams* don't quite get going but struggle along at or slightly above the level of the average member.
3. *Real teams* perform quite well.
4. *High-performing teams* perform at an extraordinary level.

The author believes that team development must pave the way to all other kinds of improvement initiatives. Team development must be strategically placed at the very heart of quality assurance and must form the hub around which all other components of quality will revolve. The disciplines team members span from all the technical

levels to management levels. The leadership culture of an organisation has to reflect its commitment to quality. The management of an organisation may change, but the commitment to quality is enduring. The journey to quality is never ending. It may be detrimental is for an organisation to believe that it has achieved total, since quality process is an ongoing exercise and the quality of today might not be good enough for the quality of tomorrow. This is sustained by Peters (1999) who stated that "Although quality assurance is essentially about doing the same things over and over again as efficiently and cost-effective as possible, the principle which drives effective quality assurance is continual questioning." It must be said that the management should strive continuously to train the staff at the Unit to reach its quality objectives.

6.6 Continuing Professional Development (CPD)

Every member of the staff within the Unit affects the level of quality of the same Unit. The Unit should establish procedures for identifying staff training needs and providing appropriate training. A quality assurance procedure is adopted to describe and document the specific training approach, which should also include skill identification. The staff appraisal review is the appropriate moment to identify the training needs. Further more new staff should be well aware of the quality system requirements. The quality manual should address the training process for new staff.

It must be said that implementing a quality assurance system may require the introduction of new tools to help the Unit do things better. The Unit is committed to

explore and introduce new technology when this is available and so the staff will need to enhance their skills. The Unit must integrate the staff with these new tools through education and training. It is important to spend time and money on education to narrow the gap between the current system and quality system principles. It is proposed that education and training courses should include process cycle and process analysis, document writing and quality audit. The type and amount of training required by staff should be identified during the quality system reviews. The quality assurance officer will regularly update the training records for all staff. Records of employees, who leave the organisation, are only kept for a pre-defined period of time and then destroyed or put away. It is the responsibility of the quality control officer to see that the organisation adheres to legislation regarding data protection and confidentiality.

6.7 Quality Control Officer

It is recommended that the Land Survey and Mapping Unit should have a quality control officer within its ranks.

The duties of the quality control officer could be as follows:

i. To ensure that quality control personnel have adequate training, and excess to continuing professional development.

ii. To decide the type and amount of training required and make the necessary arrangements.

iii. To design a highly motivated and effective quality assurance program.

iv. To select and assign qualified individuals to carry out the approved quality control tests.

v. To supervise personnel performing corrective action.

vi. To ensure that test equipment is calibrated and working properly and that the adequate tools are available to perform the quality tests.

vii. To make sure that ample time is available to carry out the quality control tests and hence analyse the results.

viii. To update quality assurance personnel on new quality assurance procedures.

ix. To review the quality tests results every so often until the desired product is achieved.

x. To ensure that records concerning employee qualifications, quality control, health and safety are properly maintained and updated in the Quality Assurance Manual.

xi. To ensure that newly recruited employees review the policy and procedure manual upon employment and at least once a year.

xii. To be responsible for all the documentation regarding quality control tests

6.8 Quality Circles

The author believes that the organisation can improve the situation by creating a "Quality Circle". This would be a drive in the right direction. Quality Circles have a vital role to play in the quality process. Quality Circles have proved successful in all continents of the world, across the whole range of industries and in every function of a business, from sales to production, from accounts to engineering (Robson, 1988). A Quality Circle is a group of four or more volunteers who meet for an hour once a week with their 'one up' supervisor to discuss and analyse and solve work related problems. The one up supervisor usually chairs the meeting. It is believed that Quality Circles can help change the culture of an organisation to one where there is team culture of common quality goals and where commitment of the staff prevails. The staff are given the opportunity to improve their performance to a high level of efficiency that can reflect positively on the overall performance of the organisation. Quality Circles are about improving the quality at work that will hence reflect the quality of the product. Quality Circles cost time and money and so have to be managed properly to be fruitful.

6.9 ISO 9000

As mentioned in the research findings and analysis (Sections 4.12, 5.10, 5.12) there is a general opinion that the Unit can design a quality assurance system based on ISO standards.

The International Organisation for Standardization (ISO) is a worldwide federation of national standards member bodies. The work required to prepare the international Standards is normally carried out through ISO technical committees. The ISO quality assurance models are the following:

- ISO 9001, Quality Systems – Model for quality assurance in design, development, production, installation and servicing

  For use when conformance to specified requirements is to be assured by the supplier during design, development, production, installation and servicing.

