QUALITY MANAGEMENT A FUNDAMENTAL BUSINESS IMPERATIVE FOR CONSTRUCTION COMPANIES

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Abstract
The quality of construction projects in South Africa has long been below par which is evident in the reports of poor project performance, poorly implemented construction processes or worse projects delivered at an unexpected cost to the client. Private and public sector clients are dissatisfied with the quality of work produced by contractors, the rectification of substandard construction work on many of the low-cost housing projects throughout South Africa has left the state with a bill of around R50 billion. As a result this research suggests that company's implement quality management systems as a means to differentiate themselves from current industry performance. The research inquiry was conducted through the use of a case study (Bay West City Mall). Data was collected primarily through participant observation and survey questionnaire with the various participants of the Bay West City Mall project. The collected data were extracted, errors eliminated/accounted for, coded and entered onto an excel spreadsheet for easy reference and analysis. For the interpretation of the data the researcher used the bivariate tabulation method where categorical data is measured using ordinal and nominal scales. The study concluded that the employment of quality management systems should no longer be seen as optional but as fundamental to the continual improvement of construction companies, those organizations that fully institutionalise the principles of quality management will have a strong chance of improving their project performance, reducing project costs, getting repeat business and increasing profits on projects. It is the recommendation of this study that more research be conducted into how quality management, in the construction industry, can assist in alleviating other problems that plague the South African construction industry such as poor performance relating to health & safety, cost, time, low profit margins and poor cultural practices.

Keywords: Business management, Construction; Project pPerformance; Quality management; South Africa

1 Introduction

During the past decade the construction industry has been criticised for its poor performance and productivity in relation to other industries (Honnakker, 2010: 953). The Construction Industry Development Board (2010: 2) study *Construction Quality in South Africa: A Client Perspective* revealed that public sector clients were neutral or dissatisfied with the quality of construction on around 20% of all projects surveyed in 2009. While the CIDB Construction Industry Indicators (CII's) reported that for the year 2008 around 18% of the projects surveyed had levels of defects which are regarded as inappropriate, and clients were neutral or

dissatisfied with the quality of work delivered on 20% of projects, in 2010 clients were neutral or dissatisfied with 15% of projects surveyed and around 12% of projects surveyed had defects which are regarded as inappropriate and a noticeable decrease in satisfaction among clients was observed with increasing project size.

The Movement for Innovation (2010) found that construction industry clients want their projects delivered on time, on budget, free from defects, efficiently, right the first time, safely and by profitable companies. While regular clients expect continuous improvement from their construction team to achieve year on year reductions in project cost and reductions in project time. Therefore as Seneratne and Jayarathna, (2012: 101) put it, the construction industry needs to move towards higher quality, and contractors need to upgrade the quality of their services. In order to make this move organisations in other industries turned to quality management as a reliable management tool in the competitive market environment that leads to higher project performance (Seneratne and Jayarathna, 2012: 101). Sullivan (2011: 212) describes Quality Management as any approach to achieve and sustain a high quality output by conforming to requirements and meeting customer satisfaction requirements. Much research has been done with regard to the implementation of Quality Management Systems (QMS) and Elwary and Shabayama (2008: 156) believe that an organisation experiences the benefits of higher customer satisfaction, better quality products, and higher market share after the adoption of a QMS. According to Elwary and Shabayama (2008: 156) a QMS has the single purpose of improving the performance of one's business.

With the changing construction environment and the reported cases of dissatisfied clients it is necessary that studies be conducted to reveal the importance of Quality Management Systems and how they can not only turn around the trajectory of a single organisation, but that of the industry as a whole. A failure to conduct these investigations presents a risk to business in that it will be difficult to rectify poor quality on projects so that companies can eliminate cost overruns, improve client satisfaction and increase turnover. Thereby making the construction sector a less favourable investment solution for investors.

