

QUALITY MANAGEMENT FOR DELIVERING SUSTAINABLE CONSTRUCTION PROJECTS IN SOUTH AFRICAN RURAL AREAS: THE CONSTRUCTION PROJECT MANAGER'S PERSPECTIVE

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ABSTRACT

Although many construction professionals, with diverse expertise, participate early in setting the plans of construction projects in rural areas, the final product is less satisfactory than planned. This could be attributed to a number of reasons, amongst them the lack of quality management procedures applied in later stages. This paper aims to investigate the role of implementing quality management procedures throughout the project life cycle as an approach for delivering sustainable construction projects in South African rural areas from a construction project manager's perspective. To achieve this aim, a research methodology is designed to accomplish four objectives. Firstly, literature is used to review the concepts of sustainable development, quality management procedures, the construction project lifecycle, rural area construction projects in South Africa and the Construction Management Profession. Secondly, interviews are carried out with government officials involved in rural area projects to identify the causes of delivering poor quality projects. Thirdly, survey questionnaires are directed to a selected sample of construction project managers to investigate quality management procedures and frameworks adopted in the different stages of the rural areas construction projects and their limitations. Finally, a framework is developed to facilitate the integration of quality management procedures throughout the project life cycle as an approach towards developing sustainable projects for rural areas.

Keywords: Construction Project's Life-Cycle, Construction Project Management, Sustainability, Quality Management Procedures, Rural Area Projects, South Africa.

1. Introduction

Throughout South Africa, rural areas were shaped and conditioned by past policies during the apartheid regime. These past policies influenced settlement patterns and demographic profiles, access to services and facilities, and the location and character of economic activity (Hart, 1996). Political changes from apartheid to democratic times have also meant changes in government policies in areas such as rural construction projects other development spheres that have had an impact on sustainable construction in these areas (Adebayo, 2000).

It has been argued by Rodwin (1987) that the construction industry is unique in its ability to facilitate development by fulfilling human needs, stimulating investment and generating employment opportunities. Recent developments in rural areas have witnessed an immense lack of attention towards delivering on time, within budget and high quality projects. . This could be referred back to a number of reasons, amongst them (1) lack of experience and capacity of the small, medium and micro-enterprises, (2) poor tendering procedures and (3) poor implementation of quality management procedures throughout the construction projects lifecycle Adebayo (2000).

Most projects in rural areas are planned, coordinated and executed by a professional team made up of the various construction consultants in the industry, including construction project managers. These managers coordinate and supervise the construction process from the conceptual development stage through final construction, making sure that the project gets completed on time and within budget Halpin et al (1980).

This places the CPM in an opportune position towards ensuring that quality management procedures are implemented and adhered to throughout the lifecycle of construction projects in rural areas. Based on the assertion that quality management procedures need to be implemented throughout the project lifecycle for rural area projects to attain the desired level of quality as planned, this paper aims to investigate the role of implementing quality management procedures throughout the project life cycle as an approach for delivering sustainable construction projects in South African rural areas from a construction project manager's perspective.

2. Research Objectives and Methodology

In order to achieve this aim, a research methodology consisting of a literature review, interviews and questionnaires was designed to accomplish four objectives:

- Firstly, literature is used to review the concepts of sustainable development, quality management procedures, the construction project lifecycle, rural area construction projects in South Africa and the Construction Management Profession.
- Secondly, interviews are carried out with government officials involved in rural area projects to identify the causes of delivering poor quality projects. A purposive sample of 10 officials was selected based on their direct relation to rural area projects.
- Thirdly, survey questionnaires are directed to a selected sample of construction project managers to investigate quality management procedures and frameworks adopted in the

different stages of the rural areas construction projects and their limitations. A sample of 100 CPM's was selected throughout the broad spectrum of project management firms registered in KZN.

- Finally, based on the data collected from the literature review, interviews and questionnaires, a framework is developed to facilitate the integration of quality management procedures throughout the project life cycle as an approach towards developing sustainable projects for rural areas.

3. Literature Review

3.1 Sustainable Development and Rural Area Construction Projects in South Africa

3.1.1 Definition

Giddings, *et al.* (1999) stated that at its heart sustainable development is the simple idea of ensuring a better quality of life for everyone, now and for generations to come. This means achieving four objectives simultaneously:

- Social progress which recognises the needs of everyone.
- Effective protection of the environment.
- Prudent use of natural resources, and
- Maintenance of high and stable levels of economic growth and employment.

