How Nigerian PPP Affordable Housing projects can be better implemented Using Institutional Analysis Development Framework

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Abstract

The international community recognised that increasing the provision of affordable housing is one of the major development challenges of the twenty-first century. This challenge is even more severe in developing economies with high population such as Nigeria, where the government have tried a variety of housing initiatives to help address the challenge but to a relatively very little effect. One of the recent initiatives involves the use of Public Private Partnership (PPP). Unfortunately, the implementation framework does not accurately reflect what is needed to stimulate and broaden housing provision.

This paper adopts an Institutional Analysis Development (IAD) Framework approach to analyse PPP as a mechanism for the delivery of affordable housing in Nigeria. Although the IAD approach is best suited to policy tasks that involve developing new policy initiatives, or comparing alternative policy designs, this research have used it to explain the institutional underpinnings of the many complex problems encountered in affordable housing delivery. The IAD framework helped to integrate the theoretical concepts of PPP and affordable housing provision with the empirical findings of PPP for affordable housing delivery in Nigeria. The empirical data was gathered using semi-structured interviews with practitioners associated with the provision of housing in the public and private sectors in Nigeria.

In addition to providing the basis for more effective policy, the research outcomes provide a firm foundation for building partnership for affordable housing delivery. The research also revealed a number of interesting insights that could assist in successful use of PPP for the provision of affordable housing in Nigeria. Therefore, research objective is to develop a sound framework to facilitate the implementation of PPP affordable housing project. This framework defines the issues, attributes, rules-in-use, interaction and evaluation criteria that define how PPPs will be implemented throughout the PPP project life cycle.

Keywords: public private partnership, affordable housing, nigeria, institutional analysis development framework.

Introduction

South African initiatives to improve H&S performance on construction sites have reduced accidents (Construction Industry Development Board (CIDB), 2009). Despite the reduction, construction work sites are still among the most dangerous work places in South Africa. For

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example, approximately 160 deaths occurred on construction sites in 2007/2008 (CIDB, 2008). The construction industry was ranked third after mining and transportation, with 74 deaths recorded on site in 2003 (CIDB 2004). Further, a report by the Department of Labor (DoL) (2012) indicates that between 2007 and 2010, construction incurred 171 fatalities and 755 injuries. Thus, the construction industry in South Africa is generally known to be one of the most hazardous, with an unacceptably high level of injuries and fatalities resulting in considerable human suffering (Memarian, 2012). From general statistics released throughout the world and also from past historical perspectives, it is clear that H&S has always been problematic (Geminiani, 2008). Compared to other high risk sectors, construction involves more frequent but smaller scale accidents with many and diverse hazard sources. Construction work involves a large number of work processes that need to be adapted to the project specific requirements and context. Gangolells *et al.* (2010), Hallowell & Gambatese (2009) and Hallowell (2008) opine that in contrast to the well-defined procedures of the high-risk system, the loosely defined construction work processes allow the work crews to have high degree of freedom concerning how they organize and coordinate work. As a result, construction crews and to a large extent, the site supervisors determine how the actual work is structured, coordinated, and carried out.

To ease the situation, construction H&S studies have proliferated in the past three decades. However, limited effort had been made to reduce the injuries caused by form work and false work hazard sources in South Africa. Therefore, this research investigated some of the hazards of form work and false work on construction sites and the possible solutions to overcome the problems.

Formwork is any type of construction, including structural support, designed to enable concrete, cement or other materials to be poured in a fluid state to assume a particular shape upon setting. False work is any temporary structure used to support a permanent structure, when the permanent structure is not self-supporting, for either new construction or refurbishment. False work does not include scaffolding or the use of cranes for supporting structures. In many codes, formwork and false work together are called ‘formwork structure’ or just ‘formwork’ (Krishnamurthy, 2012; 2013). For instance, in developing countries, the materials used for formwork and false work tend to be rough or used timbers, which further endangers the life of the workers as the timber easily breaks when subjected to pressure (Ismail and Ghani 2012). A major problem with formwork is that it is ‘temporary’. In many under-developed, ‘temporary’ is associated with lack of need for planning, design and care, and with neglect of appearance, strength, and safety. The causes of many past failures were foreseeable and could have been prevented by proper consideration when planning, erecting, loading or dismantling the form work and false work (Maloney, 2011).

