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IMPEDIMENTS TO IMPLEMENTATION OF GREEN BUILDINGS IN SOUTH AFRICA

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Abstract
The South African building industry has incorporated an energy standard, SANS2004 (Green Building in SA) and is busy incorporating a new standard, SANS 10400 XA, which aims to provide energy-saving practices as a basic standard in South African context. There is lack of speedy implementation of Green Building in the South African Republic. The purpose of implementing Green Building standards is to make the South African environment sustainable which will provide comfort to the end-users. Open-ended interviews were adopted to dig deep into challenges surrounding the poor implementation of Green Building standards. The respondents were construction professionals (Architects and Quantity Surveyors) that deal directly with the construction clients. A purposeful sampling strategy was adopted to identify professionals that have wealth of experience with Green Building projects. Thematic content analysis was used for data analysis. The finding shows that there are challenges with the implementation of Green Building standards, such as; Green Buildings are too expensive, lack of good communication, lack of team integration, the use of expensive technologies, etc. Therefore, for the South African building industry to achieve environmental sustainability there should be commitment to team integration and proper communication between all stakeholders involved to achieve its stated primary objectives of giving comfort to the end-users. It is recommended that further studies be conducted on the professional networking on sites, green washing problems, and encouraging developers to embrace green building techniques. It is also recommended to conduct further research in the public sector projects, such as the South African National and Provincial Departments of Public Works for purpose of comparison.

Keywords: Environment, Green Building, Implementation, Strategies, Sustainability.

1 Introduction

A Green Building is a building which is energy efficient, resource efficient and environmentally responsible. It incorporates design, construction and operational practices that significantly reduce or eliminate the negative impact of development on the environment and occupants. Buys and Hurbissoon (2011) have defined Green Buildings as the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle. Furthermore, the Green Building Council of South Africa (GBCSA) defines Green Buildings as a building which is energy-efficient, resource-efficient and environmentally responsible (GBCSA, 2013).

1.1 The state of Green Building in South Africa

South Africa has incorporated an energy standard, SANS2004 (Green Building in SA), which aims to provide energy-saving practices as basic standards in the South African context. There is, however, a need for The Green Building Council of South Africa (GBCSA) to investigate further in terms of the challenges affecting Green Building implementation in South Africa. The construction industry is responsible for a large amount of pollution that is produced around the world (Howard *et al.*, 2012). Buildings are one of the main users of electricity and therefore play a role in contributing towards global warming and the depletion of our natural resources (Rosenberg and Winkler, 2011). In order to reduce the effects caused by the built environment, there is a need to have changes in construction methods. These changes need to be implemented as quickly as possible in order to prevent more harm to the environment. These changes in construction methods are the changes from conventional construction methods to using Green construction methods. The developing world has started to adopt these strategies of sustainable construction and many developed countries are implementing Green Building techniques at an effective level (GBCSA, 2013). However, the developing world has been left behind. Only recently has South Africa started to take an active role in this evolution. According to Shi and Wei (2011), the GBCSA had awarded Green Star SA Ratings to only seven buildings in South Africa. The demand for going green does however, seem to be on the rise (GBCSA, 2013). The rapid growth of the building industry over the past few years has created a complex challenge between construction and its environment. Sustainable construction is an attempt made to restore this balance between the natural and built environments. South Africa's government and its private sector are becoming more conscious (Shi and Wei, 2011) of the need to practice construction in a sustainable way and to protect its environment.

However, compared to most developed countries, South Africa is still far behind (GBCSA, 2013) in this category. It is realized as though the environmental impact assessments (EIA) are struggling to balance the impacts linked with the social and the economic sides of the building environment. The Sustainable Building Assessment Tool (SBAT) has been used to fix this imbalance (Marelli, 2010). When it comes to "new" methods of developing sustainable construction, South Africa lacks the skills to achieve this successfully (GBCSA, 2013). Most small to medium sized companies cannot afford workers with technical and managerial skills as well as qualified professionals (Kats, 2003) to address these sustainable construction needs of the industry.

A conference on Public Involvement and Social Impact Assessments (Marelli, 2010) showed that public participation can play an important role in impact assessments and this resulted in stakeholder's consultations having a large impact on these assessments. This shows that a wider range of people are involved and have an influence in the construction process and that is why proper communication is vital to achieve success for sustainability (Korkmaz, 2012).