3.1.2 Sustainable Construction and the Environment

A broader, comprehensive and inclusive characterization of sustainable construction must embrace much more than just the process of constructing buildings and structures like houses, bridges, roads, ports, silos and factories in a “sustainable manner”. Both the process and the product must be seen in its backward forward linkages (Shah, 2000). In addressing the complex problem of construction and the environment, efforts towards sustainable construction are fundamentally an attempt to put into place practice that restores the balance between the natural and built environment. It is a search for an ecological model that views both spheres as fundamentally interrelated. It should be recognised that mankind is locked into a highly dynamic relationship with the natural world and that the two are acutely interdependent. If this relationship is forgotten, certainly mankind and his integration into the environment has failed to effectively utilize it to build and shape the land in a manner that is harmonious, symbiotic and sustainable (Schaefer, 1994).

3.1.3 Sustainable Construction in South African Rural Areas

Rural areas are characterized with having a paucity of fragmented services delivered by different spheres of government. In addition, there is extreme poverty, high disease burden and low incomes with heavy reliance on social transfers. Furthermore, rural areas suffer from scare economic opportunities and eroded natural environment (Area Based Management and Development Programme, 2007).

Sustainable construction has been understood by many nations as the way the building industry responds to achieve sustainable development. Sustainable development in the South African context differs from other interpretations regarding the subject matter. In South Africa

development in rural areas are paralysed by poverty, apartheid and an exhausting debt burden which left future generations with a mammoth debt repayment problem and disempowered them to respond to its present and future needs. State low-cost projects have turned areas of natural vegetation to desert, with construction activity causing removal of all the trees on site rather than integrating them into the built environment. A comparison of this scenario with informal settlements in Durban and other South African cities reveals that trees are well -preserved in areas where there is no intervention of new construction (Adebayo, 2000).

3.1.4 The Level of Quality of Rural Area Projects

The South African rural areas have seen tremendous bursts of rural construction projects over the past decade. These projects include the development and construction of low cost housing, schools, clinics, road infrastructure as well as services including water, sanitation and electricity (Hart, 1996). To date many rural area projects are often not completed within the project duration, those which are fortunate enough attain completion, frequently do not achieve the targeted level of quality as originally planned (Ardington and Lund, 1996). There are many reasons for rural projects not achieving the desired level of quality towards meeting the satisfaction of its end users (rural people). These include poor contractor selection, political issues and corruption amongst contractors but most importantly improper implementation of quality management procedures during the construction lifecycle of the project (Adebayo, 2000).

3.2 Quality Management Procedures

3.2.1 Definition

Quality means excellence. It is a philosophy rather than a mere attribute. The difference between two objects is judged by their qualities. We set some standards which determine the level of acceptability (Sarkar, 2007). Quality is thus defined as fitness to purpose (i.e. providing a product such as building) which provides an appropriate quality for the purpose for which it is intended (Quality Management, 2009). Quality management process consists of three interrelated activities of: quality planning, quality assurance and quality control, see figure (1)

Quality Planning (QP)

Identifying the quality standards that are relevant to the project and determining how to meet them. It is one of the Key facilitating processes during the project planning. Quality planning should be performed regularly and parallel with the other project planning processes.

Quality Assurance (QA)

Quality assurance is concerned with evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards. It is a system for prevention and should be performed throughout the project lifecycle. Quality assurance could be internal or external. At the internal level, quality assurance is provided to the performing organization, where at the external level it is provided to the customers and others stakeholders.

Quality Control (QC)

Quality control is concerned with monitoring results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory. It focuses on: measuring correction and should be performed throughout the project life cycle.

