DEFINING THE CRITICAL SUCCESS FACTORS FOR THE IMPLEMENTATION AND MAINTENANCE OF A TOTAL QUALITY MANAGEMENT SYSTEM IN SOUTH AFRICAN CONSTRUCTION COMPANIES INVOLVED IN BUILDING

by

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ABSTRACT

Title of treatise: Defining the critical success factors for the implementation and maintenance of a Total Quality Management system in South African construction companies involved in building.

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The aim of this study was to determine what the requirements were for a South African construction company to successfully implement and maintain a system of quality control known as Total Quality Management. The need for the study originated from the higher levels of competition experienced in the construction sector due to globalisation together with the economic downturn experienced after the 1998 rise in interest rates.

The study was based on a literature study of the writings of pioneers in the field of quality such as Crosby and Juran. From these works a better understanding of what is meant by the word “Quality” was extracted. The characteristics of quality, as well as its relationship to productivity were explored. The meaning of quality in

the construction industry, methods for measuring quality and the costs pertaining to quality was also researched.

The next step was to determine what a Total Quality Management system entailed. Three axioms of Total Quality Management were identified and these were Commitment, Scientific knowledge and Involvement. It was shown that Total Quality Management required Primary- and Secondary strategies and had various focus areas.

In defining the critical success factors for the implementation of a Total Quality Management system, it was found that commitment; cultural change and empowerment were necessary. The process of installation also required the continuous repetition of fourteen steps.

The critical success factors in maintaining a Total Quality Management system was found to be leadership's ability to motivate people through communication, recognition, rewarding and empowerment as well as the management of areas such as team building, training and education.

Finally, conclusions were reached, recommendations made and possible subjects for future research identified.

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LIST OF ABBREVIATIONS

CBSF	Critical Business Success Factors
ISO	International Standards Organisation
NBR	National Building Regulations
OHSACT	Occupational Health and Safety Act
TQM	Total Quality Management

CHAPTER 1

THE PROBLEM

1.1 Introduction

In recent times quality has come under the spotlight in South Africa. This is due to various factors including increased globalisation, which opened world markets to South African producers. It also meant that foreign producers started competing for local market share. In order to get products into the foreign markets, products had to comply to standards like ISO9000. In South Africa, products had to be of an acceptable quality while the price had to be competitive in relation to those of foreign products, which often came from established world-wide brand names.

At the same time foreign markets opened for South African construction companies, especially in Africa and the Middle East. The South African construction companies were eager to generate foreign income following the disastrous effects of the sharp interest rate hikes of 1998 on the construction industry, and foreign income were to sustain turnover should the same happen again.

Although the construction industry is not an exporter of completed products, there is an export of expertise and abilities when a South African construction company ventures onto foreign soil.

The need for producing quality buildings in South Africa increased as buildings built locally could be used as examples of what a company could produce and therefore impact on the decision to award a contract to a specific company.

The economic downswing in the South African construction sector in 1998 was followed by negative growth figures in the following years which subsequently caused an increase in competition between local companies in the construction sector. The increased competition forced margins down and this, coupled with decreasing contract periods, caused quality to suffer. It is a well-known fact that if either time or cost comes under pressure, quality is usually the first constraints of a contract to be sacrificed.

The general decrease in quality standards and increased competition highlighted the need for companies who wanted to survive, to look at ways of ensuring a good name with clients which could lead to follow-on work. The expected economic upswing in the construction sector would further find companies who can produce quality buildings at an immediate advantage over their rivals. This is where Quality Management came into

the picture. Although not a new theme, it is one that has not received the proper attention in the construction industry.

This study endeavours to shed some light on the efforts necessary to install and maintain a quality system, and maybe more importantly a quality-culture, for producing quality buildings in a South African construction company.

1.2 The problem

"The establishment of critical success factors required for the successful implementation and maintenance of a Total Quality Management system for the South-African Construction Company in the building sector"

1.3 The sub-problems

Sub-problem 1 "The definition of the critical success factors required for the successful implementation of a Total Quality Management system"
(What are the critical success factors required for the successful implementation of a Total Quality Management system?)

Sub-problem 2 "The definition of the critical success factors required for the successful maintenance of a Total Quality Management system"

(What are the critical success factors required for the successful maintenance of a Total Quality Management system?)

1.4 The hypothesis

Hypothesis 1 "The most important factors that should be present for the successful implementation of a Total Quality Management system is a systematic approach with training and empowering of employees as a major focus"

Hypothesis 2 "Factors critical for the successful maintenance of a Total Quality Management system are persistent senior management involvement, suitable continuous training of employees and effective motivation of employees resulting in a quality-culture"

1.5 Delimitations

The study will focus on the implementation and maintenance of a TQM system for construction companies in the building sector of the construction industries. The building sector should be understood as the part concerned with the construction of buildings according to normal methods i.e. not civil engineering projects or projects requiring extremely advanced construction techniques.

1.6 Definition of terms

Patent defects as used in this treatise means defects that should be exposed by a reasonable inspection.

Latent defects as used means defects that would not have been identified during a reasonable inspection

Critical success factors are those factors that need to be present for the successful implementation or maintenance of a system.

1.7 Assumptions

Due to the literary nature of this study, no assumptions had to be made.

1.8 Importance of the study

The importance of this study stems from the increased competition in the construction industry forcing construction companies to focus more attention on ways of improving their market image, market share and ultimately their profits. With an increase of 16.1 percent in building costs, as measured by the Bureau for Economic Research at the University of Stellenbosch, in the third quarter of 2002, as compared with the same period in 2001, and the high level of competition in tendering prevalent in the industry (Business Report, “Real growth in construction slowing – bureau”, 11 October 2002, Roy Cokayne), construction companies will need to show a pro-active approach to bettering quality, resulting in increased profitability.

1.9 Research methodology

The study will be based mainly on research into literature on the subject of quality management implementation and maintenance as well as limited interviews.

CHAPTER 2

THE CONCEPT OF QUALITY

2.1 What is quality?

2.1.1 Definition

According to the South African Oxford Dictionary (seventh edition) quality is: a "degree of excellence; general excellence; attribute or faculty; relative nature or character". For a study of this nature this definition is inadequate in relating the myriad of complex issues surrounding the concept of quality, especially in the building industry.

Quality is more a conformance to requirements in the construction industry. But as the requirements are subject to the expectations and acceptance of the client, and as each client's perception or view of quality differs, it becomes more difficult to set fixed parameters within which the product must fall to be deemed a quality product. The parameters must be related to the client's expectations and needs.

Quality is determined by the customer and the marketplace and include all the product's attributes. Quality includes everything the client expects and requires and is continuously changing. (Hradesky, 1995, p.2)

It is a fact that there is no single definition of quality that will apply to all companies in all industries. Each company must define their own meaning of quality if they are to meet the challenges of modern business which almost always require a recognition and improvement of the quality of the company's product or service. (Hradesky, 1995, p.630)

Quality is often thought of as the fitness for use. The "fitness for use" is the extent to which the product successfully serves the purposes of the user. Fitness for use is determined by the features of the product that the user can recognise as beneficial to himself. It is thus a function of the product as seen by the user, not the manufacturer, merchant or repairman.

Other expressions used for fitness for use are "product performance" and "product effectiveness", but as the word "product" fails to include the service industries, these phrases are not considered adequate. (Juran, 1951, p.2-2)

In this early stage we can see that quality means different things to different people. For the producer quality is "conformance to specifications", but for the customer quality is "fitness for use".

Today most companies admit that quality is not accurately definable as the client defines it. According to ISO 9000, quality is “the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs.” Today quality is considered to be more of a process than a product. It is a process where lessons learned are used to change future products to better satisfy the clients needs and expectations.

Quality should be seen as a process and not a result. The process of quality is followed to retain current customers as well as to gain new ones and regain lost ones.

Fitness of use is thought of by some as a goal rather than a definition for Quality. The same is said of “zero defects” and “customer satisfaction”. (Kerzner, 2001, p. 1085)

Simply put, quality is meeting the customer requirements. The term reliability goes hand in hand with quality. Quality and Reliability are not synonyms, as quality is the ability to meet the requirements initially while reliability is the ability to *continue* meeting these requirements. Both are however equally important as reliability is often considered when a product is purchased. (Oakland, 1989, p.5)

In the construction industry this is especially true, as aspects such as life cycle cost takes the maintenance cost of a building into consideration when the initial decision to invest in a property is considered. Maintenance cost will be directly influenced by how "reliable" the building is. The building's reliability is dependent on the construction methods, materials, design, etc.

A product "meeting the customers requirements" is not just dependent on its functional characteristics, but also on the satisfaction of ownership i.e. it is a status symbol to own the product. This is not always a factor in choosing who will build the building, but definitely when choosing the architect, engineer and the location of the planned building.

It can be stated that there are two types of quality i.e. quality in fact and quality in perception. Quality in fact is achieved when the producer of the product achieves conformance to specifications. Phil Crosby (1979, p.7) said that quality is "conformance to requirements." The source of the requirements is however, unclear. The requirements could be those of either the client or the manufacturer.

Quality in perception is the subjective quality as seen by the user. It is based on the belief the customer has in the product's ability to satisfy or exceed his expectations. Both quality in fact and quality in perception must be given attention in the pursuit of quality goals. If a building is built

according to specifications, but the client believes that it is of poor standard, then quality has not been achieved. The same is true where the customer is satisfied with the building, but where specifications were not adhered to and where latent and patent defects are present even though the client does not know about them.

How to achieve quality in fact is easily understood by the people who physically manufacture a product. Their impact on quality in fact is obvious. The problem arises in their understanding of the impact their actions have on quality in perception. For instance: if a wall is built and parts of it are demolished three times, due to defects, until it complies to all the set specifications, the people who built it would agree that it is a quality wall. However, the client who knows that the wall has been demolished three times, might doubt the quality of the wall. In this case quality in fact is attained, but total quality is lacking because quality in perception was not achieved. (Townsend, 1990, p.3-7)

2.1.2 The characteristics of quality

Quality characteristics are the basic building blocks of fitness for use. Quality characteristics are any feature needed by the product to achieve fitness for use. Several types of characteristics exist e.g. technological (hardness), physical (length, shape, etc), time-oriented (reliability, maintainability), contractual (guarantees) and ethical (honesty).

These characteristics can further be divided into different categories i.e. quality of design, quality of conformance, abilities and field service.

Quality of design is a technical term. It consists of the following steps: Identification of what constitutes fitness of use, choice of the concept or product that respond to the identified need, the translation of the concept into design and specifications, etc.

Quality of design consists of: quality of market research, quality of concept and quality of specifications.

Quality of conformance is the extent of the product's conformance to the design. It is dependent on machines, tools, supervision, workmanship, etc.

The abilities are of importance for products with a longer live e.g. buildings, cars, etc. These abilities i.e. "Availability", "Reliability" and "Maintainability", are time-oriented factors. They are vital for quality.

Availability is achieved through a minimum disruption of use. Reliability is the freedom from failure of the product. It is determined by quality of design and influenced by quality of conformance. Maintainability is a

function of the preventative maintenance and unscheduled maintenance required to keep the product in operation.

It can be stated that availability is the sum of reliability and maintainability.

The “safety” of a product represents the hazard connected with the use of the product while “field use” is the way the product is used by the customer. (Juran, 1951, p.2-4)

2.1.3 The relationship between quality and productivity

There is a close link between quality and productivity. In modern times productivity is often singled out as the root of many problems relating to profit margins and competitiveness. The influence of quality is overlooked or at best deemed less important. This is however, a grave mistake. P.L. Townsend states that “..productivity is not quality. Quality incorporates productivity” (1990, p.6). This translates into the fact that productivity is heavily influenced by quality. Productivity is defined as the achievement of higher output with lower input. By improving quality of work, fewer resources will be wasted. This will lead to a reduction of input while less re-work will mean more products completed in a set period i.e. more output. The influence pattern does not end there. Once quality, productivity and, inevitably, profitability has improved, the workforce should see the benefit of the improved productivity that will, in turn,

inspire them to increase their quality even more. It is further stated that, whereas increased productivity might mean fewer jobs (less resources for the same or higher output), quality can be described as doing the current work better but with the same resources. This description comes in handy when trying to motivate the workforce to improve quality, as it is not seen as something which will cost them their jobs, but something which will have a positive influence on profitability. Profitability in turn will lead to more jobs and higher job security (Townsend, 1990, p.6).

2.2 Quality in the construction industry

Quality, together with cost and time is part of the project triangle. It is of equal importance with cost and time, in that all three have to be controlled if the project is to be called a success.

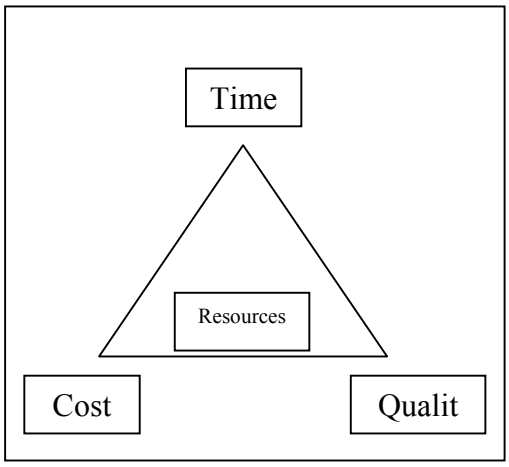


Figure 1

The Project Triangle

There is, however, a problem due to the fact that there are usually plans to control the time and cost aspects of a project, but quite often there is no such plan for quality. Where quality is considered during the planning phase of a contract, it usually does not involve a plan but rather the draughting of specifications and ways of inspecting for defects. As has been said before, one cannot inspect quality into a product. The idea of inspecting is further flawed, as it is end product oriented and the nature of the product, the building, means that the correction of defects involves time and money.

The fact remains that quality is almost always sacrificed first when cost or time constraints come under pressure. This is short sighted as, even though the pressure might be relieved for the time being, it will almost always resurface at a later stage in the contract when the need to correct defective quality will have a negative impact on time and cost. The lack of quality control will also affect the maintainability of the project, as more maintenance will be necessary later in the building's life.

2.2.1 What is quality in construction?

Quality in construction is different from quality in production as the client has a far greater and more direct influence on the quality of the completed building. The reason for this is the fact that the client has

greater input in the design of the product (the building) than is usually the case in production. In production this input is usually restricted to market research prior to and during the design of the requirements a product must fulfil or feedback on the changes that would make a product better suited to the client's needs. It is mostly aimed at a generic product that will be produced more than once. In construction the product is primarily a once-off effort and changing anything in the design will be much harder to effect.

When the quality of a building is discussed, the two types of quality can both be identified. There is quality in perception and quality in fact. Quality in fact is a function of the input of the customer, project team and the contractor. The design team must obtain and interpret a brief from the client which they must then translate into a design for the building. The ability of the design team, together with the input given by the client, will determine if the building, if correctly constructed, will fulfil in the expectations of the client from an aesthetic and functional point of view.

The project management team and the contractor must also work together to achieve quality in fact. The word "contractor" is meant to represent the main contractor, various sub-contractors and suppliers of materials and equipment. The contractor must follow the guidelines given to him by the project team according to which to build the building. The project team must ensure that this is done. Both must ensure that the

correct materials are used, that the best methods are used, that workmanship is of the required degree and that all components are installed and installed correctly. If all of these are ensured, then the building should represent quality in fact.

Quality in fact will be influenced by the quality of design. Quality of conformance will influence the availability, safety and field use of the completed building.

The actions and competencies of the project team and the contractor will determine quality in perception. If the project team creates an image of competence and professionalism, the customer will be confident that they will ensure a quality in fact product. If the contractor does the work correctly and without major defects to be remedied, then the client will feel the building is “well built.” Both these factors will influence the way the customer perceives the building. If he perceives it as a well designed and constructed building then quality in perception will be achieved. Even if the building is technically well constructed, but the client suspects that there might be hidden defects or he does not have confidence in competence of the project team, then quality in perception has not been achieved. The client’s knowledge and understanding of construction methods and acceptable standards will also have an influence on perception of the quality of the building. The fact remains that even if quality in perception is achieved, but quality in fact is lacking due to for

instance, latent defects in the building, then true quality has not been achieved. This will be revealed later through the occupancy and maintainability of the building.

It must further be noted that a technically quality building that has been delivered late or at an inflated cost or both, might not be viewed by the client as a quality building.

2.2.2 Sources of requirements for quality

There are various sources for the quality requirements for a construction project. The main source is the client who relies on professional project teams to ensure that the building corresponds to his requirements. The requirements are communicated to the design team by the client during the design briefs. Once these are in place, the design team will write specifications that formulate standards to achieve and methods to ensure this achievement by. The drawings and even the bills of quantities will further assist in the definition of the required quality to the contractor.

The specifications are influenced by the law and certain features like compressive strengths, compaction, etc will be based on legal requirements enforced by local authorities, etc. Examples of these include the National Building Regulations (NBR) and the Occupational Health and Safety Act (OHSACT).

There is further the issue of expectations. These expectations are based on what society would consider to be an acceptable level of quality. This is also referred to as industry norms and are what a reasonable client should expect to get from a contractor who has performed a reasonable job.

The word “reasonable” is problematic in that it is subjective. A reasonable inspection from an architect would identify more patent defects than that of a housewife, where the problems could become latent defects. To the contractor a client may be asking for unreasonable quality while the client may consider it fully justified in expecting to get what he feels he is paying for. Conflict often arises when there is a difference of opinion regarding the reasonableness of an expectation by the client and/or his project team.

A further problem arises from the use of standard specifications that are used repeatedly without careful consideration regarding their applicability to each specific project. This can, and often does, cause problems relating to for instance, an acceptable tolerance in floor levels. The contractor might argue that the specified tolerance is unnecessarily strict in relation to the purpose for which the floor will be used, or by what it will be covered. However, this will cause the project team to feel that they are

not getting what they asked for and therefore their perception of the quality of the floor will be negatively influenced.

The above is an example where requirements and expectations may not be aligned. Even though a set standard is expected, and most probably influenced by some standard specification, it might be excessive when the standard that is required to fulfil the function successfully is considered. It might be argued that what the client wants is what he should get, but the contractor might be able to offer the client a saving by having to work within more relaxed parameters. This saving will regularly influence the client's perception of the value for his money and will in turn influence his perception of quality.

The client and the state are not the only role players to influence quality requirements. The contractor himself has quality requirements. The contractor is bound by his contract to the client to deliver a project at a certain quality, on a certain date and at an agreed price. If the contract documentation was given sufficient attention, it should have provided the contractor with the necessary information at tender stage to price for all risks associated with the erection of the building. The contractor would have considered these risks against the abilities of his workforce and that of his sub-contractors and allowed for the cost of re-work and waste which will inevitably be generated.

Once the contract amount has been agreed and the work starts, it is of paramount importance to the contractor that his spending on waste and re-work be avoided or contained as far as possible. To achieve this, he needs to achieve certain quality standards. These might overlap with that of the client and state, but the motivation is different. Whereas the client's requirements are contractual and the state's legal, the contractor's requirements are mainly cost driven. Not only is he concerned with the cost of the project but he must also keep the cost of a bad reputation in mind.