2 Literature Review

The world is currently facing a crisis with regards to global warming (Rehm and Ade, 2013). It is acknowledged that the construction industry plays a significant role in aiding the expansion of the global warming crisis. According to studies conducted by Rehm and Ade (2013), the construction industry is responsible for 40% of primary energy usage and it is also responsible for 36% of the emissions in the world which result from construction in industrialized countries. These emissions originate from the materials that are used in conventional buildings such as concrete and steel while others result from the use phase of buildings (Rosenberg and Winkler, 2011). According to a study conducted by Marelli (2010), the construction industry is responsible for about a third of the greenhouse gas emissions in the world and they contribute to the change in climate. Buildings in the European Union have been recorded to using up to 16% of the world's potable water; along with using up to 50% of raw materials and 40% of the

land waste comes from the construction industry (Rehm and Ade, 2013). With all of these negative impacts that the construction industry has on the environment, it is still a mystery why people are not embracing the implementation of Green Building. This clearly shows that there are various problems which are unsolved that are hindering the progress of Green Building implementation, especially developing countries like South Africa, such as: there is a gap between Green Building practices and legislation requirements; a high degree of unawareness of Green Building legislation/practices by construction company stakeholders; selective implementation of health and safety legislation requirements; and management staff had a more "positive" attitude to Green Building practices than site-based staff who tended to be less motivated and open to such practices (Windapo and Gaulding, 2015). Table 1 shows the rating based on the Green Star in South African building industry.

Table 1. Rating Achieved based on points in Green Star SA

Score	Rating	Remark/Title
10-19	One Star	Not eligible for certification
20-29	Two Star	Not eligible for certification
30-44	Three Star	Not eligible for certification
45-59	Four Star	Best Practise
60-74	Five Star	South African Excellence
75 and above	Six Star	World Leadership

(Source: GBCSA, 2013)

2.1 Climate Change in the City of Cape Town, South Africa

Assessment of current climate trends and future projections as an initial step towards developing a City Adaptation Plan of Action (CAPA) consolidates and integrates existing adaptation and climate proofing initiatives of the Western Cape Provincial Government, Cape Peninsula National Park and participating municipalities (Muheibir and Ziervogel, 2006). An initial step towards developing a CAPA would be to consolidate and integrate existing adaptation and climate proofing initiatives of the Western Cape Provisional Government (Muheibir and Ziervogel, 2006; Slabbert, 2013). Table 2 shows the Green Star rating based on best practice, South African excellence and World leadership.

Table 2. Distribution of Green Star SA rating

Rating	No of Buildings
Four Star	28
Five Star	5
Six Star	3

(Source: Derived from GBCSA, 2013)

2.2 Adapting to Climate Variability and Change

United States Aid for International Development's (USAID's) development activities proceed through a design process that is generally refer to as the project cycle and it includes four basic steps, such as problem diagnosis, project design, implementation and evaluation (USGBC,

2009). USAID's Global Climate Change Team, in the Bureau for Economic Growth, Agriculture and Trade (EGAT), has been working to address the causes and effects of Climate change since 1991. USAID has funded programs that have reduced growth in greenhouse gas (GHG) emissions while promoting energy efficiency, forest conservation, biodiversity, and other development goals (USGBC, 2009). A cursory review of the U.S. Foreign Assistance Guidance on Operational Plans suggests that all five Objective Areas could feature projects and programs potentially impacted by climate.

To help project planners to understand and address the climate's impacts on their projects, the USAID Team has developed a Guidance Manual. This manual provides guidance on how to assess vulnerability to climate variability and change, as well as how to design or adapt to projects so that they are more resilient to a range of climatic conditions (USGBC, 2009). Climate change involves not only changes in an extreme weather patterns of wet and dry, hot and cool periods, but also changes to average climate, which means that systems and activities that are adapted to the average climate can be affected and that natural vegetation, such as forest or grasslands, exists in certain locations because the climate is favorable for particular species (Rehm and Ade, 2013).