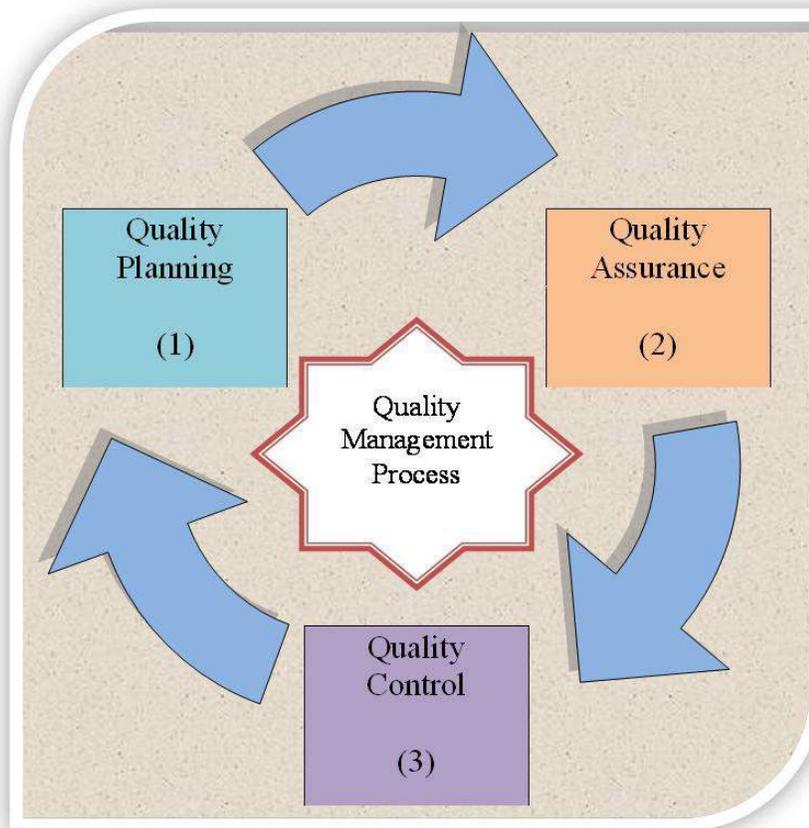


Figure (1) Quality Management Process

3.2.2 Quality Management in the Construction Industry

Presently, the application of quality management is not only trendy but also mandatory in the construction industry. Quality management methods and tools have to be adopted and implemented in the industry. In addition, the concept and its practice must be tuned in harmoniously. Quality planning has to be carried out as early as possible. Quality assurance in construction activities guides the use of correct structural design, specifications and proper materials ensuring that the quality of workmanship by the contractor /sub-contractor is achieved and finally maintaining the structure after construction is complete through periodic assessments for maintenance and repairs. Quality control has to be imposed by the contractor whereas quality assurance is carried out by a separate third party agency (i.e.: a construction project manager) engaged by the owner (Sarkar, 2007).

Quality control in the construction industry can be looked at as having three elements: To produce a building which satisfies the client, where quality is related to the price and where sufficient time is allowed to obtain the desired level of quality. Like most other aspects of construction project management, quality control has to be planned. Planning seeks 'order' and a

quality control system for a construction project reflects this sense of order (Quality Management, 2009). This order can be seen in five basic stages:

- Setting the quality standard or quality of design required by client.
- Planning how to achieve the required quality, construction methods, equipments, materials and personnel to be employed.
- Construct the building right first time.
- Correct any quality deficiencies.
- Provide for long term quality control through establishing systems and developing a quality culture.

By construction professionals not adhering to and not ensuring that quality management procedures are implemented throughout the project lifecycle the following outcomes in relation to the project are possible:

- Design faults, misunderstanding the client's brief to develop the design, using information which is incorrect or out of date, misunderstanding of the client's expectations of quality standards.
- Construction faults, not building to drawings or specifications, poor supervision leading to bad workmanship, insufficient management of the quality of construction (Project Procurement Lifecycle, 2007)

3.3 The Construction Project Lifecycle

3.3.1 The Role of the Construction Project Lifecycle in Construction Project Management

Construction project managers can divide projects into phases to provide better management control with appropriate links to the ongoing operations of the performing organisation. The project life cycle generally defines what technical work has to be done in each phase, when the deliverables are to be generated in each phase and how each deliverable is reviewed, verified, and validated, who is involved in each phase and how to control and approve each phase (PMBOK, 2004). Generally projects are divided into five phases: initiating, planning, executing, monitoring and controlling and finally closing. It is essential in terms of successful project completion and level of quality planned, that the construction project manager ensures quality management procedures are implemented and adhered to in each phase of the project lifecycle.

3.3.2 Characteristics of the Construction Project Life Cycle

A structured project lifecycle plays a key role in the control strategy for the evolution of a project. Unlike schedule bar charts and flow diagrams, the project lifecycle phases represent significant changes as the project progresses through succeeding levels of maturity (Patel and Morris, 1999). The PMBOK (2004) lists some characteristics of the project life cycle below:

- It defines the beginning and the end of the project.
- Phases are generally sequential and are usually defined by some form of technical information transfer or technical component handoff.
- Cost and Staffing levels are low at the start, peak during the intermediate, and drop rapidly as the project draws to a conclusion.
- Probability of successful completion is lower at the start, higher toward the end.
- Risk and uncertainty is higher at the start, lower towards the end.

- The ability of stakeholder to influence the project product is higher at the start, lower towards the end.

