

Small and Medium Scale Contractors' Perception of the Factors Affecting Production Cost of Building Projects in Nigeria

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Abstract

Knowledge and understanding of key factors affecting production cost of building projects is significant to mitigate problems of poor cost performance in the construction industry. This study investigated factors affecting production cost of building projects and attempts to classify the factors into three resource groups. The study involved an explorative research adopting questionnaire survey. The survey involved 145 professionals from small and medium scale contracting firms in Nigeria. Fifty five potential factors were ranked by professionals to determine their effect on the production costs of public building projects. Data collected were analysed using mean item score, and Mann-Whitney U test was conducted to compare respondents' perception in both categories. The results revealed design changes, fluctuation in prices of materials, construction error, production waste, inadequate planning and high cost of labour and machinery are significant factors affecting the production cost of public building projects. The respondents' perception is consistent in both categories as no significant difference was established by the hypothesis test ($p = .938, .871; \text{ and } .820 > 0.05$). To mitigate the influence of these factors, the study recommends proactive cost management strategies should be instituted and embraced as company's philosophy to achieve cost-effective delivery.

Key words: Building Project, Contractor, Estimation Accuracy, Perception, Production Cost.

Introduction

The growing need to achieve value for money which is the effective utilization of scarce resources necessitated the need for research into the effect of resource-related factors on production cost of public building projects. Cost is one of the major considerations throughout the project life cycle and is often regarded as one of the most important parameters and determinant of project success (Choge & Muturi, 2014; Memon, Rahman, Abdullah, & Azis, 2010). The construction industry and the society at large are concerned about high cost of building in various ways. Transformation of production cost of construction resources over project activities is fundamental to the achievement of client's goal of completing the projects within budget. Production cost also referred to as contractor's cost is a major component of the overall project cost. Effective management of production cost in construction project largely determines the total project cost and profit margin.

The major challenge facing the construction sector today is project completion within estimated costs. Studies show that poor cost performance is prominent in the industry, globally (Ameh, Soyngbe, & Odusami, 2010; Enshassi, Al-Najjar, & Kumaraswamy, 2009; Le-Hoai, Lee, & Lee, 2008; Azhar, Farooqui, & Ahmed, 2008; and Koushki, Al-Rashid, & Kartam, 2005). Ramli (2003) observed that cost performance in the construction industry is less effective compared to other project objectives such as schedule. Poor cost management is common among the Small and Medium Contractor Enterprises (SMEs) in developing countries like Nigeria. Investigation into the performance of these categories of contractors with the view to enhancing their performance cannot be compromised in the economy of a nation. Small and medium scale contractors have been noted to be the engine through which the growth objectives of developing countries can be achieved and are potential sources of income in many developing countries (Kayanula & Quartey, 2000). They are labour intensive, capital saving and capable of creating new jobs. Lack of effective management during their early stages has been reported as a major cause of business failure for small and medium sized contractors (Thwala & Phaladi, 2009). The rate of poor cost performance in the construction industry is enormous especially among the small and medium scale contractors who could hardly stay viable in construction business more than four or five years (Thwala and Phaladi, 2009). Cost performance measures the degree to which the general conditions promote the completion of a project within the estimated budget. Among the factors responsible for the poor cost performance of construction projects are resource-related factors which this study intends to investigate.

Poor cost performance of construction projects over time has given bad reputation to the industry because of its diverse implications. Globally, most mentioned effects of the poor performance is cost overrun (Ameh, Soyngbe, & Odusami, 2010; Enshassi, Al-Najjar, & Kumaraswamy, 2009; Le-Hoai, Lee, & Lee, 2008; Azhar, Farooqui, & Ahmed, 2008; and Koushki, Al-Rashid, & Kartam, 2005). Other effects include company failure, delay, supplementary agreement, adversarial relations among stakeholders, budget shortfall of project owners, project abandonment, project failure, and a drop in building activities (Mbachu and Nkado, 2004; Nega, 2008). These are some of the problems arising from poor cost performance of construction projects. This study however focuses on production cost of construction projects. The importance of production cost to the overall project cost has necessitated the investigation into resource-related factors affecting the cost. Many of the small and medium contractors in the study area have ignored or have not adequately considered these factors during planning and implementation of buildings projects