The cost of the project for the contractor is influenced by quality by way of its influence on productivity. If quality is maintained during execution of the works, the contractor will not use more resources than planned, to execute the project within the contractual period. He will have less wasted materials and spend less time repairing work of an inferior nature. This has a direct impact on productivity that aims to achieve a set output with less input. In this case it is a question of achieving a set output with the planned input.

As will be discussed later, the cost of quality goes further than the cost of re-work and waste. There is also a cost connected to developing a bad reputation. Insufficient quality will lose the contractor both current and prospective clients. If the contractor cannot be seen to be able to produce a quality building in the time required and at the correct cost, no client will

return to do business with him again. Clients who are considering contractors to ask tenders from, might also be reluctant to approach such a contractor. In the past, this was not always the case and many clients still preferred the cheapest rather than the best contractor. However, with the decline in workmanship and increase in competition, many clients are beginning to see the merit in identifying and using a preferred bidder rather than the cheapest one.

In summary we can see that the requirements for quality start out as a fairly vague indication by the client of what he wants. This “wish list” is then refined by the design team and translated into industry terms and specifications. In turn, these specifications are then dissected into practical methods and standards by the contractor who then has the task to ensure that they are adhered to. He needs to do this to ensure his profits as well as to comply with his contract with the client and his adherence to the law of the land. The project team must ensure that the design team’s specifications and the government regulations are met and the client will finally determine whether his requirements are met. If all three these role players are satisfied with the quality they receive or achieve, then the project will be a quality project in all senses of the word.

2.2.3 How is quality measured?

To measure means to compare something to a known factor. This comparison can either be expressed in quantitative or qualitative terms. If there is a difference between the item being measured and the goal, then there exist a variance (Hradesky, 1995, p.61).

Quantitative measurement is expressed in specific numerical values, for instance the wall is 20 meters long. Certain things are, however, more easily measured in qualitative terms like smaller, better, faster, etc. This method of measurement can become a problem, as it is often open to the subjectivity of people.

It is obvious from the subjective nature of quality that in order to justify improvements required to it, it is necessary to try and measure it quantitatively rather than qualitatively. The need for improvement is more clearly identified through quantitative terms. Quantitative terms do, however, quite often, set expectations with such clarity that any deviation might be considered a failure.

To measure quality one must first identify the variance between the quality of the actual product and the quality of the ideal (goal) product.

In the construction industry both quantitative and qualitative methods of measurement of quality are applied. Dimensions, compaction figures, tolerances, compressive strengths are all expressed through exact numerical values. The use of mock-up panels and showrooms are also used to measure the completed building against. The latter method is, through its qualitative nature, open to different interpretations and often causes conflict between the project team and the contractor. The fact remains that quantitative standards are more clearly defined than qualitative standards.

The type of measurement described above is usually done by the supervisors of the contractor (the foremen) and by the project team in a supervisory role over the contractor. It measures quality in fact.

But quality is not only about achieving a numerical value or a good resemblance of something, it is also about the perception the client has of the product. If the client views the building as below quality, then a great amount of numerical values will not convince the customer that it is a quality building. To measure the customer's perception is difficult but can be done through interviews and questionnaires to determine the client's satisfaction with the building.

Quality measurement in buildings is complicated by the fact that time can have a big influence on it. Small or undetectable defects at completion

can suddenly become eyesores or dangers a year later, affecting quality in perception or quality in fact.

Quality measurement is closely linked to the measurement of the cost of quality. The cost of quality will be discussed later but it should be mentioned here that measurement of waste, re-work, etc, which is also linked with productivity, gives an indication of the quality of the building process and the completed building.

In the past the quality of a building was addressed in two ways. The design team set various standards during the design phase of the project. These took the form of specifications, preambles, drawings, etc. In most cases the contractor was then left to follow these in order to build a building that conformed to the designed standards. The design team then came and inspected the building to see whether it conformed to the standards. If defects were found, they were pointed out and the contractor had to attend to them. This system has been so generally accepted that most contract agreements make provision for this system.

This system is however, end result oriented, and the fact must be repeated: quality cannot be inspected into a completed product.

Recently efforts have been made to involve the design team in quality control during the construction process, as it was realised that this could

go a long way towards completing projects within the time and cost constraints. The right time for the client and the right cost for the contractor.

2.2.4 The cost of quality

The cost of quality can loosely be described as the costs that would not have been incurred had there not been any quality deviations. Understanding the concept of cost of quality is vital as this understanding should lead to the identification of these costs which would stimulate quality improvement and provide a basis for a continuous tracking of this improvement (Juran, 1989, p.50).

In most cases, the cost of quality is not easily determined in business and this has lead to a lack of focus on these costs. These costs are, usually, scattered throughout the construction process with some easily identified while others are difficult to define and quantify.

The importance in identifying the costs of quality is based on the fact that it translates quality into the language of management i.e. money. It provides something that can be measured, improved and controlled. The cost of quality was once described as a goldmine in which profitable digging could be undertaken, a concept that would find favour with the management of most companies (Juran, 1951, p.5.1).

Due to its long life, the cost of maintaining a building, as influenced by the quality of its construction, is a major driving force for improving quality in the construction industry.

In order to start looking at ways and reasons to improve quality, it is necessary to look at the cost of quality. Once the cost of quality is known it provides a method of assessing the effectiveness of the management of quality and a means of determining problem areas, opportunities, savings and action priorities (Oakland, 1989, p.186). The cost of quality consists of three factors. The cost of poor quality, the cost of appraising quality and the cost of preventing poor quality. These are also called prevention costs, appraisal costs and failure costs. According to J.S. Oakland (1989, p.188-189), failure costs can further be separated into internal and external failure costs.

2.2.4.1 Prevention costs

These costs are incurred before the actual construction of the building. Prevention costs include quality planning, quality assurance, inspection equipment, training and improvement projects, etc. Quality planning involves, amongst others, the cost of time and money spent creating quality-, operational- and inspection plans.

Quality assurance costs overlaps with this and is the cost of creating and maintaining the quality system. Inspection equipment are bought for use during the construction process for instance “Dumpy levels”, ”Squares”, “Levels” etc.

Training involves the development and maintaining of training programs for everyone from management to supervision to labour. Clerical-, communication- and general office management costs are collected as miscellaneous costs.

2.2.4.2 Appraisal costs

These costs are associated with the builder and the client’s evaluation of the construction process and completed building. The costs include verification of materials and methods of construction, quality audits, inspection equipment, etc.

For the client, the cost of verification is covered by the fee he pays to the contract team to ensure a quality building. It further includes fees for inspections by local governments. For the contractor these costs are included in the costs of supervision through foremen and surveyors. There is also the cost of having compaction and other tests done and although the contractor incurs these directly, it is the client who ultimately

pays for this through the preliminary and general items charged by the contractor.

Quality audits should be undertaken by the contractor to ensure that his quality management system is operating effectively. Costs are further incurred when inspection equipment has to be maintained and repaired.

2.2.4.3 Failure costs

Internal failure costs are costs that are incurred prior to the building being handed over to the client for occupation, in other word, before completion of the building. These costs are usually for the contractor's account. External failure costs are those costs incurred in correcting defects, after completion of the building, when the client or tenant has occupied the building. External failure costs include costs by the contractor as well as costs incurred by the client due to the failure e.g. loss of rent.

2.2.4.3.1 Internal failure costs

Internal failure costs are incurred prior to the building being handed over to the client and should be based on problems identified by the contractor's quality assurance program. Internal failure costs can be called "Correction costs" as phrased by P.L. Townsend (1990, p.126). A pro-active contract team will also contribute to the identification of defects

that lead to internal failure costs. These costs include waste, rework and rectification, re-inspection and the cost of failure analysis.

Whenever work has to be demolished and re-done or rectified, labour and supervision costs will be incurred. Material will also be wasted in the process. These costs are some of the biggest factors in determining the successfulness of a project in the eyes of the contractor and should therefore receive a great deal of attention.

The cost of investigating failures that manifest themselves in problems like leaks, can also spiral out of control, but is usually more prominent as an external failure cost.

2.2.4.3.2 External failure costs

External failure costs manifest after the building has been handed over to the client and where the client and professional teams then identify poor quality. These can include patent defects that were overlooked or latent defects that could not reasonably have been identified during the post hand-over inspections. These costs include repair and servicing costs, complaints, liability and loss of goodwill.

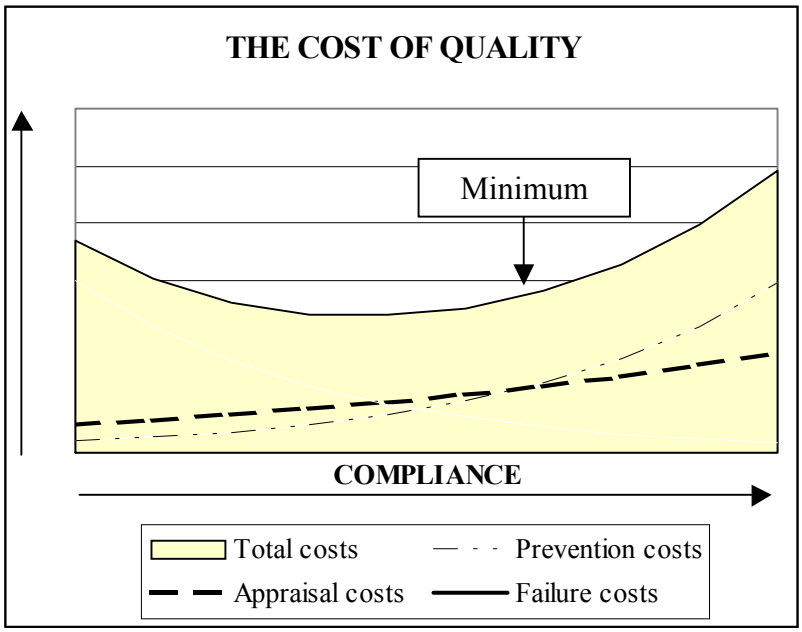
The costs of having to return to a building, identifying the cause of a problem and rectifying it, has a major influence on the contractor's bottom

line. The client further incurs costs when being hampered from using his building to its full extent and in having to communicate problems to the contractor. This, inevitably, will lead to a loss of goodwill which, in the current market, is even more devastating than repair costs as it can prevent a client from using the same contractor in the future.

Failures in building can further cause liability costs. The collapse of a building, or portion thereof, will not only cost the contractor or design team money in litigation but can also damage their image to such an extent that the continued existence of the company becomes endangered.

When sub-standard quality causes the client or the project team to refuse to take possession of the building e.g. refusing to certify that the building is ready for occupation, then penalties are incurred under certain construction contract agreements. These penalties can then also be considered to be failure costs.

It must be noted that the cost of quality is linked to the company's awareness of quality. The more a company becomes aware of the quality issues, the less the cost of quality becomes.



The cost of quality

Figure 2

The relationships between the various quality costs are indicated in the figure 2. This graph demonstrates that striving for a complete elimination of failures may not be cost effective. If too much money is spent on prevention and appraisal, then cost of failure will reduce but the total cost will begin to rise. The opposite is also true i.e. if too little is spent on prevention and appraisal, then the cost of failure will increase and this will increase the total cost. The minimum cost will be effected when a balance is found between cost of failure, prevention and appraisal, as indicated in the graph.

2.3 Conclusion

The cost of achieving quality is high, but pales into insignificance when compared to the cost of not achieving quality. The costs incurred to initiate and maintain a quality management system is obvious costs that are often seen as too high to be justified. However, the cost of rectifying poor quality has become such a part of the everyday construction process that most budgets allow for this cost through factors such as “maintenance allowables” or “snagging provisions”.

The fact remains that the cost of initiating and maintaining a quality system would usually be far less than the cost of rectifying poor quality, both before and after the building has been handed over to the client.

The next question that needs to be answered, is what a quality system should look like. A system called Total Quality Management will now be studied in response to this question.

CHAPTER 3

TOTAL QUALITY MANAGEMENT

3.1 What is Total Quality Management?

The Total Quality Management approach is the managing for total quality and managing for effectiveness and competitiveness, involving each and every activity and person at all levels of the organisation. This approach often involves the total transformation of the existing management and corporate culture. It leaves no room for half-hearted efforts or complacency. Total Quality Management (TQM) is a culture that requires a total commitment to customer satisfaction through continuous improvement and innovation in all aspects of business (Logothetis, 1992, p.1). In TQM the view is taken that each person or departmental activity within the organisation affects another and is in turn affected by others. As each person or department receives output from another, this makes the said person or department a customer of the other. When customer satisfaction is targeted, it therefore means that the quality focus is not only externally focussed but also turned inwards. TQM supplies a common language and proper communication to the organisation for achieving quality. Achieving customer satisfaction becomes an everyday duty for everyone involved with the creation of the product or service.

In the words of J.L. Hradesky (1995, p.2) TQM is "…a philosophy, a set of tools, and a process whose output yields customer satisfaction and continuous improvement." The major difference of this system to traditional systems is that it requires everyone in the company or organisation to practice it.

The objectives of TQM are continuous improvement and innovation. This process is never-ending as no process is perfect and cannot be improved. In TQM the top managers are the driving force behind the culture change and they must take the responsibility for ensuring the beginning and continuation of this change. They do this by leading the process of defining a new total quality process and creating the ideal conditions for everyone in the organisation to fit into this policy.

The changes required by TQM are not only technical changes but, more importantly, social changes. These social changes which constitutes the abandoning of established habits and attitudes, requires a great deal of faith and commitment from all involved. It must be remembered that a corporate culture takes a long time to evolve and changing it in a relatively short period of time is difficult. The existing culture also reflects the image that the outside world has of the company, and this might not always be something that should be drastically altered, especially if the company enjoys a favourable image.

TQM thus combines cultural-changing tactics with structured technical techniques to satisfy internal customer requirements and this leads to external customer satisfaction. Once effectively implemented, TQM will become integrated into all aspects of the corporate identity (Hradesky, 1995, p.3). TQM takes quality, from a product appraisal function, to a corporate imperative for excellence and a refusal to accept the current situation.

To effect a cultural change, management has to be in touch with behavioural sciences, human motivation and the concepts of the existing culture such as beliefs, attitudes, habits and practises. The cultural change should be a process that offers an alternative to the current culture while not creating a void where a new culture has to be built from scratch.

Total Quality Management creates an environment where employees are proud of their work, where they are part of a team and are respected for their efforts, where fear is eliminated and where everyone strives for the best interests of the company while not abandoning their own.

To achieve this the following three fundamentals need to be established:

1. Commitment to continued quality improvement and innovation.
2. Scientific knowledge of the proper tools and techniques for technical change.
3. Involvement by everyone to effect social change.

These three fundamentals are known as the axioms of the TQM culture and all three are of equal importance. (Logothetis, 1992, p.3). These three are represented by a triangle as shown below.

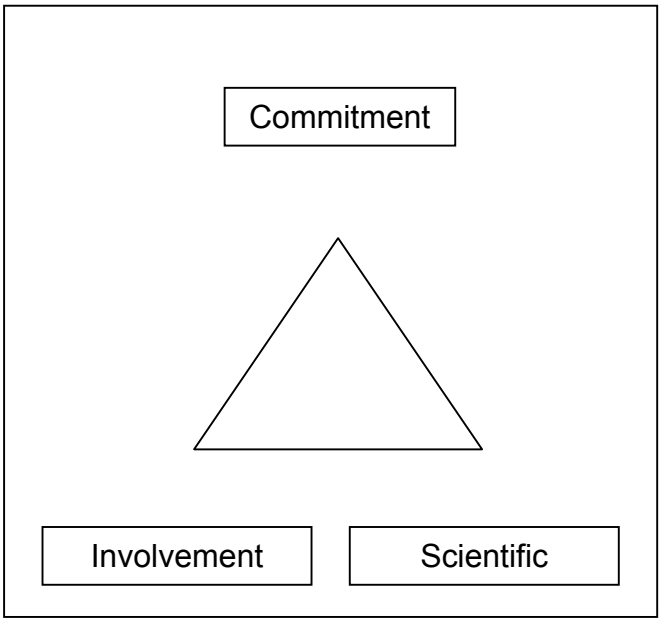


Figure 3

The axioms of TQM culture

These three axioms should be present in any complete statement about quality. In order to establish a TQM culture, all three fundamentals should be realised. According to Logothetis (1992, p.5) Total Quality Management can be defined as follows: “Total quality management is a culture; inherent in this culture is a total commitment to quality and an attitude expressed by everybody’s involvement in the process of continuous improvement of products and services, through the use of innovative scientific methods.” To further justify this definition, a discussion on the three axioms is required.

3.2 The Total Quality Management Axioms

3.2.1 Commitment

Although management commitment to continuous improvement of quality sounds like an obvious necessity, it is not an easy commitment to adhere to. It often involves a change from the old style of management and a total cultural transformation. Increasing customer expectations require the development of a new, management-led strategy focussing on total quality.

Senior management should plan, initiate and co-ordinate the quality improvement process and keep up the momentum should the enthusiasm die down. This requires training, not only for the workers, but also for

management. Senior management must further always demonstrate their commitment by active participation in quality improvement projects. This commitment must be demonstrated not only through words and declarations but also through actions like the formation of a quality steering committee.

Slogans and posters quite frequently do not have the desired effect and can in some cases be counter productive. Senior management should rather create the right conditions in which quality can flourish and be maintained. One cannot expect to build a quality building by only using the cheapest materials, regardless of their quality. Unreliable suppliers will put the time aspect of a project under pressure, which might lead to poor quality. Top management must ensure that the system in which the employee works, does not handicap his potential.

For a system to be able to motivate workers, it must include proper working conditions, supply training and education, encourage good communication and co-operation, utilise modern leadership rather than strict supervision, supply good incoming materials, equipment and appropriate quality tools and create job satisfaction. This type of system can only exist when top management lead by example and do not create a scapegoat (like a quality manager), to blame if and when things go wrong.

Top management must create the right environment for quality improvement and start the ball rolling. Middle management however, must ensure that the TQM principles are communicated and spread throughout the organisation. They must also be the link through which the employees' efforts are recognised and rewarded by top management.

Further commitment to education, training and re-training for everyone, from top management to general workers, is required. Training must be done using modern, up-to-date techniques and material. This also requires a willingness by top management to invest in the development of their workforce and its long term survival and growth. No future however, can be possible without the attainment of appropriate scientific knowledge.

3.2.2 Scientific knowledge

Quality improvement tools exist for use by management, technicians and both. These tools have all been tried and tested and have scientific proof that they can work. These tools provide a common quality language throughout the company and helps in the assignment of responsibility. This eliminates the vicious circle of blame, unjust recrimination and apathy. Everyone knows exactly what his part in producing a quality product is. The idea of using these tools is to continuously improve the process that produces the product.

Although the technical tools are tried and tested, there is still the need to co-ordinate their use and to train people in using them optimally. New uses for these tools and further development of them should also take place. The main function of the tools should be to identify when and where bad performance occurs and to suggest and implement corrective actions immediately. This will fix small problems at low cost before they become big problems that incur large costs. Should the process become successful, quality output would become an expected reward rather than a forced obligation. This will lead to job satisfaction which will, in turn, lead to company survival.