3.4 The Construction Project Management Profession

3.4.1 The Importance and Roles of Construction Project Managers

As we enter the first decade of the twenty-first century, our perception of construction project management has changed. Construction project management, once considered nice to have, is now recognised as a necessity (Kerzner, 2003). Project management offers a structured approach to managing projects (Burke, 2003). Construction project managers plan, direct, coordinate, and budget a wide variety of construction projects, including the building of all types of residential, commercial, and industrial structures, roads, bridges, wastewater treatment plants, and schools and hospitals. Construction project managers may supervise an entire project or just part of one. They schedule and coordinate all design and construction processes, including the selection, hiring, and oversight of specialty trade contractors, such as carpentry, plumbing, or electrical, but they usually do not do any actual construction of the structure (Halpin et al., 1980). In addition, these managers coordinate and supervise the construction process from the conceptual development stage through final construction, making sure that the project gets completed on time, within budget and achieves the planned level of quality.

3.4.2 The Responsibilities of Construction Project Managers

The specific responsibilities of construction project managers vary depending on the industry, the company size, the company maturity, and the company culture. However, common responsibilities noted are: developing the project plan, managing the projects stakeholders, managing the team, identifying and managing risk, managing time, the budget, and quality. A construction project manager wears many hats. They are a supervisor, planner and sometimes worker to boot. This is an interesting job as it requires a multitude of talents to carry out such a role. By possessing traits such as multitasking abilities, timeliness and good problem solving skills, the construction project manager will be able to complete daily job tasks quickly and efficiently (Halpin et al, 1980). These attributes places the CPM in a unique position on construction projects to utilise these tools and techniques towards ensuring the implementation of quality management procedures throughout the project lifecycle as an approach towards improving the quality of sustainable rural area projects.

3.5 The Relationship between Sustainable Development in Rural Areas, Quality Management Procedures, the Construction Project Lifecycle and the Construction Project Management Profession

Although the significant role played by the South African government towards developing rural areas through constructing housing, education, medication, infrastructure and service projects, rural areas suffer from delivering poor quality projects. Quality management procedures and its implementation in construction projects have been highlighted as imperative. In addition, the implementation of these procedures throughout the lifecycle of construction projects plays a crucial role in attaining the desired level of quality initially planned.

The construction industry plays host to many professionals' each specialising in an area specific trade. Among these includes the construction project manager, who together with the rest of the construction professional team is involved in most rural area projects from conceptual stages through to completion. Construction project managers have been distinguished as individuals who plan, coordinate, direct, manage and facilitate construction projects. This unique role places the CPM in an appropriate position to influence the frequency of implementation of quality management procedures throughout the construction project lifecycle in an attempt towards improving the quality of sustainable development in rural areas.

4. Data Analysis

Out of the 100 survey questionnaires sent to construction project managers, 62 were completed and returned. This represents a 62% response rate which supports the research findings and recommendations. A total of 10 semi-structured interviews were planned to be conducted, however due to time constraints on the research and limited schedules of government officials, only 4 interviews were achieved. This represents a 40% response rate from the intended sample and still provides rich and valuable data to the research. The Relative Importance Index (RII) is used to rank the causes and parties responsible for delivering poor quality projects in rural areas using the following equation: $RII = \frac{\sum W}{AN}$, Where W= weighting given to each driver by the respondents and range from 1 to 5, A= highest weight (5 in our case); and N= total number of sample (Kometa and Olomolaiye, 1997; Olomolaiye et al., 1987; Shash, 1993).

4.1 Analysis of the Interview

- With respect to the importance of quality in rural area projects, all 4 respondents indicated that quality is of a very high importance as illustrated in Figure (2).

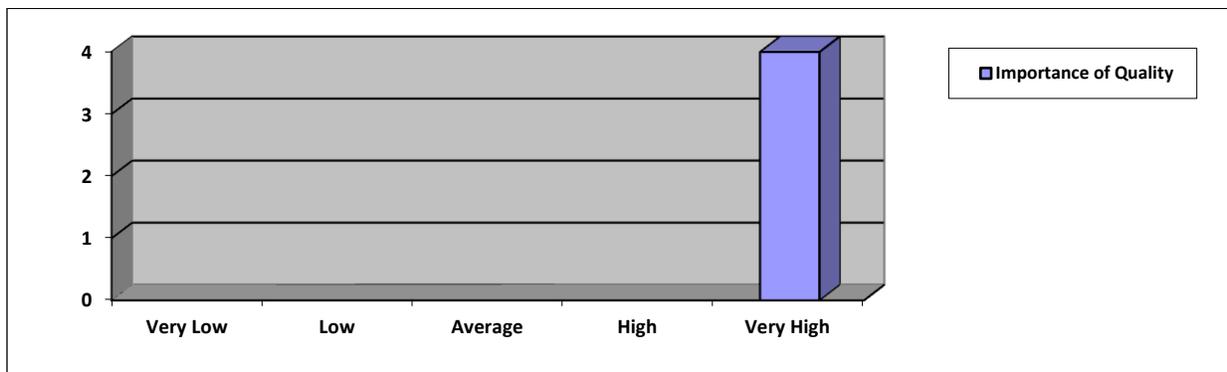


Figure (2): The Importance of Quality in Rural Projects

- Figure (3) shows the different types of projects that interviewees worked on in rural areas. :