Construction Industry Development Board, (2011: 41) suggests that industry regulation bodies' and Government advocate for and strengthen the requirements for the appointment of professional services and contractors based on quality criteria.

2 Literature Review

The modern quality movement has only been with us for a few decades, it still has far to go before becoming widely operational among world economies (Maguad, 2006: 201). Therefore, it will probably take many more decades if not a century for the quality management discipline to mature and for nations and economies to digest this change (Magaud, 2006: 201). Nevertheless Maguad (2006:201) is confident quality will continue to become an imperative for the survival of organizations and national economies. He further asserts that the 21st century may well become known to historians as the Century of Quality.

2.1 Performance improvement and why it is important

Construction Industry Indicators (2010: 3) report that the contractor's survival depends on repeat work from clients, which is linked to the contractor's performance in past projects, contractors need to provide value for money to the client, as existing clients award contracts on the performance of the contractor on past contracts. Gharakhani et al., (2013: 46) observe that improving the quality with which an organization delivers its products and services is crucial for competing in an expanding global market. As the construction industry is now a highly dynamic sector, industry structures and product characteristics are changing at an ever-increasing pace (Seneratne and Jayarathna, 2012: 101).

With the changing economic environment, managers of construction companies and projects need to look for emerging construction management philosophies to keep up with the demands of the industry and its clients' (Seneratne and Jayarathna, 2012: 101). Hoonakker et al., (2010: 953) report that many of the management practices used to support construction organisations are being challenged, the industry's clients are moving forward, clients demand improved service quality, faster delivery and more innovative buildings.

2.2 The role of QMS in performance improvement

Delagado-Hernandez and Aspin (2008: 919) conducted a study called *Quality Management Case Studies in the UK Construction Industry* and found, that companies that have Quality Management Systems in place have won repeat business, increased their market shares and improved their customer satisfaction levels. Cagnazzo et al., (2010: 312) found strong evidence that ISO 9000 certification leads to improved performance, improved management and operational processes, which results in less waste of time and material, increased productivity, and cost saving. While Din, et al., (2011: 1047) report that quality management systems are not limited to influencing production based processes, but lend themselves to the improvement of financial procedures, risk management practises and information management among others. It is evident from studies by Cagnazzo (2010), Taticchi and Fuiano (2010), Chachadinha 2009, Coffey (2011), Willar and Trigunarsyah (2011), and Seneratne and Jayarathna (2012) that the use of ISO 9000 is associated with an increase in financial performance that brings benefits to companies' and stakeholders. Ghodbane, (2014: 68) confirms that QMS help organisations to optimize operations and increase sales, improve quality, provide cost savings and strengthen customer satisfaction.

To improve the performance of construction organisations and reduce project costs Davis et al. (1989), Abdul-Rahman (1993; 1995), Low and Yeo (1998), Love and Li (2000) stressed the need to measure quality costs. Costs associated with failure arise both from internal and external sources. Internal poor quality costs increase an organisation's cost of operations, for example, rework and material waste. External poor quality costs, however, result in loss of profits through contractual claims, defect rectification (rework), and the loss of future business (Jafari and Love, 2013: 1245). QMS provides a framework for measuring quality costs. Certified quality management systems can provide a solution for several issues in a construction company; it constitutes a good opportunity for restructuring and modernization, as well as changes in traditional ways that have been accepted without in depth analysis (Chachadinha, 2009: 245).

2.3 Quality Management and its impact on the business

Cagnazzo et al. (2010: 313) reports that the adoption of QMS yields visible concrete benefits to organisations in the form of increased customer satisfaction. He further writes that certified organisations are praised by researchers and scholars alike for being aware of customer requirements, having processes/activities that are designed to increase customer satisfaction, have systems to avoid misunderstandings about client instructions, systematically review contracts, and have systematic process for handling complaints.