It is in line with this perception that this research investigated form work and false work hazards in South African construction. The various causes of formwork and false work hazards on sites were explored. Preliminary investigation by the researchers shows that in Bloemfontein, formwork contractors use measuring tapes, strings and water tubes for erection of formwork and false work and there may also be a surveyor available to mark the levels with the help of a theodolite. Unfortunately, contractors work without adequate H&S measures and failures relative to false work often lead to the collapse of a permanent structure. This has caused lots of injury and fatalities among people working on or near such false work, as well as loss of time and money for the project actors.

Research Method

Due to the desire to identify the hazards that are significant to formwork and false work in the South African construction context, an exploratory phenomenology study was conducted among construction workers and their superiors on various project sites in Bloemfontein,

South Africa in 2014. The immediate causes of these hazards and their effects on construction participant were examined in the study. Specifically, nine construction actors were interviewed in nine different firms (one from each firm) with semi-structured questions that was initially sent to them by post and then sent by e-mail as reminders before the actual date of the interviews. This was done to assure consistency in the nine interviews, which were conducted over a period of two weeks. The interviews, generally, were between 15 to 25 minutes in duration. At the commencement of the interviews, each participant was reminded of the research problem and of the interview processes. Each interviewee was then provided with a covering letter to read, a confidentiality agreement to sign; if opted to do so, and a short questionnaire to complete. This process was then followed by the actual interview during which the interview protocol was utilized as a guide. Each participant was asked about his / her experience and perception related to formwork and false work hazards. All interviews were recorded and transcribed accordingly.

As mentioned earlier, nine interviewees participated in the study. The interview findings were further supported with on-site observation of the use of formwork by the researchers. The interviewees consisted of 2 women and 7 men between the ages of 31 and 59. The educational levels of the participants ranged from a senior certificate to a post-graduate diploma, and construction industry experience ranged from 3 to 33 years (see Table 1). The management levels of interviewees varied from junior management to senior management, with job titles ranging from junior construction manager to managing director.

Table 1: The demographic information of the interviewees

Interviewees	Highest Level of Education	Years in Industry
1	Honor's Degree	21
2	National Diploma	19
3	Bachelor's Degree	28
4	National Diploma	3
5	Bachelor's Degree	13
6	National Diploma	18
7	Honor's Degree	9
8	Post Graduate	33
9	Bachelor's Degree	8

Results and Discussion

Given that textual data form the nature of the findings, the following sub sections are based on the thematic analysis of the interviews that were conducted in the study.

Causes of Formwork and False Work Hazards on Construction Sites

All the nine interviewees stated that the main cause of formwork and false work accidents on sites is lack of planning, as most formwork and false work are not actually planned for before requesting for their use by the site engineers. Seven of the nine interviewees affirm that stripping of formwork, especially for in-situ concrete construction, falling objects (primary hazard), floor collapse (secondary hazard), working in awkward postures, and repetitive handling of materials are the major causes of formwork and false work accident on construction sites. This affirmation was based on the project experiences of the interviewees in South Africa. Further, six of the interviewees also stated that severe formwork and false work accidents occur on site during delivery, storage, loading and unloading process. For example, they observe that materials can be too heavy or bulky for

safe lifting and work men may not have safe loading / unloading facilities or may lack the proper machinery to assist in material handling.

Six of the interviewees further opine that occasionally, if the safe loading / unloading facilities are available, some of the construction workers may want to complete a task immediately in order to start another one. As a result of doing this fast track mode of operation, the workers may not use the facilities with proper care to the extent that an accident may occur. Although, all the interviewees agreed that most of the formwork and false work accidents on site are due to the sloppiness, three of them further emphasize that inadequate construction H&S knowledge by H&S officers as well as construction managers is the main reason for most accidents on site. Only two of the interviewees strongly perceive that the lack of construction H&S knowledge related to formwork and false work among contractors is the main cause of accidents. Table 2 summarizes the opinions of all the interviewees on other forms of hazard associated with formwork and false work as well as their causes and number (in range) of occurrence on construction sites in the past 3 years. Poor fixing of guardrails to scaffoldings was also perceived to be a major contributor to accidents as shown in Table 2. Only the use of inferior materials records a low level of impact.