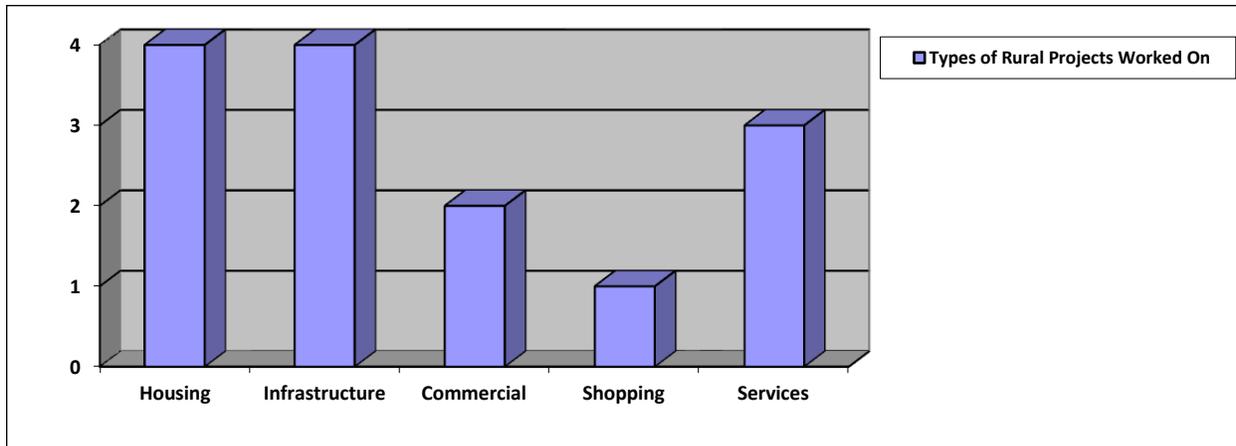


Figure (3): Types of Rural Projects Worked On

- With reference to whether rural area projects achieve the level of quality as planned, all 4 respondents indicated that rural area projects do not achieve the level of quality as planned. They went further in highlighting some of the shortfalls promoting poor quality standards on rural projects:
 - Emerging contractors are still learning to adopt and implement quality management as a tool towards delivering quality projects.
 - Political issues often result in contractors being changed during the project lifecycle, thus each contractor with different levels of quality standards impacts directly on the completed projects quality.
 - Contractors' using inferior materials, taking short cuts as well as corruption also attribute towards rural projects poor quality levels.
- Table (1) rates the major causes of delivering poor quality projects in rural areas. The respondents were asked to rate the influences from 1 to 5 (were 1 = very low influence and 5 = very high influence):

Table (1): Causes of Poor Quality in Rural Projects

Respondent	Causes of Poor Quality						
	Quality Standards	Monitoring Techniques	Conflicting Standards	Work Methods	Tools and Equipment	Motivation	Finance
1	4	3	2	5	3	3	2
2	5	4	3	4	3	2	1
3	5	4	3	4	3	2	3
4	5	5	3	5	3	2	2
RII	0.98	0.86	0.58	0.9	0.52	0.42	0.42

From the results tabulated above, the major influences were highlighted as quality standards, work methods and monitoring techniques with RII of (0.98, 0.90 and 0.86) respectively.

- In respect to whether rural projects require a quality management framework to be implemented towards improving quality standards in rural projects, all respondents indicated “yes” and listed the following areas that should be concentrated on:
 - Education and training for emerging contractors including workers.
 - Support structures to aid in the implementation of quality management procedures
- Finally, the respondents were asked to rank the parties which they felt contributed/ or mainly influenced the delivery of poor quality rural projects (were 1 = very low influence and 5 = very high influence), see table (2).

Table (2): Ranking of Parties Responsible for Delivering Poor Quality Projects in Rural Areas

Party	Interview Respondents				RII
	1	2	3	4	
Client Organizations	2	3	2	2	0.44
End Users	2	1	1	2	0.3
Design Firms	3	2	2	2	0.42
Construction Project Manager	4	4	3	2	0.60
Suppliers	2	2	1	2	0.34
Government Authorities	4	5	4	4	0.84
Funding Bodies	2	1	1	1	0.22
Contractors	4	3	4	4	0.76

The above tabulated results showed that the two major influential parties effecting quality on rural projects are: government authorities and contractors, while the construction project manager with RII of (0.84, 0.76 and 0.60) respectively.

