

An Analysis of Quality Assurance in Low-Cost Housing Construction

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Abstract

The motivation of the public sector is more social and political. The housing crisis is a major political issue for every ruling party. In many countries there are political commitments to housing, but sadly we witness this commitment being misdirected. Every government wants to see that its citizens are housed adequately. Very often it is seen that in its endeavour, government try to follow the private sector process, establishing huge parastatals to carry out the whole process, for example design, construction and financing (Lankatilleke, 1994).

Lankatilleke, L. (1994) further mentions that mass produced public sector housing schemes are aesthetic disasters. They are either rows of match-boxes or high-rise blocks with no identity or individuality. There are numerous examples of such housing schemes that have deteriorated into ghettos.

This research consequently presents findings which implies that government is being pressurized by the housing backlog within the Western and Eastern Cape, which brings about time constraints and tight budgets. These pressures are transferred to the design teams which need to speedily produce designs for low-cost housing homes within the best possible budget. This results to the implementation of common model designs.

It is also founded that contractors ultimately suffer, due to these pressures which do not allow them to produce good quality homes. It is therefore recommended that better community involvement for sustainable methods in the design and construction process should be practiced.

This therefore concludes that government should take more responsibility for the delivery processes of low-cost housing as well as the procurement and quality systems to be followed.

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To a sister who keeps me on my toes, thanks to you for being you. I know we don't see eye to eye at times, but I guess that's what drives the both of us to do our best. You are well on your way to achieve what you want for yourself, that's my dream for you. So be your best and never look back.

To my fiancé, Leonie, I thank you for walking this road with me; I know it has not been a life time as yet, but yet it feels like one. My appreciation for having someone like you in my life is too much for words. Your love is what drives me to do my best, but most of all it's your whole being that keeps me motivated.

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Lance Wentzel

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Declaration

I....., declare that the contents of this thesis represent my own work and that no plagiarism occurs. It was executed with the support of my supervisor, Mr. J. Crowe.

Signed

Date

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Chapter 1

Introduction

1.1 Background

Southern Africa currently is faced with many problems, housing being one of them. The quality of housing and the aspects which contribute to it leaves much to be desired. The key purpose of this research study is to suggest that by systematic focus on design and the implementation of skilled workmanship in low-cost housing projects, results in effective quality assurance and an improved product. When placing emphases on the word quality it may be described as the degree of excellence (Croome and Sherratt, 1977). However, Barrie and Paulson (1984) mentions that quality assurance is considered generally to be a broader, more nearly all-encompassing term for the application of standards and procedures to ensure that a product or facility meets or exceeds the desired performance criteria. Powell (1976) further mentions that quality in housing construction demands functional soundness and also demands subjective acceptability for it to be a marketable product.

According to Griffith (1990) as well as Levey (2002), at present quality assurance within the construction industry is fraught with difficulty. The relatively unique aspect of each construction project and its temporary nature make the continuity and development of approach across projects far from easy. Griffith (1990) further postulates that quality assurance should try to address science and technology aspects of construction as well as manage the physical and psychological aspects of the human element. Quality assurance in construction therefore represents a complex socio-technical managerial challenge (Griffith, 1990). In order to overcome these challenges, considerable efforts need to be made to achieve perfection at the very first attempt (Bennett, 1991). Therefore, by focusing on the quality of designs in conjunction with the quality of conformance to these designs, quality to the constructed facility is made possible (Barrie and Paulson, 1984).

Housing of the poor in developing countries has been the focus of the international development debates for almost half a century. Today the world has become urbanized, a process which is irreversible. This has resulted in tremendous pressure on the formal housing delivery sector across the globe. These pressures have affected the quality of low-cost housing projects in many ways, for example skilled workmanship in the design and construction stages of these projects. As mentioned earlier the key purpose of this research study is to suggest that by a more systematic approach on design and the implementation of skilled workmanship in the low-cost

housing projects, effective quality assurance and an improved product will be achieved.

Low-cost housing is an enormous challenge in this day and age for developing countries like South Africa. Key interest in research into this area takes into consideration the huge housing backlog that the country is faced with currently not forgetting the skill shortages and the time constraints that exacerbate the pressures. Concerns such as repetitive designs and lack of community input based on the designing process are also scrutinised. The Tiho lego Ecovillage (2008) postulates in addition to this, that low-cost housing produced in South Africa currently are very low in quality, in particular thermal, environmental and aesthetic characteristics. This in their view further raises concerns in community participation at the design stage of low-cost housing units.

Griffith (1990) contends that in recent years the need for well-formulated, structured and formal systems of construction management to take into consideration aspects of performance, workmanship and quality has increased as a direct result of deficiencies and problems in design, construction, materials and components. Quite a number of problems, such as design and workmanship, which have been experienced in the building process, seem to be inadequacies ranging from small technical and aesthetic aspects to the major building defects.

Levey (2002) further states that the growing shortages of skilled workers, be it designers or construction managers and their labour, which began to appear in the 1980's in the United States of America, has reached dangerously low levels in today's construction industry. This concern remains one of the major challenges facing the industry, ultimately jeopardizing quality. Powell (1976) adds that quality would also be jeopardized due to the fact that there are no acceptable quality criteria for middle management and site management in speculative housing. These problems are known to cost the building industry hundreds of millions of rand annually due to mismanagement. Therefore it is said that many of these difficulties might be dealt with through greater care and attention to standards of performance and quality at the client briefing, design and construction stages which form part of the building process (Griffith, 1990).

1.2 Design

According to Griffith (1990), most of the blame for inadequate building performance and low quality work is placed on the designer. This however puts a lot of pressure on the designer, pressure such as a lack of awareness of the building processes; or for failing to understand the latest technology and the performance of innovative materials; or the reluctance to delegate authority to project-based supervisors; or simply for not spending more time on these building sites. However, Barrie and Paulson (1984) mention that designers generally recognize that no human undertaking the task produces absolutely perfect results. Therefore designers often specify not only the desired standard for the characteristics that define a product, such as dimensions or strength, but tolerance or ranges for acceptable variations from the standard. These standards therefore need to be maintained and quality of conformance monitored by the construction manager, who will also be held liable if quality standards drop.

Although these are said to be some of the faults the designers and construction managers on building sites tend to make, it is not them who are the only ones at fault. Clients in building may also be found lacking clarity regarding their desires and requirements since most often they find it difficult to decide what they want in terms of building performance and standards of quality (Griffith, 1990).

1.3 Workmanship

According to Zietsman (2004), when human error occurs at the setting-out stage of the construction process (which is the first physical activity in the chain of activities), the result might be very costly and the ripple effect down the chain of activities may be disastrous in terms of time constraints. Swain and Guttman (1983), found four types of errors in the construction industry. They are: time, qualitative, sequence and quantitative errors, which can take place. Time errors occur when a task must be performed within a specific time. Qualitative errors are such errors which include right action on wrong object, wrong action on right object, wrong action on wrong object, information not obtained/ transmitted or substitution/ intrusion error. Sequence errors however occur when an activity is done or performed out of sequence. Quantitative errors are errors which are made in rates, prices, and mathematical errors.

Building contractors should spend more time in structuring and planning their approach and organization in order to meet their requirements of quality rather than focus on progress. Barrie and Paulson (1984) further mention that planning forms the

standard upon which the project control system is based and by which future performance taking into consideration quality is judged. They should also pay greater attention to aspects of leading and motivating the workforce in order to achieve better workmanship (Griffith, 1990). The forms of building procurement and contract systems also affect the quality of building. In the traditional procurement approach each building professional acts in an independent role and also structures a project organization which shows that the main aim of contractual parties are partially to be blamed for project inadequacies instead of them integrating their resources and efforts in order to achieve project success (Griffith, 1990).

Griffith (1990) further states that the importance of quality and quality assurance based on designers, contractors and suppliers does not always question integrity and the intrinsic desire to provide a quality product or service, but focuses more on the requirements or demands to maintain or up their commercial portion of work available, or also the role they play in the fight to face and survive the marketplace. Quality, which is assured to any client, is a test of commitment of quality to which the product or service has been subjected.

To any consumer quality assurance is a cost effective means of obtaining a product of known quality, recognized performance and most of all a purchase which brings about better value for money (Griffith, 1990). To the manufacturer, building contractor or designer it is the way in which to demonstrate the confidence in a product or service shown to the industry and points out the importance and commitment given to achieving better quality and value. It is said that quality assurance is not always cost effective, but can be measured by the product's performance and whether the client or consumer is satisfied (Griffith, 1990).

When focusing on the issues such as the housing backlog, design faults, lack of skilled shortages and client manipulation, it is made clear that all these factors influence low-cost housing in South Africa currently. Due to this a problem statement and hypothesis is formulated to address these concerns and to find appropriate solutions and views.

1.4 Problem Statement

The problem to be investigated may be stated as:

Quality assurance in low-cost housing construction projects is not properly prioritised given the design and workmanship factors!

1.5 Hypothesis

The hypothesis to be tested in this analysis is:

Systematic focus on government, design processes and workmanship qualities in housing projects will result in effective quality assurance and an improved product.

1.6 Objectives

The objectives of this study therefore, are:

- i) To identify and compare the three procurement systems which are most relevant in this area of study, namely, Traditional, Design-and-build and the Management contracts in terms of making good decisions based on the task at hand, providing an excellent end product.
- ii) To identify possible problems relating to poor design processes, looking at parameters such as: the selection of inappropriate material, innovative designs, approval of defective products, client selected products and the quality of staff.
- iii) To identify possible problems relating to poor workmanship in the construction process, looking at parameters of time, cost and quality.
- iv) To identify the Quality Assurance mechanism currently available to construction practitioners.

1.7 Research Methodology

The methodology employed in this study comprises qualitative and quantitative research methods and involves a combination of both approaches. This includes:

- i) A literature review of previous research and subject matter on quality assurance in housing construction.
- ii) An analysis of the interaction (questionnaires) between low-cost housing home-owners. This is done in order to achieve their personal views on the homes which they have received, also giving one some guidance as to what solutions for better accommodation could be concluded and worked at.
- iii) A questionnaire survey to establish the opinions of local authorities (Building Inspectors etc.) based on the quality of low-cost housing in South Africa. This is done to ascertain whether there are different factual answers on the housing issue and if there are double standards.
- iv) An analysis of the results obtained from the questionnaire survey.

1.8 Significance of the Research Study

This study would examine the impact quality assurance has upon low-cost housing in South Africa, but more so in the Western Cape. This would be done in such a manner where factors such as design and workmanship will be thoroughly scrutinized in order to validate the hypothesis set. Furthermore, the expected outcomes of this research would be to see an improvement in quality assurance of low-cost housing projects and a better product for house occupants.

1.9 Limitations of this Research Study

- i) The research will be confined to the Western Cape (Delft) and Eastern Cape (Chatty Ext 3&4-1687 Units) regions.
- ii) The research will be limited to the low-cost housing sector due to logistical and time constraints. This may affect the interpretation of this research results due to illiteracy in these areas.
- iii) The research to be completed within a time frame of eighteen (8) months i.e. February to October 2010.

1.10 Structure of the dissertation

Chapter 1 comprises of the introduction and the background, and also includes the problem statement, hypotheses, objectives, methodology and significance of the proposal.

Chapter 2 of this research study will review literature concerning all the objectives established in order to validate each hypothesis set.

Chapter 3 will analyse the various research methods available, to obtain the required information and the choice of the most suitable research tools.

Chapter 4 researches instruments used to gather data via interviews and questionnaires.

Chapter 5 presents the research results, scenarios and factors which will affect data validity. These will be highlighted and an empirical analysis and testing of the hypothesis will be undertaken. This will be achieved via computations of questionnaires and interviews.

Chapter 6 presents the findings with recommendations and conclusion emanating from this study.

1.11 Definition of Terms

Social Housing: low-cost housing funded by government agencies e.g. Provincial Housing Board; to provide accommodation for low income households.

Quality Assurance: Attainment of a predetermined standard inherent in a product.

Benchmarking: Standards set for a certain level of quality.

Procurement: Mechanisms set in place for the purchases of goods and services.

Performance Criteria: Inherent factors through which a product or service renders its performance.

Tolerances: A margin of acceptable error that a product or services is allowed.

1.12 Chapter Summary

In conclusion, quality assurance is a broadly based aspect integral to the house building industry. It is however enlarged dramatically when examining low-cost housing. Therefore by analyzing each objective mentioned previously in this chapter, conclusions can be drawn around quality assurance in the low-cost housing sector which currently affects the South African construction industry.

Within the following chapter literature is gathered generating an overview on the objectives set.

Chapter 2

Literature Review

2.1 Introduction

In the previous chapter objectives were presented to identify possible problems relating to poor design processes and workmanship qualities in the construction processes relating to low-cost housing provision. The correspondence to quality standards were also raised in conjunction with time and cost factors, which affect design as well as construction simultaneously. The importance of quality assurance in low-cost housing construction has been extensively documented in journals and other reference materials. Opinions are many and varied. To give an overview of these perspectives, this chapter will review the relevant literature currently available, in particular on quality assurance and how it impacts the low-cost housing sector, workmanship, procurement, benchmarking and existing Quality Assurance systems.

2.2 Quality Assurance and the low-cost housing Sector

Quality Assurance plays a great role in the low-cost housing sector. Quality Assurance, in short refers to a program for systematic monitoring and evaluation of the various aspects such as design processes and workmanship characteristics of a project, to ensure that standards of quality are being met (Quality Assurance-Wikipedia, 2010). Quality Assurance systems cannot guarantee with absolute certainty the production of quality products, but makes this more likely.