Commitment to quality without the backup of scientific tools will soon be rendered useless. The result of matching the scientific tools to the TQM structure will result in the creation of a learning curve, the refinement of the TQM system and the redistribution of knowledge throughout the organisation. This redistribution is especially important in South Africa today and through the construction industry, this distribution can be spread to people outside the organisation through the extensive use of subcontractors. These subcontractors are often from previously disadvantaged communities and their education could be seen as a contribution to the company's social responsibility.

The use of scientific tools creates a common language that can make it easier to communicate the quality requirements to labour. Whereas the lowest paid employee of the company or subcontractor might not understand the overall economic repercussions of poor quality workmanship, he will understand what it causes if poor quality is expressed in terms of "rand to fix" or "time spent on re-work" if he is given some basic education. The system must be extended to include education of all the role players i.e. all subcontractors and their labour, suppliers, etc.

Some technical techniques for implementing TQM include:

- Statistical process controls which aim to reduce variation from customer requirements thus improving customer satisfaction
- Effective problem-solving techniques which solves problems, prevents future problems and create opportunities for improvement.
- Design of experiments that provide for finding causes for significant problems
- Quality function deployment through which customer requirements are determined and translated into design- and process requirements and manufacturing inputs.
- Using proven World-class manufacturing techniques which are easier, cheaper and faster to implement.

- A quality / productivity improvement process which combines all the various techniques into an effective approach
- ISO 9000 Plus which revolves around the implementation of an international standard quality management system that leans towards having effective procedures and policies rather than documentation only. (Hradesky, 1995, p.3-4):

A common language, coupled with the necessary commitment will help to realise the third axiom, which is involvement.

3.2.3 Involvement

It can be stated that axiom one was concerned with structural aspects while axiom two involved technological aspects. Axiom three, involvement, is concerned with social aspects. No TQM initiative can bring about the required cultural change without properly addressing the social aspects. This is because total quality is not about a particular process or person's responsibility, but rather about everybody in the company embracing a new attitude and creating a new network of relationships. Management commitment will become fruitless unless the workforce is motivated to get involved in the effort.

Monetary rewards or penalties, which are currently being used to motivate people / subcontractors to achieve quality, is only effective as a

short-term motivator. Pride and the achievement of excellence are longer-term motivators, which will usually, also lead to monetary rewards. People should be made to feel part of a team striving for success and sharing failures. They will respond to trust placed in their abilities and will increase their efforts if they believe that their actions have an impact on further activities and that someone is depending on them. Quite often subcontractors are made to feel like outsiders rather than important contributors, a fact that can explain a lot of the poor quality that is currently evident in the construction industry.

If the team is strong enough, occasional failures that will arise, can be absorbed more easily and will be corrected more successfully. The achievement of team spirit requires the absence of fear, of mistrust, of communication barriers, of individualism and of isolation. This can only be achieved if top management changes the system accordingly.

Teamwork inevitably leads to easier identification and resolution of problems as more people take an interest in the entire process. Using the experience of the people nearest to the process will increase efficiency. Their inputs on specific areas become paramount in the continuous improvement of the system as a whole. If this experience and resultant recommendations and adjustments are communicated openly and honestly, the results achieved will far exceed those obtained through a campaign of unsupported slogans and exhortations.

It is up to senior management to champion active participation and involvement through open discussion of problems and recommendations. Adequate time should be allowed for planning and team building and resources allowed for training. Accepting greater responsibilities should be encouraged, within bounds, while continuous monitoring of the improvement process helps to maintain the momentum.

Creating cultural change can be achieved through some of the following techniques (Hradesky p.3-4):

- Implementation of values that will produce the behaviours that achieve the company mission and vision.
- Producing questionnaires that measure the effect of cultural change.
- Creating cultural-fostering groups that monitors the effectiveness of the cultural change efforts and recommend how and when adjustments to the implementation process should be made.
- Ensuring effective communication that serves as the basis for interchange of information and in relationships
- Empowering the workforce to enable everyone to participate in making the vision a reality.
- Making the workforce take responsibility for the processes, the flip side of empowerment

The requirements needed to get everyone involved, sounds like an awesome task but is one that can be achieved if management is committed to the process of TQM, which brings us back to axiom number one.

3.3 The objectives of Total Quality Management

Various strategies are used to achieve quality improvement through TQM. The strategies most commonly used can be divided into Primary and Secondary strategies. Some of these strategies can be used on their own, but more than one is generally found to be in use.

3.3.1 Primary strategies

These are long term strategies and include:

- Benchmarking all major operations to ensure that it is done as effectively and efficiently as possible
- Obtaining suggestions on improvement from employees
- Team identification and development to identify and solve problems
- Team development to encourage participative leadership
- Process management tools to reduce cycle times and improve customer service
- Developing and training staff to find ways to improve customer service

- Implementing improvements in order to qualify for ISO 9000 registration

3.3.2 Secondary strategies

Secondary strategies are focussed on operations and profitability and include:

- Continuous contact with customers to understand and anticipate their needs
- Developing customer loyalty through exceeding their expectations
- Working with suppliers to improve their product or service quality
- Using information and communication technology to improve customer service
- Developing focussed units within the organisation to improve performance
- Using concurrent and simultaneous engineering
- Encouraging, developing and supporting employee training and development
- Minimising all production cycle times
- Focusing on quality, productivity and profitability
- Focusing on timeliness and flexibility

(Kerzner, 2001, p.1134)

3.3.3 The focus areas

The implementation of the various primary and secondary strategies is achieved through focus areas. There are basically three focus areas in a TQM system. These are Management focus areas, Tool focus areas and Employee focus areas.

3.3.3.1 Management focus areas

Management focus areas are items that the management of the company decide on and give attention to. They include:

- Customer focus
- Benchmarking
- Re-engineering
- Cycle time reduction
- Time-based competition
- Just-in-time (JIT) operations
- Adaptability
- Concurrent engineering
- Activity-based costing
- Supplier co-operation and development
- Product Innovation

(Kerzner, 2001, p.1135)

3.3.3.2 Tool focus areas

This involves ascertaining which tools would suit the company best and how they may be adapted to the specific requirements of the company. The tools are:

- Brainstorming
- Pareto Analysis
- Cause and Effect Diagrams
- Statistical Control Charting
- Quality Function Deployment
- Process Quality
- ISO 9000

(Kerzner, 2001, p.1135)

3.3.3.3 Employee focus areas

These areas revolve around the employees of the organisation and what they need in order for the TQM process to be successful. These include:

- Employee Motivation
- Group Dynamics
- Team Problem Solving
- Teamwork
- Employee Education and Training

(Kerzner, 2001, p.1135)

3.4 The result of Total Quality Management

The results of an effective TQM system include error-free processes that produce products or services that are fit for use, produced at the right time and at the right cost (Hradesky, 1995, p.3). It further ensures that customers are retained, increasing profits and generating new business. TQM will ensure that employees take pride in their work, contributing towards job satisfaction.

3.5 Conclusion

In the harsh reality of the current economic situation, both in South Africa and the world, TQM supplies a means to improve a company's image, profitability and employee satisfaction, leading to higher competitiveness and an increased ability to survive and adapt.

With this understanding of Total Quality Management, it becomes necessary to investigate the requirements for and processes involved in the implementation of a Total Quality Management system. This will be the focus of chapter 4.

CHAPTER 4

IMPLEMENTING TOTAL QUALITY MANAGEMENT

4.1 Quality culture

Kanji (1998, p.261) says, “Total Quality Management is the culture of an organisation committed to customer satisfaction through continuous improvement.” Although the corporate cultures differ from industry to industry, there are universal principles that should be implemented to gain market share, reduce cost and increase profits. For the successful implementation of TQM it is essential to create a Quality Culture within the company. To do this the existing company culture needs to be examined to determine the relevance of the current objectives towards which it is directed.

Culture represents the way in which people in a business unit behave in order to communicate with each other and other people in that society. It reveals behavioural patterns, customs, practices and beliefs they share and encompasses the totality of the norms and values that control their behaviour.

A corporate culture is established over a long period and can be hard to recognise for the people working within it. In most cases the establishment of TQM will require an adjustment of the corporate culture of a company. In the South African construction industry this is especially true as most construction company cultures have become fixated on the need for completing contracts on time and within budget, thus neglecting quality which, as has been proven, has the effect of delaying completion and reducing profits in any case.

The tempo at which an organisation should attempt to change its culture is described as, “as fast as is practical, but not as slow as the organisation may find comfortable.” This means that certain feathers will and have to be ruffled in order to change a company’s culture. The culture of the company should ultimately support its business strategy. The ultimate aim of cultural change should be to create a culture that will be the force behind the actions taken to achieve the vision and goals of the critical business success factors (CBSF). The objective of changing the corporate culture should be to create commitment to the company, to the quality improvement process and to the accomplishment of the CBSFs. (Hradesky, 1995, p.129)

In broad term the creation of cultural change means the following:

- Identify values to retain
- Identify values to adopt or adapt
- Define the values
- Convert the values to behaviours
- Develop implementation plans for these values
- Execute the value implementation plans
- Measure the implementation
- Follow up to ensure achievement and sustainability.

It also means creating open and effective communication through an empowerment process.

There are certain necessities for implementing Total Quality Management. These are:

1. The creation of commitment to the company's articulated goals
2. The creation of cultural change
3. Empowerment

4.1.1 Creating commitment

The first requirement for cultural change is the total commitment of every person in the organisation to the company and its survival. Part of this

commitment must be commitment towards reaching the company goals, CBSFs and cultural change. Commitment must not be confused with interest. Interest is involvement when it is convenient, whereas commitment is a tenacious pursuit of goals regardless of obstacles and without excuses. The commitment boils down to devotion to excellence. It is further evident in a triumph of integrity over scepticism. (Hradesky, 1995, p.131)

Commitment requires accountability for failure or success. Mistakes should however not be seen as only negative in value. Lessons are learned through mistakes and contribute toward experience. The idea is to confront and overcome obstacles while learning how to attain objectives.

Some obstacles to achieving commitment are:

- Conflicting goals e.g. extensive capital projects while the company is having cash-flow problems
- Procrastination e.g. a lack of sense of urgency
- Lack of focus identified by a lack of priority setting and a tendency to always be putting out fires
- Inflexibility and resistance to change often caused by fear or misunderstanding of change
- Allowing excuses to be made
- Self-defeatism with the idea that one person cannot influence change

- Lack of enthusiasm which usually occurs if top management does not lead by example
- Perceived or real lack of time to devote to goals
- Misinterpreting commitment as interest and waiting to act until it is convenient.

Commitment starts with the highest manager in the company be he the managing director, the chief executive officer or the owner. His role of leading managers who lead the workforce who work with the clients is turned upside down. He is now expected to support the managers, who support the workforce, who support the customers. All focus must be directed toward the customers. It is often stated that the single biggest reason for failure of TQM implementation is a lack of commitment by the top manager and other senior staff.

Characteristics of an uncommitted leader are:

- Personally solves daily problems and makes instant decisions
- Does not meet immediate subordinates individually or in groups
- Is critical and unreceptive to ideas regarding TQM
- Does not provide adequate resources for TQM
- Takes people out of team meetings
- Ignores continuous systematic problems
- Does not spend any time on TQM
- Does not reward or recognise TQM accomplishments

As with all business factors, commitment should also be measured. Although it is not possible to measure the level of commitment of an employee, it is possible to measure the results of commitment. Some questions that can be asked to establish a company's commitment to TQM are listed below.

Does the company track and report:

- Achievement of Critical Business Success Factors?
- Number of TQM projects completed?
- The results (in rands, hours, etc) of TQM projects?
- Number of quality-related standard operating procedures?
- Percentage of employees on TQM teams?
- Number of TQM projects initiated after suggestion by employees?
- Hours of TQM training per employee?
- Number of rewards given?

Management activities supporting commitment can be broken into four areas i.e. Permitting, Supporting, Managing and Leading by example.

Permitting	All managers must permit the people under their authority to attend TQM training. They must be willing to release them from activities even though they may think the work more important than the training. This will indicate the manager's true commitment.
Supporting	Management should support the TQM implementation process by allowing their personnel to serve on committees and by taking part in or attending launches, discussions, etc.
Managing	This involves chairing committees, mentoring, providing resources. People must be held accountable and their activities measured. A recognition and reward system must be put in place and managers must provide constant feedback to employees.
Leading by example	Executives must develop a vision, mission and value statement and clearly communicate these to all personnel. The manager must ensure that TQM is used in all significant issues to achieve organisational goals. By being an effective role model the manager can

influence others to conform to the new values and behavioural model.

In order to stay committed one must be aware of possible obstacles to meeting objectives. Through planning these obstacles can then be avoided or overcome with less effort. It is a fact that reaction to a problem requires more work than taking steps to avoid the obstacle becoming a problem. The need to fulfilling one's commitments must be a personal issue through which the employee beliefs that he is making a positive contribution to the company as well as to his own career.

Once a person is committed it will become apparent through a demonstration of constructive dissatisfaction with the status quo, the developing of an inspiring vision of the future of the company and a concentration on the CBSFs of the company.

Once employees start acting in a way that supports their belief in the concept that they have developed personal commitments to continuous improvement, then it can be said that commitment to TQM has become tangible. This will manifest through timeliness for meetings and completion of tasks and intolerance for poor performance by all concerned.

Managers that are committed will be deeply involved in spurring on actions required for the implementation of TQM. They will constantly motivate employees to strive for the company goals and will celebrate successes. They will also constantly remind people of the company vision through their actions and interactions with others.

In order to improve the chances of achieving commitment, it is necessary to plan for small successes. Short-term goals must be set and their achievement become non-negotiable. All measurable improvements must be celebrated and publicised at every opportunity. An atmosphere must be established in which collaboration is encouraged and the general feeling of the employees are constantly monitored.

Commitment boils down to people being willing to change their behaviour in such a way as is required to achieve the company's goals rather than their own, immediate ones. This must become group behaviour promoted by all in the company, in other words, a cultural change is required.

4.1.2 Creating cultural change

Every organisation has a culture. The culture is influenced by amongst others the following:

- The business environment which relates to the relationship between the business and its market. This is in turn influenced by the type of

product sold, the competitors, the economic state, technologies and government relations.

- Values which represent the basic beliefs and concepts of an organisation. Values determine what the employees will regard as "successful" and thus determine the standards of achievement expected by employees and management within the company. (Hradesky,1995, p.142)

Company culture can be either *strong* or *weak*. When a company's values are openly stated and no tolerance allowed for deviations from the company standards, then that company is said to have a strong culture. When the company values are related to subculture issues and not openly defended or even shown in print, then it is considered a weak culture. A strong culture is a system of informal rules that identify how employees should behave generally. This will guide them in situations where time would otherwise be wasted in trying to find out what to do.

An important part of the company culture is The Cultural Network. This network is the primary, yet informal, means of communication within the organisation. This network is the broadcaster of corporate values and is the most important tool in getting things done. If the network is used correctly, the company will be successful in manipulating the corporate culture.

4.1.2.1 The process of cultural change

There are five preconditions before cultural change can take place. These preconditions are:

1. There must be a good reason to change the culture, for instance economic survival. Management must predict the results of keeping to the current track i.e. losses resulting in economic failure of the company.

2. There must be a plan that indicates the necessary changes. This would include actions to be taken, responsibilities, target dates and desired results of change. This plan must be well communicated to all in the company and have the committed support of management.

3. Regular measurements of the values being promoted must be taken. If deviations are identified from the desired targets, correction plans must be implemented.

4. Expectations must be made clear to all employees and training supplied to teach them the desired values, behaviours and skills.

5. Recognition, rewards, incentives and promotions to encourage the correct behaviour must take place and must be seen to take place.

> Undesired behaviour must be dealt with swiftly and strictly to indicate management's commitment to the plan.
>
> (Hradesky, 1995, p.143)

4.1.2.1.1 Defining the Current Culture

The first step in changing the culture is to define the difference between the present culture and the desired culture. The perceptions of the current culture are important, as people will emulate behaviour that they perceive to be desired and rewarded in this culture. A situation may exist where the perceived desired behaviour is in fact not desirable but has become so embedded in the company that no ones dares to challenge it. An example of this in the construction industry is where foremen have become used to working on Saturdays regardless of the need thereof, thinking that this makes them look diligent when in fact, this is causing overtime costs that have a negative effect on the profit margin of the contract.

4.1.2.1.2 Defining the desired culture

This is the next step towards changing the company culture. Identifying a company whose quality standards are known and respected is the best method of doing this. The company does not have to be in the construction industry. It can be a company that produces merchandise

that is generally accepted to be of high standards and that your company employees would buy for themselves if they were given the choice. Examples of these type of companies can be found in the German automotive industry e.g. BMW and Mercedes-Benz.

Next a plan must be drawn up that will close the gap between the current culture and the desired goal. The most important changes required for the implementation of TQM are listed below.

From	To
Bottom-line emphasis	Quality first, but equally important as delivery date and cost
Short-term objectives	Long-term and short-term goals
Product delivery	Customer satisfaction, on-time completion
Focus on product	Focus on process and input variables, a correct process ensures a correct product
Quality-delegated responsibility	Management-led improvement processes
Inspection orientation	Prevention orientation
Minimum-price suppliers	Focus on lowest cost, not lowest price, through partnering with suppliers
Compartmentalised activities	Co-operative team efforts
Management by edict	Employee participation, focus on common goals

Table 1

Changes required for the implementation of TQM

The key to the success of this process is management commitment. The focus must also change from quarterly or monthly profits to a plan for achieving profits over the long term. If this plan is followed, monthly profits should be better than expected. There is a trend in certain construction companies to generate as much turnover as possible in order to boost quarterly figures. This often results in poor quality buildings that inevitably causes increased costs when problems have to be fixed. The consequence is higher turnover at lower margins that will have a negative impact on the company in the long run. TQM is again proved as a method of maximising profitability. Emphasis must be placed on building defect-free buildings and sustaining a competitive edge through timely delivery of buildings.

Focus on product emphasis results in reaction to problems rather than prevention. The company culture must change to the degree where employees try to influence and change the construction process. Inspection orientation is also not the answer, as no degree of inspection will identify all defects. Inspection also becomes too expensive at some point. The company culture must be such that defects are prevented, rather than fixed.

Using the cheapest supplier or sub-contractor has often been proven as costly mistakes in the long run. There should rather be looked at

developing relationships with suppliers and sub-contractors that can provide quality products at the right times and at reasonable costs. Price can often be negotiated to fit into the budget, but once time is lost or quality neglected, these cannot be corrected without incurring extra costs. Co-operation between different departments within the organisation must further be encouraged. This will lead to fewer arguments about supplying resources at the right times or of the right quality.

Management orders on how things are to be done, without a willingness to accept criticism or suggestions of alternatives, can lead to various problems. The most obvious being that improved methods of doing something may never be identified or employees may follow the orders even though they know it may not be suitable or correct, just to prove a point.