This study is therefore concerned with determining the effects of resource-related factors on production cost based on the assessment of small and medium scale contractors in the building industry. The determination of these factors and the ranking of their effects on production costs enable the identification of critical factors and the need to seek mitigating solutions. The objective of this study are therefore to evaluate and determine resource-related factors affecting production costs of building project based on the perceptions of small and medium scale contractors in the study area. Achieving of this objective will help to overcome the challenges of poor cost performance of construction projects in the study area. The three null hypotheses formulated for the factors affecting the production cost: material, labour, plant and equipment are:

- i. There is no significant difference in the perception of small and medium scale contractors on the effects of material related factors affecting production cost of public building projects.
- ii. There is no significant difference in the perception of small and medium scale contractors on the effects of labour related factors affecting production cost in public building projects.
- iii. There is no significant difference in the perception of small and medium scale contractors on the effects of plant and equipment related factors affecting production cost of public building projects.

Small and Medium Scale Contractors in Nigeria

Small and medium scale contractors contribute enormously to the Nigeria economy and to the survival of a large number of people. The success of construction projects in the developing countries is closely related to these two categories of contractors. The small and medium scale enterprises have the potential of ensuring a self-reliant industrialization, in terms of ability to rely largely on local raw materials, generate and boost employment, guarantee a more even distribution of industrial development in the country, including rural areas, and facilitate the growth of non-oil exports (Osotimehin, Jegede, & Akinlabi, 2012). The majority of construction firms are small enterprises that rely on outsourcing personnel as required (Thwala & Phaladi, 2009). Most studies have tried to come up with classification or grouping of small and medium scale enterprises. The study noted that they can be distinguished from each other by any of a combination of the variables such as: number of employees, financial strength, scales value, relative size, initial capital outlay and type of industry (Dlungwana & Rwelamila, 2003). Bodinuba (2012) defined small and medium scale construction firms as a business or enterprise which though mainly owner-managed, employs between 5-10 and 100-200 people respectively, pre-qualified and classified by the Ministry of Water Resources, Works and Housing (MWRW & H) to undertake projects from US 75,000 to US 500,000. Essien (2001) defined small and medium scale industry as an industry with total capital employed for over N1.5 million but not more than N50 million and per a labour size 11-100 workers.

Despite governmental and institutional policies to enhance the capacity of small and medium scale enterprises, small and medium scale enterprises have fallen short of expectations (Osotimehin, Jegede and Akinlabi, 2012). According to Thwala & Phaladi (2009), 3 out of 5 small and medium scale contractors fail within the first few years of operation. Complex nature of work, risks, financial constraints are among the challenges facing small and medium scale contractors in developing countries (Osotimehin, Jegede, & Akinlabi, 2012; Thwala & Mvubu, 2008; Thwala & Phaladi, 2009). The condition in developing countries is further compounded by lack of resources for training contractors, such as funds, poor construction procurement systems and lack of management capacity and resources to equip managers to operate their business enterprises effectively and efficiently (Thwala & Phaladi, 2009). The efforts of Small and Medium Contractor Enterprises (SMEs) should be enhanced through investigating the factors militating against their survival in the Nigerian construction industry, especially in cost management of project resources.

Production Cost of Building Project

Components of production cost of buildings have been identified as material, labour, plant and equipment, finance or money and other costs (Warsame, 2006; Chitkara, 2008; Rahman, Memon, Azis, & Abdullah, 2013). Prominent among these resources are material, labour, plant and equipment. The proportion of these resources and their associated costs varies from project to project due to the nature of construction industry, stakeholders involved, environmental factors and contractor's related factors. According to Bertelsen and Nielsen (1997) the proportion of components of building costs for social housing schemes in Denmark is divided as follows: materials 50 percent, labour 30 percent, heavy equipment 5 percent, construction management and supervision absorbs the other 15 percent. Ayeni (1987) earlier established the proportion of labour to material costs as 40:60. By definition, construction material being the first major resource is an intermediate component of construction input in any construction project. Raw materials are heavily used in the construction industry and their costs greatly affect the construction sector, which in turn both affects and is affected by the economy in terms of its indicators such as Gross Domestic Product (GDP) (Bassioni, Elmasry, Ragheb & Youssef, 2012). A study by Adu and Anjiba (2014) revealed that the proportion of material to production cost of building elements varying from 52.98% to 77.17%. Achuen and Ujene (2006) established the proportion of materials in both public and private projects varying between 42% and 77%. Okupe (2000) also rated the cost of materials and associated components in Nigeria to 75%.