According to Harrison (2005) the quality assurance systems currently implemented in the low-cost housing sector are:

- **Document Control:** To ensure employees have the correct procedures and that the procedures are properly maintained.
- **Audits:** To verify that quality procedures are being followed.
- **Non-conformance Tracking:** To monitor and track quality issues and that defects are kept from customers.
- **CAPA (corrective action and preventative action):** To correct flawed processes (i.e. quality procedures) when detected via audits and non-conformance tracking and to prevent defects from reoccurring.
- **Management Review:** Reviewing quality systems data (performance) (quality metrics) to determine if the quality system is working and if it is not, taking the appropriate action to improve the system.

When looking at these quality assurance systems, it is evident that they are structured allowing for various aspects in the design processes as well as construction processes to be thoroughly tested and checked for any flaws. These aspects are presented as follows.

2.3 Poor Design Processes

There are several aspects that can contribute to poor design processes and which can lead to design failure. They are: selection of inappropriate materials, innovative designs, approving a defective product, client selected products and quality of design staff (Sawczuk, 1996).

2.3.1 Selection of Inappropriate Materials

Greig (1971) states that the early settlers at the Cape used natural building materials, which they found near at hand, like stone and mud to make bricks and mortar, shells from Robben Island to make lime, reeds for thatch and timber from the forests which were then limited in extent.

Today everything is made of some material, but it is not only the properties of materials that dictate poor performance or the failure of structures. It is through the rational use of mechanics, linked with intelligent material choice-part of a process called design-which will assure success (Rossmanith, 1996).

Problems can arise when the designer selects an inferior product or a good product, but which is not suited to its specific application. This problem also arises because of the workload or inexperience of the designer, which leads to improper evaluation taking place of the product being specified. In addition, smaller design consultancies cannot afford to keep a full technical and product library and those that can will often have staff who still keep by their desk their own personal library which soon becomes outdated (Sawczuk, 1996).

The Institution of Civil Engineers (1990), in addition, mentions that among a group of research projects into build-ability undertaken at Loughborough University, one studied the source of build-ability problems. The identified stage in the design process where many design details giving difficulties originated was generally on the drawing board of young, inexperienced engineers, and the most common cause of this inadequate detailing was a lack of supervision. Therefore poor performance and inadequate quality in housing can result from a building 'fault' in design which

manifests during the life of a building, given certain precursors, as a 'defect' (Griffith, 1990).

2.3.2 Innovative Design

The early settlers at the Cape depended on the memories of rural buildings which they carried with them from Flanders, Germany and the Netherlands, and on their own skills which by trial and error gradually improved (Greig, 1971).

In today's lifestyle, designers like to produce modern computer-generated designs and in so doing, sometimes use materials in a way that they have not been used before or use new materials that have not been tried and tested. The risk of failure in one way or the other when incorporating innovative design is high and requires above-average skill and care from the designers themselves to succeed (Sawczuk, 1996). Douglas and Ransom (2007), postulate that, there is of course nothing wrong with introducing new products and processes in construction. The main requirement for doing so is that they are adequately tried and tested, and that those installing them are aware of any special fixing requirements. In addition to this, if the principal causes of quality problems include specifications that are incomplete or out of date, faulty calculations, incomplete or superseded drawings and design changes that are not transmitted to all parties; all may be improved through computer use (Stukhart, 1985).

2.3.3 Approving a Defective Product

It is generally accepted that, while the assessment of quality of construction is a subjective matter, quality can be measured against design drawings and specification (Kwakye, 1997).

Within specifications produced by the designer a product may be specified with the option for the contractor to offer an alternative product of equal standard and quality for approval. Complications come about when comparing the two products in every respect. Therefore the product that the designer specifies originally, is a product which the designer has confidence in. When the designer is offered an alternative product he or she must take great care in evaluating it. If this is not done, quality is compromised (Sawczuk, 1996). Furthermore when compromising quality, threats to structural failure are almost a certainty, which in turn is thought of as an unplanned or unintentional negative effect of one or a combination of faults, which leads to a shortfall in structural performance (Douglas and Ransom, 2007).

2.3.4 Client Selected Products

Kwakye (1997) postulates that some clients are well-informed when it comes to construction and hence know what they want and take decisive steps to achieve it. Some know nothing about construction and need help and guidance to formulate their wishes and match them to the available budget.

Now and then the client will select a particular product and ask the consultant (designer) to incorporate it into the project. The potential problem here is that the consultant is not aware of the product and that there is insufficient information available from the manufacturer to give the designer confidence in selecting the product. Alternatively the product could be of inferior standard and not appropriate to the application. Another scenario is if the project is over the budget which is available and the consultant is instructed to make cost savings by changing the specifications to a lower cheaper standard (Sawczuk, 1996).

2.3.5 Quality of Staff

The client is responsible for the selection of the design staff. This task should be carried out in a professional manner, with the same amount of care as in the selection of the contractor. Although some situations will demand prompt negotiation with a proven team, if circumstances allow, proposals should be sought from three to six consultants. The information submitted by the consultants should include the design and supervision methodology as well as a fee proposal (Ashworth and Hogg, 2002).

Sawczuk (1996) further states that the consultant should make sure that the people writing specifications and making product selections are of the appropriate calibre. The design team must be kept up to date with current standards, regulations and detailing applications. There must be in place some form of quality management with regime of checking all work leaving the office. Therefore if selection of inappropriate materials, innovative design, approving a defective product, client-selected products and quality of staff are not constantly examined, quality assurance will be compromised.

2.4 Poor Workmanship in the Construction Process

Although the factors contributing to poor workmanship in the design process have been previously mentioned, parameters such as time, cost and quality also impact its

sector. However, when focusing on problems concerning poor workmanship in the construction process these three parameters are pivotal (Chan and Chan, 2004).

2.4.1 Time

Buildings are long-lived capital assets. The period between decision and action, inception and occupation, use and obsolescence is rarely measured in months, usually in years or decades and occasionally, in centuries. More than in almost any other aspect of human activity, time is central to design, production and use of the built environment (Raftery, 1991).

Chan and Chan (2004) postulate that time in the construction industry refers to the duration for completing the project. It is scheduled to allow the building to be in use by a date determined by the client's future plans. In addition, time is related to effectiveness, which in construction refers to how well the project was implemented or the degree to which targets of time and cost were met from the start-up phase to full production. Ashworth and Hogg (2002) mention that project duration or completion dates may be critical to the success of a project, and in some situations if these dates are not met due to poor workmanship, it could lead to total failure in meeting the clients objectives.

Ashworth and Hogg (2002) further state that while most clients desire early building completion, it is important to distinguish between this and true need since attempting to meet the objectives of early completion is likely to have consequences such as poor workmanship which is not a project requirement. In conjunction with this, unrealistic deadlines and bonus work encourages workers to rush their jobs, which often leads to unnecessary mistakes or skimping on standards (Douglas and Ransom, 2007). In general, clients could have the highest standards specified for their projects but through time constraints which contribute to poor workmanship; this will bring about a low quality product (Sawczuk, 1996).

2.4.2 Cost

The cost of a commodity, whether it be a simple one like a length of timber or a complex item like a building, is the sum of all payments made to the factors of production engaged in the production of that commodity (Raftery, 1991).

Oakland and Marosszeky (2006) mention that when manufacturing a quality product, providing a quality service, or doing a quality job- one with a high degree of customer

satisfaction- is not enough. The cost of achieving these goals however must be carefully managed, so that the long-term effect on the business, be it construction, is a desirable one. These costs are a true measure of the quality effort.

When reducing cost in any construction project, workmanship and ultimately quality is compromised (Sawczuk, 1996). Ashworth and Hogg (2002) however postulate that if a limited capital budget is the prime consideration of the client, then the quality in the form of reduced specifications as well as workmanship is likely to be restricted. If the clients cost increases, a higher standard of workmanship will be specified (Ashworth and Hogg, 2002).

Regular cost reports should be produced throughout the construction stage of the project. From these, potential overspending can be identified before it occurs and corrective action taken. The client should however, recognise that such corrective action is not always beneficial since it is likely that cost savings can be made only by reduction in standard which includes a lower standard in workmanship produced (Royal Institution of Chartered Surveyors, RICS Foundation, 2002).

2.4.3 Quality

The word quality has many meanings: a degree of excellence; conformance with requirements; fitness for use; delighting customers; freedom from defects, imperfections or contaminations (Hoyle, 2006).

Chan and Chan (2004) confer that in the construction industry, quality is defined as a totality of features required by a product or service to satisfy a given need- “fitness for purpose”. However the way in which quality is determined is by the extent to which a product or service successfully serves the purpose of the user during usage (not just at the point of sale). Price and delivery are both transient features, whereas the impact of quality is sustained long after the attraction or the pain of price and delivery has subsided (David Hoyle, 2006). Nowadays, quality is the guarantee of the product that convinces the customer or the end-user to purchase or use. The meeting of specifications by good workmanship is one way of measuring quality.

Specifications act as workmanship guidelines provided to the contractor by the client or the client’s representative at the commencement of the project. If quality assurance mechanisms, such as benchmarking is not in place during construction, poor workmanship will be the end result affecting the quality directly (Ashworth and

Hogg, 2002). Therefore poor workmanship affecting the quality of the end product is a direct link to time constraints and cost reductions made by certain clients. Additional problems contributing to poor workmanship in construction are problems such as lack of motivation, control and coordination between the main contractor, consultants and the client. Furthermore, when focusing on poor workmanship in the design and construction processes it brings to mind the selection of the correct procurement system to ensure smooth construction production (Pheng and Hwa, 1994).

2.5 Procurement

According to Harrison (2005) the need for construction quality assurance is easy to demonstrate, due to lawsuits, project delays, finger pointing, lost time and other costs of quality issues in newspaper and industry journals which have taken place for the past years. Many of these issues pointed to the low-cost housing sector. Harrison (2005) in addition confers that quality assurance systems in the Low-Cost sector plays a fundamental role in the know how and the ways in which government, housing contractors and sub-contractors implement and use the procurement systems at hand. This creates a better systematic approach to the procurement systems in the paragraphs which follow.

Ashworth and Hogg (2002) postulate that procurement is the process which is utilized to deliver construction projects. The RICS Foundation (2002) adds that procurement facilitates the formal configuration and realization of a project, where a project is defined as the investment of resources for return. In the context of construction, procurement deals with the arrangements for acquiring construction goods and facilities by various clients, be it private individuals, corporate establishments or public institutions. Construction procurement from the 1960s has grown in the sense whereby all public jobs and most private jobs were offered on just competitive tendering to having various alternatives. Currently there are several forms of procurement systems in place within the construction industry. They are: separated and co-operative arrangements, management-orientated procurement systems, integrated arrangements and discretionary systems (Fotwe and McCaffer, 2007).

The figure below represents alternative procurement routes for clients in the construction industry.

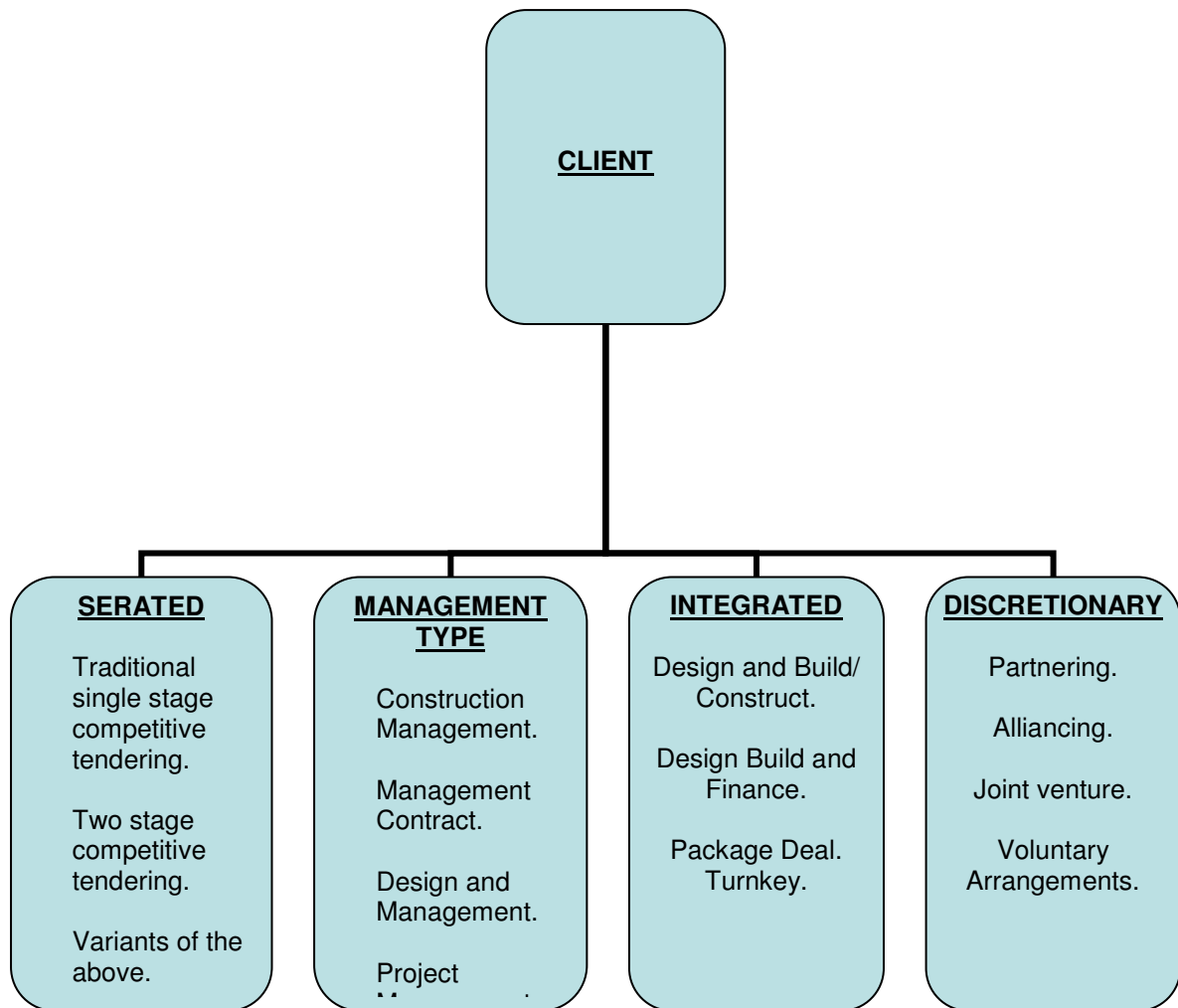


Figure 2.1 **Procurement Routes**

Sources: **Edum-Fotwe and McCaffer (2007)**.