Prince (2008: 15) discovered that QMS had the following long term effects on organisations that implement them;

- Improvements in product and service quality
- Production system improvements
- Productivity improvements
- Cost reductions in material and labour
- Reduction in cycle times and improved delivery

- Maintaining an "improvement" culture

Sidumedi (2006: 17) found that the dominant South African firms have recognized the benefits that could be derived from certified Quality Management Systems and have relentlessly pursued and have subsequently been awarded ISO 9000 certification.

2.4 Importance of certification

In his study, Sidumedi (2006: 16) observed that inspections were the dominant measure of addressing quality problems. However, Gharakhani et al., (2013: 48) states that in order to achieve quality on construction projects contractors must do more than conduct inspections, inspections are an inadequate control measure as they fail to address the root of the problem. Gharakhani et al., (2013) add that the inspection stage is too late; contractors must aim to reduce defects during production and eliminate mass inspection through the use of structured quality management systems.

Cagnazzo et al. (2010: 314) and (Ghodbane, 2014: 68) discovered that ISO 9000 certification increases a firm's revenue as firms are able to enter new markets, increasing their potential to get new contracts and their ability to enter international markets. Din et al., (2011: 1044) observed that the advantages of a certified QMS clearly outweighed the inconveniences and the investment of resources involved as ISO 9000 certified companies' have enhanced levels of performance in their projects compared to those that are not certified.

Results of a study by Liu (2003) on quality implementation in public housing projects in Hong Kong showed increased customer satisfaction after ISO 9000 implementation. Furthermore, the average number of defects in housing projects built by companies with ISO 9000 certification was significantly less than the number of defects in housing projects built by companies without ISO 9000 certification. Corbett et al. (2005) studied the impact of ISO 9000 certification on the financial performance of listed companies in three American economic sectors, over a period of 10 years (1988-1997). The authors stated that certification leads to an improvement of financial performance for firms that had a comparable level of economic performance before starting ISO programs.

Din et al. (2011: 1046) and Coffey et al. (2011:403) report that new regulations in Malaysia required Grade G7 contractors, the highest grade, to be certified with the ISO 9000 QMS as a compulsory condition of registration by January 1st, 2009. Failure resulted in being downgraded, which adversely impacts on the ability to do business. Such initiatives by government to improve quality in the industry will compel companies to adopt quality management systems. Malaysia is not alone in this process Australia, Hong Kong and Singapore have imposed regulations for construction firms to be ISO 9000 certified in order to qualify to bid for public sector projects. There is a global move towards certification and companies that operate globally that neglect to get a certified quality management system may soon find that they do not meet the required standards in some of the markets they previously operated in without difficulty.

3 Research Methodology

This study was conducted in two parts an observation / participation case study and a survey within the case. The survey was conducted amongst participants of the case in order for the phenomena observed to also be described from the participant's view. The study was conducted over a period of 12 months. The research design employed was mostly qualitative although some aspects of quantitative were borrowed during the interpretation of the data.

The sample population was chosen using the *maximum variation* sampling strategy described by Merriam (2009: 82) and consisted of 54 persons in management positions and of these 21 responded. Respondents ranged from the Project Manager, Designers (Architects and

Engineers), and Contracts Managers to Site Foremen. Palys (2008: 2) wrote that searching for cases or individuals who cover the full spectrum of positions and perspectives in relation to the phenomenon one is studying, allows the researcher to capture both extremes (negative/positive, high/low,) and typical cases plus any other positions that can be identified.

Primary data were obtained through participant responses to the research questionnaire/survey, participatory observations made by the researcher and physical sources, while the secondary data came from the researched literature and these were used for (1) the description of contemporary and historical attributes (2) comparative research (3) reanalysis (asking new questions of the data that were originally not asked and (4) research design and methodological advancement.

Raw data were extracted from the questionnaire coded and plotted on an excel spreadsheet, errors and omissions were corrected and missing variables allocated a code such that no data was incorrectly entered as that may produce false results.