Cultural change must be a continuous process, the same as the quality improvement process. It cannot have a completion date, only dates for reaching certain milestones.

It is often seen that certain teams within a construction company “complete” their projects on time, regardless of the quality thereof, and are, more often than not, praised for “getting the job done”. It is usually later found that large costs are incurred to fix quality problems while the personnel responsible for the project have moved onto a new project.

Sometimes temporary staff has to be employed to deal with these problems after the original team has already received rewards, like bonuses, for the project. A cultural change will stop the poor quality from being produced in the first place and TQM will hold the original team responsible and accountable for the project until it is successfully completed.

4.1.2.1.3 Closing the culture gap

Closing the gap between the current culture and the desired culture requires the launching of project teams to influence the performance of the CBSFs, the implementation of desired values and the alignment of the organisation by developing and measuring internal customer satisfaction. Internal customer satisfaction is based on the concept that the various departments within an organisation are customers of each other. A production department can be seen as an internal customer of the buying department for example.

In the construction industry, the different projects can be seen as internal customers of various departments i.e. the buying, plant and labour-relations departments. If these departments strive to please the internal customer in the same way as the project team is striving towards meeting the external customer's goals, then a huge step would be taken towards TQM.

The idea of internal customer satisfaction can be extended to include the various sub-contractors on a project. Instead of only doing their work to be in accordance with their agreement with the main contractor, the various sub-contractors must be encouraged to see the sub-contractors who will be performing follow-on trades after them, as internal customers. In this fashion, the plasterer will aim to give the tiler a quality wall to tile on.

In order to reinforce the idea of internal customer satisfaction, agreements can be drawn up which are signed by the parties wherein they agree on what it is the internal customer requires. Failure to comply with these agreements must be addressed and where necessary, fines, rebukes or some other form of action must be taken.

In order to implement the desired values one needs to identify what the current values and the desired values are. Certain existing values will be retained while new ones will have to be adopted. The company's definition of the identified values must then be defined. Implementation plans are drawn up for attaining each value and measurements developed for the implementation plan. People must now be encouraged to change their actions to align with the goal of achieving the value. It is important to recognise and reward individuals that show commitment through their actions.

The aim of measuring internal customer satisfaction is to align different departments to become customer-driven. In the typical building project the different trades with their labour and subcontractors can be seen as departments. These departments have internal customers i.e. the trade that follows after it and external customers i.e. the person that will in time occupy the building. These customers' satisfaction must become important to everyone involved within the specific trade.

Implementing each value starts with the identification of a starting point. Next, agreement must be reached on the changes required. A plan is then created after which the process is launched. Finally a calendar is created that indicates milestones that are to be achieved.

In order to close the gap between the current and desired culture, it is best to start with values that are to be retained and to build on them. The gap must then be tackled by addressing the values that need to change. This results in bringing into the future that which worked in the past while also implementing new values.

4.1.2.1.4 Resistance to cultural changes

People have a natural fear of change, as they believe it will result in them being taken out of their comfort zone. To overcome this, repeated

education and positive reinforcement is required. The employees' perception of acceptable behaviour must be aligned with the vision, mission and value statements of the company to achieve cultural change.

Time and ease of effecting change is proportional. Different types of change require different amounts of time. Knowledge is easily obtainable and needs very little time. Changing attitudes, individual behaviour and group behaviour becomes increasingly difficult and time consuming.

The key elements that should be present to effect change are role modelling by the leader, an urgent need to change and an understanding of the consequences of failing to change. Individuals and teams must become proactive for change to build momentum. This means that problems must be anticipated and corrective measures taken before they occur.

People must further become result-oriented. This means they must measure their performance and strive for their goals. The process must further be viewed as one in which everyone is involved and not just a specific department or team.

The time needed to change, and the degree to which change is attained, are determined by the effort expended, the size of the gap between the desired and actual culture and the time taken to address the change.

Teams will eventually become self directed and drive TQM by themselves. TQM implementation can be a management training and development tool.

4.1.2.1.5 Techniques to foster change

Cultural change is fostered by implementing company values and rewarding behaviour that is in line with these values. Failure to measure change may scuttle the entire process. Many people are sceptical about how to measure values. Before the company can measure behavioural change it needs to identify what the desired behaviour is, identify how to recognise the desired behaviour and then determine how to instil this behaviour. The behaviour is then measured by looking at employee involvement, for instance. This would require counting the number of suggestions made, number of people submitting suggestions and number of suggestions implemented. Surveys can also be done to test people's knowledge of company goals, their opinion of management performance and determining the number of formal recognitions.

It must be kept in mind that behaviour is a result of attitude. Therefore it is important to change attitudes before trying to change behaviour. Changing behaviour will ultimately manifest in a change in performance, which is the main aim of cultural change.

Negative reinforcement should never be used to foster the desired behaviour as it can only stop unacceptable behaviour, which will lead to confusion regarding what acceptable behaviour is. (Hradesky,1995, p.154)

4.1.2.2 Management responsibilities to effect change

In order for the change in culture to happen, it must be ensured that the company's management does the following.

- They must assess the current culture that exists in the company. They must also be aware of why this culture exists and how deeply it is embedded in the attitudes of the personnel. The assessment must preferably be made by an external party who will be more objective. This is particularly true where most of the senior management has been with the company for many years, as is often the case in the construction industry. The assessment must include interviews with workers, analysis of employee's perceptions and an evaluation of participation, team spirit and motivation.

- The next task is to define what the desired future culture should be. This is done by determining which values would lead to the success of

the company. Once these values are entrenched it would form a new culture.

- Training needs to be supplied. Implementation plans must be designed that will reinforce the training and thereby foster the new culture. Management must ensure that relevant training is given to all levels of personnel and not just the people directly responsible for a project e.g. the site agent and foremen. More often than not no training or motivation is given to the labourer who is actually doing the work and producing the quality. Motivating this person to do the job right the first time could win the battle for quality.

- Management must further act as role models. This is true for all levels of management from the managing director to the site foreman. It is a case of “Action speaking louder than words.” It is of little use to lecture people on quality if your own behaviour suggests that you are more worried about completing a project on time.

- Management needs to define what they expect from the personnel. They must indicate how the expected behaviour can be achieved, define authority levels and assure that everyone has access to the required resources. This all can be phrased as empowerment.

- Management must provide programs to identify and reward successes in changing behaviour. These programs must reinforce the correct values. Rewarding a project team because the project is completed on time and in budget, while quality is poor, will be detrimental to the quality improvement process.

4.1.3 Empowerment

Empowerment has become a frequently used term in the modern South Africa. It has is some instances been made law by the government. It is therefore necessary to investigate how empowering the workforce can and should be used to improve quality.

Empowerment in quality terms means that every employee feels that he is responsible for quality and for solving problems that arise. This leads to a whole company of committed problem solvers who will greatly outperform their rivals who are still caught in the trap of a few people trying to control everything.

By empowering people they are given the authority to do whatever is necessary (within reason) to achieve the quality goals. This can be achieved by creating an environment where everyone feels free to suggest solutions and act on problems. To understand the immensity of such a change one only needs to imagine the reaction should a labourer,

responsible for cleaning the building site, walk into a site office and make a suggestion to a project manager regarding a quality problem that he has identified. Only once one can imagine this actually occurring in a company can it be said that the workforce is empowered. Empowerment also means the willingness to take risks rather than trying to live with a problem.

If management takes the risk to relinquish some of its control to well trained employees, a more productive organisation will develop that makes faster decisions and copes better with problems. It must be understood that empowerment does not take away management's responsibility to make final decisions. Management is also still required to intervene where the correct processes are not being followed.

Empowerment ultimately means that workers are assured that their decisions will be supported and they will be rewarded for being innovative in dealing with obstacles. The worker must know what is within his authority to do.

4.1.3.1 Reasons for empowerment

By empowering people, the person who is closest to the quality problem, i.e. the person physically responsible for the work, is given the authority to decide how to resolve it.

Empowerment leads to higher productivity and personnel involvement. People will take responsibility for the quality of their work. It is an effective method of changing the culture of an organisation. Empowerment also improves communication, which in turn, leads to fewer misunderstandings regarding what quality is expected and how it is to be achieved, because people are not afraid to ask questions.

Empowerment forces the employee to use his knowledge and will identify where additional training may be required. It will also identify individuals with potential to be trained for higher levels of management. This way a carpenter may be identified for training as a foreman. This will, in turn, have a direct influence on his family life and eventually even on his community. Employees who feel they are being supported and trusted will enjoy their work, which in turn leads to commitment and a change in culture.

The empowering of personnel will change reactions into actions. Rather than blaming someone for a problem, the person responsible will make the necessary decisions to achieve solutions. This also means that the company has problem solvers on every level and will therefore become more efficient.

Once everyone is empowered they will start working together on previously unrivalled levels. The failure by construction companies in South Africa to empower their workforces right down to the lowest levels has been a major reason for their problems. Most companies are still entrenched in the situation where workers are told what to do, often not very clearly, and expected to comply no matter what. This is compounded by the fact that South Africa has eleven official languages which makes communication even more difficult. This leads to problems not being identified and solved immediately, and eventually causing delays and losses. If the worker was able to ask questions in order to understand what was expected from him, or to make suggestions on how a problem might be overcome, tasks would be performed better the first time and problems solved quicker.

Empowerment is achieved through motivation where people are encouraged to act in accordance with the vision and mission of the company. Currently the situation in construction companies more closely resembles domination that is the control by a superior authority. Domination is characterised by one way communication, from manager to employee, whereas motivation encourages two way communication. People should not be intimidated to blindly do as they are told, when they know of a better way of doing it.

4.1.3.2 Empowerment barriers

Some employees might feel insecure and suspicious when a company starts an empowerment process. They may feel that their responsibilities are being reduced and therefore their usefulness to the company is also reduced. There is also still an element of mistrust between the workforces and the management of many construction companies. Employees often believe that the company is making money at their expense because they are given added responsibility without additional remuneration, while management considers employees incapable of making correct or informed decisions.

The following must be remembered when empowering the workforce:

- Management must also be trained in empowerment
- Empowerment is a process, not an event
- Success will not be attained overnight
- Make expectations and guidelines clear
- Keep up measuring, monitoring and feedback.
- Do not empower people without the skills to do the job
- Empowerment is a new culture and mindset, not a tool or strategy
- Make sure people understand their responsibilities

  (Hradesky, 1995, p.162).

4.1.3.3 The empowerment process

The process of empowerment consists of three parts i.e. empowerment, process management and taking responsibility.

The act of empowerment involves giving people clear objectives to attain. This is augmented with guidelines on how these objectives can be reached and specifying the level of authority for decision-making. The necessary resources and relevant skills must also be supplied.

Process management begins with determining how to measure performance and then actually measuring it. Individuals and groups must then be held accountable for their performance. The progress of the process must regularly be reviewed and the results thereof made known. Finally, positive performance must be identified and rewarded while negative performances must be addressed.

In taking responsibility, the employee must acknowledge that he has been given the necessary information to willingly accept the empowerment. He must agree that he understands what is expected from him, and he must start acting in accordance with his responsibilities.

4.1.3.4 Results of empowerment

Empowerment is a very effective method of bringing about a change in the culture of an organisation. This change can have two distinct outcomes: either Threats or Opportunities. Threats can be divided into Denial- and Resistance phases. Opportunities can be divided into Exploration- and Commitment phases. Each person affected by the changing culture will to some degree go through each of these phases.

Denial means that when empowerment is started some people will react as if nothing has been changed or will continue to do their work as they did previously. People are blind to the problems facing the organisation during the denial phase. Emphasis during this phase is still on style and not results.

In time they will be forced to admit that change is taking place but may still resist changing their behaviour. This can lead to anxiety, frustration, anger and depression. Resistance can be detected by lack of progress in the change process and blame being passed around.

Once the process of change gets into full swing, people will start to discover what their new responsibilities are and what their future and that of the company is. They will begin to experiment with adopting new

attitudes and will see results achieved by other people who have already embraced the empowerment. This phase can be chaotic, as there is a lot of energy but a lack of focus.

Finally everyone in the organisation will realise what benefits the empowerment can have and become committed to the ideals at which the new culture is aimed. People will begin to focus on a plan and start working together. Once everyone is totally committed the organisation should find that continuous improvement takes place because it is driven on all levels of management and by all employees. (Hradesky, 1995, p.171)

4.1.3.5 Management of phases of change

In order to ensure that change brought on by empowerment proceed through the various phases listed above, it is important for management to do the following:

- Denial Phase — Confront employees with information on how and why the change will happen. Also explain what they should do to adjust to the change.

- Resistance phase — Grievances must be listened to and support encouraged. Rather than telling people how to react, management should work with them to develop a plan to overcome their obstacles.

- Exploration — Management must provide training and help people focus on priorities. They must manage the positive energy that begins to develop. Short-term goals must be set during this phase.

- Commitment — Long-term goals should be set and attention given to team building. Recognising and rewarding people producing the required results should be kept up.

It is important that management recognise each phase of the change process as failure to deal with a particular phase can result in a stagnation of the entire process. One important point to remember is that team building should not be attempted too soon. Team building cannot start before people have finished complaining and had time to re-assess their situation, before they will begin to rebuild trust and start co-operating.

4.1.4 Summary of quality culture

In order to implement Total Quality Management, an organisation needs to create commitment towards the goals of the organisation. Once commitment is attained, the organisation needs to go through the process of cultural change. This process must be managed and measured in order for it to be completed successfully.

The ultimate purpose of changing the culture is to implement desirable values in the company. This is achieved through empowering the workforce to such an extent that they have clearly defined expectations, responsibilities, levels of authority, resources and skills. Empowerment requires a high degree of focus from management.

Once empowered the workforce will be quality driven, proactive, able to adapt and always striving for improvement.

4.2 The implementation process

Before one looks at the process of implementing a Total Quality Management system, one needs to look at some pitfalls that can scuttle the process before it has time to get off the ground.

Pitfall number one is a belief by the executives that commitment is interest or interest is commitment. They underestimate the effect of themselves being role models and how their behaviour can and will influence the implementation of TQM. A typical sign of this happening is the delegation of responsibilities by executives who should be doing the motivation, planning, etc. This robs the implementation process of vital leadership.

In order to avoid this situation, management or executives should be trained and made to understand what commitment means so they can buy into their role responsibilities. Commitment must be defined as making no excuses and accepting none either.

Pitfall number two is the use of internal personnel to do a self-assessment. This might lead to a subjective view of the current situation. A lack of knowledge and experience in this field may further skew the assessment. To avoid this it is recommended that the assessment be done by an external, professional firm that will allow objectivity and do an in-depth analysis of the company.

Pitfall number three is the failure to educate managers on the concepts of TQM. This will lead to misunderstandings between them and will fail to gain their commitment and bind them into a goal-oriented team.

The fourth pitfall is the failure to conduct strategic business planning to set the future direction of the company prior to starting the TQM process. Without an effective mission, vision and value statement, the executive management may fail to buy into the undertaking. Without these statements, the company will lack focus and the whole TQM effort will suffer. It is once again recommended that an expert be called upon to lead the company executive and key managers in a strategic planning session. This should have the further benefit that a team starts to develop before the TQM process is started and that people from the highest level of the organisation become committed and involved.

Failure by senior staff to produce a list of critical success factors for the company can be seen as pitfall number five. Without this list, no milestones can be set for the TQM goals and its monitoring will become difficult. To avoid this situation a tactical planning session can be held in conjunction with the strategic planning session mentioned above.

The last pitfall is a lack of internal customer satisfaction agreements between various departments. This will result in departments continuing individually as they did before without collectively focussing on the external client requirements, causing the whole company to suffer. To overcome this problem a system should be set up whereby the internal

customer satisfaction is measured and corrective actions taken where the satisfaction is lacking. (Hradesky, 1995, p.30)

Once the realisation has settled in that a company needs to change its culture and management style, it becomes necessary for someone to start the implementation process. Quite often the implementation is tackled in a haphazard fashion and soon runs out of momentum. To avoid this situation, it is important that it becomes a corporate priority for the implementation process to be done in a methodical manner.

Distributing booklets and having discussions does not equate to implementation. In most cases of implementation of a process, there is a general progression of activities that need to be followed. These can be summarised as follows:

- A goal or objective is identified
- A team gets appointed to draw up a plan for the achievement of the goal
- The plan is followed methodically
- Measurements are taken during the execution
- Corrective actions are taken, should they be required
- People are educated on how to use the new system

This process, which at its heart has the changing of the company culture, is not a short one, but rather one without an end. Changing a culture is "..a matter of exchanging values and providing role models. This is done by changing attitudes." (Crosby, 1984, p.98)

The importance of role models cannot be overemphasised. People will do what they think the company expects from them, even when the opposite is true. People's perceptions are moulded by the way the examples the company show them. Should a manager only be worried about getting a project done on time or within budget, then his subordinates will only focus on those issues. Should he however question methods of doing and their impact on the quality of the product, then the people working for him will also start looking for better ways of doing their jobs.

To change the corporate culture, we need to decide how we want it to be and then set about changing it accordingly.

According to Crosby (1984, p. 99) there are fourteen steps in the implementation of quality improvement. They are:

1. Attaining management commitment
2. Establishing a quality improvement team
3. Measuring
4. Determining the cost of quality

5. Creation of quality awareness
6. Taking corrective actions
7. Planning for quality
8. Employee education and training
9. Launching
10. Setting goals
11. Error-cause removal
12. Recognition and rewarding
13. Establishing quality councils and quality circles
14. Repetition

These fourteen steps do not necessarily have to be done consecutively. Once measurement starts, people will automatically start identifying goals while education will become a never-ending process.

Senior management is the most important key to the process of quality improvement. Senior management needs to be educated regarding quality and to set out on a mission to change the culture, before any benefit can be derived from such a change.

The company's culture only change when all employees realise their roles and responsibilities in attaining quality. They will also expect management to start demanding quality and themselves producing it.

4.2.1 Attaining management commitment

Senior management must not only be committed to quality improvement, but must exhibit their commitment in such a manner that it is clearly conveyed to the other employees.

The first step towards establishing commitment should be the drafting of a quality policy. The quality policy must first be written and then proven to be a serious message. The policy must be clear to avoid misunderstanding.

An example of a quality policy for a construction company could read:

> We are committed to establishing our company as the best in the industry by delivering buildings to our clients that conform to their requirements, on time and within our budgets.

The next step in establishing quality commitment is to ensure that it is given the same status as finances in management meetings. It must be placed on the agenda as a separate item for which a status report must be tabled.

The quality status report must include items describing the status of the quality improvement process, the latest updates regarding the cost of

quality and a report on the actual quality achieved. Reasons for failures, corrective actions and successes must be highlighted.

Public affirmation from senior management through speeches by senior managers at social events, general meetings, etc. will further enhance the confirmation of their commitment to the quality improvement process. It must also continuously be emphasised that senior management takes conformance to requirements seriously and therefore no exceptions should be made.

In the construction company, with its emphasis often skewed towards time and budget constraints, it is important for managers to impress upon their subordinates that urgency or monetary impacts should never override the decision to do something correct the first time.