Ashworth and Hogg (2002) further state that clients who have made the major decision to build are responsible for procuring the construction works that they require. This process may be a daunting prospect, given the level of financial commitment and other risks associated with the venture. However, if the client has more information on procurement systems, the decision making process will be more comfortable.

In addition to this, The RICS Foundation (2002) mentions that the choice of procurement route is intrinsically and strategically linked up with the best value and value for money. Procurement strategies and contract strategies are not tactical choices within projects. They are in fact linked with the management and legal

frameworks which are set up for risk, the delivery of functionality in the design and construction stages and the relationship between time, cost and quality.

Simultaneous to this, the Queensland Government (2006) mentions that when the time and cost factors have significant constraints on projects, but more so a low-cost housing project, a non-traditional procurement system may be appropriate. The Queensland Government (2006) further adds that if quality is a high priority and requires maximum control, then agencies should retain the management of consultants. Unless the constraints of time and cost are critical, a traditional approach should be considered.

2.5.1 Traditional Procurement

The RICS Foundation (2002) mentions that under the traditional procurement system, design should be completed before tenders are invited and the main construction contract is awarded. Franks (1998) confirms that the design should be fully developed before the bills of quantities and subsequently, tenders are prepared. If not, excessive variations and disruption of works are likely to occur. As a result, and assuming no changes are introduced, construction costs can be determined with reasonable certainty before construction starts (RICS Foundation, 2002). In addition to this the contractor will assume responsibility and financial risk for the building work while the client will take responsibility and the risk for the design team performance. Therefore, if the contractor's works are delayed by the failure of the design team to meet their obligations, the contractor may seek recompense from the client for additional costs and/or time to complete the project. In turn, the client could also seek to recover these costs from the design team members responsible if negligence can be proved (RICS Foundation, 2002).

The RICS Foundation (2002), further states that, clients who are involved in the construction industry are able to influence the development of the design to meet their needs because they have a direct contractual relationship with the design team. As the physical construction process begins, there is normally a single contractual relationship between the client and the main contractor. This, however, gives the client the ability to influence, but not control the construction process. In addition it is mentioned that the key features of this form of procurement is the separation of the design and construction process (Ashworth and Hogg, 2002).

Franks (1984) states that the separation of the design and construction processes tend to foster a “them and us” attitude between the designers and contractors which reduces the team spirit, which is pivotal for the satisfactory conclusion of a building project. Franks (1984) further mentions that lines of communication under traditional procurement between the parties tend to be tenuous and the interests of all involved in the project may suffer as a consequence contributing to problems affecting quality assurance. To conclude, the Queensland Government (2006) stipulates that the traditional procurement is best suited or used in projects when the construction commencement and completion times are not as critical as overall cost and quality, giving the agency more control over project quality, aesthetics and utility by directing its design consultants.

The table below represents the advantages and disadvantages of the Traditional Procurement System.

Table 2.1 **Traditional procurement**

<u>Procurement Systems</u>	<u>Advantages</u>	<u>Disadvantages</u>
<u>Traditional Procurement</u>	A high level of price certainty for the client.	A relatively lengthy time from inception to start on site.
	Accommodates design changes and aids the cost management process.	Problems relating to design error. The risk relating to the design lies with the client. Post-contract design changes are frequently abundant and resultant delays and disputes are common.
	Relatively low tender preparation costs. In addition, subject to the status of the tender documents, high tender quality.	Lack of involvement of the constructor in the design process.

Source: Ashworth and Hogg (2002).

2.5.2 Design and Build

The traditional procurement system has been responsible for a number of problems such as those relating to design error as well as the lack of involvement of the contractor in the design process. However in the design and build system, these problems can be solved by integrating these two separate functions within a single organisation. This single firm is generally known as the contractor. In this system the client approaches the contractor directly without approaching the architect. With this method of procurement the contractor accepts the risk for the design element of the project (Ashworth and Hogg, 2002).

Under this system a single point of responsibility is provided to the contractor so that in the event of building failure the contractor is solely responsible. There can be no question of “passing the buck” between architect and builder as has so often been the case in the past. The client’s interests are safeguarded in this respect (Franks, 1984).

Ashworth and Hogg (2002) further state that under this system, the contractors are invited to tender on the basis that the contractor will be fully responsible for designing and constructing the project and will submit a bid, which will include design and price information. The contractor’s proposal will then be examined by the client and the project subsequently let. Under this system, clients may need to balance their conflicting desires to both direct design and transfer full design risk to the contractor. Franks (1984) further mentions that the nature of the design and build system tends to restrict changes from the original design and disruptions of the works is less likely to occur. Therefore, according to, the Queensland Government (2006) this procurement system is best suited to projects when:

- The construction commencement and completion times are required earlier than may be achievable under the traditional system;
- Innovation in design is desirable (all tenderers submit design proposals for consideration); and
- Cost certainty is required at the commencement of the design and construction phase.

The table below represents the advantages and disadvantages of the Design and Build Procurement System.

Table 2.2 **Design and Build**

<u>Design and Build</u>	<u>Advantages</u>	<u>Disadvantages</u>
	The client has only to deal with one firm.	There is no design overview unless separate consultants are appointed by the client for this purpose.
	Inherent build-ability is achieved.	Difficulties can be experienced by clients in preparing an adequate brief.
	Price certainty is obtained before construction starts.	Bids are difficult to compare since each design, programme and cost will vary.
	Reduced total project time due to early completion is possible because of overlapping activities	Design liability is limited by the standard contract.

Source: **Ashworth and Hogg (2002)**.

2.5.3 The Management Contract

Sawczuk (1996) confers that, under this system the client appoints the managing contractor at an early stage so that the contractor's expertise can be brought in to assist the development of the project during the procurement phase. The basis of appointment of the managing contractor under this system will be on a free basis which will be either on a percentage of the total cost of the project under his control or alternatively a fixed sum.

Although the management contractor does not directly design or construct any part of the permanent works he or she as previously mentioned does give expert advice on construction techniques such as on-site knowledge, for example knowing in what sequence to construct in order to avoid the design of sections or elements that will be problematic to produce (Kwakye, 1997).

Kwakye (1997) further states that, under the management contract the management contractor seeks to meet the design requirements by the provision of specified common user and service facilities for example, tower cranes and site offices and letting each element of the project to a number of subcontractors in the work package. Generally, under this system, the management contractor is responsible for the smooth running of the project within time, cost and quality parameters.

The management contract is frequently used when time is a critical factor as it allows design to overlap construction activities. This is particularly useful if the client is not able to define fully their requirements at the outset. Furthermore there is additional scope for improved quality of design because there is greater opportunity for the design team and specialist contractors to work together to improve quality and buildability (Sawczuk, 1996).

The table below represents the advantages and disadvantages of the Management Contract Procurement System.

Table 2.3 **Management Contract**

<u>Management Contract</u>	<u>Advantages</u>	<u>Disadvantages</u>
	Early involvement of the management contractor.	Commitment prior to full design.
	Accommodates later design decisions.	Increase in client risk. E.g. delays, defective work, claims from other works contractors.

Source: Ashworth and Hogg (2002).

The table below represents the ratings of the three Procurement Systems mentioned above.

In Table 2.4 on page 21 a rating system is used to define the various categories mentioned. On a table from 1-5 the rating is specified as follows: 1- Bear Minimal; 2- Minimal; 3-Moderate; 4-Bad; 5-Worse. What the table stipulates is that, the procurement system with the least value is the most appropriate system to put in use under the below performance requirements and expectations.

Table 2.4 **Comparative Analysis (Procurement Systems)**

<u>Clients performance requirements/ expectations</u>	<u>Traditional Procurement</u>	<u>Design and Build</u>	<u>Management Contract</u>
Minimum risk	4	1	5
a) Technical complexity: the project has a high level of structural, mechanical services or other complexities.	4	5	4
b) High aesthetic or prestige requirements.	5	3	3
c) Economy: a commercial or industrial project or project with minimum cost is required.	3	4	4
d) Time is of essence: early completion of the project is required.	2	4	5
e) Exceptional size and/or administrative complexity: involving varying clients/user requirements, political sensitivity, etc.	2	4	4
f) Price certainty: is required at an early stage in the project's design development.	4	2	4
g) Facility for change/variation control by client, users or others during the progress of the works.	5	5	1

Source: Franks (1998).

The table below indicates the risk allocation to the client and contractor in the various procurement systems

Table 2.5 **Indicative Risk Allocations**

<u>Procurement System</u>	<u>Client</u>	<u>Contractor</u>
Traditional Procurement	±25% Risk	±75% Risk
Design and Build	±10%Risk	±80%Risk
Management Contract	±75%Risk	±25%Risk

Source: **The Scottish Government (2005).**

When comparing these three procurement systems it is essential to compare “like with like”. Each system has been developed to meet particular client needs, therefore if one seeks the system which best meets the clients performance requirements in broad terms, the rating represented above will provide a guide for ranking (Franks, 1998).

As the factors of poor workmanship in the design and construction process have been reviewed and the three procurement systems have been identified and rated, it is essential to discover the quality assurance mechanisms in place (Pheng and Hwa, 1994).

2.6 Benchmarking

According to Alarcon and Serpell (1996) there is still a consensus around researchers and the construction industry experts, that one of the principal barriers to promote improvement and sustainability in construction projects is the lack of appropriate performance measurements. Alarcon and Serpell (1996) further mention that for continuous improvement to occur it is quite pivotal to have performance measures in place in order to check and monitor these performance, to also verify changes and the effect of improvement actions, to understand the variability of the process and in general it is a necessity to have objective information readily available in order for any construction company to make effective decisions.

Mohamed (1996) confers that the ever-rising customer requirements and expectations have increased demands for continually introducing improvements in the cost, timing and quality of the construction output. With competitors in construction increasing at a vast rate, construction organizations all around the globe are enhancing their competitive position by improving their performance and in

addition setting new operating targets and standards for the national market. This dynamic mechanism and the well-known fierce national competition have raised the awareness of performance measurement known as benchmarking among the majority of construction organizations.

According to Alarcon and Serpell (1996) benchmarking is considered to be a new topic within the construction industry. Alarcon and Serpell (1996) further mention that to this day there is almost no available information that describes the potential that benchmarking offers to construction. However Kyro (2003) states that benchmarking has established its position as a tool to improve organizations performance and competitiveness. Kyro (2003) defines benchmarking as the process of evaluating and applying best practices that provide possibilities to improve the quality of work. Kyro (2003) further mentions that benchmarking is an evolving concept that has developed since the 1940's towards more sophisticated forms. He proposes that it has undergone five generations. McCabe (2001) adds that many of the techniques directly associated with benchmarking may have their roots in the so-called quality movement of the 1980's, but the concepts which underpin them are a lot older.

MacCabe (2001) explains that records show that the Egyptians used benchmarks in construction work, by cutting a notch in a lump of stone at accurately determined points, while a flat strip of iron would then be placed horizontally in the incision to act as the support (bench) for a levelling staff. Using this as a reference (mark) further heights and distances could be measured. While the term benchmark may have changed to a more contemporary meaning, at its heart it is still the fundamental principle of being able to measure in a definitive way, in order to improve quality standards (McCabe, 2001).

Mohamed (1996) mentions that in construction benchmarking is not a straight forward task due to both the very nature of the industry which lacks solid data-gathering and the remarkable fluctuation in productivity. In construction benchmarking attempts always run a risk of facing certain difficulties such as incomplete or non-existing data (plans incomplete). Even if the data was complete or did exist, benchmarking would be highly dependable on project size, type and budget. Therefore, it is difficult to use it effectively as a basis for comparison. Benchmarking only works if consistent methods of measuring the performance of operations can be developed and introduced.

The principle of benchmarking and best practice in construction is based on the assumption that there is a number of approaches in order to carry out any task and that these tasks involve certain processes. Figure 2.2 below illustrates a typical process, therefore improvement in quality standards can only take place if there is a set standard (benchmark), and in order to know if the changes have made a difference, measurement is essential (McCabe, 2001).