Table 2: Formwork and false work hazards and their causes on construction sites

Hazards	Responsible Factor (s)	Number of Occurrence (range) in the past three years	Remarks
Slips and Trips	Carelessness	25-35	Very high
Hit by falling objects	Poor fixing of guardrails to scaffoldings	25-35	Very high
Falling at Height	Poor design, Carelessness and inadequate safety construction knowledge	12-15	High
Floor Collapse	Poor design and inadequate construction H&S knowledge	15-18	High
Dust	Use of substandard material during design	5-10	Low

To be succinct, all the interviewees agreed that formwork and false work hazards are also caused by a wide range of factors, which include:

- Lack of awareness of safety regulations;
- Lack of enforcement of safety regulations;
- Poor regard for safety by people involved in construction projects;
- Engaging incompetent personnel;
- Non-vibrant professionalism;
- Mechanical failure of construction machinery / equipment, and
- Physical and emotional stress.

The findings of the study suggest that hazard related to formwork and false work could also manifest due to many factors that are relevant to different activities on a construction site. Table 3 shows the summary of the opinions of all the interviewees on the various forms of activities on site that often leads to hazards. The interviewees were of the opinion that

poor design, lack of diligence in practice, and poor H&S knowledge could always lead to hazardous conditions during the erection of formwork and false work on sites. These factors are also applicable to the dismantling, stripping and pouring of concrete on construction sites. The impacts of these hazards include injuries and fatalities. In fact, the interviewees opine that any failure of formwork and false work, especially at the decking (deck collapse) may lead to the collapse of the permanent structure with the attendant cost of accident.

Table 3: Formwork and false work activities that often leads to hazards on construction sites

Activities	Responsible Factor (s)	Remarks
Erection	Poor design, carelessness and lack of H&S knowledge	Always
Dismantle	Carelessness / negligence of the contractors	Always
Forming	Use of substandard material during design	Always
Pouring of concrete	Poor design, lack of H&S knowledge and Carelessness	Always
Striping	Poor design, lack of safety knowledge and Carelessness	Always
Transportation	Carelessness	Not always

Means of Eliminating Formwork and False Work Hazards on Construction Site

According to Table 2, the notable hazard in this study pertains to slips and trips. In particular, all the nine interviewees emphasized that construction sites can be busy places where lots of materials and substances are being moved around, often resulting in untidy, uneven surroundings for workers. As a result, the most prevalent injuries on site while constructing formwork and false work are trips over materials and obstacles. Small oil and grease spillages present further hazards, while rain water can become an unexpected slippery mischief source. Thus housekeeping status is crucial to mitigate accidents related to slips and trips. They therefore, suggested that walkways and work areas should be clear of obstructions at all times before the place of formwork and false work.

The second hazard in Table 2 is falling at height. Seven of the interviewees opine that lots of construction works are carried out at lofty heights; therefore injuries from falling happen often and can be quite serious. For instance, builders fall off scaffoldings due to lack of guardrails being in place. The interviewees state that scaffolds should be solidly built; workers should ensure that sufficient guardrails are placed wherever necessary and be equipped with appropriate fall protection such as harnesses and rope grabs.

The third hazard that was also mentioned is ‘hit by falling objects’. Five of the interviewees elaborated that falling objects such as tools, materials and debris pose a very real and potentially fatal threat to workers. According to the interviewees, at time, relying on a safety gear may not be enough and it is better to prevent these risks in the first place. The use of the appropriate personal protective equipment (PPE) is relevant in this context. The five interviewees suggested that fixing guardrails to scaffoldings are essential when it

comes to construction safety, preventing workers from falling off; similarly, fences and barricades can help to reduce the amount of objects from falling onto workers and provision should be made for it. In addition, workers should install safety nets where possible as these will catch falling debris.

Further, some of the interviewees made it clear that supervisors play an important role in creating and maintaining safe and healthy working environments (working conditions), practices, policies and procedures. Therefore, it is the supervisor's responsibility to identify potential formwork and false work hazards, identify methods to control or eliminate the hazards, ensure employees engage in safe and healthy work environments by ensuring that construction employees pass through formwork and false work H&S training before the commencement of work. Some of the interviewees opine that quick and consistence actions / responses by the management of a construction firm to employees' reports on hazards or potential hazards will go a long way to reduce the occurrences of formwork and false work hazard on construction site.

Six of the interviewees suggested that formwork and false work contractors as well as other construction participants should be given the opportunity to contribute their input regarding recommendations on H&S products, procedures, and training as it pertains to daily work operations before the commencement of site activities. The mandatory 'tool-box' talk before the commencement of daily work is an opportunity to hear the views of everyone related to H&S. They further stated that these inputs may be provided through the available suggestion systems such as suggestion box. Seven of the interviewees suggested that formwork and false work contractors should be allowed to participate in a variety of activities such as; a trainer, inspector, or problem solver. One of the interviewees suggested the following PPE and materials for effective protection of formwork contractors before going to the site:

- Eye protection, which is needed when there are potential for hazardous flying objects or particles, chemicals, arcing, glare, or dust.
- Leather work boots, which should be worn for protection against falling objects, chemicals, or stepping on sharp objects. Safety toe footwear may be necessary in some instances. Athletic or canvas-type shoes shall not be worn.
- Protective gloves or clothing should be worn when required against hazards.
- Harnesses and lanyards should be used for protection against fall as required.