The responses on each questionnaire were recorded horizontally, under a separate heading as suggested by Struwig and Stead (2009: 151).

The bivariate tabulation method as discussed by Struwig and Stead (2009: 152) was used to tabulate the data. All questions in the questionnaire required categorical data, two types of measurement scales were used namely; nominal and ordinal.

The interpretation is coherent and accounts for all the data, although it must be noted it is seldom possible to account for every utterance by the research participants or every paragraph in a large document such as this (Struwig and Stead, 2009: 154).

4 Findings and Discussion

4.1 Case observations

This case examines the implementation of a quality management system (QMS) on large construction project by a South African construction company. At the start of the project the contractor had been operating for 112 years albeit since inception the organisation has become a large construction group operating on six continents. The organisation employs around 4000 employees.

The Bay West City Mall is a Regional Shopping Centre of approximately 90 000 m2 situated in the Hunters Retreat area, west of Port Elizabeth in the Eastern Cape. The project population consisted of a Client, Development Manager, Investors, Project Manager, a design team of Architects and Engineers, Tenant coordinators, Leasing agents, Branding agents, Main Contractor, Nominated / Selected Subcontractors and Domestic Subcontractors.

The quality management system was based on the contractors SHEQ Policy (Safety Health Environmental and Quality) which encapsulates the company's mission, visions and goals. These form the basis of the project specific project quality plan, which was drafted and presented to the client for approval.

The project had a construction value of R900mil of that approximately R1, 2 mil was lost through rework, defective workmanship, waste, material failures and other quality issues. However, the existence of quality management system was what allowed the contractor to quantify the value of money lost through quality issues. The contractor was able to recover as much as R 121 444, 73 from selected subcontractors and R38 334, 14 from labour only sub-contractors through the non-conformance system. Considering the overall construction value R1, 2 mil makes 0.13% of R900mil, which is less than 1%.

These issues were not only quantified, but the system also calls for an accurate description and investigation into the root cause of quality issues, preventative measures and proposed action,

which minimises the possibility of the same errors reoccurring. On a monthly basis a report is compiled highlighting the most prevalent quality problems experienced onsite, this information is presented to the contractor's project manager, contracts managers and site agents who manage the foremen. Foremen are advised on what to look out for and resources are invested towards reducing the likely hood of these issues reoccurring.

Where necessary the system records which subcontractors are responsible for the most costly non-conformances, what is the most prevalent root cause and which trade has the highest number of defects, all this historic data is important for the contractor to understand where his shortcomings are and plan on how to reduce them on the project going forward, but also eliminate them on future project this facilitates continuous improvement on the contractors part.

The client was updated regularly on the performance of the project, through his agents and project reports this allowed the client to form a perception of the contractor and how well or poorly he was performing on the project. The presence of a structured system for recording and rectifying non-conformances boosted the client's confidence in the contractor's ability to manage the risk of poor quality.