2.3 Benefits of Sustainable construction

Sustainable construction is not only about implementing Green Building with internal measures that are energy efficient, but it also includes external measures such as the adoption of green roofing, for instance (Shoniwa, 2008). This is the process of buildings having a roof which has plantation, where buildings have materials like grass and trees that are planted on the roof. For instance, Green Buildings that have implemented green roofing have lots of advantages, such as a reduction in ambient temperature due to the cooling effect of the evaporation caused by the plants (GBCSA, 2013). The green roofs also provide shading, which in turn leads to a cooler space on the roof (Shi and Wei, 2011). Green roofs also create thermal comfort for occupants on the top floor who are directly under the green roof (GBCSA, 2013). Then the occupants under the green roof found the temperature comfortably moderate throughout the year. The main reason for the floor under the green roof being naturally cooler in summer is because of the evaporation and the water retention from the soil (Shoniwa, 2008). After understanding the benefits of Green Buildings, the question that arose was that "why do people not implement Green Buildings and always complain about the heat during summer and cold during winter"? Some of the answers that might come to the mind are that these facts have not been communicated to the construction clients. Moreover, the challenges within the context of South Africa is legislation enacted to control the design and construction of Green Buildings (in order to move towards a greater construction industry) are perceived to be "constraints/limited" (Windapo and Goulding, 2015), especially, compared to the implementation of Green practices within the building industry (Naidoo, 2008; cited in Windapo and Goulding, 2015). There is also the lack of sufficient knowledge from stakeholders' perspectives in understanding legislation to influence attitude and perceptions of Green Building legislation and practices to create a Green Building "mindset" (Naidoo, 2008; cited in Windapo and Goulding, 2015).

2.4 Green Building Rating Systems

This study has looked into the green building rating systems that are found in the world. In Australia, they have adopted a green building rating system which is called the "Green Star", this rating system was developed by the Green Building Council of Australia (Green Building Council of Australia, 2006). How this rating system works is that it rates a building's ecological performance by its functional factor and allocates a star to it.

In the United Kingdom, the Building Research Establishment Environmental Assessment Method (BREEAM) rating method is used. BREEAM classifies functionalities of the buildings

under categories such as: management; energy usage; health and wellbeing; pollution; transport; land use; ecology; materials and water (Lowe *et al.*, 2000). Then it assesses each factor and provides points to each factor then the points are added up to formulate an overall score. Once the score has been calculated, the certificate classifies the scores as pass, good, very good or excellence.

Japan has a green rating system that is called the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE). The CASBEE rates the building's environmental efficiency (performance and quality = Q), when it rates the environmental efficiency it looks at: indoor environment; quality of service and outdoor environment on site. Then it also rates the building's environmental loading (L), which comprises energy; resource and materials and the offsite environment (Adapted from United State Green Building Council, 2009). Then they divide Q by L in order to get a ratio which will rate the building's green measures. Then the certificate will sum up the calculated ratios and have symbols that represent the scores, which are: "C" for poor; then there is a "B" rating; "B+"; "A" and the last one is "S" for excellent.

In the United States, they use the LEED rating system which stands for the Leadership in Energy and Environmental Design (United States Green Building Council, 2009). This rating system categorises the green measures into six categories which are: Sustainable site; water efficiency; energy and atmosphere; materials and resources; indoor environmental quality and innovation in design process. All of these categories in a building are rated and then all the separate scores are put together in order to make one score rating of the building out of 69. Then in the certificate the final score out of 69 will be given a specific classification which will be either bronze; silver; gold or platinum which is the highest qualification.

The GBCSA (2013) has launched the Green Star SA, known as Public and Education Building Rating Tool that will allow all public spaces to be rated whether they are publicly or privately owned. The Council provides the commercial property industry with an objective measurement for Green Buildings and recognises and rewards environmental leadership in the property industry, whereby scoring is done in nine categories such as: Management, Indoor environment quality, energy, transport, water, materials, land use and ecology, emissions and innovations. A building development can receive either a 4-Star rating signalling that it has employed best practice, and a 5-Star rating which recognises ''South African Excellence'' or the coveted 6-Star rating indicating that the project is a world leader.

In the first quarter of 2012, South Africa had one building with a Green Star Rating and this has now grown to nine, this year three were added just in the third quarter of 2012. The first development to receive a 5-Star rating was Aurecon Century City Office in Cape Town for its office design, indicating excellence in South African Standards, followed by Nedbank's new regional head office at the Menlyn Maine precinct development in Pretoria, which was awarded a 4-Star rating by Green Building Council of South Africa (GBCSA) for green office design and this is the third Nedbank building to achieve a four-star rating, joining the Nedbank head office in Sandton, Johannesburg and the Nedbank Ridgeside office development in Umhlanga, Durban (GBCSA, 2013).