- ISO 9002, Quality Systems – Model for quality assurance in production, installation and servicing

  For use when conformance to specified requirements is to be assured by the supplier during production, installation and servicing.

- ISO 9003, Quality Systems – Model for quality assurance in final inspection and test

  For use when conformance to specified requirements is to be assured by the supplier solely at final inspection and test.

Although the standards specify requirements that determine what elements make up a quality assurance, it is not the intention for these International Standards to impose uniformity of quality systems. The design and implementation of a quality system will be dependent on the varying requirements of an organisation. The quality system will reflect the organisation objectives, the products and services supplied, and the processes and specific work practices.

Research in the early 1990s conducted in Scotland (Witcher, 1993) and Northern Ireland (Taylor, 1995a) found that the main reason why organisations implemented ISO 9000 was external pressure from customers (Douglas et al, 2003). The ISO standard is most often implemented to satisfy the demands of customers.

ISO 9000 is not seen with the same measure in the eyes of everyone. Many question the unnecessary paper work that the standard requires. Good record keeping is an essential necessity in any organisation. The cost of training is also seen as a burden. Adequate training of personnel will avoid problems and hence save costs. Some might argue that quality auditing depends on the auditor's interpretation of quality. Auditors should be and are trained well enough to give unbiased results when interpreting quality. Performing internal quality audits is binding. Unfortunately many organisations see this as a burden due to the fact that it is not directly productive. Others are sceptical about the ISO standards as they might interfere with new and better ways of operating.

6.9.1 ISO and Geographic Information/Geomatics

In 1994 the International Standards Organisation created technical committee 211 (ISO/ TC 211 - 19115) with the responsibility of Geographic information/Geomatics. They are also preparing a family of standards; this process involves a working group, a committee draft, a draft international standard and finally the international standard. ISO have now released the committee draft of 'ISO 15046-15 - GI - Metadata'. According to the draft, ISO 15046 aims to establish a structured set of standards for information concerning objects or phenomena that are directly associated with a location relative to Earth.

6.9.2 Quality assurance and ISO 9000

The ISO 9000 standard provides comprehensive guidance on the principles, scope and implementation of a quality assurance system. The Land Survey and Mapping Unit must decide for itself to what extent it wishes to comply with the standard. The options are:

i. Implement a quality assurance system without reference to the standard;
ii. Use the principles and concepts within the standard;
iii. Adopt the standard and seek an ISO 9000 certificate.

Many organisations successfully adopt a quality assurance system without an ISO 9000 certification, relying on their internal review procedures to keep the whole process on track. ISO 9000 certification leads to formal review and approval of the

quality assurance system by an outside body and, more importantly, the certification body will review the quality assurance system every six weeks.

6.10 Cost-Benefit Analysis

Understanding and estimating the costs and benefits of a Geographic Information System (GIS) project is an important part of the strategic planning and decision making process. The use of cost-benefit analysis is increasingly becoming an important tool in assessing any major GIS /LIS investment would it be in hardware, software or processes. Cost-benefit analysis (CBA) is a management tool that allows an organisation to assess the strategic and financial implications of investing in a particular development or to assess the relative business advantage of different investment options (Worral, 1994). The broad objectives of CBA are first, to develop a complete picture of all the costs of a project; secondly to evaluate in financial terms, the benefits accruing from the development; and thirdly to provide the business with an overview of the cash flows involved with an estimate of the payback period of the project (Worral, 1994).

Nothing comes cheap and quality is no exception. Costs of a newly implemented quality system have to be monitored. Monitoring will indicate if the efforts and investments in quality will reduce non-conformance and what the remaining non-conformance still costs.

Cost-Benefit analysis could be done in the following steps (Smith & Tomlinson 1992):

i. Specify the objective or desired outcome of the activity in question and determine all relevant impacts;
ii. Use identified impacts to define all costs and express these in monetary value of the base year;
iii. Identify positive impacts (benefits) occurring over time and assign monetary values for the base year;
iv. Benefits and costs spread over a period extending many years into the future must be discounted to the base year using a discount rate to capture the time and value of money; and
v. The appropriate decision criterion is that socially-desirable projects should generate positive net present values.