The figure below illustrates a Typical Process (McCabe, 2001)

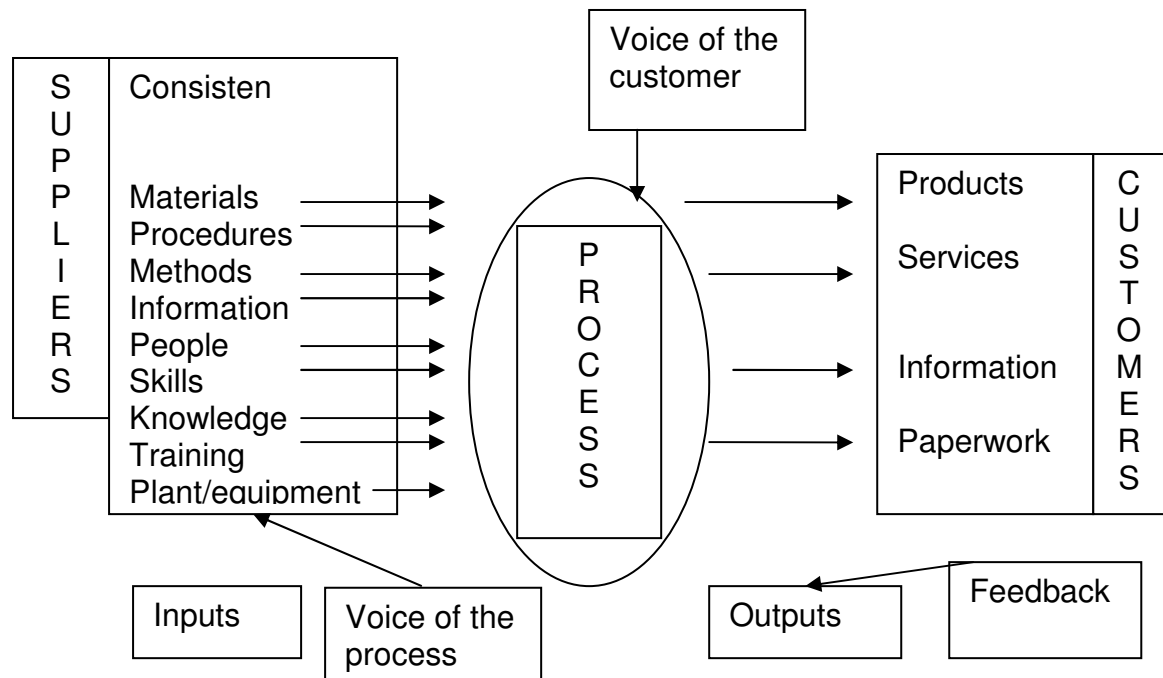


Figure 2.2 **Benchmarking Process**

Source: McCabe (2001).

Therefore the RICS Foundation (2002) postulates that when focusing on benchmarking there can be various benchmarking objectives such as:

- Internal detail comparisons
- Competitors internal detail comparisons
- Competitors distinctive capabilities comparisons
- Competitors external detail comparisons
- Industry- wide external detail comparisons
- Out- of- industry external detail comparisons
- Internal dynamic environment comparisons
- Competitors dynamic environment comparisons
- Industry-wide dynamic environment comparisons
- Out-of- industry dynamic environment comparisons

The table below illustrates proposed project performance parameters

Table 2.6 **Proposed Project Performance Parameters**

RESULTS	PARAMETERS	UNITS
Cost	Cost variation	Actual cost/Budget cost
Scheduled duration	Scheduled variation	Actual duration/Planned duration
Quality	Rejection of work	% Sample rejections
Scope of work	Change in scope of work	Change orders/Budget cost
PROCESS	PARAMETERS	UNITS
Procurement	Delivery time	Delivery cycle time
	Compliance work/specs	% compliance work/specs
Construction	Labour (Man Hours)	Actual labour Man Hours vs Planned Man Hours
	Productivity	Actual vs Planned
	Rework	Rework Man Hours/Total Man Hours
	Material waste	% Material waste
	Equipment	% stand by hours
	Activities at planned rate	% activities working at planned rate
Planning	Planning effectiveness	% Planned Activities Completed
Engineering Design	Design changes	Number of changes/Total number of drawings
	Errors/ Omissions	Number of errors/Total number of drawings
OTHER VARIABLES	PARAMETERS	UNITS
Occupational Health & Safety	Accident frequency	Number of accidents*100/ Total number of workers
	Risk rate	Number of days lost*100/ Annual Average of workers
Subcontractors	Subcontracted Man Hour	% Man Hours subcontracted
	Subcontracted Rates	% of cost subcontracted
Others		

Source: Alarcon and Serpell (1996).

Alarcon and Serpell (1996), further postulate that the collection of the information on these performance parameters expressed in table 2.6 will allow, as the database grows, to statistically study the existing correlations among results, characteristics and intermediate processes of projects and to develop models in order to explain the existing casualties; all of which will help to recognize the sources of success and failure in not only construction, but low-cost housing projects. In this way it is possible to put extreme focus on accurate studies of operational benchmarking in order to identify best practices for the industry to improve as a whole.

2.6.1 Types of Benchmarking

McGeorge and Palmer (1997) state that there are three types of benchmarking; they are: internal, competitive and generic benchmarking.

2.6.1.1 Internal Benchmarking

Internal Benchmarking is where a construction organization aims towards identifying improvement areas within its structure through comparing its business operations with those of others who do things better, thus setting new targets to meet (Mohamed, 1996). McCabe (2001) confers that internal benchmarking is the most straightforward of the three types, because it is carried out inside the organization. When focusing on internal benchmarking, it may be discovered that a particular department is able to perform better than others. McGeorge and Palmer (1997) further state that internal benchmarking allows best practice that exists within the organization to be identified and installed company-wide. An example of internal benchmarking would be a construction company comprising of a major works division, a housing division and a refurbishment division and comparing the way the three divisions deal with the hiring of plant.

2.6.1.2 Competitive Benchmarking

Competitive benchmarking is a comparison between the processes of companies operating within the same industry (McGeorge and Palmer, 1997). Therefore if a competitor of the same industry suddenly gains a competitive advantage for example selling goods at a cheaper rate or to a higher specification, other companies will be forced to follow or meet the same standard (McCabe, 2001). The problem however with competitive benchmarking is that because it deals with the companies operating in the same industry, best practice of a competitor is not necessarily good enough. For example, a construction company can have an excellent reputation for design

and build projects, due to no direct follow-on from this; this does not mean their estimating processes are any better than others (Mohamed, 1996).

2.6.1.3 Generic Benchmarking

According to Mohamed (1996) generic benchmarking is when the industry as a whole attempts to increase productivity through tools and techniques developed and successfully used by other industries applicable to construction. The advantage of generic benchmarking however is that it breaks down the barriers to thinking and offers a great opportunity for innovation. The disadvantage is that it can be difficult, time-consuming and expensive (McGeorge and Palmer, 1997).

2.6.2 Benefits of Benchmarking (RICS Foundation, 2002)

1. Competitive Advantage via:

- Integration
- Flexibility
- Speed: improved cycle times
- Quality: reduction in defects
- Cost reductions
- Customer focus: delivering client expectations
- Improved image and reputation

2. Profitability via:

- Increased opportunity
- Cost reduction
- Reduced wastage
- Reduced re-work

3. New Market via:

- Differentiation
- Focus
- Niche

4. New Products and Services via:

- Segmentation
- Specialization

With all that was mentioned concerning the different groups of benchmarking it is quite evident that when one takes a closer look at the construction industry, it is made clear that the most dominant form of benchmarking methodology used to date

is that of Competitive Benchmarking. This is primarily so due to the many competitive elements which limit room for error.

2.7 Chapter summary

When taking into consideration procurement systems, project parameters such as time, cost and quality as well as benchmarking, it is clear that the construction industry can learn from these sectors in order to produce a best practice product which incorporates good quality as well as quality assurance (RICS Foundation, 2002). It is also quite evident that these factors will improve design processes and workmanship qualities in the construction processes of low-cost housing projects.

Furthermore from all the information gleaned from the literature expressed in this chapter it is evident that procurement is quite pivotal in ensuring quality, but more so quality assurance. The impact of poor workmanship in the construction process as well as the design sectors brings forth a major concern when focusing on quality. It is however two of the major sectors which require significant attention if quality is to be integral to construction projects. Benchmarking also comes into play as a key area through which contractors, consultants as well as government can set desirable levels which are attainable, bearing in mind that all three entities should run on the same wavelength, which is difficult taking into consideration their backgrounds. Therefore to achieve ultimate quality all these areas need to join forces and should act in accordance with best practices and within accepted minimum standards which are evident in current construction in South Africa.

Chapter 3

Research Methods

3.1 Introduction

In chapter 2 an overview of existing literature was presented. It was established that there are many viewpoints which lead to problems concerning quality assurance in housing construction, but more so the low-cost housing sector. These viewpoints however, do not only reflect negativity but in fact brings about a sense of prosperity, reason being that South Africa itself is still undergoing tremendous development and growth which comes with time, leading to a lifestyle upliftment to people inadequately accommodated

In order to test the hypothesis relating to quality assurance the two research methodological approaches (Qualitative and Quantitative) as well as research tools (Questionnaires, surveys, Interviews, case studies and triangulations) available will be presented and analyzed to accomplish the validity of the hypotheses set in the first chapter. This will be done to ascertain the most appropriate methodologies for this research study.

3.2 Qualitative Research Methodology

Qualitative research methodology is recent; it did not ascend to prominence in the professional literature until the 1960's (Leedy, 1993). Thomas (2003) postulates that qualitative research is a multimethod in focus involving an interpretive, naturalistic approach to its subject matter. However, it is also a creative scientific process that necessitates a great deal of time and critical thinking, as well as emotional and intellectual energy (Leedy, 1993). According to Jackson (2008) when making use of qualitative methods, researchers are typically not interested in simplifying, objectifying or quantifying what they observe. Instead when researchers conduct qualitative studies more interest is given to interpreting and making sense of what has been observed (Jackson, 2008). Jackson (2008) further mention that when using this method, researchers may not necessarily believe that there is a single "truth" to be discovered, but instead that there are multiple positions or opinions that have some degree of merit. Leedy (1993) further mentions that qualitative research is not slovenly, undisciplined, "soft" research, but creative scholarship at its best.

This research study however incorporates the qualitative research method in both the questionnaires (Questionnaires delivered by hand) as well as the standardised open-

ended interviews conducted. Much emphasis is given to this research method to accumulate theoretical and partially emotional responses from the respective respondents. Questionnaires (Questionnaires delivered by hand) are also used in this research study to accommodate for the time constraints.

3.3 Quantitative Research Methodology

According to Leedy (1993) quantitative methodologies manipulate variables and control natural phenomena. It constructs a hypothesis and “tests” it against the hard facts of reality. Of all quantitative hypotheses, the null hypothesis is perhaps the most often tested: the researcher decides what factors or variables might cause certain results (cause and effect) and carries out tests to either support or reject the null hypothesis at some level of statistical probability. The whole process is cold calculating and deductive logic from the positioning of a hypothesis to supporting or not supporting it.

In addition Thomas (2003) confers that quantitative research seeks explanations and predictions that will generalize to other persons and places. Careful sampling strategies and experimental designs are aspects of quantitative methods aimed at producing generalizable results. In quantitative research the researchers’ role is to observe and measure, and care is taken to keep the researchers from “contaminating” the data through personal involvement with the research subjects. Maree (2007) further adds that when making use of the quantitative research methodology, the sample sizes are usually large and are ideally randomly selected from a larger population in order to generalise the results to the specific population. The major quantitative designs include experimental, quasi-experimental, correlational and survey research designs (Maree, 2007). Researchers “objectivity” is of utmost concern.

This method is also incorporated into this study and is evident in the questionnaire (Questionnaires delivered by hand) survey. The method is utilized in order to achieve certain statistical outcomes, outcomes which would be of assistance to ascertain further theoretical recommendations and conclusions

3.4 The Questionnaires

Leedy (1993) defines a questionnaire as a commonplace instrument for observing data beyond the physical reach of the observer. Leedy, (1993) further mentions that a questionnaire, like the Geiger counter, is a totally impersonal probe. Melville and

Goddard (1996) confer that a questionnaire is a printed list of questions which respondents are asked to answer. These instruments are commonly used and as commonly abused.

According to Blaxte *at el* (2006) the data which is collected by questionnaires may be qualitative or quantitative. Blaxter *at el* (2006) further mention that questionnaires do however lend themselves more to quantitative forms of analysis. This is partly because they are designed to collect mainly very discrete items or packages of information, with either numbers or words which can be coded and represented as numbers. Blaxter *at el* (2006) in addition mention that this emphasis is also partly due to the larger scale of many questionnaire surveys, and their common focus is on representation, which encourages a numerical or quasi-numerical summary of results.

Greenfield (2002) postulates that in designing a questionnaire the first step is to develop specific questionnaire items for the concepts that are employed in the research question. This involves translating what are often vague and abstract concepts into specific and concrete indicators of the concepts. This process involves “descending the ladder of abstraction” which includes:

- Defining the concepts;
- Identifying different dimensions of the concepts;
- Identifying sub-dimensions;
- Developing indicators for these dimensions/ sub-dimensions.

Greenfield (2002) further mentions that there are eight principles to guide the design of questionnaire items and they are:

- Reliability;
- Validity;
- Discrimination;
- Response Rate;
- Same meaning for all respondents;
- Relevance;
- Exhaustiveness;
- Inclusiveness.

