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To cite this article: Auwalu Sani Shehu *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **513** 012003

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# Building projects delivery challenges on remote sites in northern Nigeria

Auwalu Sani Shehu<sup>1</sup>, Yakubu Ibrahim<sup>1</sup> and Ibrahim Ibrahim Inuwa<sup>1\*</sup>

<sup>1</sup>Department of Quantity Surveying, Faculty of Environmental Technology, Abubakar Tafawa Balewa University (ATBU), Bauchi-Nigeria

\*Corresponding author: iinuwa@atbu.edu.ng

**Abstract.** Most building projects sited on remote sites in Nigeria fail due to less attention given to logistics. Hence, this paper identifies and assesses challenges faced by such projects, as well as strategies for curbing them. Literature review, unstructured interview, and personal observation were employed to design a structured questionnaire for the study. A total of 117 questionnaires were administered to building procurement professionals through disproportionate stratified random sampling technique in northern Nigeria. Subsequently, descriptive and inferential statistics were used to analyze data obtained. Six challenges and ten strategies were identified. The challenges were assessed to be severe; with resource scarcity, predetermined designs, and poor accessibility found to be extremely severe. While maintaining retainer-ship with suppliers, outsourcing work force, integrating local community in works, stacking materials before starting works, and subcontracting labour were ranked highly effective strategies for curbing the challenges. The study recommends: appropriate attention on project site logistics; government provision of socio-economic infrastructures in rural areas; and the adoption of effective curbing strategies where challenges seem inevitable.

## 1. Introduction

The concern of key construction project stakeholders globally (clients, consultants and contractors) is to deliver a project that meets time, cost, quality, and other requirements that define project success [1,2,3,4]. The quest for attaining construction project success in a developing country, in contrast with a developed country, can be made more difficult if the project is located on a remote site, due to inadequate socio-economic infrastructures that ensure quality, timeliness, and budget effectiveness [1] [2]. This agrees with Ofori [1] and Callahan *et al.* [3] assertion that attainment of construction project success in developing countries is increasingly difficult, due to the absence of the necessary external factors that are attributable to site location. Thus, resulting in projects time and cost overruns, and quality being compromised. In Nigeria, logistic problems associated with project location on remote sites according to Shehu [4], attracts little attention. The objectives of this paper therefore, is to identify and assess challenges faced by construction projects on remote sites in northern Nigeria, as well as strategies for curbing them. In other to achieve its objectives, this study sought to answer the following questions: what are the challenges faced by building projects on remote sites in northern Nigeria; and what are the strategies for curbing them?



## 2. Review of literature

### 2.1. Nigeria as a developing country

Going by the UNDP [5] report, there are over 100 countries globally that are referred to as developing countries; Nigeria inclusive. A developing country is a country with an economy characterised by poor level of industrialisation, less income per capita, low life expectancy, low rate of literacy, and poor standard of living; such a country is also referred to as a developing economy or an underdeveloped country. The Human Development Index (HDI) determine a country's level of development. The HDI is a statistic that aggregates a country's level of economy/development in a composite index; it consider level of industrialisation, income per capita, life expectancy (health measure), literacy level, and standard of living [5]. Thus by implication, Nigeria as a developing country lacks the adequate infrastructures that support industrialisation, capital formation and investment potentials, health, education, and agriculture. Hence, their economic deficiency constitutes logistical problem that adversely affects the attainment of project success especially on a remote site.

### 2.2. Challenges faced by building projects located on remote sites

Remote construction sites are sites that are situated far from the main centres of population; they are in most cases difficult to access [4] [6]. By their characteristics, most remote sites are found in developing countries [7]. This is virtually because of the level of under development and the concentration of development in urban centers [8]. Consequently, leads to paucity of construction resources in the rural communities. It follows therefore that the remoter the location the higher the scarcity of construction resources and the costlier the construction development. The features of a remote site have adverse disadvantages on the realization of a project. These disadvantages pose severe challenges to project success, and they include: poor communication; poor accessibility; distance; expensive site situations; pre-determined designs; and resource scarcity [13,14,15,16].