Management commitment will always be under close scrutiny, as people fearing change will always be on the lookout for the slightest indication that this commitment is slipping and thereby justifying their reverting to their original comfort areas.

4.2.2 The quality improvement team

Although individual commitment is a must for quality improvement, it takes teamwork and co-ordination to make it happen. This requires

organisation. The first step in organising for quality improvement is the establishment of a quality improvement team. This team will implement quality plans and motivate the acceptance of quality through teamwork. The task of the team must be to co-ordinate and support.

The team must consist of people from all functions of the organisation. They must further have the authority to make commitments without the threat of these commitments being overturned.

The team must have a champion. This team leader must be in direct contact with or part of top management. The team leader must also understand the overall business strategy and be able to change it if necessary. There must further be a full time co-ordinator who will ensure that all team members are fully briefed, attend meetings and supply the resources required to keep the process going.

The team leader, with the co-ordinator and top management will draw up an overall strategy for the implementation of Total Quality Management. This strategy is then developed in more detail with the quality team members. It is important that the team members adjust the strategy to comply with their practical needs.

The members of the quality team must all be educated in the concept of Total Quality Management. If they are not, a lot of time will be wasted and

the entire process can become disoriented. The team must, above all, be aware that it is the attitudes and practices of management that they want to change first, before they can hope to change that of the rest of the employees. The team needs to buy into the process to be committed to its success.

The main purpose of the quality team must be to effect change. They will do this through the creation of procedures and actions to be followed and taken, but also through ensuring the education of all employees. Training is best achieved through experiencing what can be achieved if certain actions are taken.

4.2.3 Measurement

Collecting information on how an organisation operates, including the determination of the cost of quality will identify the areas where improvement will have the greatest impact. This collection must be done through measurement. Measurement enables communication in finite terms. It is essential if the company wishes to know exactly how it is doing. Measurement is describe by Hradesky (1995, p.61) as "...the first step in being able to determine what additional action will be required to achieve our goal."

The quality improvement team does not have to determine what has to be measured. All work is a process of changing input, by applying a process, to output. Input, process and output can all be measured. The quality team must bring this under the attention of every employee and they must then determine how their own processes can be measured themselves. The quality team must however, ensure that the measurements are designed to give definite quantitative answers and not vague qualitative measures like “better” or “faster”.

People must be convinced that measurement is done in order to track improvement, not to supply information for checking up on them. It must be made clear that the measurement targets improvement, not the employee.

There might be a perception that quality measurement must be done by the use of cost-accounting information. This is incorrect, as this information cannot map process performance. It does not indicate the improvement as observed by the customer. It is, for instance, not sufficient to measure quality based on cost-accounting methods for construction projects where cost reports are often only drawn up between two to six weeks after work was physically performed. This means that the cost of mistakes made is only identified up to six weeks later, by which time it is very difficult to do anything about it.

Measurement enables the company to identify areas of opportunities, determine how successful its process control and improvement is and comparing its performance with those of its competitors. Measurements should give information on how well people and processes are doing in order to motivate better performance.

The Deming cycle of continuous improvement is a useful aid in designing a measurement system (Oakland, 1989, p.165). It is based on the following:

- PLAN establish performance objectives and standards
- DO measure actual performance
- CHECK compare actual performance with objectives and standards, determine the gap
- ACT take the necessary steps to close the gap and make the necessary improvements

Some reasons for measurements are as follows:

- To ensure that customers are satisfied
- To provide goals to be attained
- To provide standards for comparisons
- To determine areas where additional attention to quality is needed
- To provide status reports on the progress of improvement

Measurement will further indicate what the overall impact of the TQM process on the business is.

In order to measure performance, one needs to measure quality, effectiveness, efficiency, impact and productivity. These are measured through determining input or output figures, the cost of quality, customer comments and complaints, etc. Indicators are used to communicate the results of the measurements. Indicators can include ratios, rankings, financial and time-based indicators. The indicators must emphasise quality improvement.

In developing Quality Indicators the following principles will be common to all cases:

- The entire process should be considered. No control mechanism or process can detect or correct weaknesses generated by activities or inputs not covered.
- Indicators should diagnose the real causes of each problem identified.
- The information system, as well as the measurement and evaluation of quality should be above reproach, i.e. values of indicators should be reliable.
- Indicators should be expressed as deterministic as possible, i.e. preferably percentages or costs, otherwise as a quantity or, at least,

degree of seriousness. Although difficult in the light of the above, indicators should, however, cover both “hard” and “soft” issues.

- Ranges of indicators concerning the same entity or process should be grouped together to afford a complete picture of the specific entity or process. Indicators are often grouped into, at least, internal and external indicators. Internal indicators identify problems which the entity’s own control system detects and external indicators those which are not detected but present.
- Indications in each group should be weighted and prioritised to recognise Pareto’s law (20/80% rule) and ensure maximum affect when improved.

(Basson G, 2002, *Quality Indicators*, p. 3)

It is important for the measurements to be directly related to the company’s competitive strategy, adjustable if required, easy to use, provide fast feedback and encourage improvement rather than just monitoring. Measurements must be understood and accepted by everyone involved, compatible with a recognition and reward system and not be open to manipulation. They must be correct and precise and relate to controllable aspects of the processes. The measures must further be timely and result-oriented. The measurement system must be designed to measure progress in excess of the current status.

Some examples of what must be measured in the construction industry are listed below:

- Total cost of construction versus Allowed cost
- Percentage of budgeted income realised
- Value of savings made
- Cost of rework
- Date of actual completion versus contractual completion date
- Number of items on defects lists
- Cost of items on defects list to quantify seriousness
- Completion times of defects on defects lists
- Number of bricks laid per week or per month
- Cubic meters of concrete placed per week, per month or per floor area.
- Value of work produced per employee
- Value of variations compared to contract value
- Material wastage as a cost or a percentage of material used
- Wastage reduction percentage
- Number of material orders made per month
- Number of suppliers
- Number of subcontractors
- Percentage completion of subcontractor work
- Percentage of defects costs of total cost of subcontractors' cost
- Material on site turnover

- Equipment downtime as a percentage of total operating time
- Labour force absenteeism
- Overtime as a percentage of total time worked
- Number of casual labour hours used or as a percentage of total workforce
- Labour turnover
- Training hours as a percentage of total hours
- Hours of training per employee per period
- Accidents per month
- Head office accounting cost per total project incomes
- Overhead percentage
- Market share
- Number of tenders submitted
- Percentage of tenders won
- Number of tenders awarded
- Value of tenders awarded versus submitted
- Follow up projects from existing clients
- Percentage of overhead cost to total construction cost
- Percentage of available employees currently busy on construction projects.

(Hradesky, 1995, p.66-73)

It is important to measure all the elements of performance i.e. time, cost and quality. The performance measures must also reflect the requirements of the internal and specifically the external customer. The measurements made must be ones that indicate problems where smaller adjustments will have greater results. The principle described by Pareto's law can be followed here. It states that an 80 percent difference can be achieved through expending 20 percent of the effort required to achieve an 100 percent change, and that the last 20 percent change will require the remaining 80 percent of the total effort. It follows therefore, that measurement must focus on that 20 percent of actions required that will cause an 80 percent increase in quality. The measurement system will also have to be flexible, as most construction projects are unique and will require some adjustments thereof.

Ultimately the measurement system must indicate whether progress is made in the improvement process, and if not, it must indicate where management needs to focus their efforts to get it back on track.

Thought must be given to benchmarking. Benchmarking is the measurement of the organisation's performance against that of its competitors. The fact that information regarding the financial, time and quality success of construction projects undertaken by competing construction companies are very difficult to obtain renders benchmarking

difficult in this industry. Most information would be based on perceptions that do not allow accurate measurement.

4.2.4 The cost of quality

The next step is to provide a system that calculates and reports the cost of quality, as discussed in chapter 2, to senior management and to provide them with useful information regarding the quality improvement process. The cost of quality is usually only used to determine defects on the manufacturing or construction line. It could however, be used to determine where a small amount of effort would save a big amount of money.

One of the main obstacles in generating the cost of quality, is attempting to calculate it to one hundred percent accuracy the first time. This becomes a drawn out exercise that soon looses momentum. It should rather be attempted to get al least an eighty percent accurate figure, which will be alarming enough to get everyone's attention. The cost of quality can be calculated more accurately as proficiency in TQM grows. The more accurate figure must not be assumed to represent an increase in the cost of quality. It may only take account of costs that were previously overlooked. According to Philip B Crosby (1984, p.86) the rule for determining the cost of quality is: "Take everything that would not have to be done if everything were done right the first time and count that

as the price of nonconformance." In other words, the cost of quality can be described as the cost to ensure the client gets what he requires. The effort expended in determining the cost of quality must be weighed up against the benefits received from use of that information.

The quality team must involve people from all departments of the company to help it design a system for measuring the cost of quality. In a construction company these people would include quantity surveyors who work with the costs on building projects individually to accountants who deal with accounting costs. The system must give an outline of how the cost of quality can be calculated per project and how the costs from various projects are to be combined to give a company wide cost. This would require aligning of the cost of quality system with the overall accounting system of the company.

The cost of quality must then be used by management as a tool to track improvement by measuring the same thing over and over, and not something to threaten people with. It must also not be used as a basis to place different projects in competition.

The determination of the cost of quality is a subsystem in the overall quality improvement system and therefor will require its own commitment, management, training, promotion and participation. The ultimate goal of

the cost of quality system must be to impact on the mission of the organisation.

4.2.5 Quality awareness

Creating quality awareness requires communication. Acceptance of quality improvement can only be achieved through communication processes. The quality team must make sure that the company's quality goals are communicated in an understandable format to all employees. This communication must be part of the overall communication system. Communication of quality improvement must not be kept separates as people who think it does not affect them, might ignore it.

Communication is required to let people know how they will become part of a TQM system, what the process will be and what the benefits and successes of the TQM system are. Improving communication may require the quality team to have people in management positions, including themselves, trained in communication skills and methods such as talking in front of a group, group communication, reporting and writing.

In order to remind people to strive for quality, they need to be constantly reminded of it. Useful means of communication are competitions, prizes, formal presentations, demonstrations, exhibitions and company newsletters or –magazines. The use of posters should not be

underestimated. Having regular, formal discussions with the labourer on site regarding quality will also keep quality in the forefront of his mind. This is perhaps more important than posters when working with a labour force that may not have a high degree of literacy, as is often the case in the construction company.

Management's commitment to quality must be made clear through the quality communication. The workforce must know what the company policy regarding quality is and also what the costs of doing things wrong are.

The quality team must strive to make quality a part of the everyday communication in the company.

4.2.6 Corrective actions

A system is required to identify quality problems and to correct them. This fact, though simple, is often overlooked in the construction industry. Although people are aware of problems, these problems are not identified to the correct people who can do something about it. When a labourer comes across poor quality, he more often than not ignores it and applies his trade to the defective work. This only compounds the problems and results in higher cost to fix it. If the labourer was quality conscious and a

system was in place for him to notify his superior, the problem might have been solved earlier and cheaper.

A system of corrective actions must focus on eliminating problems. The phrase is however, often misunderstood and taken to mean “fixing mistakes that have already been made.” Although this must be part of the corrective action system, the system must aim to prevent mistakes from being made, which would negate the need to fix mistakes.

The first step in taking corrective actions is to determine the cause of the defect. This is done through quality audits and reviews, surveys, scheduled inspections and unscheduled tours. The next step is to identify what has to be done in order to avoid a repeat of the actions that lead to the defect. The corrective action system must be based on data that indicate the root cause of the defect, as that is where the least amount of effort will have the greatest effect on quality. The identification process involves collecting, checking and selecting data to analyse. The data is analysed by determining causes of defects, determining and recording preventative measures and then reporting to all relevant people.

In the construction industry, with its high use of subcontractors, a system is required that involves the subcontractors in corrective actions. Regular meetings with and audits of the subcontractors’ quality have a great impact on overall quality. The ideal would be to use subcontractors who

have proven quality management systems in place. In a country where companies are obliged to make use of and help with the development of subcontractors who are from previously disadvantaged communities, this is however not always possible. The bigger construction companies must therefore invest time and energy in helping the subcontractors in understanding quality and developing their own systems to manage it. This investment will eventually pay off in the form of better quality at lower prices.

Open communication between the large company and the subcontractor, regarding quality, is essential in ensuring subcontractor quality. If the subcontractor is aware of exactly what quality is expected of him, as well as the effect his lack of quality will have on the rest of the construction process, then he will be more inclined to deliver the required quality.

The quality system cannot function without regular audits and reviews. The audits must ensure that actual methods are following the prescribed procedures while reviews will determine whether the quality system is attaining the desired results.

4.2.7 Plan for quality

Quality planning must be focussed on attaining zero defects. Quality planning must involve a review of existing quality systems to identify

strengths and weaknesses of these systems. The new plan must then incorporate the strengths and avoid or address the weaknesses.

The plan must consist of detailed operating plans, procedures and techniques. It must set out all quality-related aspects in the construction process. These will include specifications for materials and services to be used, subcontractor adjudication methods, process controls and inspection procedures, including the use of checklists.

The plan should define the following:

- Specific allocation of responsibility and authority during the different stages of a project.
- Specific procedures, methods and instructions to be applied throughout the project.
- Appropriate inspection, testing, checking and audit programmes required.
- Methods for changes or modifications in the plan required as the project proceeds.

(Oakland, 1989, p.70)

The quality plan must aim to provide processes that reduce the possibility of malfunctions to a minimum. It must ensure a safe, clean and orderly workplace, with adequate facilities and resources. The quality plan must

also describe where and how information must be gathered, how it must be reported on and whom the reports must be made to.

The system as set out by the quality plan, must be able to continue functioning regardless of changes in management and personnel involved.

4.2.8 Employee education and training

Once management is committed and well on its way towards TQM, the need arises to educate the rest of the employees on how to achieve quality. This requires training. It is such an important step that Juran says "..- training is how to make quality happen." (Juran, 1989, p.321)

The ideal is to develop a comprehensive quality education system that provides a standardised method of training that could be used by anyone who has been trained to use it. The system can include formal classes, with video or slide presentations, workshops, discussions and practical examples on site. The system would have to take the trainee's level of authority and education into account.

Although there is an investment required by the company to have employees trained, this investment will pay off in dramatic increases in

quality. Every person who undergoes training will understand that he plays an important part in the production of quality.

The training system must ensure that training is done objectively, systematically and continuously. As with all systems, the training system must be improved on a continuous basis. This means that once it has been implemented, it must be monitored, results assessed and adjustments made. The training programme must include follow-up activities and encourage the exchange of experiences and new ideas.

The main elements of quality training should include the following:

- Error/problem prevention
- Analysis and reporting
- Investigation
- Reviewing

(Oakland, 1989, p.391)

Training needs to happen on four levels of the organisation. These are:

- Senior management i.e. Contract managers,
- Middle management i.e. Site agents and Quantity Surveyors
- First level supervision i.e. Foreman, Gang leaders.
- All other employees i.e. labourers and artisans

4.2.8.1 Senior management

Training must instil awareness of and commitment to quality under the senior management staff. The training must include the tools and methods to be used to create an atmosphere where quality can thrive.

Topics to be included in senior management training are meeting internal and external customer demands, setting quality standards, monitoring quality performance and spreading the idea of quality throughout the company.

4.2.8.2 Middle management

The aim of training middle management should be to ensure that they are conscious and anxious to achieve the benefits that TQM can provide them with. These managers should be trained with the technical skills to design, implement, review and change the parts of the quality system that is under their direct control.

Responsibilities must be clarified. This will prevent people from trying to avoid taking ownership of the quality system. The training must focus on the implementation of teamwork and the use of tools for process control.

4.2.8.3 First level supervision

This level of management is where the implementation of TQM is managed. These people must be trained in the principles of TQM and what quality will mean to them. They must be made aware of their role in the TQM system, teamwork and the need for their commitment.

4.2.8.4 All other employees

Awareness of and commitment to quality is as important on this level as on any other. The basics of quality must be taught at this level. It is important to use practical examples in order to ensure understanding.

The training should provide training in the quality procedures with which the employee will be involved. This will include “on the job” training and also foster an understanding of what the client requires. Follow-up on training is important to ensure implementation is followed through.

The group size for training should not be between ten and twenty people at a time. This size group will ensure that there are enough people to keep discussions going while enabling the trainer to give fairly personnel attention to everyone.

Consultants are often used to introduce TQM. A consultant should be chosen with specific attention given to his qualifications, experience, knowledge and proven previous successes.

When using someone from the company to conduct training, that person must himself be trained first.

The person selected to do the training must be:

- Technically competent
- Resourceful
- Professional
- A good communicator

And have:

- Management skills
- Good interactive skills
- Evaluation and feedback skills
- Planning skills

Successful training will manifest itself in a positive change in performance, positive relationships between managers and subordinates and a higher level of desired behaviours. (Hradesky, 1995, p.243)

4.2.9 Launching

There is a need to have an official launch day when implementing TQM. It is however, incorrect to see this day as an occasion when all employees must sign a piece of paper to signify their commitment to quality. Although this can happen, it is much more important for management to stand up and publicly commit to quality in a manner that will leave little, if any, doubt with the labour force that they are serious about improving quality.

In a construction company where the basis of operations are not centralised but spread over various construction sites, some of which can be hundreds of kilometres apart, it may not be practical to have a single day exclusively. It would be advisable to have a launch-day at the company's head office, which must be attended by the management teams from all the projects, and then have site launch-days where management visits a site and reaffirm their commitment in front of the general labour force.

It is important to make sure that material suppliers and subcontractors attend these site launches, as they will also be involved in the quality process. Launch-days can be combined where projects are in close proximity and share subcontractors. The various launch-days must be held within a restricted time frame, to avoid a perception that quality is

more important on some projects than on ones where the launch is on a later date. Consideration can be given to a “Quality launch-week” during which management will have their site launches and the main launch.

The launch should include special presentation techniques. The use of videos or even live actors to explain the impact and cost of quality may be useful. Using some of the management staff as actors will provide some comic relief while their willingness to do the acting will help express their commitment to the process. It is important to make the days memorable, and its anniversaries must be celebrated.

4.2.10 Setting goals

As mentioned earlier, goal setting will start automatically after measurement. The ultimate goal is to completely satisfy the requirements of the internal and external customers. Intermediate goals are however necessary to help identify progress towards that ultimate goal. The goals must be significant, as insignificant goals will detract from the importance of progress. According to Juran (1989, p.72), each goal should be quantified and should have a target date for completion. The monitoring of achievement of goals is necessary for the reward system that will be described later.

Goal setting will take place on all levels of management. Upper management will deploy macro goals while middle management will determine what is required to attain these goals. They will then set goals for the next level of management who will again interpret these goals and decide the courses of action required for achieving them. This process will repeat all the way down to the individual employee. Once at the lowest level, the goal should indicate a specific deed to be done by a specific person and the resources required by that person. The time frame for achieving the goals will also decrease the further down the chain of command one moves.