In a questionnaire there are two types of questions, open (or unstructured) questions and closed (or structured) questions which may be asked. The difference between the two is as follows: Open (or unstructured) questions are used in a preliminary

survey or to get a feel for the subject. Here the respondents answer questions in their own words, whereas closed (or structured) questions are used in large-scale data collection. Here respondents choose from a collection of alternatives (e.g. true/false) or assign a numerical score or ranking. Closed questions often use for point scales, for example:

Table: 3.1 **Closed Questions**

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

Source: Melville and Goddard (1996).

According to Melville and Goddard (1996) a good questionnaire:

- Is complete: gets all the data needed;
- Is short: does not abuse the respondents time or concentration;
- Asks only relevant questions;
- Gives clear instructions;
- Has precise, unambiguous and understandable questions;
- Has objective questions: does not suggest answers;
- Starts with general questions;
- Has appropriate questions: if sensitive questions need to be asked, put these at the end;
- Uses mostly closed questions, often with a 4-point scale.

3.4.1 Types of Questionnaires

3.4.1.1 Mailed Questionnaires

According to De Vos (1998) a mailed questionnaire is one which is sent off by mail in the hope that the respondent will complete and return it. However this does not always happen, actually, a response rate of 50% is considered as adequate, 60% as good and 70% as excellent. Mailed Questionnaires are in fact the survey technique most frequently used (De Vos, 1998).

3.4.1.2 Telephonic Questionnaires

When attempting this kind of questionnaire the researcher and the respondent are physically removed from each other, but are able to communicate with each other about the contents of the questionnaire. As this questionnaire is executed the

communication is handicapped in that no non-verbal communication is possible (De Vos, 1998).

3.4.1.3 Personal Questionnaires

This form of questionnaire is handed over to the respondent who completes it on his or her own, with the availability of the researcher if any problems are experienced. With the personal questionnaire the researcher limits his own contribution to the completion of the questionnaire to the absolute minimum (De Vos, 1998).

3.4.1.4 Questionnaires delivered by hand.

According to De Vos (1998) this questionnaire is self-explanatory, whereby the questionnaire is delivered by hand to the respondents, which can be completed by the respondents in their own time. De Vos (1998) adds that, a date for collection of this data is to be agreed upon by the researcher and the respondents. The time period between delivery and the collection of this questionnaire should preferably not be more than 48 hours (De Vos, 1998).

3.4.1.5 Group-administered questionnaires

De Vos (1998) postulates that in this form of questionnaire, respondents who are present in a group complete the questionnaire or questionnaires on their own. Preferably each respondent should receive the same stimulus and complete his own questionnaire without discussion with the other members of the group (De Vos, 1998).

3.4.2 Advantages and Disadvantages of a questionnaire

According to Kumar (1999) the advantages and disadvantages are:

3.4.2.1 Advantages

- It is less expensive
- It offers greater anonymity

3.4.2.2 Disadvantages

- Limited application
- A low response rate
- Self-selected bias
- Lack of opportunity to clarify issues

- Spontaneous responses are not allowed for mailed questionnaires
- The response to the questions may be influenced by the response to other questions.

3.5 Survey Research

Greenfield (2002) states that survey research and questionnaire research are not the same thing. Although questionnaires are frequently used in surveys, there is no necessary link between surveys and questionnaires. There are two distinguishing characteristics of surveys and they are: the form of data and the method of data analysis. Neither of these features requires questionnaire-based data collection: in-depth interviews, observations, content analysis and so forth can also be used in survey research.

In survey research survey methods involve gathering information about the current status of some target variable within a particular collectivity, then reporting a summary of the findings which includes data in a questionnaire form (Thomas, 2003). MacMillan and Schumacher (2001) mention that surveys are used to learn about peoples attitudes, beliefs, values, demographics, behaviour, opinions, habits, desires, ideas and other types of information. Surveys are frequently called upon in business, politics, government, sociology, public health, psychology and education because accurate information can be obtained for large numbers of people with a small sample. Furthermore Blaxter, Hughes and Tight (2006) postulate that survey research involve systematic observations or systematic interviewing. It is known that they ask the questions which the researcher wants answered, and often dictate the range of answers that may be given. The standardization of survey research lies at the heart of it, and the whole aim is to get consistent answers to consistent questions.

According to Greenfield (2002) there are two types of surveys and they are: descriptive and explanatory surveys. In descriptive surveys the questions would include the word “(what)”, whereas in explanatory surveys the questions will include the word “(why)”. An example of a descriptive question is as follows: What is the average length of time teachers use to prepare lessons? However an example of an explanatory question is: Why do some principals send regular letters to parents and other principals rarely send letters?

3.5.1 Advantages and Disadvantages of Survey Research

According to Blaxter, Hughes and Tight (2006) the advantages and disadvantages to survey research are:

3.5.1.1 Advantages

- With an appropriate sample, surveys may aim at representation and provide generalized results.
- Surveys can be relatively easy to administer and need not require any fieldwork.
- Surveys may be repeated in the future or in different settings to allow comparisons to be made.
- With a good response rate, surveys can provide a lot of data relatively quickly.

3.5.1.2 Disadvantages

- The data, in the form of tables, pie charts and statistics, become the main focus of the research report, with a loss of linkage to wider theories and issues.
- The data provide snapshots of points in time rather than a focus on the underlying processes and changes.
- The researcher is often not in a position to check first-hand the understandings of the respondents to the questions asked. Issues of truthfulness and accuracy are thereby raised.
- The survey relies on breadth rather than depth for its validity. This is a crucial issue for small-scale researches.

3.6 Interviews

According to Blaxter, Hughes and Tight (2006) the term interview is applied to one-to-one interactions, to one-to-many interactions and to many-to-many interactions; its applied to interactions where the researcher has a prepared list of questions and to interactions where the researcher has none; its applied to data collection with and without props, about past, present, future and hypothetical settings and numerous other facets.

3.6.1 Strengths and Weaknesses of Interviews

According to Thomas (2003) the strengths and weaknesses are:

Strengths

- Face to face encounters with informants;
- Large amounts of expansive and contextual data quickly obtained;
- Facilitates cooperation from research subject;
- Useful for discovering complex interconnections in social relationships, and
- Data is collected in a natural setting.

Weaknesses

- Time consumption;
- Ineffective method to gather trustworthy information.

3.6.2 Types of Interviews

3.6.2.1 Informal Conversational Interviews

In this form of interview questions emerge from the immediate context and are asked in the natural course of things. There is no predetermination of question topics and wording (Greenfield, 2002).

3.6.2.2 Interview Guide Approach

Under this form of interviewing topics and issues to be covered are specified in advance, in outline form. The interview also decides the sequence and wording of questions in the course of the interview (Greenfield, 2002).

3.6.2.3 Standardised Open-Ended Interviews

Here the exact wording and sequence of questions are again determined in advance. All interviewees are asked the same basic questions in the same order (Greenfield, 2002).

3.6.2.4 Closed Quantitative Interviews

Questions and response categories are determined in advance. Responses are fixed: the respondent chooses from among these fixed responses (Greenfield, 2002).

3.7 Case Studies

There are a number of definitions and understandings about what case study research is all about.

According to Thomas (2003) a case study consists of a description of an entity and the entity's actions. Frequently case studies also offer explanations of why the entity

acts as it does. Entities that are the focus of case studies can be of various sorts, such as individuals, groups, organizations or events. Furthermore Maree (2007) confers that case study research is a systematic inquiry into an event or a set of related events which aims to describe and explain the phenomenon of interest. In addition a case study may also be defined as an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Maree, 2007).

Thomas (2003) also states that case studies usually focus on a single entity; they can also assume a comparative form whenever the likeness and differences between two or more entities are analyzed. In addition Fellows and Liu (1997) mentions that case studies yield deep but narrow results. They also employ triangulations both in the case study and facilitate generalisation of the findings.

3.8 Triangulation

A triangulation is the cross-validation among data sources, data collection strategies, time periods and theoretical schemes. In this method to find regularities in the data, the researcher compares different sources, situations and methods to see whether the same pattern keeps recurring (McMillan and Schumacher, 2001). Furthermore this method reduces the risk of chance associations and systematic bias (Maree, 2007).

In this research study a triangulation is well conducted by the literature produced in chapter 2 with the questionnaire (questionnaires delivered by hand) and the standardised open-ended interviews produced and analysed in chapter 5. this is done to ascertain an all round perspective on the problem statement, hypothesis and objectives set within chapter 1.

3.9 Chapter summary

In this chapter different research methods were discussed in detail in order to prove or disapprove the hypotheses set in the first chapter. In conclusion the two methods which have been employed to complete this research successfully are questionnaires and interviews. The reasoning behind the choice of these two methods, are due to the fact that "Quality" is defined very differently by each individual, and therefore in order to get a better perspective of the word in low-cost housing a social method had to be adopted introducing various expectations of the word itself.

Chapter 4

Research Methods Employed

4.1 Introduction

In the previous chapter various research methods concerned with the collecting of data to prove or disapprove the hypothesis were discussed. Due to the vast need for information surrounding the hypothesis set in the first chapter a decision was made to incorporate alongside the questionnaires, structured interviews.

This chapter will further scrutinize the formulation of the questions set and the comparisons of the results derived from the literature review. This therefore means, the research results, scenarios and factors, which affect the data validity, will be highlighted and undertaken. From this an assessment will be made as a result of the responses to the questionnaires and structured interviews as to how quality assurance in affordable housing construction could be properly implemented and improved in order to eliminate the poor quality prevalent in affordable housing construction.

The fundamental purpose of this chapter therefore is to attain the required data through the usage of relevant research methodology.

4.2 Questionnaire Survey

The questionnaires which were structured, and targets the occupants of specific low-cost housing situated in the two respective provinces the Western Cape and the Eastern Cape.

With the questionnaire survey, questions most relevant to this research study were developed. The questionnaires were developed around a pilot questionnaire which was drafted up and handed to random individuals in order to ascertain various criticisms on the type and style of questions brought forward. The criticisms on the pilot questionnaire were based mainly on interpretation and total understanding of the questions asked. These criticisms were positively reviewed, justified and corrected. Questions were also corrected and correlated to the hypothesis and objectives set in the first chapter, checking whether the hypothesis and each of the objectives were covered. Finally all checks and balances were done on the pilot questionnaire refining and moulding all questions to the desired needs of the criticisms generating the true questionnaires.

Questions with a limited set of possible choices were identified, and corresponding sets of answers were developed.

4.2.1 Open-Ended-Questions: Firstly the majority of the community members which were interviewed have limited educational backgrounds. Due to this open ended questions were included into the questionnaire survey in order for the community members to express their views as openly and as fully as they desired. These questions were also used to retrieve insights, side comments and more in-depth explanations to develop a comfortable “feel” for the research findings.

4.2.2 Close-Ended-Questions: These questions were included in the community surveys in order to achieve sharp effective answers on points more sensitive to the topic matter where needed. Answers were either “Yes” or “No”.

Based on the questionnaire surveys, respondents were not required to state their names, and they were assured that the results of the survey were going to be used in aggregated form. This ensured the anonymity of the respondents.

4.2.3 Sample Size

The questionnaires were distributed to community members who at present occupy affordable housing in Delft (Western Cape) and Chatty Extension 3-4 (Eastern Cape). Residents of these two areas were the most appropriate candidates due the fact that these areas are undergoing low-cost housing developments at present. These occupants served as suitable candidates mainly because they are knowledgeable witnesses to the structural quality of their homes. They were also chosen due to their daily experiences and their desired needs pertaining to the quality of their living space. It is ultimately these occupants which occupy their homes who are able to produce the information required.

These questionnaires were delivered by hand to randomly selected occupants in their respective provinces. Assistance was given to complete the questionnaire where it was most needed.

From the 90 questionnaires which were handed out to the community members only 42 were retrieved for scrutiny. In the Western Cape 45 questionnaires were distributed of which 24 was retrieved. However in the Eastern Cape 45

questionnaires were also distributed of which 18 were retrieved, this bringing the total percentage of responses for these respective provinces to 46%

4.3 Interview Survey

With the interview surveys, structured interviews were conducted with a designer, contractor and government member (Inspector) in order to get their views and inputs on the quality assurance within affordable housing in South Africa. The questions which were drafted for these interviews were structured to close any loop-holes between what the community perspective entails in conjunction with that of the designer, contractor and government role-player in this sector. Therefore the information obtained via these interviews is of such a nature that either supports previously drawn inferences, or else provides information from which further inferences may be drawn.

4.3.1 Sample Size

Due to the interviews being directed to various individuals in the affordable housing sector it was decided that three interviews would be critically conducted to achieve an all round answer which could be integrated with the community questionnaires. These interviews were however restricted to the Western Cape region due to time constraints. Even though time constraints governed the interview process, interviews were ultimately still executed due to the fact that questionnaires would have lacked the ability to produce data under the following criteria:

- Face to face encounters with informants.
- Obtaining large amounts of expansive and contextual data quickly.
- Facilitating cooperation from the research subject.
- Discovering complex interconnections in social relationships.
- Data collection in a natural setting.

4.4 Chapter summary

In this chapter the research methods which have been implemented to conduct the study have been explained carefully. In the next chapter the data attained from the questionnaires as well as structured interviews (refer to **Appendix A** and **B**) will be presented in order for recommendations and conclusions to be made in this research study.

Chapter 5

Data Presentation and Analysis

5.1 Introduction

In the previous chapter, the methods which were employed in this research study were discussed. In this chapter the data from the questionnaires and interviews will be presented and a discussion of the findings delivered in order to draw up various conclusions to the problem statement, hypothesis and the objectives.