#### 2.2.1 Poor communication

According to Sidawi [9], remote construction project site exists in many regions throughout the world. One of the problem faced on such site, is in managing the communication chains in implementing such projects. Poor communication on construction site will obviously affect project planning, as well as project process integration [9]. This will leads to misinterpretations and miscommunications of project results and needs issues. Szava *et al.* [10] revealed that communication problem makes it difficult to remobilize workers back to remote sites to effect remedial works after the expiration of defects liability period. This poses a problem that usually results in arbitration and in some cases to ligation as the owner perceives the project as being uncompleted.

#### 2.2.2. Poor accessibility

Remote sites are mostly characterized by poor accessibility, hence making the contractor incurs more cost that is transferred to client as site overheads. In most of the remote sites in northern Nigeria, access roads are either absent or in poor conditions. The situation in most cases calls for the construction of access roads; in some cases leading to delay in project execution and cost overrun. Thomas [11] confirmed that poor accessibility leads to high cost of labour, money, the technology and methods to be used in construction. This is because in most remote sites adhering to a strict construction method may mean adopting the use of certain equipment and personnel which in turn means increasing the scope of logistic supports (preliminaries) required to achieve that [12]. Generally, accessibility of any site commands the cost of achieving project goals set at the brief and design stages [9]. It is therefore pertinent to know the level of accessibility of a site to the human and material resources needed to be mobilized for the actualization of the project at that stage.

### 2.2.3. Distance

Szava *et al.* [10] reported that the overall increase in the cost of construction in remote locations is compounded by the rising cost of transportation which increases progressively. The impact of higher transport costs is felt where human and material resources need to be transported from central regions to remote site where important construction projects are sited [13]. Moreover, fuel price which is another component of transport cost increases accordingly. Szava *et al.* [10] further reported that labour cost shot up to 60% of the total construction cost in remote areas which may result in pay hesitant and consequent resentment of people to work in remote sites. Similarly, Sidawi [9] pointed out distance-specific problems occasioned by remote sited projects to:

- i. Delay in achieving project goals due to mistakes in construction, delay in project time-table, personnel safety issues, poor quality in construction, low productivity of workers
- ii. Using unskilled workers due to unavailability of skilled workers ;
- iii. Low productivity due to inaccessibility to specified materials on time and shortage of construction equipment; and
- iv. Unavailability of supervisors when needed.

In some situations contractors have had to contend with carrying out works using the obtainable skills with very little input from appointed supervisors due to distance and the fact that there may be other projects in near places to supervise at the same time [14]. In Nigeria, many projects were completed in remote locations without the predetermined supervision due to distance of the project location.

### 2.2.4. Expensive site situations

Most construction sites in remote areas are small and medium sized, in cases where such projects are large and gigantic, the logistic supports allowed in the project plan takes care of the infrastructure challenges, for instance; access roads, water supply, electricity, communication and resident supervision and accommodation [15]. However, where projects are small and medium size, such provisions to take care of the logistic support cannot be incorporated in the project plans as in many situations such logistic requirements are costlier than the actual project itself. On remote sites where operatives cannot be shuttled every day due to distance, the need to provide accommodation becomes inevitable. Moreover, welfare facilities such as mess room, convenience, and other social amenities will be needed to provide a suitable working condition. Contractors handling construction projects located on remote sites in Nigeria find it difficult to address issues emerging from poor logistics consideration due to inappropriate attention given to logistics. Thus, putting them in a dilemma as to whether they are doing business or running a charity. Usually, the preliminaries allowed in such project cannot take care of the logistic support requirement of the projects, hence a contractor has to make do with substandard materials and poor workmanship, which eventually result in project failure. In addition [10], the isolation and long transport distances have a compounding effect on all other logistics issues, thereby increasing normal risk. This means that any unforeseen events, conditions, or even small mistakes like miscalculating the amount of materials needed, or forgetting a tool, can have substantial consequences.

### 2.2.5. Predetermined designs

Most projects (e.g. dispensaries, schools, etc.) sited on remote sites in Nigeria, which are sponsored by public and development partners, adopt prototype designs. Such projects faced serious challenges because the design adopted failed to consider the dynamics (logistics) of each site [4]. Consequently, neglecting the uniqueness of each project [21,22]. Accordingly, when the uniqueness of a project manifest itself, it becomes a problem that was not foreseen and planned for, thus resulting in excessive variations, litigation, or eventually in abandonment.