A four-star rating indicates "best standards practices'', but the most important aspect of the entire Menlyn Maine project is its highest goal to become climate positive and once the full precinct – a mixed–use development of office blocks, shops, and living and entertainment spaces is complete, it will work toward reducing on-site greenhouse emissions to zero (GBCSA, 2013). Menlyn Maine is set to becoming Africa's first green city, one of 17 worldwide that fall under the Climate Positive program. Some of Menlyn Maine's green features include storm water tanks built into the structure and roof of buildings. The water will then be treated and circulated for reuse inside as well as outside the building and is expected to

provide non-potable water for almost a full year (GBCSA, 2013). The program, a Clinton Climate Initiative, recognises that while increased urbanisation is inevitable, cities can still grow in climate positive ways (USGBC, 2009).

3 Research Methodology

A qualitative research method was adopted for the study. This is to dig deep (Yin, 2009) to uncover facts (Saunders *et al.*, 2012) underpinning the phenomenon under investigation (i.e. Green Building implementation). The reason for the adoption of qualitative strategy is because the researcher wants to uncover the facts from construction professionals (Architects and Quantity Surveyors) that dealt with Green Building projects in South African building industry. It should be noted that there are no specific or permanent formulas for conducting a qualitative study (Leedy and Ormrod, 2010). Unstructured (in-depth) interviews were adopted to understand the meanings interviewers attach to issues and situations in contexts that are not structured in advance by the researcher (Easterby-Smith, 2008). The research was conducted in Johannesburg metropolitan council which is one of the three metropolitan councils in Gauteng province. Based on the literature reviewed, the best research strategy is by conducting in-depth interviews with construction professionals who deal directly with construction clients. Although interviewing is often claimed to be 'the best' method of gathering information, its complexity can sometimes be underestimated (Easterby-Smith *et al.*, 2008). Though, in this study, an in-depth interview was used, which was based on carefully prepared set of questions piloted and refined until the researcher was convinced of their validity. Interviews vary in accordance with the philosophical starting points that underpin them. Therefore, the epistemological and methodological bases of interviews and interviewing are necessary prerequisite in research designs that involve them (Silverman, 2001). The research was conducted with five (5) construction companies (where one professional was chosen from each company) that have dealt with Green Building projects in Johannesburg, Gauteng Province of South Africa. Five (5) relevant and experienced construction professionals (3 Architects and 2 Quantity Surveyors) who were registered with their professional bodies and have 20 years and above working experience with construction clients were interviewed for an hour. The construction professionals (i.e. Architects and Quantity Surveyors) are the once who construction clients consult for advice before embarking on Green Building projects. The construction professionals were chosen from grade 7 to 9 registered with the South African Construction Industry Development Board (CIDB).

4 Findings and Discussion

The private sector clients were chosen for the studies because of the wealth of experience gathered working with Green Building implementation over 20 years in the South African building industry. Thematic content analysis was used in the analysis of the data to identifying the recurring material or subject matter as well as identifying content that is noticeably different. The themes and constructs were identified from the interview transcript. The themes and constructs were ranked in frequency percentages (%) and results obtained are shown in Fig.1. From the analysis, four (4) factors were frequently ranked 100% (i.e. green buildings are too costly, lack of good knowledge about green buildings, lack of information on its benefits, and developers are building to sell not considering end-users comfort. Two (2) factors were frequently ranked 75% (i.e. lack of team integration between stakeholders and the use of expensive technologies). Three (3) factors were frequently ranked 50% (lack of good communication, no enough building regulations and the lack of stakeholders buy-in to the technology). From the outcome of the studies four major factors which all the five (5) respondents (3 Architect and 2 Quantity Surveyor) agreed were the most frequent impediments to the rapid implementation of Green Buildings. The major challenges uncovered by

construction professionals that led to poor Green Building implementation in the South African building industry include:

- Green Buildings are too costly
- Lack of proper knowledge of the advantages of Green Building
- Lack of information about its benefit to the construction clients
- Developers build to maximise profit only, not for users' comfort
- Lack of team integration within stakeholders
- Use of expensive technologies
- Lack of proper communication strategies
- No effective enforcement by professionals and government by-laws
- Lack of stakeholders buy-in to the technology