5.2 Data Presentation

5.2.1 Questionnaire Survey Section A: Personal Details of Occupants

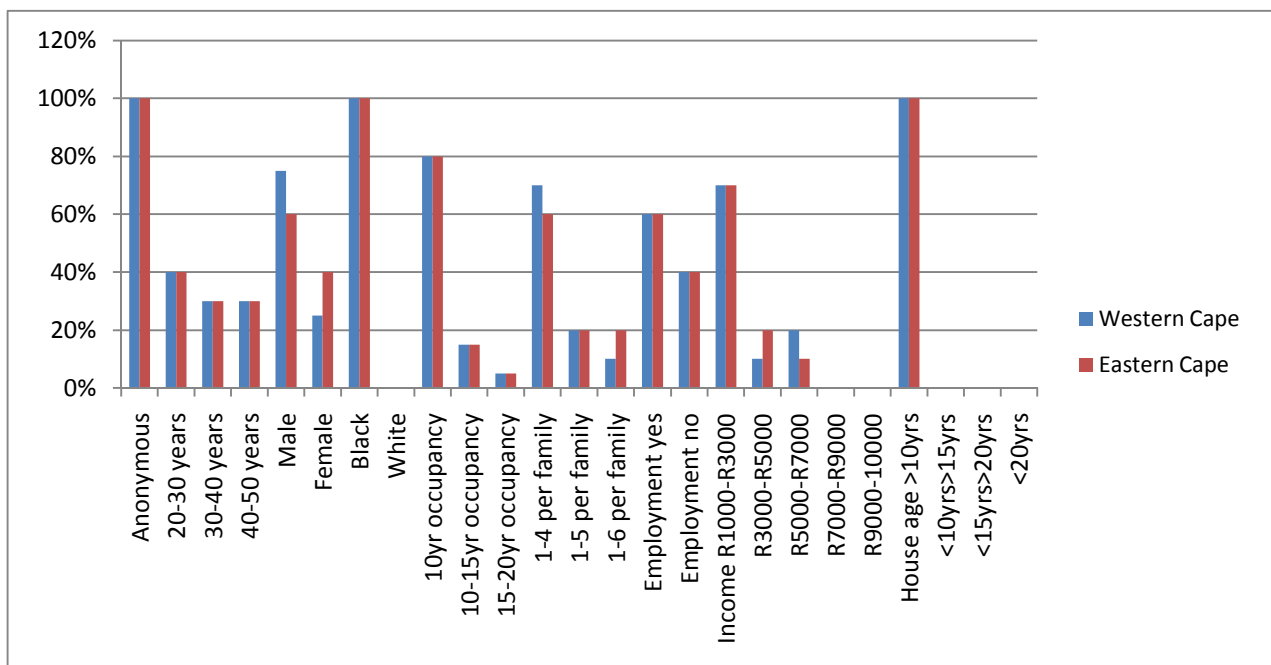


Figure 5.1 **Personal Details, based on the statutory requirements for low-cost housing in the Western and Eastern Cape.**

The validity of the application from a prospective low-cost housing occupant is dependent upon fulfilling certain statutory requirements. These include:

- Race: which is focused on redressing the past inequalities South Africa has faced.

- Age and Gender: focusing on the even spread of low-cost housing across the age and gender spectrum so that a balance is created within the country.
- Employment and Monthly Income: addressing the issues concerned with the qualifications of home owner subsidies and the abilities of maintaining their homes.
- Number of occupants; Duration of occupancy: aimed at addressing concerns/ issues on the amount of living space each house provides and the time periods occupants have been utilizing these homes, placing emphasis on the quality of life for each and every occupant.

5.2.1.1 Address

From the table above it is made clear that no one individual wanted to reveal his/herself exact location. This was respected as it was the occupants right to do so.

5.2.1.2 Age and Gender

It is made evident by the table that there is no real balance of housing distribution across the age and gender spectrum within the two provinces. This raises huge question marks around inequality.

5.2.1.3 Race

The table indicates that the past inequalities have not been sufficiently worked away; however the statistics clearly show that these concerns have merely been reversed, which is evident in the 100% black ownership presented by the table.

5.2.1.4 Employment and Monthly Income

Within the two provinces employment and monthly income statistics indicates drastic concerns. This is due to the fact that 70% of the low-cost housing home owners earn between R1000 and R3000 per month, creating huge problems when it comes to the qualification for subsidies and the self maintenance of these houses which the homeowners are responsible for.

5.2.1.5 Number of Occupants; Duration of Occupancy; House Age.

Within the two provinces it is clear that most of the low-cost housing homes constitute 1-4 occupants per unit. This serves as a good indicator to a certain extent;

however further statistics also show that there are homes constituting 5-6 occupants per unit. The statistics in addition also include that majority of these occupants are housed in these two areas for ±10years which gives rise to most of the units ageing in the vicinity of ±10years. This information formulates a conclusion that the living space is problematic to some households, but not to all due to the statistics observed in figure 5.1. Those unfortunately suffering due to living space suffer poor quality lifestyles.

5.2.2 Section B: Details of the house

Due to the tremendous housing backlog within South Africa, more specifically in the Western and Eastern Cape it is clear to see why government enforces a repetitive model design. The backlog brings about pressures to not only government, but to the designers and housing contractors who are governed by time constraints and are put under strain with the tight financial budgets put in place. This enhances the use of a repetitive model design within the two provinces.

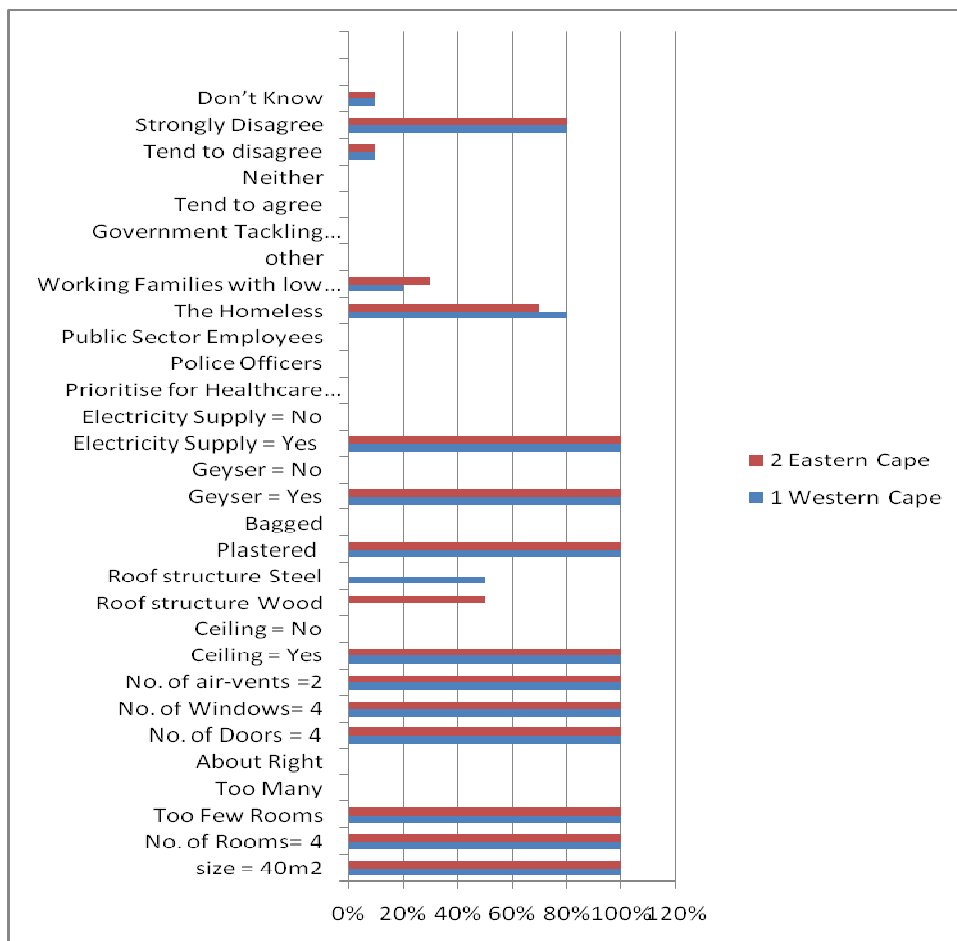


Figure 5.2 Represents statistics on the house details within the two provinces. From figure 5.2 it indicates that a repetitive model design is implemented within the two provinces, due to similar trends being evenly matched such as: the house size;

the number of rooms; the number of windows, doors and air-vents; plastered walls; geysers and electricity supply put in place. There is however one distinct difference. In the Western Cape steel roof structures are implemented whereas for the Eastern Cape traditional wooden roof structures are constructed.

5.2.3 Section C: Design Quality

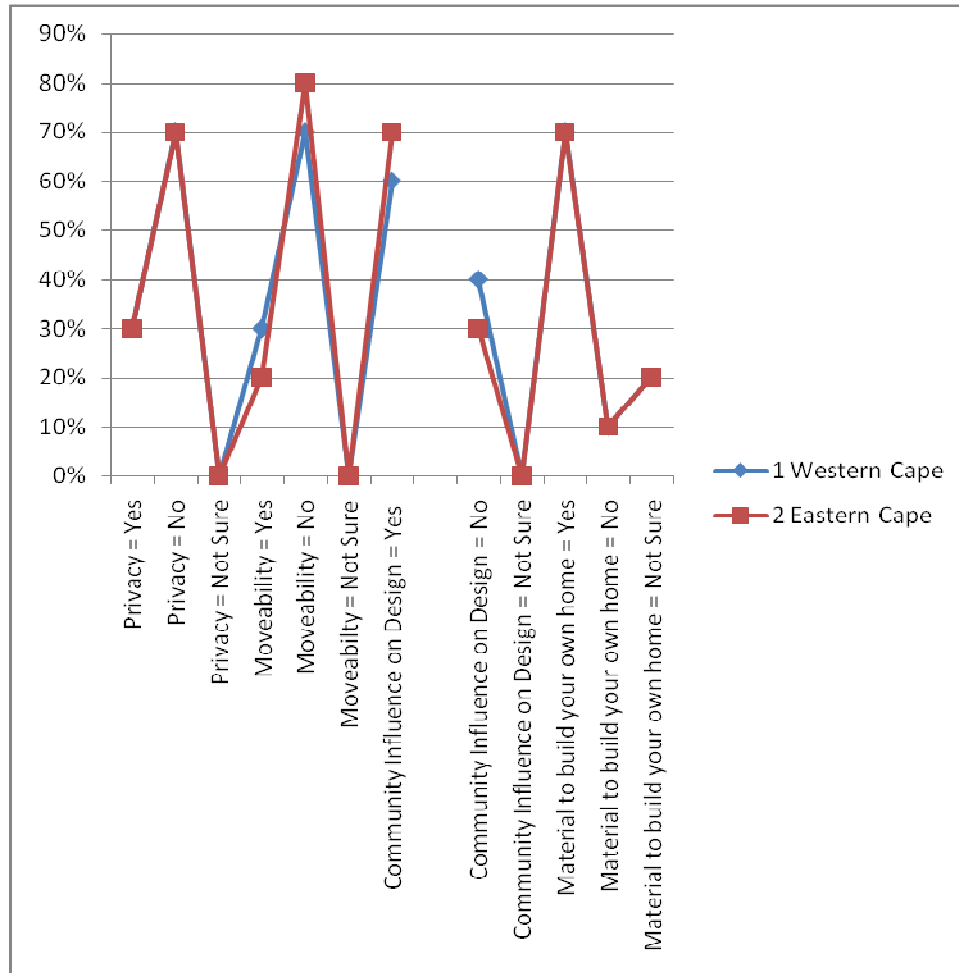


Figure 5.3 Design Quality

From figure 5.3 above, it is evident that majority of the homeowners within the two provinces state that their homes do not offer them enough privacy and moveability. This is however not due to poor design processes. It is ideally caused by problems which government is faced with, the housing backlog which gives rise to time and cost constraints and which puts a lot of strain on the designing teams and the design processes ultimately generating poor designs. From the statistics produced by figure 1.5 above it is made clear that occupants want more say when it comes to housing designs. This certainly could generate better ideas and solutions to the housing crisis.