### 2.2.6. Resource scarcity

Construction resource encompasses both human, material, and equipment and plants. It is very evident that construction projects sited on remote sites experience resource scarcity especially in a developing country [5,15,14,17]. In most remote sites in Nigeria, lack of skilled operatives compelled contractors to engage substandard operatives, thus contributing to resource management difficulty. The transporting and maintenance of plants needed on site is certainly a challenge too, and frustrates projects on remote sites in the attainment of success [12,13,23].

## 3. Methodology

### 3.1. Study area

This study was conducted in the north-eastern and north-western geopolitical zones of Nigeria. The two zones constitute slightly more than one-third of Nigeria's 36 States (13 states). They occupy a land size of 512, 572.06 sq. km representing almost 55% of Nigeria's total land size of 937,052.16 sq. km and accommodate a population size of over 55 million people, representing 39% of Nigeria's total population of over 140 million people [16]. In the north-eastern zone, Bauchi and Gombe States were selected as a sub-study area, while Kano, Katsina, and Jigawa States were selected in the north-western zone to complement the research study area. These States were selected because of their large population and concentration of construction activities in their respective geo-political zones [24,25,26].

### 3.2. Research design, population, sample size and sampling technique

This study's objectives inform the adoption of an exploratory (interviews & literature review) and descriptive (observation & questionnaire survey) research design [24,27]. Findings from literature review, interviews and physical observations on remote sites were used to design the study questionnaire. The population for this study comprised of a set of core building procurement professionals: architects; engineers; and quantity surveyors. They were drawn from 75 identified remote sites in the north-eastern and north-western geo-political zones of Nigeria. Hence, given a population size of 225 professionals from 75 remote sites. Subsequently Krejcie and Morgan [17] table was used to arrive at a sample size of 144. Disproportionate stratified random sampling technique was employed to administer questionnaire; this technique was used to capture all the sites, as well as to proportionately address the disproportionate numbers of respondents on the various sites identified [18].

### 3.3. Method of data analysis

This study used Microsoft excel to conduct descriptive and inferential statistics analyses on the data obtained from questionnaire responses. A 5-point Likert scale of severity (scale: 5-extremely severe; 4-severe; 3-moderately severe; 2-least severe; & 1-not severe) and relative effectiveness (scale: 5-highly effective; 4-effective; 3-moderately effective; 2-least effective; & 1-ineffective) index (see: eqn. 1 & 2) were used to rank the severity of challenges faced by projects on remote sites and the relative effectiveness of the strategies for curbing the challenges respectively. The formula used for the computation of the ranked severity index and relative effectiveness index are given as [4]:

$$\text{Severity Index}(SI) = \sum IF/N \quad (1)$$

- Range for SI: 0-1.44 not severe; 1.45-2.49 least severe; 2.45-3.49 moderately severe; 3.45-4.49 severe; 4.50-5.00 extremely severe.

$$\text{Relative Effective index}(REI) = \sum_{i=1}^n aixi/3 \quad (2)$$

- Range for EI: 0-1.49 ineffective; 1.45-2.49 least effective; 2.45-3.49 moderately effective; 3.45-4.49 effective; 4.50-5.00 highly effective.

#### 4. Results and discussions

Table 1 depicts that a total of 117 valid questionnaires were returned out of a total of 144 distributed; representing 81.25% response rate. This response rate is higher than other studies carried out in the construction industry. For instance: Usman *et al.* [19] recorded a response rate of 55.25%; Iro *et al.* [20] received a 55.25% response rate; Ibrahim [21] recorded a 47% response rate; [22] recorded a 25.4% response rate; Olatunji [23] obtained a 33.5% response rate, Crafford [24] received a response rate of 22.8%. Hence, making it more appropriate for generalization of the results on the study population [35,36]. Table 1 also shows that all the respondents' used for the study are specialized in core building procurement professions [25] and about 89% of the respondents' have more than six years working experience in the construction industry. This indicates that all the respondents' are knowledgeable and aware of the problem being investigated.