The ideal must be to get the individual worker to set quality goals for himself, which will result in the goal setting process turning around and forcing the managers to react to the success of the lower level. This will indicate a degree of maturity in the quality culture with communication flowing in both directions.

Examples of goals to be set by the senior management of a construction company are:

- Reducing the cost of rework on all projects by 50% over the next year
- Obtaining five projects through follow-up work from satisfied customers, as opposed to tendering, within the next 18 month

Goals should be:

- Legitimate - so they have undoubted official status
- Measurable - so they can be communicated with precision
- Attainable - so they can be met by application of reasonable effort
- Equitable - so they can be attained by all employees on the same level

(Juran, 1989, p 152)

Goals can be based on technological, market or historical analyses. The trend is to base macro goals on the requirements of the customers, performance in comparison with competitors and improvement on historical successes.

Goals must help employees to get a better understanding of what quality requires. This means that the goals must be expressed in language that is understandable and must describe results that have meaning to the employee. These goals will then serve as a motivational tool.

4.2.11 Error-Cause removal

This step involves the collecting of feedback in order to make the necessary adjustments to the system. Emphasis must be placed on the fact that people must indicate problems they have with the system, and

not necessarily come up with suggestions on how to fix them. This will convince people to freely communicate problems they see without having to know what the solution is. Care must however be taken not to let people just look for the faults. This could lead to focus being moved from the positive aspects to reasons why the system must fail.

It is important that the quality team act on all error-causes communicated to them. It is even more important that they are seen to act on them. This will increase the confidence in them and the system as people will see that their communication is received, analysed and acted upon.

Error-cause removal increases open, two-way communication that, in turn, will strengthen the success of error-cause removal. In the construction company with its various points of activity, it is important that the flow of information between the building site and the head office is effective. This might require the quality team to schedule regular meetings with the people on site in order to ensure that problems picked up there are passed on to where changes can be initiated. This is especially true if there are conflicting personalities involved. This may lead to a problem picked up by a foreman not being communicated up the line because he is unwilling or unable to communicate it to his direct manager. It is important for the quality team to be approachable by all employees. This might require dedicating each member of the team to

deal specifically with certain levels of people while not excluding communication with other levels.

Error-cause removals can also be tied in to the recognition and reward system by rewarding positive contributions made through identification of major problems or workable solutions suggested.

4.2.12 Recognition and reward

People use other people as reference points in determining their own behaviour. This is why mentors are such a great method of teaching. The pupil learns how to do something by watching someone he respects doing that specific task.

In implementing a total quality management system, the quality team must design and initiate a system whereby people who act as good examples regarding quality are identified and rewarded. The purpose of the recognition and reward system must be to influence employees' performance through reinforcement of desired values and behaviour. It is important that their peers choose the people who are rewarded and not management, this will give them a greater sense of achievement and respect.

The results of a recognition and reward system is the identification of hard-working, quality committed people, the description of what quality performance should be and the provision of an example everyone can strive to match.

The recognition and reward system is very important for TQM and should focus on employees and executives. People are not motivated by their salaries and therefore the company must provide alternative means of motivation. Rewards should also not only be monetary rewards, but must give the person respect and enhance his pride in his work. As Philip B. Crosby (1984, p.119) says: "…money is a very bad form of recognition. It is just not personal enough."

It may be necessary to reward some initial or intermediate performances to get the TQM system up and running. Once the system is operational, smaller rewards can be used to keep the momentum.

A team can be formed to run the recognition and reward system. This team should include employees from all levels of the organisation. They then need to be educated in what the desired behaviours to look for must be. These behaviours do not have to be ones whose benefits can be easily quantified i.e. having the lowest amount of defects per floor area, but can be ones with a more indirect influence i.e. the manager whose employees have been given the most hours of training. The first

behaviour has an immediate effect on quality but is limited to the specific project, while the second will reap rewards over a sustained period and on many projects in the future.

Some of the focus areas for the recognition and reward system can be training, involvement, individual suggestions, group and individual achievements and knowledge of the quality vision, mission and goals. The timing of rewards is critical. The more immediate the reward given after the desired performance is achieved, the more powerful the effect of the reward or recognition becomes. (Hradesky, 1995, p.188)

When a reward is awarded, it should be described in detail what the behaviour was that lead to the reward being given. The recognition should be clearly communicated throughout the company. Having official "Award ceremonies" which combines with social events like the Christmas party, will popularise the awards.

Recognition can take the form of verbal praise in public or private, a certificate, mention in the company newsletter or posting a photograph of the person and description of his behaviour on a notice board. Rewards do not have to be financial and could include dinner with the boss, promotion, additional leave days, holiday trips and even a token cup or shield engraved with the employee or team members' names. Economic rewards can be a cash bonus, company shares or salary increases.

In the construction company where many people from previously disadvantaged communities are employed, financial rewards will attract the most attention. These rewards should focus on bettering the employees' long-term financial situation. This could include combining raises with opportunities for further study. The raise would help alleviate possible poverty while education would empower the employee to better himself and his future.

Recognition and reward should be an ongoing process with awards being made at regular intervals. Irregular awards will create the illusion that it is done only when someone remembers to do it and will detract from its impact.

The system should also guard against creating any perception of punishment. No employee must ever feel he is being punished when he is not given recognition. Punishment has been proven to stop negative behaviour but not to encourage positive behaviour and also often create resentment and fear.

A reward and recognition system in the construction industry could be established on separate projects and be run by employees working on the specific projects. The system can also incorporate subcontractors and their employees with all the companies involved sponsoring rewards. The

traditional “Roof wetting” could be used for the awards while smaller recognition and rewards can be given on bimonthly intervals. For this to work however, all employees should be made aware of the system as part of their education in quality achievement.

4.2.13 Quality Councils and Quality Circles

Quality councils are ways of bringing people that are driving the quality process together to exchange ideas and learn from each other. Establishing a quality council provides a disciplined and systematic approach to ensure continuous improvements.

The quality council must be lead by the top executive in the company. The rest of the senior management together with the people in charge of the various construction projects must all be members of the council. Meetings must be held at least once a month and the aim of the meetings will be to review strategy, implementation progress and improvement. The objectives of a quality council are:

- Providing strategic direction on TQM for the organisation
- Establishing plans for TQM on each site
- Setting up and reviewing the project quality teams that will run the quality process
- Reviewing and revising quality plans for implementation

(Oakland, 1989, p.306)

The separate project quality teams must also have formal monthly meetings. These meetings must result in reports that are forwarded to the quality council for discussion during their meeting. It is further advisable for a member of senior management to be present at the project quality meetings to show management's support for employee participation and commitment to quality.

The Quality Council must concentrate on quality strategy while the project quality teams must try to solve problems themselves as far as possible. It would also be a good idea to get different project quality teams to meet on regular intervals. This would further the communication of solutions for problems encountered and keep everyone informed of the latest methods and results. These meetings can be arranged quarterly.

Quality circles are groups of people involved with similar work who meet voluntarily, regularly and under the leadership of their supervisor to identify, analyse and solve problems related to their work and to then make recommendations to management (Oakland, 1989, p.311). Quality circles provide the workforce with an opportunity to participate creatively in matters relating to their own jobs (Juran, 1989, p. 284).

In a construction company this should involve getting all labourers, artisans and subcontractors connected to the various trades i.e.

plastering, bricklaying or painting to form a quality circle under the leadership of the foreman in charge of that trade. It is important to have these meetings during working hours as attendance will not be guaranteed otherwise.

If a quality circle has identified a problem and has come up with a solution, they must implement it themselves and report on the effectiveness of the solution. Managers need to be trained in establishing and running quality circles. Initial education for all employees is necessary to get the process of TQM started. This education will lead to employees getting involved in quality circles. These quality circle meetings can then become an excellent forum to introduce further education and training.

It is important for higher level managers, like contract managers, to attend some of the quality circle meetings. This will again stress management's commitment to quality and will give the members of the quality circle an opportunity to communicate its successes, requirements or frustrations directly.

The fact that quality circle meetings should be held in working hours will mean that the company will be investing in the quality process in the form of "unproductive" man-hours. The fact does however remain that the improvement in quality and subsequently productivity will result in more

than adequate returns on this investment. Quality circles will give people a sense that they are important in the quality process and can, if administered correctly, be a very good motivational tool. Quality circles embody the concept of empowerment, which is very important in the current South-African social landscape.

4.2.14 Repeat

After the quality team decides that the TQM process has been implemented, they can hand over the responsibility of driving quality improvement to a new quality team. This team can include one or two members from the original team to ensure some form of continuity.

The new team will have been educated about quality improvement during the implementation process and would have experienced, first hand, some of the highs and lows of the quality improvement process. This will stand them in good stead to develop new and improved methods to maintain improvement, foster commitment and continue education. They will be the people who will be responsible for maintaining the quality momentum gathered during the implementation process by helping the quality culture evolve and adapt.

The route the new quality team will take will be familiar as it will always include attaining commitment, measuring, creating awareness, taking corrective actions, planning, education, setting goals, removing problems,

recognising and rewarding people, serving on quality councils, -circles and –teams and in the end seeing someone else repeat the process.

4.3 Critical success factors for the implementation of Total Quality Management

For a Total Quality Management system to be implemented successfully, certain critical factors have to be present. Through this chapter the following factors have been identified.

- Create Commitment

Every person in the organisation must be committed to the improvement of quality. This requires planning for small successes and celebrating their achievement. Commitment will direct all focus on the customer. Through commitment people will change their behaviour to attain the organisation's goals and their own.

- Change the Quality Culture

The quality culture must identify how employees should behave generally when faced with a problem. To bring about a change in the quality culture, it is necessary to identify good reasons to change. A plan with

measurable goals and clear expectations must be drawn up. Training must be supplied and recognition given.

In an effective quality culture, defects will be prevented, not fixed. Co-operation must be at an optimum between departments and with suppliers and subcontractors. Cultural change is a continuous process without a completion date.

- Empowerment

A company of empowered employees, where every employee regards quality as his personal responsibility, will be a company with many problem solvers. Empowerment means that employees' decisions are supported and innovation rewarded.

Empowerment improves communication. Management must be trained in empowering people. Empowerment is a process that will take time. The phases of change taking place with empowerment must be managed carefully.

- A methodical implementation process

This is a process without end. This process has a change in culture through a change in attitude at its heart. The implementation process has

14 steps that are repeated over and over. These 14 steps do not all have to be done consecutively but must all be completed.

- Communication

Communication is necessary for any venture. Good communication will allay fear of change that is a natural reaction to a changing environment. The lack of communications will scuttle the process of implementation very quickly. The success of the implementation process will hinge on how well the employees are informed. The necessary flow of information can only be achieved through effective communication channels.

- Measurement

Measurement allows communication in definite terms. Measurement is necessary to track progress and forms the basis for corrective actions to be taken to keep the implementation process on track. Measurement provides goals to be achieved and standards for comparison. Measurements must be made of all areas of performance i.e. time, cost and quality.

- Continued training and education

Training is necessary for the implementation process but also for maintaining Total Quality Management. TQM implementation plans must reinforce the training supplied. Training must be given to all levels of employees. Training requires investment in people from the company, but this investment will inevitable pay off in increased profitability and productivity.

- Recognition and reward

Recognising and rewarding behaviour that is in line with the TQM goals are very important. This is true during the implementation process and the continued maintenance of the TQM system. Recognition requires effective communication to be truly effective in providing role models. The recognition and reward system must be implemented on all levels of the organisation.

4.4 Conclusion

The critical success factors for the implementation of a Total Quality Management process has now been established as the creation of commitment, changing the current culture to a quality culture, empowering people, a methodical implementation process, effective

communication and measurement, continuous education and training and a structured recognition and reward system. However, once the TQM system has been implemented it will, like any system, require maintenance. The critical success factors for the maintenance of a TQM system will form the focus of chapter 5.

CHAPTER 5

MAINTAINING THE TOTAL QUALITY MANAGEMENT SYSTEM

5.1 Maintaining Total Quality Management

In the previous chapter it was described how a company should go about implementing a system of Total Quality Management (TQM). This chapter will discuss what the critical success factors are for maintaining this system.

Once a company has gone through the process of installing a TQM system, it cannot sit back and expect the system to keep on achieving results. As with any system, problems will occur from time to time and momentum will be lost. These problems must be analysed and adjustments made to the system. If not, the system will run the risk of becoming a paper generator, producing various reports that are of little use because they were drawn up haphazardly and infrequently. People's attention to detail on quality matters will wane as time goes by and with it, their commitment to quality. People may look for any justification to relax on quality issues. Examples may be superiors not attending quality meetings, which will make the employee think that his superiors are not as committed to the process as before and therefore the employee can

also start giving it less attention. Indicators that the system is failing will be seen in the cost of quality rising again as pressure on time and monetary constraints occur. Attendance of quality meetings will decline and less new ideas will be put forward.

There are two requirements in order to ensure the continued success of the Total Quality Management system. These are leadership and management. Leadership involves influencing groups and individuals to do the right things while management, in this context, involves getting them to do things the right way. Leadership involves interpersonal skills while management is more based on technical skills.

5.2 Leadership

Leadership is absolutely crucial to quality improvement. Without it the quality improvement process will be attempted by a group of people with no direction and everyone doing what he thinks is the right thing. Leadership is required to focus the energies of the individuals, thereby creating a team dedicated towards quality improvement. Leadership requires management commitment and is the basis for company wide participation, customer focus and continuous improvement.

Leadership would have been required to implement the TQM system, as discussed in the previous chapter. However, once the system is in place,

further leadership will be required to ensure that it continues to achieve its goals, namely to produce continuous improvement.

According to Hradesky (1995, p. 195) there exists a direct correlation between leadership and the effectiveness of a company's personnel. People should have the authority to make decisions to get their work done properly. Once employees use their leadership authority, they will become role models for other employees. This will lead to continuous motivation for improvement. The ability of leadership to maintain the momentum of the TQM system relies on the ability of the leadership to develop and sustain continued motivation of personnel. Continued motivation is achieved through communication, recognition and rewarding and empowerment.

Effective leadership requires certain characteristics. These are:

- Vision – the ability to conceptualise what is to be achieved and to focus thereon
- Confidence – based on inner strength and the belief in oneself and others to achieve goals
- Risk taking – challenging paradigms, experimenting and exploring options
- Decision making – courage to make the right decisions in difficult situations

- Development of others – patience, decentralising power and sharing responsibility
- Influence on others – inspiring others through energy and enthusiasm
- Communication – clear communication, listening and observing

5.2.1 Motivation through communication

The media, through television, advertisements, etc. is ample proof that people's behaviours and attitudes can be, and is, influenced through communication. This fact would have been realised by any organisation that has implemented a total quality management system. What further has to be realised is that, although good communication is necessary for the implementation process, it is also vital for the maintenance of the system. Without communication, motivation through reinforcement will be impossible. Without communication, feedback regarding problems will be lost and the system will deteriorate. The main functions of communication for quality must be to motivate people to achieve continuous improvement and to facilitate adjustments to the system that might be required to ensure its success.

It is further necessary to keep workers informed regarding changes made by management to the system. As Juran states (1989, p. 314): “We should also

(a) provide means for workers to communicate their views and ideas, and

(b) explain to workers those management actions that on their face value are antagonistic to quality.”

5.2.1.1 Types of communication and their use

According to Gerber, Nel and Van Dyk (1987, p. 345) in company communication, “What is important is not what is said, but how it is said”.

There are various types of communication. These include verbal communication, written communication, visual communication and examples (Oakland, 1989, p.370).

5.2.1.1.1 Verbal communication

When a manager uses verbal communication to motivate employees, it can be done in various manners. He can have formal or informal conversations with individuals, small groups or large groups. The more people he communicates with, the less two-way communication is likely. When two people have a conversation, they usually readily share

opinions and ideas. Once a group is involved, some people find it difficult to communicate because of fear of humiliation, etc. It also happens that the conversation is hijacked by one or two individuals who are trying to convince everyone of their opinion, causing people to avoid this type of discussion in the future. When a large group of people is involved, the communication usually takes place as a speech or presentation. Although questions might be asked afterwards, this does not allow for much two-way communication.

It is therefore important for a manager to consider the number of people he wishes to involve in verbal communication. In introducing TQM it would have been necessary to start with the whole company in order to introduce them to the concepts involved. Later group discussions would have been held. Conversations with individuals would have been reserved for special situations. Once the TQM system is up and running however, addressing the company as a whole would be reserved for special occasions. Group discussions would be more frequent and regular. Discussions between top management and site management, regarding the quality produced on a construction site, should ideally be held once a month. This type of discussion must not be incorporated with other meetings, e.g. cost report meetings, as this might detract from the importance management is seen to attach to quality.

Group discussions on quality between the people involved in running a project must be held at least once a week. These meetings will be less formal than the monthly meetings, but must not be completely casual. Verbal communication regarding quality between individuals can take on two forms. The first is formal communication where an employee might be required to discuss problems with his performance with his manager. This type of action must be structured towards getting the employee to improve his performance through motivation and not through threat.

The second type of communication between individuals will be informal discussion regarding quality issues. This is probably the most important form of communication for the survival of the TQM system and must be encouraged as far as possible. Any employee must feel comfortable to discuss quality with any other employee, be that his pier or superior. An "open door" attitude must be generated, and employees encouraged to bring suggestions, problems and opportunities to management's attention. The employees must be able to communicate with people on higher levels than their direct supervisors in order to identify problems they may experience with these direct superiors.

Individual conversations between a manager and an employee, to congratulate the employee on good performance, have great impact. It is not practical to give awards and official recognition to every employee for positive behaviour every time, but it is possible for his superior to walk up

to him and give him a pat on the back. The effectiveness of this action must never be underestimated.

Due to its nature, verbal communication has certain requirements for the manager. He needs good individual communication and presentation skills, needs to know the subject and must have credibility with the person or audience.

The directness of the impact of verbal communication is one of its main strengths. It is also useful in getting quick responses and is generally, easier to understand than written communication. It is also not hampered by illiteracy, which is something that has to be kept in mind when dealing with lesser-educated people, as found from time to time in the construction industry. Verbal communication can be used to personalise the quality improvement process.

It is important for managers to prepare for verbal communication. They must work on their presentation and public speaking skills, but also on skills such as effective listening and body language interpretation for times when they are dealing with smaller groups or individuals.

When problem behaviour has been identified, it is important for the manager or supervisor of the person involved to remember that there are certain essentials that have to be kept in mind when addressing the issue

with the employee. The steps taken must never be punitive. The manager must be honest and firm, without humiliating the person in front of other people. The time and place of the meeting must be considered carefully. The aim of the session must be to get the employee to want to do better, not to threaten him into a short-term change in behaviour. It must be remembered that fear generally only stops people from acting incorrectly and does not necessarily motivate them to strive to do better.

5.2.1.1.2 Written communication

Written communication includes reports, newsletters, notices, etc. Written communication is less personal than verbal communication. Different types of written communication will be used in different situations. Reports are formal and will be used mainly in the higher levels of the organisation. It is impractical to expect a foreman to write a report on the effectiveness of the TQM system on a site. He should however, be allowed and even required to give input to his manager when the manager is drafting such a report. Although this input would best be acquired through verbal communication, things like tick-sheets or questionnaires can be used, depending on the level of literacy of the person involved. Formal reports should be tabled at monthly quality meetings held between site management and top management.