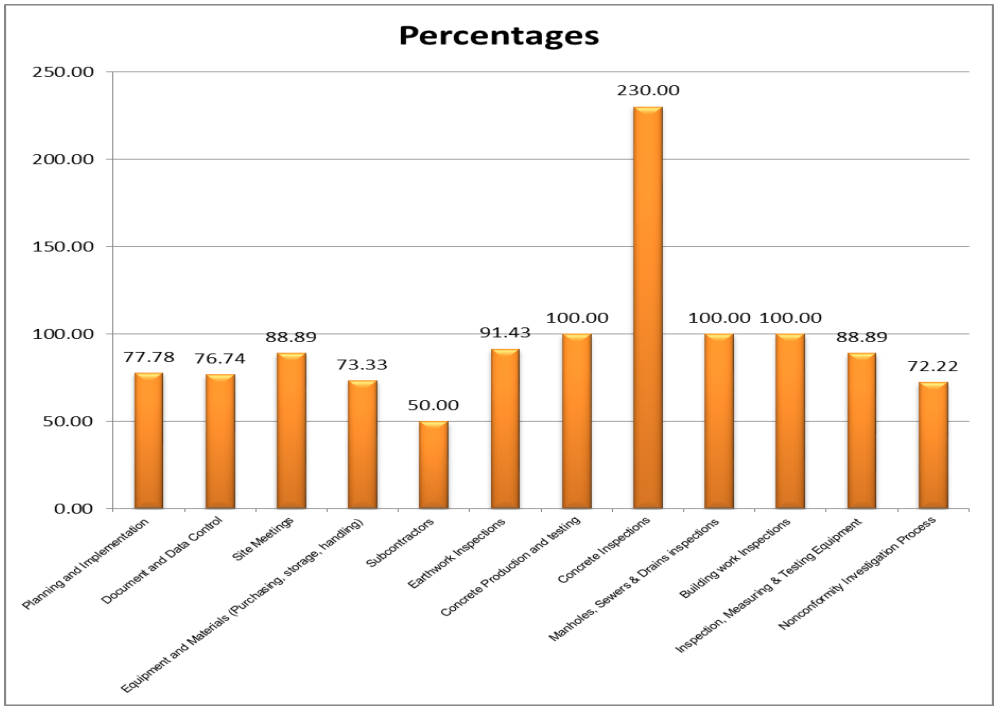

Figure 1. Audit results

Non-compliance to system and processes	70
Partial compliance to system and processes	100
Compliance - room to improve	150

Figure 2. Audit results

Figure 1 seen above shows a graphical representation of an audit conducted by the main contractor and shows that the highest score was achieved in concrete inspections and the lowest score was from sub-contractor performance. This showed the contractor that when it comes to quality his staff had a high focus on inspections and sub-contractors were provided very little guidance and management, which is not the correct view of quality this provided the contractor with an opportunity to change his focus and attempt to achieve a more level graph.

The contractor was able to get more business from the client, in the form of two additional but separate contracts these were negotiated with the main contractor before the client approached other bidders. The cost of rework on the project amounted to less than 2% of the contract value. Employee morale was raised as milestones were met and employees wanted to improve their statistics, wastage was reduced drastically because the main contractor kept a record of material orders versus requirements and was able to track where wastage was highest and resolve, newer employees were inducted on safety as well quality on their arrival and because all their peers were actively managing quality they easily adapted. Employees were sent on training courses to improve their knowledge and management skills, contracts managers took an active position in ensuring quality on the project, with time allocated to discussing quality at all formal site meetings.

The contractor was able to continually improve his processes as the staff got familiar with the quality system, however, it did not stop there a needs analysis project was initiated by the quality management department to assess the shortfalls of the quality system and suggest solutions. One of the shortfalls identified was that the staff did not fully comprehend the impact the quality management system was having on the project and therefore did not see the 'real' value of the system. This was overcome by showing the employees a record of their non-conformances and how much they had cost the company and it was presented to them how a collaborative effort between themselves and the quality department would not only reduce non-conformances but would lead to improved performance in terms of quality of work and delivery time.

4.2 Survey Findings

A survey was conducted amongst the participants of the case, the survey had questions/statements relating to five hypotheses. The sample population consisted of 54 persons in management positions and of the 54 only 21 responded giving a 39% response rate. Respondents ranged from the Project Manager, Designers (Architects and Engineers), Contracts Managers, Site Foremen and sub-contractor staff.

The questions and responses from the questionnaire could not all be tabled in this paper, however, Table 1 shows a summary of the hypotheses generated from this study through literature review and observation, these were then confirmed/supported by the data collected from the survey questionnaires.