5.2.4 Section D: Workmanship Quality

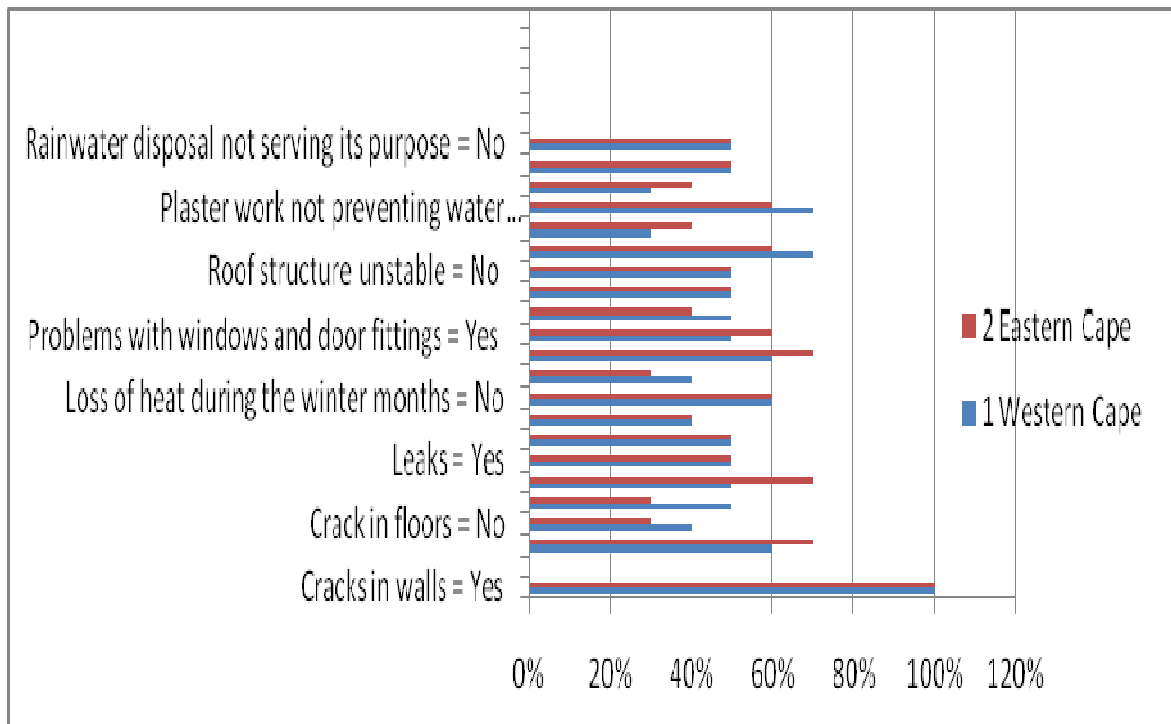


Figure 5.4 **Workmanship Quality**

Information from figure 5.4 it indicates that in both the Western and Eastern Cape problems arising from poor workmanship qualities is evident. The figure indicates that issues such as: cracks in walls , floors, structural leaks, unstable roof structures etc. are issues causing moderate to extensive concerns when it comes to the quality of workmanship being delivered in the low-cost housing sector. The poor quality of workmanship generated are also concurrently affected by the pressures passed down from government. Time constraints and cost factors play a major part in the effectiveness for workmanship quality.

5.2.5 Section E: Ailments and Disabilities

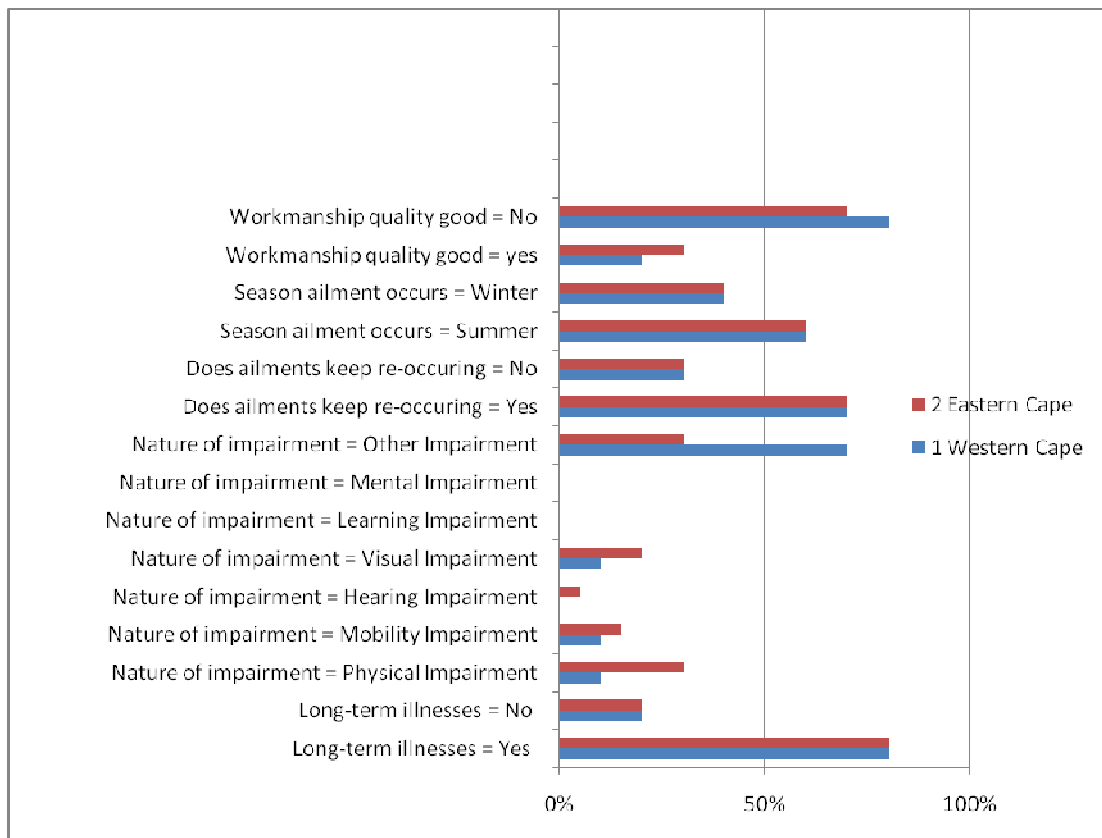


Figure 5.5 Ailments and Disabilities

Figure 5.5 indicates that 80% of the occupants within the Western and Eastern Cape suffer from long-term ailments and certain disabilities. These ailments are many and varied between the two provinces. The majority of the occupants' state that these ailments keep on reoccurring more particularly within the winter months. Many comments have been made specifically by the occupants based on design changes and quality of workmanship to alleviate certain aspects which bring about these ailments.

5.2.6 Structured Interviews

These interview responses are anecdotal due to the Designer, Contractor and the Building Inspector wishing to remain anonymous. Refer to **Appendix C, D and E**.

5.2.6.1 Designer

According to the designer the words “quality” and “quality assurance” are closely linked to each other. It is mentioned that the word “quality” is interpreted very differently by each individual based on their own perspective. As for the designer the word “quality”, when looking at the low-cost housing spectrum means a house which

is fit to live in and serves its purpose. However to the designer the words “quality assurance” refers to a policy or promise put in place to achieve a quality product. The designer further mentioned that there are certain factors which, threaten the design of low-cost housing within South Africa, for example, governments inconsistency when it comes to decision-making as to what face low-cost housing should represent to the public and more so to the world. The current backlog of housing in general also impacts the design and development of the low-cost housing system at present.

.According to the designer the housing backlog in South Africa affects the Western and Eastern Cape dramatically. This backlog puts government under tremendous pressure which in turn is passed down to the designers who need to generate certain model designs in a stipulated time period within a tight budget. The designer further mentions that the time periods and budgets allocated to low-cost housing can ultimately give rise to a selection of inappropriate materials, approving a defective product and adamant clients (government) forcing their decisions on certain construction products causing the design processes to fail.

It was gathered that the repetition of design models are being constantly employed, which is politically incorrect. In terms of low-cost housing delivery the bureaucratic process is one of the major threats concerning low-cost housing design.

The designer furthermore mentioned that procurement systems can be incorporated as a problem, affecting design quality due to the fact that coherent design processes with their checks and balances are not in place. The designer however suggests that more self-help methods involving local skills should be employed in order to reduce costs as well as to minimize procurement misfortune. Lastly the designer postulates that international appropriate benchmarking is important to achieve good design quality and through all of this he believes that quality assurance will be achieved in low-cost housing for years to come.

5.2.6.2 Contractor

When analyzing the interview done with the contractor, it is mentioned that workmanship quality in low-cost housing is not up to standard and that it is dropping considerably taking into account the unrealistic time-frames and tight budgets allocated by government as well as procurement systems being a major threat. Ultimately in order for workmanship quality to improve these threats must be looked at, especially procurement systems which play a major role when it comes to factors

such as time, cost and more so quality. Pressures exerted by government such as time constraints and financial support also have a major contribution towards poor workmanship in the construction process. In addition the contractor stressed that benchmarking mechanisms are critical in achieving good workmanship quality and more so quality assurance in the low-cost housing sector.

As per the contractor it is then finally mentioned that the prospects of low-cost housing in South Africa are promising, but requires continual monitoring and support from government as well as developing communities, gaining the trust and full confidence in one another to make these developments a success.

5.2.6.3 Building Inspector

Based on the interview done with the building inspector, it is mentioned that low-cost housing and the problems it faces within South Africa has not yet been adequately mastered. Due to the housing backlog land availability becomes a problem causing conflict between community members. He also adds that government has set unrealistic time-frames to eliminate or better the backlog at present. It is however, not achievable if one analyzes the amount of skilled labour and construction companies available. This he says puts quite a lot of pressure on construction and design companies but more so government itself. Lastly the building inspector adds that to achieve an end-product with maximum quality (low-cost housing), one needs to establish better procurement measures as well as more skilled labour in order to bring about a quality product with continuous support of well-established construction companies.

5.3 Discussion of findings

With the questionnaire survey conducted in both the Western and Eastern Cape it was founded that majority of the occupants owning these low-cost housing homes were males between the ages of 20-30 years. This indicated that there is not yet a balance over the age and gender spectrum. Employment and monthly incomes also raised huge concerns due to most occupants only earning between R1000-R3000 per month. This indicates that these occupants battle to qualify for housing subsidies and struggle to maintain their homes which they occupy. Living space also seems to be a huge concern due to moderate amounts of homes housing 5-6 occupants. This gives one an indication that the quality of life within these homes are not what the occupants desire.

When looking at the details and design of these low-cost houses within the two provinces, it is clearly noticeable that a model design is implemented having many similarities across the two areas. There are also concerns raised as to the privacy and moveability that the house offers to the occupants. Due to these issues the majority of these occupants felt the need for more community involvement when it comes to the design processes of houses in low-cost housing schemes.

The workmanship qualities carried out on these houses according to the findings are poor. Many structural flaws were noticed, for example, cracks in walls, floors and unstable roof structures. Concurrent to this, many ailments and disabilities were evident within the two communities which are either caused or enhanced by the poor quality homes in which they live. These ailments according to the statistics are more apparent in the rainy winter months. This tends to suggest that poor cross-flow ventilation in the units exacerbate the ailments.

Within the interviews carried out with the designer, contractor and building inspector it was found that similar comments were suggested. These stakeholders came to conclusion that government should set more realistic time-frames and provide better budgets in conjunction with better procurement measures being put in place, to allow a better housing product.

5.4 Chapter summary

This chapter presented all the data and findings based on the two batches of questionnaire surveys conducted within the Western and Eastern Cape as well as the interviews carried out with the designer, contractor and building inspector.

Problems arose however from the quality conditions that the houses possess, many of which are falling apart and not accommodating families adequately. This questioned and brought about comments around procurement measures, time constraints, tight budgets and pressures surrounding the current housing backlog which filter down from government to designers and contractors which ultimately causes design processes to fail and construction workmanship qualities to drop, resulting in a poor quality housing unit.

Chapter 6

Conclusion and Recommendations

6.1 Introduction

In the previous chapter the questionnaires and structured interviews were carefully analysed in order to reflect a true result to the hypothesis structured in chapter 1. Chapter 5 gathered valuable data to test the hypothesis to a certain extent. In this chapter the findings, recommendations and conclusions will be presented to round off this phase of the research study.

6.2 Summary/Findings

In chapter 1 a brief introduction to quality assurance in low-cost housing construction was presented. Chapter 1 also focused on the background of South Africa's construction industry, highlighting various factors affecting the concept of quality assurance. Drawing from this, a problem statement, hypothesis as well as objectives were drawn up around design and workmanship elements.

Chapter 2 of this research study reviewed literature on previous research executed, based on procurement systems, poor workmanship in the design process, poor workmanship in the construction process and the assessment of quality assurance mechanisms in practice.

Chapter 3 discussed in detail the two research methods available namely quantitative and qualitative. From these two methods various research tools such as questionnaires, surveys, interviews, case studies and triangulations were examined. This chapter concluded by justifying the reason for selecting questionnaires together with structured interviews as the most appropriate methods to collect data.

Chapter 4 scrutinized the formulation of the questions set and the comparisons of the results derived from the literature review. With this being done, the research results, scenarios and factors, which affect the data validity were highlighted and undertaken. From this an assessment was made as a result of the responses to the questionnaires and structured interviews as to how quality assurance in affordable housing construction could be properly implemented and improved upon in order to eliminate the poor quality prevalent in affordable housing construction.

Chapter 5: In this chapter the actual data collection and presentation process took place based on the selection of the tools (questionnaires and structured interviews) in the previous chapter. Chapter 5 analyzed the questionnaires and the structured interviews correlating it to the objectives established in Chapter 1. This was completed to test and validate the hypothesis.

6.3 Conclusion

It is clear that designers and their processes they follow cannot be held responsible for poor quality housing being delivered. Yes they are affected by a demanding client (government) who is pressurised by the time constraints and financial budgets due to the current housing backlog. This ultimately places the design teams under tremendous pressure.

However when focusing on housing contractors, much the same can be said. Yes they are also affected by government requirements. It is however the contractors who deliver the physical product and this is where poor workmanship qualities are evident. This does not imply that they are culpable but creates a bigger picture as to where the problem originates from. Government should ultimately be held responsible for the delivery process of low-cost housing as well the procurement and quality systems being implemented.

6.4 Recommendations

It is known that shelter is one of Maslows' basic human needs. However this need should not be manipulated when it comes to quality.

It has been found through this research study that the word quality is interpreted very differently by each individual and therefore each one's quality standards would be of a different nature. When it comes to housing, these ideas and standards make the delivery process very difficult. Granted each homeless family would appreciate a solid roof over their heads, but this does not mean that any given standard home would be the answer.