4.2 Analysis of the Survey Questionnaire

- In reference to whether CPM’s implement any quality management procedures during the lifecycle of a construction project, only 70% of the respondents stated that they do use quality procedures. The respondents mentioned that the implemented quality procedures are:
 - Ensuring that skills development is passed through to the rural community whom are actively involved in the project.
 - Closely monitoring contractor performance during the construction of the project.
 - Identifying and planning in advance for potential risks which could impact on quality.
- On a scale of 1 to 5 (where 1=lowest and 5=highest), respondents were asked to identify and rate the phases of the project life cycle where they focus on ensuring quality management is adhered to. 80% respondents (62 construction managers) rated all phase 5 out of 5 stating the importance of implementing quality management at all stages f the project life cycle. In addition, 15% mentioned that only planning, execution and monitoring and controlling is necessary with rate 5 out of 5. Finally 5% of respondents rated the importance of quality management as 5 out of 5 at planning, monitoring and controlling phase and closing phase, see table (3).

Table (3): Importance of Quality Implementation in the Project Lifecycle

No. of Respondents	% of Respondents	Project Lifecycle/ Phases				
		Initiation Phase	Planning Phase	Execution Phase	Monitoring And Controlling Phase	Closing Phase
62No. Respondents	80%	5	5	5	5	5
	15%	-	5	5	5	-
	5%	-	5	-	5	5

- Table (4) shows that phase of a project life cycle that requires the most apprehension towards ensuring that quality management procedures are implemented and adhered to.

Table (4): Most Important Phases to Implement Quality

No. of Respondents	% of Respondents	Project Lifecycle/ Phases				
		Initiation Phase	Planning Phase	Execution Phase	Monitoring And Controlling Phase	Closing Phase
62No. Respondents	72%	✓	✓	✓	✓	✓
	19%	✓	-	✓	✓	✓
	8%	-	✓	✓	✓	-
	1%	-	-	-	✓	✓

- In respect to challenges/ limitations encountered when implementing quality management procedures, all respondents stated that they have encountered challenges/ limitations in every phase of the project lifecycle.
- In reference to which CPM's worked on rural area projects, out of 62 respondents, 34% indicated that they have been involved in rural area projects.
- Out of the 34% who stated that they worked on rural projects, table (5) shows their responses in respect to the level of quality achieved on those project:

Table (5): The Level of Quality Achieved

% of Respondents	No. of Respondents	Level of Quality Achieved		
		Quality planned was the quality achieved	Quality planned was moderately achieved	Quality planned was not the quality achieved
34%	12	-	✓	-
	9	-	-	✓

- From the 62 respondents who were asked whether they implemented a quality management plan/ framework in their projects lifecycle, all respondents stated that at some stage between project initiation and completion they have used a quality tool to manage the level of quality achieved.
- When asked what quality meant to them in terms of importance and impact on the project, all CPM respondents indicated that the quality of the project is of high importance of which has an equally high impact on the project.
- Finally from the 62 respondents who were asked whether rural area projects require a framework that ensures quality management procedures are implemented and adhered to from the initial stages of the project to the closing out stages of a project in order to ensure that quality standards in rural areas are met, all respondents stated yes, however, some respondents mentioned that this will require strict implementation and monitoring in ensuring that the level of quality planned is actually achieved.

5. The Quality Management Integration Framework (QMIF)

5.1 Definition and Objectives

Framework is defined as the basic and logical structure for classifying and organising complex information (FEAF, 1999). It is a structure for describing a set of concepts, methods and technologies required to complete a product process and design (EDMS, 2007). The Quality Management Integration Framework (QMIF) (hereinafter referred as ‘the framework’ or the QMIF) is a business improvement tool contains a set of functions, activities, procedures and techniques required to assist construction managers integrate quality management concepts and procedures throughout the project life cycle.

5.2 Description of the Framework

The framework is based on integrating three steps of quality management procedures, namely: quality planning, quality assurance and quality control with the different phases of the project life cycle see figure (4).