Identifying costs and benefits of a spatial information quality system is an arduous task. Benefits of a quality assurance system will not typically become apparent until after the system is up and running. In a spatial information system alone, it is much easier to identify costs than to document benefits. Costs are much more straightforward to quantify. While costs are tangible, benefits can be both tangible and intangible.

Costs of quality are incurred through various elements. A quality assurance system requires that investment has to be made to reduce non-quality.

It may be said that increased efficiency leads to cost reduction, which can mean more revenue due to increased sales. Moreover the price reduction in geographical information products can stimulate the demand factor, generating more sales. Cost reduction is the result of improved productivity of the staff over time due to enhanced experience in the subject and rigorously following quality assurance procedures. Once a quality assurance system is running it may stimulate new ideas for future new marketable products. It may even optimise the performance of both current and future tasks. Documenting benefits expected from a quality assurance system, is not such an easy task as it is the result of the continuing increase in efficiency and knowledge through experience in the subject.

The success of a quality assurance system depends on the way it is implemented and measured. The continuous improvement should stimulate a significant amount of benefits for the quality practising organisation. Competition today is pushing organisations to develop ways to continuously improve on products and at the same time make them commercially successful. There are various ways to evaluate the performance of the quality system in an organisation, namely the overall business approach, the cost of quality approach, and the return on investment approach.

An approach the Unit may adopt to evaluate the contribution of a quality assurance system is to observe the overall performance of the Unit while the system is being implemented. This approach can illustrate that any change in a business performance can be attributed to quality assurance, and that any organisation whose overall

business shows signs of improvement will agree that implementation of a quality assurance system is a way forward strategy.

The author believes that the problem with this method of evaluation is that it is broad and spreads through the whole operations of the organisation and thus it might be difficult to relate quality assurance to the performance of the organisation. Given that many operations work simultaneously to make the Unit function, it is not really possible to be certain that quality assurance alone is responsible for changes in the Unit's business performance. Unless the Unit does not change anything else in the operations other than the implementation of the quality assurance, it is difficult to attribute the overall performance to quality assurance.

Another approach that can be used to evaluate the performance of quality assurance is the cost of quality control. Although this approach is scientific, it can be difficult to implement. This approach seeks to allocate costs of a quality system to a multitude of categories that can then be evaluated to determine how much the Unit has invested to implement a quality approach. The Unit is within an organisation so many costs are incurred by the organisation. Therefore the cost of quality control can fail as the Unit will find it difficult to establish a benchmark of costs as a baseline of comparison due to inherent costs from the organisation. It will be difficult assigning costs to factors of quality such as prevention, health and safety, internal and external shortcomings. Cost due to internal shortcomings include, production delays and stops, reworking of the product, corrective actions,

maintenance operations whilst cost due to external failure include handling customer claims, delay penalties and late delivery of goods from suppliers. This method can be used to identify saving on costs from reduction in duplicate processes, reduction in corrections and reduction in waste. To appreciate these benefits the Unit should convert these savings to monetary figures.

The return on investment approach is an elaboration on the cost of quality approach. It is about the financial aspects of an investment in a quality system. It assists an organisation to determine how much money was invested in a quality system and how much return there was on the investment in a defined period of time. From these calculations the Unit will be able to determine how much is invested each year on quality and how long will the payback period be for the investment.

Generally the investment an organisation makes in a quality system is put either as initial costs in implementing a quality system, such as training, tangible goods and the staff's time away from work, or as part of an ongoing expense in maintaining the system. Implementation of a quality system requires team skills and team development to be successful. Since at times training involves staff being away from work, production in the organisation slows down. This loss of production can be added to the expenses.

The benefits of implementing a quality assurance system can be attributed to saving on production costs by reduction in processes and reduction in rework. These

benefits will eventually reflect on the reduction of waste of material such as paper and plotter ink.

The quality assurance system will bring benefits with it but costs still have to be controlled within reasonable investment amount. It is not practical to work on achieving one hundred percent quality as this takes up too much effort and money. Errors should be corrected rather than eliminated altogether. Time is money and thus the time spent on quality system components has to be managed in a controlled manner. Time spent by quality teams and time spent on quality documentation has to be within reasonable amount. The quality system is made up of various other processes that if controlled wisely will not be a burden on the organisation. These processes include, quality audits, inspection of supplied goods and quality evaluation of products.

6.11 Conclusion

This chapter has brought together all the research conducted for this dissertation to discuss the issue for the Land Survey and Mapping Unit when it will undertake the implementation of a quality assurance system. In this chapter the author has put forward a set of recommendations and explanations to smooth the process for the Land Survey and Mapping Unit.