The findings of this South African study resonate with key issues in the literature. For instance, in the United States of America (USA), Hadipriono and Wang (1986) determine that major false work collapses of bridges and buildings occurred because of the interaction of the triggering and enabling events, which were, in most cases, produced by gaps in procedural methods. The authors note that impact forces resulting from operations often trigger false work failures that were enabled by poor bracing, components, connections, foundations, and design. In other words, inadequate review of design and monitoring procedures were frequent problems that facilitated the occurrences of failures in 85 major false work collapses assessed by Hadipriono and Wang (1986). More recently, a case study from Taiwan applied lean construction principles to the formwork erection processing in order to reduce waste. The study note that the 'silos' in current practice (Ko and Kuo, 2015). These silos that are engendered individualistic approach by the general contractor and formwork subcontractors leads to lack of integrated plans for formwork operations and the poor coordination of activities. The flow of operation results in wasted actions, which includes walking about, searching for items, and waiting for materials on site. These issues lead to situations that could proof hazardous to people on the site.

Conclusions and Recommendations

Observations from this exploratory study show that workers are exposed to significant formwork hazards; and as such, there is a major scope for the improvement of H&S practices in Bloemfontein, South Africa. The rising number of fatalities and injuries in South Africa construction in general, and on building sites in particular, is a reason to close all practice loop holes in construction. To close this gap, awareness of the implications of sloppy practices would have to percolate the fabric of the industry. First, construction workers should adequately understand the hazards pose by formwork and false work on site as well as the means of preventing the hazards before the beginning of work. Second, no worker should be allowed to access the immediate area beneath the section of formwork and false work where the concrete is being poured on site without adequate knowledge of formwork and false work in terms of H&S practice. If need be, workers should be located in a position that will safeguard them from injury if the formwork and false work fail during concrete placement.

Formwork and false work inspection by qualified engineer is important to ensure that the design is implemented according to plan, so that construction problems can be avoided. Also, inspection during formwork and false work removal by a qualified engineer is equally recommended to reduce the probability of damage of the permanent structure that can cause hazards to construction workers. This particular suggestion would have preserved the life of workers on a mall that collapse during the striking of the formwork on a slab in South Africa in 2013. This particular incident is a subject of outcry and inquiry led by the DoL in South Africa (Emuze *at al.*, 2015).

Prescriptive measures should be taken to ensure that walkways and work areas on sites are clear of every form of obstructions at all times before the place of formwork and false work. The research also recommends that in every construction projects, scaffolds should be solidly built; workers should ensure that sufficient guardrails are placed wherever necessary and be equipped with appropriate fall protection such as harnesses and rope grabs to prevent accidents that are liable to falling at height. Workers should also install safety nets where possible to catch falling debris.

It is also recommended that all construction workers should be well trained on formwork and false work H&S practice and be well educated about first aid procedures before the commencement of work; basics such as the location of emergency phones, first aid kits, stretchers, fire extinguishers locations and evacuation plans that greatly reduce the risk of injury should be considered. Finally, no construction workers should be allowed to enter the site without adequate protection against hazards. Hence, hats, cloves, eye protection glasses and proper footwear are vitals protective materials to be used. Addressing the root causes of formwork and false work failures is also recommended. Such root causes are related to design issues that can be addressed with procurement and the training of construction workers as well as H&S personnel. With respect to design, it is a good practice for all drawings, specifications, method statements, and instructions to be presented in an easily understood manner so that ambiguities are avoided. For instance, workers erecting and stripping a formwork system should understand ‘when and how’ to get the job done and the ‘frequency and details’ of inspections should also to clear to all concerned parties. Another root cause that should be addressed is the training of site management. Such training would solve the problem of inexperienced H&S officers, especially regarding the ability to stop and report hazards related to formwork and false work. An in-depth study of the root / remote causes of formwork and false work accidents shall however form the focus of a future study as this exploratory phase of the research did not do justice to root cause analysis of the malaise.

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