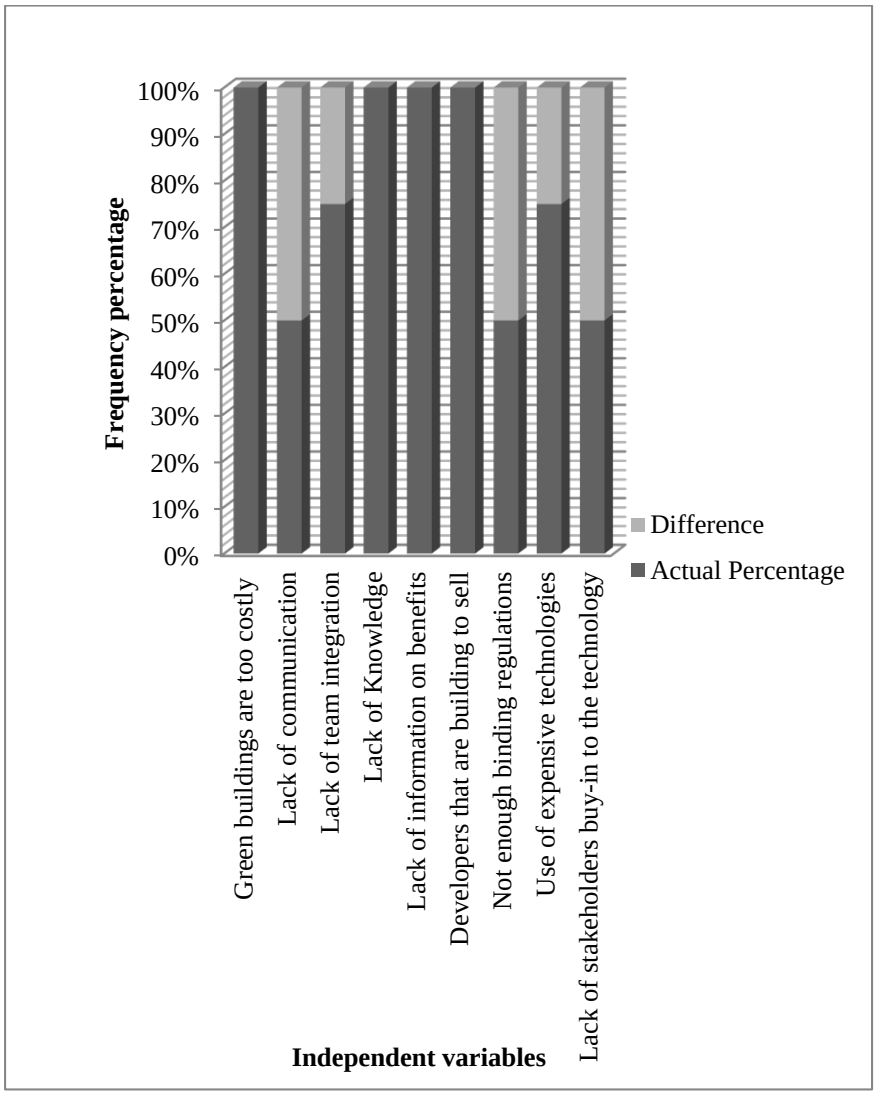

Figure 1. Challenges with the implementation of green building in South Africa

5 Conclusion and Further Research

From the data collected it is clear that Green Building implementation faces many challenges. The four (4) challenges that needed to be addressed as quickly as possible because of the alarming rate (i.e. 100%) are: Green Buildings are too costly, lack of proper knowledge of the

advantages of Green Building, lack of information about its benefit to the construction clients, and developers build to maximise profit only not for end-users' comfort. Despite the fact that these four (4) issues were the most challenging, does not mean the others challenges should be relaxed. For the South African Green Building implementation to succeed, the nine (9) challenges raised by this study need to be looked at critically and addressed to facilitate the speedy implementation of Green Building in South Africa.

The main recommendations of the study are that the concept of green development be broadened into other spheres apart from planners. As such the Green Building Council of South Africa (GBCSA) should broaden the awareness to the construction clients on the strategic advantage of implementing Green Buildings for the comfort of end-users. Again, based on the global warming challenges not only in developing economies, like South Africa, but the world at large, a reduction of green gas emission should be adopted in South Africa. It is also recommended to conduct further research in the public sector projects, such as the South African National and Provincial Departments of Public Works for purpose of comparison.

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