The second major component of production resources is cost of labour which constitutes a large part of construction cost and the quantity of hours in performing a task in construction is more susceptible to the influence of management than materials or capital (Chitkara, 2008). The results of proportion of labour components in building project in public and private projects conducted by Achuen and Ujene (2006) revealed that labour varied between 23% and 58%. Also, evaluation of labour cost component on construction projects by Hanna, Taylor, and Sullivan (2005) was estimated to be about 33%- 50% of the entire project cost. Labour cost is also one of the most contentious factors among all the factors that affect construction costs. Expected construction progress can be achieved only through the attainment of effective man-hour effort and the meeting of scheduled milestone dates.

The third selected resource for this study is construction equipment believed to be significant in the execution of modern high-cost, time-bound construction projects (Chitkara, 2008). It is an indispensable item of resources; it produces output at accelerated speed and enables completion of tasks in a limited time as it can work continuously under adverse circumstances. Plant and equipment save a manpower which is becoming scarce, costly and more demanding day-by-day; improves productivity, quality and safety. Goodrum and Haas (2002) viewed equipment technology as a key factor in long-term improvement in productivity.

Factors affecting production cost of building projects

Factors affecting construction the production cost are numerous. These include resource-related factors of production cost of construction projects. As earlier identified by Chitkara (2008) and Rahman, Memon, Azis, and Abdullah (2013) production cost includes total direct and indirect construction costs associated with project activity which include cost of materials, labour (manpower), machine (plant and equipment), finance (money) and other costs. The findings of Koushki, Al-Rashid and Kartam (2005) reported that material-related issues contribute to cost

overrun. Enshassi, Al-Najjar and Kumaraswamy (2009) investigated 42 factors causing cost overrun in construction projects in Gaza and found that increment of materials prices due to continuous border closures was the major critical and dominant factor. Others are delay in construction, supply of raw materials and equipment by contractors, fluctuations in the cost of building materials, unsettlement of the local currency in relation to dollar value, project materials monopoly by some suppliers, resources constraint: funds and associated auxiliaries not ready, lack of cost planning/monitoring during pre-and post-contract stages, improvements to standard drawings during construction stage, design changes and inaccurate quantity take-off. Weather conditions and physical damages were among factors affecting productivity of labor which resulted into extension of project duration and expenses as identified by Zayed, Amer and Pan (2008). Findings by Assaf and Al-Hejji (2006) revealed shortage of labour, unskilled labour, foreign labour, low productivity level of labours and personal conflicts among labour were amongst other as factors causing delay in construction projects which incidentally affect the project cost. Sweis, Sweis, Abu and Shboul (2008) stated that equipment related factors are generally known as factors causing suspension of construction project. Windapo and Iyagba (2007) identified foreign exchange rates over the imported construction machinery and equipment used in the production of materials and in building construction as a major factor that have led to a prohibitive cost of the final building production in Nigeria. Olawale and Sun (2010) identified 21 major factors causing cost overruns, prominent among the factors are construction resource-related factors. Ghoddousi and Hosseini (2012) also emphasized on the complex nature of the industry due to the large number of parties involved which has continued to affect construction project cost as identified. Other construction resource related factors affecting production cost include building materials cost, cost of capital or finance, cost of acquiring land, foreign exchange rates, cost of infrastructure, labour cost, availability of construction materials (in the host country), type of contract, advance payment amount, inclement weather, inflation, changes in the scope of the project, delays in schedule and lack of managerial and technical knowledge (Windapo & Iyagba, 2007; Sonmez, Ergin, & Birgonul, 2007; Kaliba, Muya, & Mumba, 2009). Construction project cost influencing variables of the foregoing centered on the overall project cost with little attention paid to production cost. This study intends to close the gap in literature by separating factors associated with production cost for evaluation of its effect on production cost based on the perception of small and medium scale contractors in the study area.