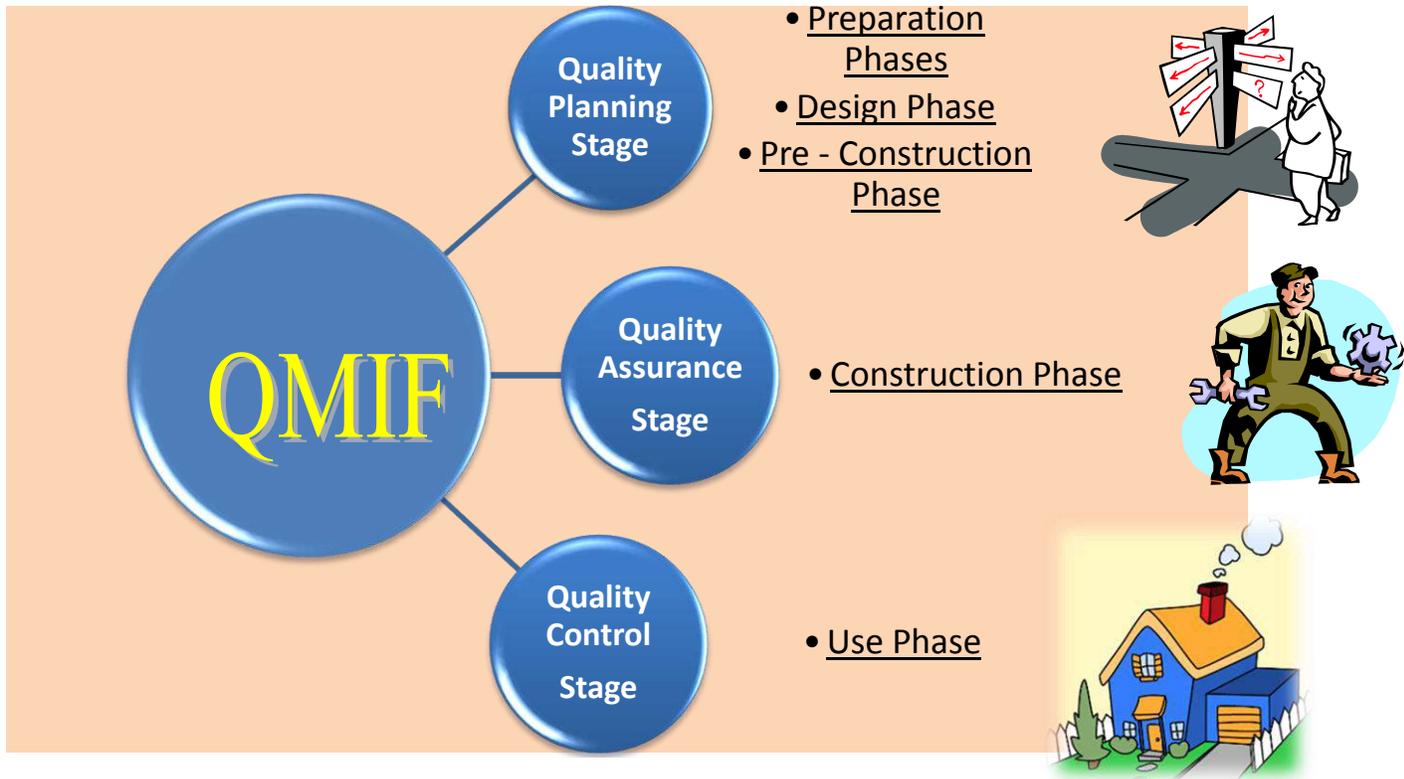


Figure (4): The Quality Management Integration Framework

5.2.1 Application of the Framework during the Quality Planning Stage

Within this stage a number of activities are carried out. They include: appraisal, design brief, concept, design development, technical design, production information, tender documentation and tender action. Because of its nature, many decisions made during this stage affect the project performance throughout its life cycle. This necessitates the importance of having a proper quality planning for each project carried out at rural areas as early as possible. Clients and other project participants have to be introduced to the Quality Management concept, its importance, procedures, different cost of quality and their benefits towards improving building performance. To ensure proper planning, the following activities have to be accomplished:



- Ensuring that the client and end-user requirements have been understood and reflected in the project design.
- Ensuring that the governmental quality standards, rules and guidelines have been implemented.
- Identifying the criteria to be used during a quality check to satisfy the client/end-user needs.
- Deciding the most appropriate way to check the quality plan.
- Identifying the events timeframe for carrying out quality check throughout the project life cycle.
- Selecting the team members to be involved in the quality management process.

At the organisational level, design firms with the collaboration with construction managers; have to set the policies, procedures and guidelines to facilitate the implementation of the planned quality requirements. In addition, lessons learned from previous projects have to be utilised in this stage in order to avoid any mistakes or obstacles when planning new projects. Proper planning of project quality and involving clients, end-users and construction professionals helps gaining their support and ownership. Tools and techniques to be used in this stage include: cost-benefit analysis, benchmarking, affinity diagrams, force field analysis, nominal group techniques, matrix diagrams, flowcharts, and prioritization matrices. The output of this stage is: quality management plan, quality metrics, quality checklists, process improvement plan and quality baseline (PMBOK, 2004).