Notices and slogans may not have the same impact as verbal communication, but are easier and less time consuming ways of reaching a wider audience. Slogans (which can also be classified as visual communication) on their own must however, never be expected to generate more than fleeting interest. Informative charts on numbers of defects or absenteeism or other issues that effect the cost of quality can be used effectively. These must be made easy to understand and, as with slogans and vision statements, must be placed in the correct areas. The information on these must be accurate and updated regularly. The danger of not updating the information on the charts are that they become like the roadside sign indicating how many motorists were speeding or buckling up: If you see the same statistics that you saw the previous week, the information loses its credibility and therefore its impact. Placement of charts and slogans must receive careful consideration. Informative charts should be placed where the labourer has time to study it, like the designated lunch area. Slogans can be placed throughout the project to act as a reminder of what the company is trying to achieve. Having different slogans and quotes will keep interest higher than repeating only one or two.

Newsletters or company magazines are more informal than the previous forms of written communication. It is up to the employee to read it as and when he wants. It therefore should be adapted to bring the quality message across in a different way. Long lists of statistics will bore

readers, while highlighting quality effective projects or individuals will have more impact. It can be used to create role models or help re-affirm a manager's commitment towards the quality improvement process by publishing interviews with or articles on these managers.

Newsletters generally only get distributed among salaried staff in the construction company, but thought should be given towards getting it to the general labour, even if this means that some copies get placed at the workers' lunch areas for those who are interested.

When using any form of written communication, it is very important to ensure that the message that is brought across is clear and unambiguous. The grammar must be consistent with the formality of the communication, while consideration must also be given to home language.

A drawback of written communication is that it is restricted in terms of feedback. Written feedback such as a suggestion box does not usually elicit much response, whereas a good verbal communicator would be able to get responses out of virtually any and all employees.

5.2.1.1.3 Visual communication

Visual communication can take the form of posters, films, videos, exhibitions and demonstrations. Posters with slogans can be placed in areas where they will serve as a reminder to the employees of why the quality improvement process is required. Films or videos can be shown to the employees as special training or motivating events. These films should be professionally prepared. Exhibitions and demonstrations can be held from time to time to bring new techniques to the attention of employees or to remind them of the proper methods to be applied.

Most forms of visual communication require simultaneous verbal communication to bring its message across. The main use of visual communication is to enhance training through the use of overhead projectors, slide shows, etc. Simple visual aids like flip charts on which ideas and feedback is recorded can be used to great effect in discussions and meetings.

5.2.1.1.4 The use of examples

Communication through examples takes place when people see how a person goes about his work in such a manner that it is evident that he is committed to the achievement of quality in his work. Showing people how to be more productive through attention to detail, will have a tremendous

impact on the way they will do their work. The saying goes that “you must practice what you preach” and this is especially true for the manager that wants his personnel to strive towards quality excellence. Personal attitude and attention to quality is very important.

If the contracts manager in a construction company starts putting pressure on his site agent to complete a section of the project within a specific time, without stating that quality must be maintained, he is opening the door for the site agent to believe that quality is less important than time. This perception will quickly be used to justify letting quality slide in the chase for time or financial goals. This perceived change in priorities will spread throughout all levels of management and supervision on site and will require great efforts to correct.

5.2.1.2 Communication with whom?

Not enough emphasis is placed on communication in the construction company. Official communication between top management and middle management is too often restricted to monthly financial meetings, while formal meetings between the different levels of people on a specific project generally tend to be focussed on progress rather than on quality issues. Communication between supervisors and labour regarding quality is generally restricted to verbal rebukes, that quite often resembles verbal

abuse and is usually done in front of other employees. This is absolutely counterproductive to the quality effort and must be avoided at all costs.

Communication must not only take place between managers and workers, but also with the other stakeholders in the quality process i.e. suppliers, subcontractors, unions and clients. Improved communication with suppliers and subcontractors will ensure that the right product of the right quality is delivered or produced on time. Potential problems will be brought to the attention of the main contractor in time for him to assist the supplier or subcontractor in addressing the problem.

Communication with unions, who have a large influence on the South African labour force in general, must receive great attention. According to Humphrey and Hulse (1991, p.32), “If you can include them (Unions) in your planning and organising sessions they are more likely to accept such changes than if you present them with a management decision.”

Communication from and with the customer is very important, as it will indicate whether the company is achieving its quality goals. Clear quality expectations from the customer will guide the company when planning and building the product while feedback during the process will help correct errors that might have occurred, timeously. It is essential to get feedback after the contract is complete to ensure that the product is of lasting quality and was not merely dressed up to appear satisfactory.

It is important that communication for quality gets given proper status through formal gatherings where quality is the main discussion point. It is up to top management to set up the required communication system when implementing TQM, and to ensure that the meetings and gatherings required be held after the initial novelty has worn off. Management at all levels must also work at keeping the channels for informal communication open as this is the way through which more suggestions on corrective measures will be generated. Needs must be identified for training people in report writing skills, meeting skills, body language interpretation skills, listening skills and public speaking skills.

5.2.2 Motivation through recognition and reward

Another method of ensuring that employees stay motivated and focussed is through recognition and rewards. Recognising and rewarding people for desired behaviour influences future performance through positive reinforcement.

Recognition is defined as “A reward in the form of an acknowledgement of gratitude perceived as a commendation by the recipient”, while a reward is defined as “A gift or prize considered to be of value by the recipient.” (Hradesky, 1995, p. 177)

It is a fact that values drive behaviour and behaviour drives performance. To get values from a statement up on the wall to behaviour willingly displayed by the employee can be achieved through the recognition and reward system.

The people administering the recognition and reward system should be representative of all levels of employees in the organisation. As is the case with any system, this system also needs to be adjusted and re-assessed on a regular basis. As the quality culture evolves, so the methods of recognition and type of rewards given must be adjusted. Smaller rewards will reinforce and maintain desired values once the desired performance has been achieved.

Consideration must be given to the type of behaviour that is rewarded. It does not, necessarily, have to be behaviour that has a direct monetary impact. A good example would be giving recognition to a site manager who has sent the most employees on training courses. In direct terms this site manager has spent more money “unproductively” however, he will have helped empower more employees which will have a long-term benefit to the company.

The recognition and reward system must, amongst other things, focus on the following areas:

- Training

- Individual involvement in quality improvement
- Team- or group performance
- Knowledge of the quality vision, mission and value statements

Some of the focus areas for the recognition and reward system can be training, involvement, individual suggestions, group and individual achievements and knowledge of the quality vision, mission and goals.

The timing of rewards must be planned to have the most impact. In the construction industry where projects have a start and completion date, it is essential to give recognition and rewards early in the project to ensure that the benefits of these rewards are received on the same project. This is especially true for the lower levels of employees who are only employed for the duration of specific projects. More senior personnel who are permanently employed by the company, can afford to receive recognition after the contract and will then carry that reinforcement into their future projects. To temporary personnel, who may be re-employed based on the amount of work available, recognition will be meaningless if he is laid of, even for just a short period.

It is important to have regular intervals between making rewards. If it appears to be performed haphazardly, it will detract from its effectiveness. Depending on the level of employee and the potential duration of his employment, recognition and rewarding can be done on a

biweekly (labour), monthly (supervisor), quarterly (site management) or yearly (senior management) basis.

The timing of rewards is critical. The more immediate the reward given after the desired performance is achieved, the more powerful the effect of the reward or recognition becomes. (Hradesky, 1995, p.188)

Recognition and rewarding should be an ongoing process with awards being made at regular intervals. Irregular awards will create the illusion that it is done only when someone remembers to do it and will detract from its impact.

Examples of recognition include:

- Verbal praise by a superior, either in private or public.
- A recognition memo, -certificate or mention in a newsletter or magazine.
- A photo and description on the notice-board.
- An invitation to present a speech to other employees.

Typical rewards can be:

- Pens, pencils or books.
- Tickets to sports events.
- Dinners or lunches.
- Extra vacation.

- Cash bonuses.
- Special increases.
- Company shares. (Hradesky,1995, p. 188)

The recognition and reward system must keep the changing needs of people in mind. These needs change as an employee progresses through his career. In their early careers, employees will seek safety, security and a steady income. Later, in his mid-career he might lean more towards advancement, increased income and development of a speciality or discipline. When a person's career reaches maturity he will strive for independence, power and prestige, recognition and self-actualisation.

5.2.3 Empowerment

Empowerment was discussed in great length in the previous chapter. Empowerment is aimed at enabling people to feel, accept and discharge responsibility (Oakland, 1989, p.320). Empowerment enables effective contributions by individuals.

Through empowerment, the person with the most expertise and who is closest to a problem will be given the responsibility to solve the problem. Empowerment ultimately leads to job satisfaction, which leads to better quality.

Due to the nature of building projects, the construction industry already has the structure to allow empowerment to take place. This is based on the fact that a project team is assigned a project for which they are responsible. This team must complete the project with the available resources and are held accountable, by top management, for the successful completion thereof.

The various levels of management on a project i.e. project director, site manager, foreman and supervisor or gang leader, allows for the delegation of responsibility to the point where the work takes place. This has been done in most construction companies for some time as the management of these companies realised that it was impossible to try and control every aspect of the building process from a centralised point, while the projects were in several locations. The fact that the work was not being done in a single production area like a factory required top management to delegate the responsibility for the management and completion of the projects to the various teams.

To ensure that the TQM system continues to operate, management has to ensure that they do not diminish the responsibility of the project team by forcing them to apply prescribed solutions for all problems. This will allow the team to place the blame for failure at the feet of the prescribed solution with statements such as “We knew it would not work, but who are we to say.” Senior management can supply guidelines on how to solve

problems, but due to the uniqueness of the products, and problems, being produced, they must guard against prescribing a solution that does not take this uniqueness into consideration. Only the person or team, who is actively involved with the work where the problem has occurred, will have all the information to make a decision which will best solve the problem.

Empowerment in the construction industry is closely linked to teamwork. If the project team is not functioning well as a team, then there will be no trust within the team. Without trust in each other's abilities, there can be no empowerment.

5.3 Managing to maintain the Total Quality Management system

5.3.1 Team building

5.3.1.1 The need for teamwork

The complexity of modern construction projects makes it impossible for a single person to control an entire project. The only efficient way to complete a construction project is through teamwork. A team in the construction industry typically includes a projects director, a site manager, a quantity surveyor, several foremen and several supervisors or gang leaders. This group is given the task, by management, to complete a

project to the satisfaction of the customer, on behalf of the entire organisation. Failure to produce a quality product will influence the entire organisation through loss of future business, profitability, etc.

The team's focus must be on producing a quality product. It is therefore essential that senior management ensure that the teams on the various projects are managed in such a way that the maximum benefit of the teamwork is extracted.

5.3.1.2 Advantages of teamwork

It takes time and effort to build successful, quality oriented teams. There are however, many advantages in having such teams. These include:

- Improved productivity and quality as the team monitors it own output
- Reduced absenteeism as the team sets its own standards of behaviour
- Less direct supervision is required
- Team members develop a sense of belonging, get support with their problems from other members, and enjoy a feeling of security
- The team members develop a sense of pride in their achievement that reinforces their concern for productivity and quality. The output of a team is usually greater than the sum of the individual efforts of team members. (Humphrey & Hulse, 1991, p. 84)

Further advantages include the fact that problems are exposed to a greater diversity of knowledge, skill and experience resulting in better decisions being made. Better decisions are more likely to be implemented. When properly managed and developed, teams improve the process of problem solving, thus producing results quickly and economically (Oakland, 1989, p.318).

5.3.1.3 Management tasks in team building

A project has, per definition, a start and completion date. It is a temporary undertaking that will produce a unique product. Because a project is a temporary undertaking, the project team also has a temporary existence. In the construction company, different personnel are moved from one project to the next as and when required and available. This means that no team will stay unchanged. The duration of the team's existence will further vary with the duration of the project. Because of these factors, it is essential that the company's management know what is expected of it, to ensure that the project team is up and running quickly and efficiently.

In order to ensure this, management must do the following:

- Provide an environment that encourages creativity and accomplishment and allows empowerment.
- Keep the project teams informed about the company vision, mission, goals, projects and progress.

- Provide teams with enough authority and autonomy to run projects and make decisions.
- Keep open communication channels with other teams and with management.
- Appreciate and acknowledge success

(Hradesky, 1995, p. 217).

Successful team building will result in the team members being committed to the pursuit of the company objectives, co-operating with other team members, management and other teams, communicating effectively with management, and achieving expectations.

Strong teamwork depends on good communication. Good communication within the team will ensure that misunderstandings are avoided and conflicts resolved. Good communication between the team and management will ensure that the team stays focussed on the overall quality goals. Communication with other teams will ensure that effective tools and techniques are spread throughout the company.

The role of the team leader cannot be overemphasised. Management must ensure that the team leader is able to do the following:

- Define the ground rules for the team.
- Agree goals that will be acceptable to management and the team.
- Monitor performance against expectation.

- Help team members identify problems.
- Guide team members towards acceptable resolutions of problems.
- Act as liaison between the team, management, client and suppliers
- Investigate and resolve personality problems within the team.
- Council or discipline team members where necessary.
- Maintain awareness of the TQM goals under team members.
- Provide adequate and meaningful feedback of results.
- Give recognition to achievements by the team and individuals.
- Obtain and organise resources to achieve goals

  (Humphrey & Hulse, 1991, p. 92).

It is the responsibility of management to monitor the team leaders and to provide them with the necessary training and resources to achieve their tasks as described above.

5.3.1.4 Pitfalls for teamwork

There are certain indicators that a team is not functioning optimally. These include excessive conflicts and absenteeism, poor productivity or quality, high wastage, etc. The reasons for this malfunction can be anyone or a combination of the following:

- The team leader is not strong enough.
- Team members are not held accountable for the successful completion of their work.

- Team members do not have the knowledge and skills to contribute towards successful completion.
- Regular meetings are not held.
- Progress is not reported on.
- Progress is not measured.

(Hradesky, 1995, p. 223).

Management must be aware of and able to react whenever any of the symptoms of defective teamwork are identified.

5.3.2 Training and Education

"Satisfaction of the workforce and hence motivation and ability to act as a constructive part in the process of continuous improvement depend upon education and training" (Dahlgaard, Kirstensen and Kanji, 1998, p. 238). For a Total Quality Management system to continue to exist and produce results, a system is required whereby employees are vigorously encouraged towards self-improvement through education and training.

Training would have been required during the implementation phase of the TQM system. This training would have focussed on introducing quality improvement to employees and teaching them specific skills towards achieving continuous improvement. Once the system is up and running, training must not be stopped. Its focus and methods may

change, but without continued effort in improving people, no continued improvement will be achieved in the company's products.

The training and education during this phase can take many forms. There need, for instance, to be a continuous concentrated, low level barrage of quality communications to remind and condition people to keep quality improvement in mind (Crosby, 1979, p. 68).

It is necessary for education to become continuous. This will ensure that everyone in the company speaks a common language, has the skills to do their jobs and understand their personal role in ensuring the quality of the product (Crosby, 1984, p.87).

5.3.2.1 Who must be trained and educated?

All levels of employees in the company need to be continuously trained and educated. Training implies teaching specific skills while education is geared towards intellectual development of the employee. Based on this premise, people were first educated in the basics of quality and then trained in specific skills to improve quality during the TQM implementation phase. Once the TQM system is active, the focus will change towards educating people to look for ways to improve the system and giving them more advanced training in things like communication and motivation.

Lower level employees should receive more training in specific skills that directly influence quality whereas higher levels of employees will receive education in order to enable them to think more independently on ways and means to improve quality.

5.3.2.1.1 Executive level: Managing– and Financial Directors

Training and education at executive level needs to ensure the continued commitment to quality of the company executive. These are the people who will ensure that the TQM system receives the required resources to continue its existence, so it is imperative that they believe in the system. The training for upper management should be clearly linked to business goals and be focussed on achieving results, not on teaching techniques. The training for upper management should show the manager what he must do to get the company to improve its quality (Juran, 1989, p. 338).

According to Crosby (1984, p. 89), the purpose of executive education should be to show the executives what their roles in causing quality problems are and to show them what to do to effect improvements.

5.3.2.1.2 Middle management level: Project- and Site Managers

The training and education here must be to keep managers anxious to achieve the benefits of improved quality (Oakland, 1989, p.394). They

must be taught to develop new and creative ideas to work with the system and to be role models to those employees under their control.

Typical training that is required should include using specific quality control tools, leading meetings, communicating with a group and identifying training needs for employees. These managers must have a basic knowledge of the programmes available in order to identify people for specific development. They must also be educated in the philosophy and concepts of teamwork.

5.3.2.1.3 Supervisors: Junior Site Agents and Foremen

Training at this level is quite often non-existent and is the reason why many TQM systems will fail. These are the people who can have the most profound impact on the quality of the product, as they are the closest managerial link to the actual construction process.

The education required here should include methods of convincing these people of the continued commitment to quality by senior management. They must be given training in teamwork, motivation through communication and people skills. Training must further expose these people to the latest techniques and technologies available.

5.3.2.1.4 All other employees

The training and education at this level must be focussed on keeping the people who do the manual labour aware and committed to the TQM system. People must be taught to see the effect that poor work will have in the long run for the company and consequently for their own financial future. They must be given the knowledge of what means there are for them to identify problems and make decisions, and also of the possible rewards that this can have.

These employees must be made aware of the programmes available for them to better themselves and to further their careers. The training and education at this level should be designed with the level of intellect, literacy and the person's home language in mind. It may have to be based on visual and verbal communication rather than written forms of communication.

"On-the-job" training is of vital importance in teaching people the correct way of doing their work. These are also helpful as refresher courses that remind people of the quality improvement effort. Training will be highly productive if the employees can be taught and reminded to think of the quality they are producing in terms of the customer they are producing it for.

In South Africa, where the majority of the people on this level in the construction industry are very poor, training should be aimed at giving them knowledge with which they can improve their personal conditions, while also providing the company with a more knowledgeable workforce. Training should be aimed at enabling the personnel to qualify themselves as artisans, trainee foremen, etc.

5.3.2.2 Who must conduct the training?

When in comes to the actual training process, there are certain key aspects that have to be given serious attention. One of the main aspects is the identity of the trainer. In general, the person who is presenting the training should be knowledgeable about the subject, be able to communicate its ideas effectively and must have the respect of the people he is training.

When looking for someone to present an educational programme to senior managers, it would be unwise to use a young, inexperienced person, even though he may have sound theoretical expertise. Senior managers would much rather listen to executives from other, successful companies. These individuals should have earned public status through their experience and competence and be able to convey their knowledge in such a way that it relates to the business realities faced by upper management (Juran, 1989, p. 339). Due to the training on this level

focussing on strategic issues, it is not necessary for the trainer to come from the same industry. It would in any case be very difficult to find any executive from one company being willing to sell his secrets to competing companies.