Chapter 7

Conclusions and Further Research

7.1 Introduction

The aim of the project was to investigate the current work procedures at the Land Survey and Mapping Unit, and hence design a quality assurance system. This chapter will present the author's conclusions deducted from the preceding analysis and discussion. It will also present further work which according to the author, should be undertaken.

7.2 Research Outcomes

The author has deducted that there is room for a quality assurance system at the Land Survey and Mapping Unit. The author would like to put forward the following thoughts on the direct/indirect benefits and risks of implementing a quality assurance.

7.2.1 The Benefits of a Quality Assurance

Direct benefits for implementing a quality assurance:

i. Consistent satisfaction of all client requirements in a cost effective manner;
ii. Constant reviewing of client needs to identify opportunities for service improvement, widening the doors for potential clients in the process;
iii. Explore the cost effective use of new technology and work processes to continually increase efficiency, productivity and quality of output;
iv. Continuous staff training to maximise performance and enhance job satisfaction and more commitment to the organisation;
v. Better management and a more effective organisation;
vi. Improve relations with suppliers;
vii. Improved promotion of corporate image.

Indirect benefits for implementing a quality assurance:

i. Review business goals, and assess how well the organisation is meeting those goals;
ii. Identify processes that are unnecessary or inefficient, and then remove or improve them;
iii. Review the organisational structure, clarifying managerial responsibilities;
iv. Improve internal communication, and business and process interfaces;
v. Improve staff morale by identifying the importance of their output to the business, and by involving them in the review and improvement of their work.

7.2.2 The specific benefits to the Land Survey and Mapping Unit:

i. Elimination of non-conformance from topographic data;
ii. A faster registration of cadastral records; more efficient map production;
iii. Complete and consistent land records;
iv. Improved data and equipment supply management.

7.2.3 The Risks of implementing a Quality Assurance

i. Initial temporary increase in production costs during training and implementation of the quality assurance;
ii. Dissatisfaction of staff because of new methodology – e.g. resistance to change and staff auditing;
iii. A whole set of new system of rules and documentation without actual results – e.g. what is documented does not reflect what is actually happening;
iv. Little or no improvement of the quality level in the final product – added bureaucracy in the system with little to show.
v. Different interpretations on quality – e.g. different auditors contrasting results.

The risks of implementing and maintaining a quality assurance are now well known. Although they cannot necessarily be eliminated they can be managed, and their impact reduced.

7.3 Achievement of Objectives

The project started off with six objectives as documented in the Project Specification reproduced in Appendix A. In relation to these objectives the project :

I. Has defined and described the current work practices at the Land survey and Mapping Unit. This was done in view of the potential that the Unit will implement a Quality Assurance System.

II. It has analysed the current system by utilising interviews and questionnaire, for the author to be able to put forward recommendations.

III. During the investigation process information on the current tools available was collected.

IV. Alternative tools were researched but unfortunately the time did not permit for such tools to be extensively tried out.

V. The author has put forward recommendations to the Unit describing an implementation plan the Unit can follow in setting up a Quality Assurance System.

VI. A cost benefit analysis procedure has been included with the recommendations.

7.4 Future Work

The conclusions reached in this research have been founded on a very limited set of information. Although the information has produced satisfactory results, it is recommended that further research be conducted. The author's recommendations for further research in this area are:

i. **Conduct a similar survey, i.e. interviews and questionnaire with clients of the Unit.**

   To achieve a high response rate, it will be required to contact as many clients as possible, especially those that are regular clients who may provide the most interesting results.

ii. **Conduct another similar survey amongst the staff when the quality implementation plan is put to practice.**

   This is recommended, as the survey should forward more accurate results, since the respondents will be answering through experience.

iii. **Research and identify new products that the Unit can market.**

   This research can be expanded amongst regular clients whose feedback is so valuable. This research should help to justify the benefit side of the cost-benefit analysis.

iv. **Confer with other organizations who are practicing ISO standards.**

This will provide information on the cons and pros of implementing ISO standards. This research should provide sound foundations for future implementation.

v. **Review in depth the emerging technologies that would enhance various work processes.**

This research should provide ways and means to save time and money.

The road to quality is infinite. The more time passes the more doors will open towards achievement to better quality. If time permitted further studies and analysis could have been performed. It is the author's opinion that some form of quality control has to be practised as to produce quality products and service. The implementation of a Quality Assurance System would put the Land Survey and Mapping Unit on track to survive the competitive edge in today's world.