5.2.2 Application of the Framework during the Quality Assurance Stage

During this stage the project has to be constructed and delivered to its client and end-users as well as closing the contracts that have been involved in the development of the project. The quality assurance stage is usually designed to be carried out during the construction phase of the project. It aims to ensure that planned, systematic quality activities decided in the quality planning stage are employed in order to meet client / end-user or governmental requirements. Due to the nature of this stage, being the longest and the majority of the project budget is spent in this stage, a number of change orders are issued to meet different needs and requirements or to respond to internal or external factors. Hence, it is of prime importance to have a change control system in place to study required changes and ensuring that they will not affect the project quality. In addition, corrective and protective actions have to be taken in order to return and retain project quality plans from deviation. Tools to be used in this stage are quality audits and process analysis, cause and effect diagram, control charts, flowcharting, histogram, Pareto chart, run chart, scatter diagram, statistical sampling, inspection and defect repair review. The output of this stage is: quality control measurements, validated defect repair, updated quality baseline, recommended corrective actions, recommended preventive actions, requested changes, recommended defect repair, updated organization process assets and completed checklists.



5.2.3 Application of the Framework during the Use Stage

After the project has been constructed and all contracts related to it have been closed, the building is put in use. Within this stage, design deficiencies and construction defects are explored. In addition, the use stage witnesses carrying out of final inspections and assisting building users during initial occupation period as well as reviewing of project performance in use. Hence, it is important to perform quality control to monitor specific project results to determine whether they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results such as cost and schedule performance. The project management team should have a working knowledge of statistical quality control, especially sampling and probability, to help evaluate quality control outputs. The tools to be used in this stage include: cause and effect diagram, control charts, flowcharting, histogram, Pareto chart, run chart, scatter diagram, statistical sampling, inspection and defect repair review. The output of this stage is: quality control measurements, validated defect repair, updated quality baseline, recommended corrective actions, recommended preventive actions, requested changes, recommended defect repair,



updated organization process assets, completed checklists, lessons learned documentation, validated deliverables and updated project management plan.

5.3 Framework Benefits and Limitations

The QMIF benefits three mentioned targeted areas, namely, construction project managers, the client and the development of rural areas including rural communities. The framework enables CPM, through the implementation of quality procedures to:

- Improve quality standards in all phases of construction projects.
- Enhance their management skills and techniques towards quality implementation.
- Contribute to the upliftment of rural area projects.

The QMIF provides a stepping stone for construction project managers to meet the clients' expectations in terms of quality through a systematic structure of implementation throughout all phases of construction projects as an attempt towards improving the quality of rural area projects. Rural dwellers and communities can be seen as the targeted beneficiaries of the framework as the QMIF is an attempt, through the implementation by construction project managers towards improving the quality of rural area projects in South Africa.

The QMIF is designed for the sole purpose of assisting construction project managers implement quality management procedures throughout all phases of the project lifecycle towards improving the quality of rural area projects. The adaptability and functionality of the framework is limited in the sense that, it depends on the initiatives of construction project managers to make positive attempts in facilitating the use of the QMIF, towards improving the quality of rural area projects in South Africa. The application of the QMIF is a long term strategy to improve the quality of rural area projects, through its implementation by construction project managers. However, it is also recommended to be implemented by other professionals in the built environment involved with rural area projects.

6. Conclusions and Recommendations

Having reviewed the concepts of sustainable development and rural area construction projects in South Africa, quality management procedures, the construction project lifecycle and the construction project management profession, and considering the results of the survey questionnaire and interviews, the research comes to the following conclusions and recommendations: The quality of many rural area projects in South Africa is poor. There are numerous built environment professionals involved in rural area projects, among these include the construction project manager. The CPM's role has been highlighted as crucial in influencing the level of quality standards planned, implemented and adhered to throughout the lifecycle of rural area projects. The interviews identified the causes of delivering poor quality rural area projects. The questionnaires investigated quality management procedures and highlighted that not many frameworks and quality procedures are used in the different phases of rural area construction projects. From the information and results gleaned, a framework was developed as an attempt to guide and assist construction project managers implement quality management procedures throughout the project lifecycle towards improving the quality of rural area projects

in South Africa. This framework is not only intended for use by CPM's, other built environment professionals and consultants are recommended to implement and use the developed framework.

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