Methodology

This study adopted exploratory survey design approach using structured questionnaires. Data used for the survey were primary and secondary. The population of the study comprised of small and medium size contractors involved in procurement of public building project in Uyo, Akwa Ibom State, Nigeria. Based on previous studies, this study identified from literature general factors affecting construction costs (Assaf, Alkhalil & Harris, 1995; Windapo & Iyagba, 2007; Sonmez, Ergin, & Birgonul, 2007; Kaliba, Muya, & Mumba, 2009; Rahman, Memon, Azis, & Abdullah, 2013) and separate those that directly affecting production cost of construction project resources for assessment. In all, a total of fifty five (55) factors were identified and were further categorized into three major groups of variables which were used in this study. The groups include material variables: 25 related factors; labour (manpower) variable group: 20 related factors; and plant (and equipment) variable group: 10 related factors. Ninety Eight (98) small scale contractors and 74 medium scale contractors practicing in the construction industry were established through a pilot survey and adopted as the study population. Eight Three small scale

contractors and 62 medium scale contractors were purposively sampled out of which 76 and 55 valid questionnaires from small and medium scale contractors were obtained and used for data analysis. The questionnaire was personally administered by the researchers to each of the respondents which gave the opportunity for the researchers to interact with the respondents and provide clarity where necessary as requested by the respondents.

The questionnaire consists of two sections; section A sought background information about the respondent (e.g. work experience). Section B was made up of the 55 resource related factors identified from literature that affects the production cost of public building projects. The respondents were required to rate these factors on five-point scale of 1-5 adapted from Nkado and Mbachu (2002) and defined by the interval of 0.8 (Kazaz, Manisali, & Ulubeylim 2008). On the scale, highest degree of very high effect was represented by 5 and no effect was represented by 1. Since the study is interested at determining significant factors affecting production cost of building projects, the study, however, adopted a baseline of 4.20 indicating very high significance as proposed by Kazaz, Manisali and Ulubeylim (2008). The mean rating of each of the three sub-groups for each item and the corresponding resultant mean rating were computed using Statistics Package for Social Sciences (SPSS) version 20. Mann-Whitney U test was used to compare the perceptions of small and medium scale contractors of the effects of factors on production cost of building projects.

Results and Discussion of Findings

Evaluation of material related factors affecting production cost of building projects: 25 common material related factors affecting production cost were identified from literature. These factors were investigated for ranking purpose by the small and medium scale contractors. The results are presented in Table 1.

Table 1: Material related factors affecting production cost

S/no.	Factors	Overall Mean Score	Rank	Mean Score of Small Contractors	Rank	Mean Score of Medium Contractors	Rank
1	Change of scope of design	4.7	1	4.64	2	4.75	1
2	Fluctuation of prices of materials	4.6	2	4.6	3	4.6	2
3	Construction error	4.58	3	4.58	4	4.58	3
4	Production waste	4.58	3	4.64	2	4.51	5
5	Material price increase	4.57	5	4.57	5	4.57	4
6	High transportation cost	4.3	6	4.3	6	4.3	6
7	Unstable inflationary trend	4.26	7	4.26	7	4.26	7
8	Delays in delivery of materials	4.25	8	4.25	8	4.25	9
9	Project duration	4.19	9	4.19	10	4.19	10
10	Changes in material specification and type	4.17	10	4.17	11	4.17	11
11	Project size	4.13	11	4.13	12	4.13	12
12	Inaccurate Quantity take-off/error due to estimation	4.11	12	3.98	13	4.25	9
13	Site conditions	3.99	13	4.23	9	3.75	13
14	Material shortages	3.7	14	3.7	14	3.7	14

15	Project location	3.55	15	3.55	17	3.55	16
16	Unavailability of construction materials locally	3.55	15	3.55	17	3.55	16
17	Inadequate infrastructural facilities	3.54	17	3.55	17	3.53	17
18	Lack of competition among the suppliers/manufactures	3.49	18	3.49	20	3.49	20
19	Limited capacity to produce required construction materials	3.49	18	3.49	20	3.49	20
20	Lack of provision for advance payment	3.49	18	3.49	20	3.49	20
21	Foreign exchange rates	3.47	21	3.47	21	3.47	21
22	High cost of energy (fuel)	3.45	22	3.45	22	3.45	22
23	Distance from source of supply of material	3.43	23	3.43	23	3.43	23
24	Late procurement	3.34	24	3.34	24	3.34	24
25	Accessibility to site	3.28	25	3.28	25	3.28	25

The results from Table 1 revealed that change of scope of design is the most significant factor affecting production cost of building projects with overall mean score of 4.70 followed by fluctuation in prices of materials with overall mean score of 4.60. Errors during construction, and production waste were ranked next with equal overall mean score of 4.58 each followed by material price increase as the fifth factor with mean score of 4.57. Other factors having very high significant effects include high transportation cost, unstable inflationary trend, delays in delivery of materials as sixth, seventh and eighth factors with overall mean score of 4.30, 4.26 and 4.25 respectively. These were the most significant material related factors affecting production cost. The factors were further discussed below.