Table 1. Hypotheses summary

Hypothesis Number	Description	Hypothesis Supported	Inconclusive	Hypothesis Rejected
1	Implementation of a certified Quality Management System leads to improved contractor performance on projects.	x		
2	Quality Management Systems are a fundamental business imperative.	x		
3	A construction company with a certified Quality Management System has a competitive advantage over one that does not have a quality management system	x		
4	The implementation of certified quality system allows a company to continually improve its processes and outputs.	x		
5	Quality management systems allow companies to meet client quality requirements		x	

Overall responses from the survey showed that respondents agreed that the existence of a certified quality management system does lead to improved contractor performance, a wide range of researchers agree that QMS leads to improved project performance as well as financial and organisational performance (Cagnazzo 2010, Taticchi and Fuiano 2010, Chachadinha, 2009, Coffey 2011, Willar and Trigunarsyah 2011, Seneratne and Jayarathna, 2012).

Respondents viewed the existence of certified quality management systems as a fundamental business function. In his study *A study of challenges small black eletrical contractors in Durban and Pietermaritzburg areas are faced with that could lead to their failure* Myeza (2006) found that successful growing firms use low-cost strategies to compete. They compete with high-quality products and superior service and adopt continuous improvement strategies. They also take advantage of new opportunities and adopt formal and professional approachs to people management. Customer care is crucial customers are not interested in the problems that the firm has but are concerned with what can be obtained from the interaction of the two parties. Losing valuable customers could be detrimental to the business survival (Myeza 2006: 20). QMS is a suited to acieving the success factors listed by Myeza (2006: 20).

Responses support the hypotheis "*A construction company with a certified Quality Management System has a competitive advantage over one that does not have a quality management system*". Cagnazzo, Taticchi, and Fuiano (2010); and Magaud (2006) suggest that companies with certified quality management systems have a competitive advantage over those that do not.

The majority of respondents strongly agreed that quality management systems allowed companies to continually improve their processes. When QMS is applied as an ongoing process it results in continuous improvement (Elghamrawy and Shibayama 2008: 156). Magaud (2006); and Chachadinha (2010) discovered that the main purpose of the ISO 9000 standards is to achieve an effective management system that focuses on continuous improvement, communications, and meeting customer requirements.

Findings were inconclusive for the hypothesis "*qms allows a company to meet client requirements*".

5 Conclusion and Further Research

The aim of this study was to highlight how important certified quality management systems have become in today's construction environment and how contractors should really begin to see the use/implementation of quality management systems as the next step in improving their business performance. Through the use of a quality management system the main contractor at Bay West City Mall was able to keep his rework related costs low, react to risks better, build his clients confidence, continuously improve his overall performance on the project through acting on lessons learnt from previous projects and even achieve some lesser known benefits of QMS's such as increased employee involvement, open communication and behavioural changes in employees.

The use of a certified QMS leads to long-term return on investment that is not only higher but also more sustainable. The study revealed that companies that use QMS are able to improve their performance, being renowned for quality makes it easier to get repeat business. Literature revealed that at present the concept of QMS was receiving utmost attention from larger construction companies while small and medium sized enterprises tended to postpone this step. On the same token QMS are a highly credible solution to challenges faced by small and medium sized enterprises such as poor customer retention, lack of continual improvement and the failure to adopt formal and professional approaches to business. There are difficulties and problems to overcome, however, the implementation of a thorough Quality Management System will permanently change the company's modus operandi in ways that could be uncomfortable for employees and / or management, nevertheless the advantages of QMS are undeniable.

It is the recommendation of this study that the South African government and industry regulation bodies (CIDB, NHBRC, BIFSA etc.) look at ways of increasing quality whether it be with push factors such as; making it compulsory for contractors wanting to undertake work for government to have a certified QMS in place or pull factors such as preference being given to contractors that can show their commitment to quality and end the practice of awarding business on price alone. Industry professionals/ client's agents should advice clients' not to appoint based on price alone but on quality criteria. Lastly studies should be conducted, as variable outcomes amongst companies using QMS lead to the hypothesis that there must exist critical elements in implementation. Identifying these elements could be the push required for companies not yet sold on quality management.

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