Over the years and at present a repetitive model design is being implemented giving people no freedom of choice when it comes to low-cost housing units. This is evident in the data presentation presented within chapter 5. The data illustrates that there is a common model design between the Western and Eastern Cape. The implementation of this common model design was found to be rooted from the

housing backlog the two provinces are faced with. This concern creates pressure at government levels to speedily and economically house the homeless but simultaneously suffocating and pressurising the design team and their processes giving them tight time frames and low budgets to work with in order to deliver a quality design which will suit the homeless. It was also found that pressures from the design team are passed down to the contractor who in turn needs to deliver the actual product within tighter timeframes and even lower budgets. Furthermore the literature and the findings create a view around procurement systems and its measures. These systems should therefore be closely looked at together with quality assurance systems to structurally alleviate the housing backlog allowing for sufficient timeframes and flexible budgets in order to deliver a quality product.

From the data presentation it is also recommended that community involvement and the incorporation of sustainable methods in the design and construction process should be practiced. In addition it is suggested that inclusion housing should be implemented making the development process much easier.

It is through mutual co-operation and consultation that we build a sound and healthy nation, giving each one a sense of pride, by providing each homeless or downtrodden family a home, and by doing so generating a positive change in South Africa today and for years to come.

This study has covered its objectives and proved the hypothesis extensively which gives rise to broader research which will be endeavoured in order to generate more conclusive evidence around low-cost housing quality and the housing backlog to be addressed.

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APPENDIX A

QUESTIONNAIRE

**COMMUNITY SURVEY ON LOW-COST HOUSING
(WESTERN CAPE)**

SECTION A

Personal Details of the Occupant

1.1 Address

1.2 Age

1.3 Gender

1.4 Race

1.5 Duration of occupancy

1.6 Number of Occupants

1.7 Are you as the occupant currently employed?

Yes	No

1.8 Monthly Income. Illustrate by making a tick in the most appropriate column below.

R1000-R3000	R3000-R5000	R5000-R7000	R7000-R9000	R9000-R11000
-------------	-------------	-------------	-------------	--------------

1.8 How old is the house?

≥ 10 Years	≤ 10 ≥ 15 Years	≤ 15 ≥ 20 Years	≤ 20 Years
------------	-----------------	-----------------	------------

1.1 How important is it to own or part own a home of your own?

Very important	Fairly important	Neither

SECTION B

Details of the House

2.1 What is the size of your house?

.....

2.2 How many rooms does your house consist of?

.....

2.3 Do you think the number of rooms you have in your home is...?

Too few	Too many	About right

2.4 How many doors does your house consist of?

.....

2.5 How many windows does your house consist of?

.....

2.6 How many air-vents does your house consist of?

.....

2.7 Does your house have a ceiling?

.....

2.8 What type of material is the roof structure built of?

Timber	Steel
--------	-------

2.9 Is your entire house plastered or just bagged?

.....

2.10 Does your house have a hot water supply (geyser?)

.....

2.11 Does your house have electricity?

.....

2.12 Who do you think the Government should prioritise for low cost rented and homeownership housing in the borough?

Healthcare workers	Police officers	Public sector employees	The homeless	Working families with low to middle income	Other

2.13 To what extent do you agree that the Government does enough to tackle homelessness?

Strongly agree	Tend to agree	Neither	Tend to disagree	Strongly disagree	Don't know

SECTION C

Design Quality

Choose the most appropriate answer by making a tick.

3.1 Does the house offer you enough privacy?

Yes	No	Not Sure
-----	----	----------

3.2 Does the house offer enough space for moveability?

Yes	No	Not Sure
-----	----	----------

3.3 Do you think the community must have more say when it comes to the design of these houses?

Yes	No	Not Sure
-----	----	----------

3.4 If you were given material to build your house would you feel more satisfied?

Yes	No	Not Sure
-----	----	----------

SECTION D

Workmanship Quality

4.1 Which of the problems in the table below are related to your own house? Indicate with a tick either in the “Yes” or “No” column and give it a rating on the scale from 1-3, 1 minimal, 2 being moderate and 3 being bad conditions.

Possible Faults	Yes	No	1	2	3
Cracks in the walls.					
Cracks in the floors.					
Draughts cutting through the house.					
Leaks.					
Loss of heat during the winter months.					
To much heat retention during the summer months.					
Problems concerning window and door fittings.					
Roof structure unstable.					
Paint work on the walls cracking or chipping off.					
Plaster work not preventing water penetration into the house causing dampness.					
Possible Faults	Yes	No	1	2	3

Rainwater Disposal e.g. Gutters and Down pipes not in a good condition to serve their purpose.					
--	--	--	--	--	--

Section E

Ailments and Disabilities

4.2 Does anyone in your household have any long-term illness, health problem or disability which limits their daily activities or the work they can do?

Yes	No
-----	----

4.3 What is the nature of the impairment?

Physical impairment	Mobility impairment	Hearing impairment	Visual impairment	Learning disability	Mental health	Other (e.g diabetes, epilepsy)

4.4 Do these ailments keep re-occurring?

Yes	No
-----	----

4.5 What time of year do these ailments take place?

Summer	Winter
--------	--------

4.6 To you as the occupant, is the workmanship which has been applied to the house of good quality? If Yes or No, please give a reason for your answer?

.....

.....

.....

.....

.....

4.7 With the above questions asked what are the changes you as the occupant will make to the design of the house, if you are given the opportunity?

.....
.....
.....
.....
.....

THANK YOU FOR THE OPPORTUNITY TO CONSULT YOU AND FOR YOUR CONTRIBUTION TO THE COMMUNITY DEVELOPMENT EFFORT IN SOUTH AFRICA.

APPENDIX B

QUESTIONNAIRE

**COMMUNITY SURVEY ON LOW-COST HOUSING
(EASTERN CAPE)**

SECTION A

Personal Details of the Occupant

1.1 Address

1.2 Age

1.3 Gender

1.4 Race

1.5 Duration of occupancy

1.6 Number of Occupants

1.7 Are you as the occupant currently employed?

Yes	No

1.8 Monthly Income. Illustrate by making a tick in the most appropriate column below.

R1000-R3000	R3000-R5000	R5000-R7000	R7000-R9000	R9000-R11000
-------------	-------------	-------------	-------------	--------------

1.8 How old is the house?

≥ 10 Years	≤ 10 ≥ 15 Years	≤ 15 ≥ 20 Years	≤ 20 Years
------------	-----------------	-----------------	------------

1.2 How important is it to own or part own a home of your own?

Very important	Fairly important	Neither

SECTION B

Details of the House

2.1 What is the size of your house?

.....

2.2 How many rooms does your house consist of?

.....

2.3 Do you think the number of rooms you have in your home is...?

Too few	Too many	About right

2.4 How many doors does your house consist of?

.....

2.5 How many windows does your house consist of?

.....

2.6 How many air-vents does your house consist of?

.....

2.7 Does your house have a ceiling?

.....

2.8 What type of material is the roof structure built of?

Timber	Steel
--------	-------

2.9 Is your entire house plastered or just bagged?

.....

2.10 Does your house have a hot water supply (geyser?)

.....

2.11 Does your house have electricity?

.....

2.12 Who do you think the Government should prioritise for low cost rented and homeownership housing in the borough?

Healthcare workers	Police officers	Public sector employees	The homeless	Working families with low to middle income	Other

2.13 To what extent do you agree that the Government does enough to tackle homelessness?

Strongly agree	Tend to agree	Neither	Tend to disagree	Strongly disagree	Don't know

SECTION C

Design Quality

Choose the most appropriate answer by making a tick.

3.1 Does the house offer you enough privacy?

Yes	No	Not Sure
-----	----	----------

3.2 Does the house offer enough space for moveability?

Yes	No	Not Sure
-----	----	----------

3.3 Do you think the community must have more say when it comes to the design of these houses?

Yes	No	Not Sure
-----	----	----------

3.4 If you were given material to build your house would you feel more satisfied?

Yes	No	Not Sure
-----	----	----------

SECTION D

Workmanship Quality

4.1 Which of the problems in the table below are related to your own house? Indicate with a tick either in the “Yes” or “No” column and give it a rating on the scale from 1-3, 1 minimal, 2 being moderate and 3 being bad conditions.

Possible Faults	Yes	No	1	2	3
Cracks in the walls.					
Cracks in the floors.					
Draughts cutting through the house.					
Leaks.					
Loss of heat during the winter months.					
To much heat retention during the summer months.					
Problems concerning window and door fittings.					
Roof structure unstable.					
Paint work on the walls cracking or chipping off.					
Plaster work not preventing water penetration into the house causing dampness.					
Possible Faults	Yes	No	1	2	3

Rainwater Disposal e.g. Gutters and Down pipes not in a good condition to serve their purpose.					
--	--	--	--	--	--

Section E

Ailments and Disabilities

4.2 Does anyone in your household have any long-term illness, health problem or disability which limits their daily activities or the work they can do?

Yes	No
-----	----

4.3 What is the nature of the impairment?

Physical impairment	Mobility impairment	Hearing impairment	Visual impairment	Learning disability	Mental health	Other (e.g diabetes, epilepsy)

4.4 Do these ailments keep re-occurring?

Yes	No
-----	----

4.5 What time of year do these ailments take place?

Summer	Winter
--------	--------

4.6 To you as the occupant, is the workmanship which has been applied to the house of good quality? If Yes or No, please give a reason for your answer?

.....

.....

.....

.....

.....

4.7 With the above questions asked what are the changes you as the occupant will make to the design of the house, if you are given the opportunity?

.....
.....
.....
.....
.....

THANK YOU FOR THE OPPORTUNITY TO CONSULT YOU AND FOR YOUR
CONTRIBUTION TO THE COMMUNITY DEVELOPMENT EFFORT IN SOUTH
AFRICA.

APPENDIX C

STRUCTURED INTERVIEWS

DESIGNER SURVEY

SECTION A

- 1.1 As a designer what does the words quality and quality assurance mean to you?
- 1.2 What is your view on low-cost housing within South Africa?
- 1.3 Are there any problematic issues relating to the design processes for low-cost housing? If yes state what these problems are?
- 1.4 Is Government an influential player in the cause of these problematic issues? If Yes or No please, state the reasons why?
- 1.5 Based on these issues what can be done to achieve a good design?
- 1.6 To you as a designer would it be correct to incorporate procurement systems as one of the problems affecting design quality? If Yes or No, please state the reasons why?
- 1.7 As a designer does the process of benchmarking play a pivotal role in achieving a good end product?
- 1.8 If you take into consideration the housing backlog South Africa is currently struggling with, do you as a designer see quality assurance being achieved in the low-cost housing sector in the years to come. Give a reason for your answer?

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APPENDIX D

STRUCTURED INTERVIEWS

CONTRACTOR SURVEY

SECTION A

- 1.1 As a contractor what does the words quality and quality assurance mean to you?
- 1.2 What is your view on low-cost housing within South Africa?
- 1.3 Are there any problematic issues relating to the construction processes for low-cost housing? If yes, state what these problems are?
- 1.4 Is government an influential player in the cause of these problematic issues? If yes or no, state the reasons why?
- 1.5 To you as a contractor what can be done to achieve good workmanship?
- 1.6 As the contractor would it be correct to incorporate procurement systems as one of the problems affecting design quality? If Yes or No, please state the reasons why?
- 1.7 As a contractor does the process of benchmarking play a pivotal role in achieving a good end product.
- 1.8 If you take into consideration the housing backlog South Africa is currently struggling with, do you as a contractor see quality assurance being achieved in the low-cost housing sector in the years to come? Give a reason for your answer?

THANK YOU FOR THE OPPORTUNITY TO CONSULT YOU AND FOR YOUR CONTRIBUTION TO THE COMMUNITY DEVELOPMENT EFFORT IN SOUTH AFRICA.

APPENDIX E

STRUCTURED INTERVIEWS BUILDING INSPECTOR SURVEY

SECTION A

- 1.1 What does the word quality and quality assurance mean to you?
- 1.2 What is your view on the low-cost housing developments within South Africa?
- 1.3 In your view what are the problematic issues which affect low-cost housing developments within South Africa more so the Western and Eastern Cape?
- 1.4 Has government set realistic time frame targets to eliminate this backlog?
- 1.5 Don't you as a Governmental department feel that you are exerting too much pressure on designers and contractors? If Yes or No, please state the reasons why?
- 1.6 If you answered yes to the above question, how do you expect to achieve a end product with maximum quality?

THANK YOU FOR THE OPPORTUNITY TO CONSULT YOU AND FOR YOUR CONTRIBUTION TO THE COMMUNITY DEVELOPMENT EFFORT IN SOUTH AFRICA.

APPENDIX F

PORT ELIZABETH SITE PHOTOS



Fig.1 represents the Nelson Mandela Bay Municipality Development (Chatty Ext 3&4-1687 Units)

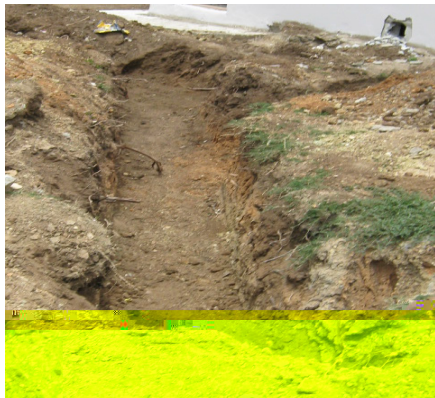


Fig. 2 represents the trenching and the ground conditions which contractors experience in the Eastern Cape.



Fig. 3 represents the plaster work that has been done on the house. The plaster mix is a 1:4 plaster mix.



Fig. 4 is a typical picture representing a wooden roofstructure.

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