Change of scope of design: The results from Table 1 indicated that change of scope of design has been ranked as the most significant factor affecting production cost of construction projects. This factor ranked second by small scale contractors with mean score of 4.75 while the medium scale contractors ranked it first with mean score of 4.75. This result is in agreement with the result of the study conducted by Jackson (2002). Minimizing changes to the design or project scope especially at production stage is a good step in enhancing performance of production cost.

Fluctuation of prices of materials: Small scale contractors ranked fluctuation of prices of materials as third while medium scale contractors ranked this factor second. The agreement in the ranking of both sets of respondents indicates the importance of this factor to production cost as well as overall project cost. The result also agrees with Omoregie and Radford (2006) who identified fluctuations in prices as major cost overrun factors in infrastructure projects in Nigeria. Fluctuation in the price of materials is a dominant factor affecting construction cost as identified by Memon, Rahman, Abdullah and Azis (2014). Marzouk and Amin (2013) opine that since materials contribute significantly to a project, a change in price can have a great cost impact on the project.

Mistakes during construction: Mistakes during construction is a major setback in project implementation with heavy cost implication. This factor was ranked fourth by small scale contractors but ranked third by medium scale contractors. This may arise due to lack of clarity of client`s brief, misinterpretation of designs, and lack of experience on the parts of consultants and contractors.

Production waste: Production waste was ranked second by small scale contractors; however, it was ranked fifth by medium scale contractors. The difference in their perceptions could be attributed to the quality of training given to their respective technical team and site workers. This factor has affected the construction industry negatively as noted by Adindu (2013) that the factor has resulted in the required workflow being interrupted and the expected value not created.

Material price Increase: Increase in prices of construction materials is an external factor which is out of control of the project team. This factor received the same assessment by the respondents as the factor was ranked fifth by both small and medium scale contractors. The result of the study also agrees with the results of findings by Enshassi, Al-Najjar, and Kumaraswamy (2009) and Nyabwari (2013) who note that material price increase is a dominant factor causing cost overrun in construction projects in Gaza and Mombasa County respectively.

High transportation cost: The results from Table 1 indicate that both small and medium scale contractors have given this factor equal ranking as the factor was ranked sixth by both of them. This ranking is not surprising because transportation is a contributing factor to the success or failure of construction projects in terms of cost and time. The factor is driven by high cost of petroleum product and road infrastructure. Nnadi (2015) supports the result of this finding by attributing increase in material cost to increase in transport charges.

Unstable inflationary trend: This factor ranked seventh in the overall ranking and also ranked the same by both small and medium contractors. Construction suffers from inflation, as inflation goes up, interest rates, costs of materials, equipment, and labours also increase proportionately (Ali & Kamaruzzaman, 2010). Akpan and Igwe (2001) also observe that inflation has resulted into two unpleasant consequences; the delay in accomplishing the different work schedules and rising cost of construction materials and labour due to extended project duration.

Delays in delivery of materials: this factor was ranked eighth by small scaled contractors but ranked ninth by medium scale contractors. Undue delay caused by this factor can disrupt the workflow and increase construction cost.

Evaluation of labour related factors affecting production cost of building projects: 20 labour related factors affecting production cost have been identified from literature. The effects of the factors on production cost were ranked by the respondents and the results were presented in Table 2.

Table 2: Labour related factors affecting production cost

S/no.	Factors	Overall Mean Score	Rank	Mean Score of Small Contractors	Rank	Mean Score of Medium Contractors	Rank
1	Inadequate planning and scheduling	4.68	2	4.69	1	4.68	2
2	High cost of labour	4.68	2	4.67	3	4.7	1
3	Rework for correcting unsatisfactory work	4.65	3	4.67	3	4.64	3
4	Mistakes during construction	4.5	4	4.6	4	4.4	4
5	Schedule delay	4.35	5	4.33	6	4.36	5