APPENDIX A

Project Specification

Project Specification

Problem

Surveying is usually involved in the initial phase of most projects, therefore the accuracy and care with which data is collected largely determines the efficiency and results of subsequent work. The Land Survey department collects data and passes it on to the Mapping department where the data is processed for the final product. As it is today there is no coherence between the two departments as regards spatial data representation and managing. This is costing time and money to the Unit. The Unit wants to create a set of standards to improve the production system.

The Land Survey and Mapping Unit lacks quality assurance. There exist no specific quality assurance methods adopted by the cartographic department. The Unit is in need of a quality assurance procedure.

Project Aim

The aim of the project is to provide ways and means of how to improve on production and assure a better quality product.

Objectives

1. Describe and define the current system.
2. Analyse the system with a view to make improvements.
3. Evaluate the current tools available.
4. Research alternative tools.
5. Cost/benefit analyses.
6. Design new systems and procedures.

As *time permits:*

7. Implement the new surveying data collection and processing system.
8. Evaluate new system.


Office
Microsoft
RE: ENG4111 - Antonello RIZZO NAUDI - Netscape
New
Reply
Forward
Move
Follow Up
Tools
From: Antonello Rizzo Naudi/PlanningAuthority
To: "Kevin McDougall" <mcdougak@usq.edu.au>
cc: "Bob Fulcher" <fulcherb@usq.edu.au>, "Nigel Hancock" <hancockn@usq.edu.au>
Date: Wednesday, March 16, 2005 10:45PM
Subject: RE: ENG4111 - Antonello RIZZO NAUDI
Hi Kevin,
I am emailing my project specification (document file attached) as a reply to email below.
Hoping to recieve a positive reply,
Regards,
Nello
Nello
"Kevin McDougall" <mcdougak@usq.edu.au>
Attachments:(Click the filename to launch)
Project_specs_RIZZONAUDI.doc
start
Mail - Netscape
Netscape
Netscape
RE: ENG4111 - Anton...
Document1 - Microsof...
02:00

APPENDIX B

Interview Questions

Interview Questions Sheet

1. Is there need for a Quality Assurance System?
2. What does it entail to set up such a system?
3. Is the Unit ready for such a system?
4. Why has it not been done till now?
5. Should the Unit follow specifically the ISO Standards?
6. Should the Unit follow other international standards?
7. Do you agree with the change this will bring with it?
8. Is the quantity of documentation a problem?
9. Is management doing anything about it?
10. How is communication in the Unit?
11. Are the people motivated?
12. How will the staff react to the change?
13. Is staff prepared to be trained?
14. Are adequate tools available?

APPENDIX C

Questionnaire

Quality Assurance (QA) System questionnaire

1 Do you know what a quality assurance is?

☐ **Yes** ☐ **No**

Comments

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2 A QA means documenting everything i.e. increase in paperwork

☐ **Strongly Agree** ☐ **Agree** ☐ **Uncertain**

☐ **Disagree** ☐ **Strongly Disagree**

Comments

_____

_____

_____

_____

_____

3 A QA means following rigorous work procedures and work instructions

☐ **Strongly Agree** ☐ **Agree** ☐ **Uncertain**

☐ **Disagree** ☐ **Strongly Disagree**

Comments

_____

_____

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_____

4 A QA promotes empowerment

☐ **Strongly Agree** ☐ **Agree** ☐ **Uncertain**

☐ **Disagree** ☐ **Strongly Disagree**

Comments

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_____

_____

5 A QA would improve quality at work

☐ **Strongly Agree** ☐ **Agree** ☐ **Uncertain**

☐ **Disagree** ☐ **Strongly Disagree**

Comments

_____

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_____

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_____

6 Would you agree if the Unit were to implement a QA system?

☐ **Strongly Agree** ☐ **Agree** ☐ **Uncertain**

☐ **Disagree** ☐ **Strongly Disagree**

Comments

_____

_____

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_____

7 Do you believe it will entail much change?

☐ **Strongly Agree** ☐ **Agree** ☐ **Uncertain**

☐ **Disagree** ☐ **Strongly Disagree**

Comments

_____

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_____

_____

8 Do you believe there is need for change?

☐ **Strongly Agree** ☐ **Agree** ☐ **Uncertain**

☐ **Disagree** ☐ **Strongly Disagree**

Comments

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