**Table 1.** Respondents' profile & questionnaire administration.

Questionnaire response rates				Respondents' organizations' profile					
respondent	Distribution		back & % response rates	Profile			Profile		
	(no.)	(no.)		educational specialization	Freq	%	working experience (years)	Freq	%
Architects	53	40	75.47	Architecture	40	46.43	≤ 5	13	11.43
Engineers	48	35	72.92	Engineering	35	33.57	6-10	60	51.42
Q/Surveyors	43	42	97.67	Q/Surveying	42	30.00	>10	34	37.15
<b>Total</b>	<b>144</b>	<b>117</b>	<b>81.25</b>	<b>Total</b>	<b>117</b>	<b>100</b>	<b>Total</b>	<b>117</b>	<b>100</b>

**Source:** Field survey (2015)

Table 2 portrays the respondents' ranking of the relative severity and relative effectiveness index of the severity of challenges building projects faced on remote sites in northern Nigeria, and the effectiveness of the strategies for curbing them respectively. All the identified challenges were ranked within the range of 3.9714-4.7140, revealing that all the challenges are experienced at a severe level; with resource scarcity, predetermined designs, and poor accessibility ranked as extremely severe challenges.

**Table 2.** Ranking of relative Severity and relative effectiveness index.

Ranking of relative severity index (RSI) of project challenges on remote sites				
S/N	Challenges	RSI	Severity	Rank
1	Resource Scarcity	4.7140	Extremely severe	1 <sup>st</sup>
2	Predetermined designs	4.6857	Extremely severe	2 <sup>nd</sup>
3	Poor accessibility	4.5444	Extremely severe	3 <sup>rd</sup>
4	Distance	4.0286	Severe	4 <sup>th</sup>
5	Poor communication	4.0286	Severe	4 <sup>th</sup>
6	Expensive site situation	3.9714	Severe	5 <sup>th</sup>
Ranking of relative effectiveness index (REI) of strategies for curbing challenges				
S/N	Strategies	REI	effectiveness	Rank
1	Maintaining retainer-ship with suppliers	4.6123	highly effective	1 <sup>st</sup>
2	Outsourcing work force	4.6142	highly effective	2 <sup>nd</sup>
3	Integrating local community in works	4.6211	highly effective	2 <sup>nd</sup>
4	Stacking Materials before starting works	4.5122	highly effective	3 <sup>rd</sup>
5	Subletting labour	4.5001	highly effective	4 <sup>th</sup>
6	Partnering with material suppliers	4.4911	effective	5 <sup>th</sup>
7	Pay increase to worker	4.1190	effective	6 <sup>th</sup>
8	Subletting part of the works	3.9523	effective	7 <sup>th</sup>
9	Sacrificing Profit to achieve delivery	2.2315	Least effective	8 <sup>th</sup>
10	Working slowly as materials arrived	2.2215	Least effective	9 <sup>th</sup>

**Source:** Field survey (2015)

Table 2 shows that maintaining retainer-ship with suppliers, outsourcing work force, integrating local community in works, stacking materials before starting works, and subletting labour strategies are highly effective in curbing challenges faced by building projects located on remote sites in northern Nigeria. Partnering with material suppliers, pay increase to workers, and subletting part of the works are ranked to be effective strategies in curbing challenges encountered by building projects sited on remote sites in northern Nigeria, while sacrificing profit to achieve delivery and working slowly as materials arrived are least effective strategies. The findings of this study are in accord with previous studies on the identified projects challenges on remote sites and strategies for curbing them [13,14,15,17,18,19,37,38]. However, this study is in contrast with previous studies in view of its assessment of the severity of challenges faced by building projects sited on remote sites in northern Nigeria, as well as on the assessment of the strategies for curbing them.

## 5. Conclusion and recommendation

This paper identified and assesses challenges faced by building projects on remote sites in northern Nigeria, as well as strategies for curbing them. The study employed exploratory and descriptive survey designs. Six challenges on remote sites were identified to be severe; with resource scarcity, predetermined designs, and poor accessibility assessed to be extremely severe. Ten strategies were identified as strategies for curbing the projects challenges on remote sites, with the following strategies found to be highly effective; maintaining retainer-ship with suppliers, outsourcing work force, integrating local community in works, stacking materials before starting works, and subletting labour. This paper recommended that: projects on remote sites should be considered on their unique site logistics; government should provides basic socio-economic infrastructures that support economic development in rural areas; and where challenges seem inevitable, effective strategies for curbing such challenges should be adopted.

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