6	Poor communication between the supervisors and labour	4.2	6	4.36	5	4.04	8
7	Labour availability	4.06	7	4.02	8	4.09	6
8	Lack of basic infrastructure	4.04	8	4.04	7	4.04	8
9	The non-productive activities	3.99	9	3.96	10	4.02	9
10	Lack of incentive/motivation	3.97	10	3.96	10	3.98	10
11	Complex design	3.84	11	3.87	11	3.81	12
12	Labour absentee time	3.79	12	3.78	13	3.81	12
13	Number of hours worked each week	3.62	12	3.64	15	3.6	13
14	Adverse/inclement weather	3.61	13	3.64	15	3.57	15
15	Lack of safety consciousness	3.59	15	3.62	16	3.57	15
16	Labour strike	3.52	16	3.51	17	3.53	16
17	Accident on site	3.5	17	3.8	12	3.21	18
18	Lack of productivity standard	3.27	18	3.29	18	3.25	17
19	Building height	3.15	19	3.11	19	3.19	19
20	Security issues	2.9	20	2.84	20	2.96	20

The results from Table 2 revealed six labour related factors having very high significant effect on production cost with minimum mean score of 4.20 based on the perceptions of small and medium scale contractors. These factors include inadequate planning and scheduling, high cost of labour, rework for correcting unsatisfactory work, mistakes during construction, schedule delay and poor communication between the supervisors and labour. Among these factors, inadequate planning and scheduling and high cost of labour were ranked highest with the same overall mean score of 4.68 followed by rework for correcting unsatisfactory work with overall mean score of 4.65. Other factors which include mistakes during construction, schedule delay and poor communication between the supervisors and labour were ranked fourth, fifth and sixth with overall mean scores of 4.50, 4.35, and 4.20 respectively. These factors are discussed below.

Inadequate planning and scheduling: This factor was ranked first by small scale contractors while medium scale contractors ranked it second with mean scores of 4.69 and 4.68 respectively. Inadequate planning and scheduling reflect weakness and incompetence of contractors and can result in poor site coordination and organization of human and non-human resources.

High cost of labour: High cost of labour is a major contributing factor to the overall project cost. This factor has been ranked first by the medium scale contractors and third by small scale contractors with mean scores of 4.70 and 4.67 respectively. The result also agrees with research findings of Bordoli and Baldwin (1998); Windapo and Iyagba (2007) of the severe effect of this factor on project cost.

Rework for correcting unsatisfactory work: This factor was given equal ranking of third position by small and medium scale contractors with mean scores of 4.67 and 4.64 respectively. This factor has dual effects as it affects material and labour components of production cost and the overall project cost. This result also agrees with the study of Palaneeswaran (2006).

Mistakes during construction: This factor ranked fourth by the two categories of contractors with mean scores of 4.60 and 4.40 respectively. This factor result from the fact that contractors do not have trained experts to carry out the project as it is generally known that most small and

medium contractors rely on rural urban migrants that have no sufficient knowledge of construction in their operations.

Poor communication between the supervisors and labour: This factor ranked fifth by small scale contractors with mean score of 4.36 but ranked eighth by medium scale contractors with mean score of 4.04. The result emphasizes the importance of communication and information exchange between project participants in the labour flow control process. The result is agrees with Memon, Rahman, Abdullah and Azis (2014) who identified lack of communication among parties as critical factor affecting construction projects based on the ranking of clients and contractors.

Evaluation of plant and equipment related factors affecting production cost of building projects: 10 common related factors of plant and equipment influencing production cost have been identified. The perceptions of small and medium scale contractors were sought on the evaluation of the effects of the factors on production cost by ranking. The results are presented in Table 3.

Table 3: Plant and equipment related factors affecting production cost

S/no.	Factors	Overall Mean Score	Rank	Mean Score of Small Contractors	Rank	Mean Score of Medium Contractors	Rank
1	High cost of machinery	4.49	1	4.8	1	4.19	3
2	High cost of maintenance and spare parts	4.46	2	4.47	2	4.45	1
3	Equipment breakdown/failure	4.28	3	4.31	3	4.25	2
4	Inefficient use of construction equipment	4.15	4	4.18	4	4.11	4
5	Late delivery of equipment	3.52	5	3.51	5	3.53	5
6	Equipment availability	3.32	6	3.33	6	3.3	7
7	Little output and efficiency of equipment	3.31	7	3.31	7	3.3	7
8	Unskilled equipment operators	2.97	8	2.96	9	2.98	9
9	Equipment selection	2.96	9	2.91	10	3	8
10	Obsolete or unsuitable construction equipment	2.94	10	2.96	9	2.92	10

The results from Table 3 showed three labour related factors that have very high significant effects on production cost with minimum mean scores of 4.20. The factors include high cost of machinery, high cost of maintenance and spare parts, and equipment breakdown/failure. These three factors are further discussed below.