From middle-management level down, in-house trainers can be used. Contract- and site managers will listen to colleagues if they have a good knowledge of the subject matter and if they possess good teaching skills. Training on this level should be based on actual cases to have more impact. External specialists may be used for contract managers, but depending on the number of site managers involved, there may be too many to make use of external teachers. It will therefore be necessary to develop people from inside the company to conduct the training.

There will almost definitely be too many foremen and junior managers to use external training specialists while keeping the training groups small enough to be effective. Most South African construction companies will not be willing or able to have a permanent training department or -team and therefore people used to conduct training would have to do so in conjunction with other duties. It is up to upper management to ensure that these people are given sufficient training and support and the necessary resources to fulfil all their tasks. There must also be guarded against using available people rather than the right people. Trainers for this level

must preferably come from middle management, but can include other foremen to help personalise the training for the trainees.

Due to the extremely diverse nature of the South African labour force when it comes to language and culture, the trainers for the workforce need special attention. It would be preferable to conduct training in the trainee's home language and to have it done by a person who understands the culture of the trainee. Supervisory level personnel can be used as trainers due to their direct contact with the labour force, but there must also be a representative from middle management involved to show the necessary commitment to the process.

5.3.2.3 The contents of training

Some information is required before the training and educational material is put together. The first step is to determine the knowledge, skills and attitudes required in completing a specific function successfully. This list must then be compared with the knowledge, skills and attitudes possessed by the individuals or groups at who the training or education will be aimed. The difference between the two sets of information can be called the learning need (Dahlgaard, Kirstensen and Kanji, 1998, p. 286). The establishment of the knowledge, skills and attitudes possessed must be done with input from the individual or group concerned.

A set of expected outcomes for the training, which indicate what and how well the trainee should be able to complete certain tasks, must be drawn up. This will determine the success of the training. The training programme must include time frames for the mastery of the determined knowledge, skills and attitudes.

Training and education can be divided into certain elements. These are:

- The concepts of quality and TQM
- The processes of TQM
- The tools and techniques of TQM

(Juran, 1989, p. 324)

Although most training for the senior management level will have been done prior to the implementation of TQM, some further education must be done. Executives must be kept up to date with the latest trends and techniques in order for them to identify those that will enhance their own TQM system. This will include further education in communication, quality cost measurements and teamwork. Specific topics should include:

- Strategic quality management
- The infrastructure required for quality improvement
- Re-motivation for improvement

Middle management training and education will be focussed on the application of quality systems and techniques, teamwork and

communication. The material must emphasise practical problem solving, rather than theoretical perfection (Oakland, 1989, p.398). Exercises and videotapes can be used to demonstrate the application of the techniques discussed. Additional material for self-study must be distributed among these managers to encourage them to become hungry for knowledge.

Supervisors (foremen) should be trained in the correct use of plant and materials, establishment of correct work procedures and the management of people. The quality training should include knowledge and understanding of the quality policy, error and waste prevention, communication with and motivation of the workforce and the quality system and procedures (Oakland, 1989, p.399). It is important for these employees to be able to communicate their knowledge of producing a quality product to the workforce. Examples and role-playing can be used in this training, as the emphasis must be on practice. Specific topics that must be addressed are:

- The quality tools available and their use
- Team leadership
- Problem solving

The quality training for the workforce must be linked to their specific tasks. They must however, be given a basic understanding of the quality concept and policy. They must be shown how their actions influence the satisfaction of the client. The training material should be adjusted for

cultural and language differences taking levels of education into consideration. Because of the high turnover of labour and the sometime short employment periods of labourers, training for the workforce must be carefully planned. Spending large amounts of time and money on training at the latter parts of a project, when many labourers may have to be temporarily or permanently laid off, is not economically sound. It must however be kept in mind that all training will empower labourers, which are not only a necessity of TQM but also a social responsibility. It is therefore necessary to do quality training of the workforce as early as possible during a project

Different levels of intensity of training can be established for use on employees with different expected periods of employment within the company. This means that a carpenter, who will stay on a project longer than a general labourer, can and should receive more training than labourers who might only be on a project for a few weeks. If the company has a lot of work, and the possibility exist that labourers can be transferred to new projects rather than being retrenched, then these labourers should receive more training so that they will be able to use it on the next project, to the benefit of the company.

5.3.2.4 Where and for how long must training sessions be held?

The venue for training is as important as the method. The venue will determine the methods available for training in terms of equipment, etc. It is therefore necessary to ensure that careful consideration is given to the decision on the venue for training.

According to Juran (1989, p.332), upper level managers prefer training away from the office. Taking managers on training weekends is a great way of ensuring that their attention is kept focussed on the training, although it might be very expensive. It must be emphasised that the weekend is for training and not a holiday. Should a training weekend be planned, it must be announced well in advance to ensure that the people involved do not make other plans or have excuses not to attend.

Middle- and lower level managers must be trained away from their normal working environment. This will ensure that interruptions or small problems do not disturb their attention. It would be preferable to have a training room at the company head office. This room must be equipped with the necessary communication equipment to allow effective training. This might include overhead projectors, slide projectors, computers, etc. Things like air-conditioning and beverages will further ensure a comfortable atmosphere conducive to learning.

The duration of the training sessions should not exceed a day at a time. It might even be necessary to split training into two afternoons, which will give the employees time to attend to some of their responsibilities in the morning while also having time to go over training material for discussions or tests the following day. When training is planned to take place during normal working hours, it must be ensured that there is someone taking care of the trainee's responsibilities during the training. It might therefore be required to stagger training sessions for the employees on a specific site.

Due to the number of people involved, it would be difficult to train the labour force anywhere other than at their workplace. The number of employees attending training at the same time must be kept to a manageable figure. Training must be designed for specific trades such as concrete, brickwork or carpentry. General training on issues such as company policy, waste prevention, etc. can be done with bigger groups and should be planned for periods prior to or after lunch or tea breaks. The trade specific training can then be held after these sessions. This will give the labourers the opportunity to ask questions in a less intimidating environment.

Due to the need for productivity, training of the labour force should not exceed an hour per week. It might be better to have training every week

on a specific day for five weeks than spending five hours in one day on training.

5.3.2.5 Why training fails

There are several reasons why training and education might fail to achieve its objectives. These include:

- Inadequate facilities
- Poor training materials
- Poor trainers
- A lack of committed resources
- Focus on tasks rather than results

Training has failed when it fails to influence behaviour. The employee must be able to apply his new knowledge in his job and then do so freely for training to be termed successful. Without confidence in himself and his training, the trainee will not accept responsibility for his task and therefore empowerment will be impossible.

5.4 The critical success factors required to maintain a Total Quality Management system

In order to maintain the momentum of the Total Quality Management System initiated in the South African Construction Company, the following critical success factors have to be attended to by the company:

- The company needs to provide leadership that motivates its employees to do the right things.

- The company needs management through team building and training and education to get its employees to do things the right way.

- Motivation can only be sustained through excellent communication, relevant recognition and rewarding and empowerment of all employees.

- All the various types of communication must be utilised to suit the requirements of communication on different levels of the organisation and to keep the focus of the entire workforce on producing quality projects.

- The recognition and rewarding must be done according to a system to reinforce positive behaviour. The system must allow for recognition

and rewarding at regular intervals and must make use of relevant rewards.

- Only through empowerment will the company have effective decision-makers at all levels of the organisation and will problems be resolved quickly and correctly. Empowerment will ensure that every employee takes responsibility for achieving the goals of the company.

- Project teams need to be exposed to team building to ensure that the company reaps the benefits of effective, goal-oriented teams. Team leaders must receive special attention to act as the heart of the team.

- All levels of employees must be continuously trained in the use and educated in the principles of the Total Quality Management System.

5.5 Conclusion

No system will continue to produce results without maintenance. This is also true for a Total Quality Management system. The lack of maintenance will soon cause the system to loose momentum and to become just another paper generator.

Good leadership and management will provide continuous motivation, training and education that will form the basis for the continued success of the TQM system.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

In the course of this research, it has been shown that, to survive the intense competition that market conditions and membership of the world economy has brought about, the South African construction company will have to become more competitive both locally and abroad.

To become more competitive the company would need to distinguish itself from its rivals in order to ensure a good name resulting in follow-up work from satisfied customers and new work as a preferred bidder.

It was found that “Quality” is a difficult term to define. To a producer it means “conformance to specifications” while to a customer it means “fitness for use.” Quality has become a process whereby future products are changed to satisfy customer needs and expectations. “Quality in fact” and “Quality in perception” must both be present for a building to be though of as a quality building.

A definite link between quality and productivity was established. It was established that it was easier to motivate personnel for quality

improvements than for productivity improvements because quality improvements did not appear to endanger their jobs.

It had been stated that quality is usually the first aspect to be sacrificed when time or cost came under pressure. This had a catch 22 effect as the temporary relief gained always turned into more pressure on time and cost, nearer the completion of the project.

Clients in the construction industry have a larger influence on the quality of the product than is the case in pure manufacturing. Client requirements regarding quality is contractually and legally motivated, while that of the construction company is financially driven.

Quality should be measured in quantitative terms as far as possible. Quality in fact is usually measurable in quantitative terms, while quality in perception is measured in qualitative terms. Current methods of result oriented quality control has even become entrenched in the construction contract law.

The cost of quality is the cost that would not have been incurred if the quality of the product had been satisfactory. The difficulty in determining the cost of quality has hampered its use. The cost of quality is a vital management tool. The cost of quality consists of prevention costs,

appraisal costs and internal- and external failure costs. The cost of quality will be minimised when these costs are balanced with each other.

Total Quality Management (TQM) involves managing for total quality, effectiveness and competitiveness and involves every person in the organisation. It is a culture that requires a total commitment to customer satisfaction through continuous improvement and innovation in all aspects of business. TQM supplies a common language for proper communication, which is required for achieving quality.

TQM is a never-ending process that is aimed at continuous improvement and innovation. Management drives the TQM system. It is not only technical changes that are required to institute TQM but also social changes within the organisation. The process of cultural change must offer an alternative to the current culture while not creating a void where a new culture has to be established.

Total Quality Management requires commitment, scientific knowledge and involvement. TQM uses primary, long term strategies and secondary strategies, focussed on operations and profitability, to achieve its goals. There are management focus areas, tool focus areas and employee focus areas that have to be attended to for the company to achieve the goals of TQM.

TQM can enable the South African construction company to increase profitability and improve its image, both of which will ensure its continued competitiveness in the current economic turmoil the world is finding itself in.

The implementation of a Total Quality Management system requires the creation of a quality culture. This process is quite often uncomfortable for people who are afraid of change. The aim of a cultural change must be the creation of a force that drives actions to achieve the vision and goals of TQM.

The necessities for successful implementation of TQM are the creation of commitment, the creation of cultural change and the empowerment of all employees. Commitment must be created towards the company and its survival. Commitment is manifested in a relentless pursuit of goals regardless of obstacles. The biggest threat to successful implementation is uncommitted management. Management must ensure commitment through activities that can be divided into groups called permitting, supporting, managing and leading by example.

The need to fulfil personal commitment must foster the belief that the individual is making a positive contribution to the company. This will manifest in a constructive dissatisfaction with the current situation, an

inspiring vision of the company and a concentration on the business goals of the company.

The corporate culture is influenced by the business environment and the values of the organisation. A strong culture will determine behaviour generally and in crisis situations, specifically. Cultural change requires a good reason for change, a plan indicating changes necessary, measurement of progress, the provision of training and incentives to encourage desirable behaviour.

Only through repeated education and positive reinforcement will people's resistance to change be broken down. Leading by role models and an understanding of the effects of failure to change are also required. Behaviour is dictated by attitude and therefore cultural change must aim at changing attitudes first.

Empowerment will give every employee the responsibility and authority to improve quality. It makes effective decision-makers of the people closest to the problem, resulting in quick action. Empowerment enables two-way communication. Obstacles to empowerment are based on a traditional mistrust between management and the workforce. Empowerment requires process management to be successful, as empowerment will go through various phases. These are a denial-, resistance-, exploration- and commitment phase and each will require action from management.

Pitfalls for the implementation of TQM include confusing commitment with interest, subjective assessment by internal personnel, lack of education in the concepts of TQM and failure to conduct strategic business planning prior to starting the implementation process.

There are fourteen steps required for the implementation of TQM. These are:

1. Attaining management commitment
2. Establishing a quality improvement team
3. Measuring
4. Determining the cost of quality
5. Creation of quality awareness
6. Taking corrective actions
7. Planning for quality
8. Employee education and training
9. Launching
10. Setting goals
11. Error-cause removal
12. Recognition and rewarding
13. Establishing quality councils and quality circles
14. Repetition

These steps need not be done consecutively, as some can be done concurrently, but all steps have to be completed to ensure proper implementation of a TQM system.

A TQM system will not sustain its own momentum. It requires leadership and management to ensure that the cost of quality does not start to increase again. Leadership must get employees to act correctly while management must ensure they do their jobs effectively. Leadership provides the basis for company-wide participation.

Leadership motivates through the use of effective communication, a relevant recognition and reward system and the continued empowerment of all employees. Management must use team building and training and education to sustain the TQM system.

There are several types of communication, each of which must be utilised in specific circumstances depending on the level of employee and location where the communication takes place.

Communication in the construction company does not receive the necessary attention. Communication for quality must be formalised, both internally and with the relevant stakeholders. The stakeholders with whom communication is essential are suppliers, subcontractors, the client

and unions. Training in communication skills must be given where required.

Motivation through recognition and rewards works on the basis of influencing future performance with positive reinforcement. Recognition and rewards change quality-value statements into attitudes. The recognition and reward system must be administered to all levels of employees and must take the type of behaviour into account.

Timing the recognition and rewards is important and must allow for regular intervals between awards. There are many forms of recognition and rewarding and the level and status of the employee must be considered when deciding on the most applicable.

Empowerment must be utilised to enable employees to feel, accept and discharge responsibility. This will ensure effective contribution to the process by individuals.

The construction industry already has, through its nature of decentralised activity points, the structure to allow empowerment to take place. Care must be taken not to counteract empowerment through the prescription of standard solutions to unique problems, as is found in this industry. Empowerment requires trust, and trust can only be achieved through team building.

It is impossible for a single person to control a modern construction project. A team, focussed on producing a quality building, is required to complete a project successfully. There are many benefits from effective teamwork including improved productivity and problem solution, due the availability of more knowledge, skill and experience within a team. Management must ensure an environment wherein a team is informed, has the authority and autonomy to act and where success is acknowledged, if it wants to reap these benefits.

Strong teamwork is dependent on good communication. The team leader establishes effective communication and management must ensure that team leaders possess the skills and attitude necessary to lead the teams effectively.

There are several pitfalls for good teamwork and management must be quick to react when any of the symptoms of poor teamwork are identified.

Employees must be encouraged towards self-improvement through education and training. This will ensure personal and professional growth with major benefits to the company. A continued, low level barrage of quality communication will keep quality in the forefront of the employee's mind.

All levels of employees must be trained and educated. It must be done to ensure top management stays committed to the quality process, to keep managers anxious to achieve the benefits of improved quality, to give supervisors the necessary people skills and keep the general workforce aware and committed to the TQM system. Training must be aimed at improving the personal conditions of the poor of South Africa that are employed in the construction industry.

People with the knowledge and skills to be effective trainers must conduct training. The trainers must have the respect of the trainees and consideration must be given to the level of the employee within the organisation, when deciding on the identity of the trainer.

The content of training must take the knowledge, skills and attitudes possessed and required from the trainee into consideration. Training and education can focus on concepts, processes or tools and techniques, depending on the level of employee being trained. The venue of training must likewise be determined with the level of employee, time available and availability of trainers in mind.

Training and education has failed when it fails to influence behaviour. Without a change in behaviour, empowerment and quality improvement becomes impossible.

6.2 Conclusions

With respect to the question regarding the critical success factors necessary for the successful implementation of a Total Quality Management (TQM) system, the following was found.

Critical success factors for implementation are:

- The creation of commitment from every employee in the organisation to the achievement of the TQM goals.
- A change of the corporate culture to become a quality culture, which will determine employees' behaviour in problem situations, preventing rather than reacting to defects.
- Empowerment managed by educated people, supplying the company with effective decision-makers at all levels of the organisation, thereby reducing reaction times and supporting innovation.
- A methodical implementation process repeated ad infinitum, bringing about a change in culture through a change in attitudes.
- Effective and open communication to promulgate commitment, supply knowledge and allay fear of change amongst employees.
- Measurement to track progress and to supply communication in definite terms for adjustment of the implementation process.
- Training and education that supplies all levels of employees with the knowledge to utilise the TQM system effectively.

- Recognition and rewards that establishes role models on all levels of the organisation.

In testing Hypothesis 1, which was "*The most important factors that should be present for the successful implementation of a TQM system is a systematic approach with training and empowering of employees as a major focus*", against the preceding factors, it can be accepted as correct although maybe not entirely complete. It would need to make mention of commitment and a change in culture to be truly representative of the factors required for the implementation of a Total Quality Management system.

In maintaining a Total Quality Management system, the following critical success factors were identified:

- Effective leadership focussed on continuous motivation to "Do the right things" is essential.
- Management that inspire employees to "Do things the right way" through team building, training and education.
- Effective communication suited to the level of the employee, motivating the entire workforce to focus on continuous improvement.
- A relevant recognition and reward system based on regular intervals, to reinforce positive behaviour.
- Empowerment that delegates responsibility for achieving TQM goals to every employee.

- Effective, goal oriented teams lead by trained team leaders.
- Continued motivation through training and education.

Hypothesis 2 stated that "*Factors critical for the successful maintenance of a TQM system are persistent senior management involvement, suitable continuous training of employees and effective motivation of employees resulting in a quality-culture*" and can be accepted as correct.

6.3 Recommendations

The following recommendations can be made:

- Invest in the preventative cost of quality i.e. installing a TQM system, as the benefits received in the long run will far outweigh the initial investment.
- Do not attempt to implement a TQM system without the genuine commitment of the entire executive level of management.
- Get a champion who will lead the quality improvement process for an extended period.
- Appoint a specialist to help with planning the installation process and where possible, keep the specialist to help guide the process itself.
- Ensure good communication is maintained throughout the organisation, prior to, during and after the installation process.
- Elicit the help and support of clients, professionals, suppliers, unions and sub-contractors in the quality improvement process.

- Amend contract agreements with clients, suppliers and sub-contractors to ensure it aligns with the TQM goals and procedures.
- Be realistic regarding the time required to implement the TQM system as it is a long process.
- Remember that quality improvement does not have a completion date.
- Celebrate successes and learn from mistakes.

6.4 Recommendations for further research

The following subjects should be considered for further research:

- A detailed study of the measurements of quality and quality indicators with the aim of producing standard measures and indicators for the construction industry.
- Studies on the reasons for failure of TQM systems implemented in South African companies.
- The effectiveness of affirmative action in empowering the South African construction worker.
- The process of including sub-contractors and suppliers in a TQM system.
- The effect of continuously changing construction teams on the TQM system of a construction company.
- The changes required to improve the effectiveness of the construction contract in ensuring quality buildings.

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