High cost of machinery: This factor was ranked first by small scale contractors but ranked third by medium scale contractors with mean scores of 4.80 and 4.19 respectively. Acquisition of new construction machinery involves heavy financial commitment which the small and medium scale contractors often find difficult to afford. To be relevant in the market, these two categories of contractors go for hiring of plant and when more jobs are going on at the same time, the demand

is triggered and this force the hiring company to increase hiring/renting cost. The extra cost incurred in acquiring this facility is charged against the project and inevitably increases project cost.

High cost of maintenance and spare parts: This factor ranked second by small scale contractors but ranked first by medium scale contractors with mean scores of 4.47 and 4.45 respectively. Contractors spend more on maintaining old machine and procurement of spare parts which add to production cost.

Equipment breakdown or failure: This factor ranked third by small scale contractors while the same factor was ranked first by the medium scale contractors with mean scores of 4.31 and 4.25 respectively. This study confirms the result of the study by Fugar and Agyakwah-Baah (2010) that equipment breakdown and failure eventually increase project cost.

Comparison of the Perception of Small and Medium Scale Contractors

The study tested three research hypotheses as earlier stated to ascertain whether there are significant differences in the perception by small and medium scale contractors of the effects of three selected construction resources-related (material, labour, plant and equipment) factors on production cost of building projects using Mann-Whitney U test at p-0.05. The rule for the rejection of the hypothesis is that when the p - value is > 0.05, the test fails to reject the hypothesis but when the p-value ≤ 0.05, the test rejects the hypothesis. The results of the hypotheses are presented in Table 4.

Table 4: Results of Mann-Whitney U Test

Comparison of perception of Small and Medium Scale Contractors	Category of contractor	N	p-value	Decision	Remark
Effect of material related factors on production cost	Small Scale	25	0.938	Accept	Difference not significant
	Medium Scale	25			
Effect of labour related factors on production cost	Small Scale	20	0.871	Accept	Difference not significant
	Medium Scale	20			
Effect of plant and equipment related factors on production cost	Small Scale	10	0.82	Accept	Difference not significant
	Medium Scale	10			

The results in Table 4 indicated that the p-values of cases compared .938, .871 and .820 respectively, > 0.05, implied acceptance of the three hypotheses that stated that there is no significant difference in the perception by small and medium scale contractors of the effects of each of the three resources factors on production cost of building projects in Uyo. This revealed that there is a significant degree of agreement in the perceptions of small and medium scale contractors of the effects of related factors of material, labour component, plant and equipment on production cost of building projects. These results of the agreement in the perceptions of the

respondents is not surprising since the factors are prevalent in the study area as observed from the assessment of the respondents.

Conclusion

This study investigates resource-related (material, labour, plant and equipment) factors and its effects on production cost of building projects based on the small and medium scale contractors' perception. The study became necessary because most small and medium scale contractors are falling short of expectations and can hardly survive in the construction business for more than a period of 5 years due to various challenges. Some of the notable challenges are in the areas of cost management of human and non-human resources. The top 8 material related factors affecting production cost are: change of scope of design, fluctuation of prices of materials, mistakes during construction, production waste, material price increase, high transportation cost, unstable inflationary trend, and delays in delivery of material. Labour related factors affecting production cost include: inadequate planning and scheduling, high cost of labour, rework for correcting unsatisfactory work, schedule delay, and poor communication between the supervisors and labour. High cost of machinery, high cost of maintenance and spare parts, and equipment breakdown or failure are major plant and equipment related factors affecting production cost.

The study submit that cost performance of construction projects can be achieved through effective cost management of production cost of construction resources - material, labour, plant and equipment. Knowledge and understanding of the effects of key factors affecting production cost of building projects is significant to mitigate problems of poor cost performance through effective project planning, management and control. The study recommends that critical factors affecting production cost of building projects identified in this study should be given adequate consideration by small and medium scale contractors at conceptual and construction stages. This study has only investigated the effects of selected construction resources and evaluated the effects on production cost, further research on other components of production cost and their influencing factors should be explored in order to educate the contractors on their decisions in achieving value for money.

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