

Significant Factors Causing Cost Overruns in Telecommunication Projects in Nigeria

*Oko John Ameh, Aliu Adebayo Soyingbe and Koleola Tunwase Odusami

Abstract: Information and Communication Technology (ICT) provides enormous benefits to economic development. However, cost overruns are a worldwide phenomenon and pose a serious threat to the development of telecommunication infrastructure, which is the platform for ICT. It is imperative to examine the possible factors that could lead to cost overruns, in order to avert the associated catalytic effects on the development of other sectors of the economy. This study involves a questionnaire survey of 42 factors that were identified as having the potential to cause cost overruns in 53 telecommunication projects that are scattered over the six geopolitical zones in Nigeria. The results indicated that construction-related factors top the list of categories that cause cost overruns in telecommunication projects. The following factors were identified as major causes of cost overruns and are ranked in their order of importance: the lack of contractor experience on the telecommunication projects, the high cost of imported materials and the fluctuation in the prices of materials that are necessary for the telecommunication projects. The study recommends that contingency provisions should be put in place to mitigate these factors at the project conception stage.

Keywords: Cost overrun, Factors, Infrastructure, Telecommunication projects, Nigeria

INTRODUCTION

The history of the construction industry worldwide is full of projects that were completed with significant time and cost overruns. A study that was conducted in 1994, which looked at 8,000 projects, showed that only 16% of the projects could satisfy the following three famous performance criteria: completing projects on time, within

the budgeted cost and maintaining a high standard of quality (Frame, 1997). During the last 15 years, the World Bank report confirms that 63% of 1778 financed construction projects had average overruns that were 40% of the start-up costs and 88% of 1627 projects had average overruns that were 70% of the start-up time (World Bank, 1990). Omoregie and Radford (2006) reported that the cost of projects in Nigeria escalated by 14% (the minimum average percentage) and the period of projects in Nigeria escalated by 188% (the minimum average percentage). Kaming et al., (1997) reported the findings from

Department of Building, University of Lagos, NIGERIA.

*Corresponding author: oameh@unilag.edu.ng

various studies, which were conducted in different developing countries (Nigeria, Saudi Arabia, Malaysia and Indonesia) had confirmed that all of the projects currently undertaken in these countries suffer from significant construction cost and time overruns.

The justification for delimiting the study described in this paper, to telecommunication infrastructure is that telecommunication projects are highly capital-intensive and developing countries have limited financial resources available to meet other developmental needs. Therefore, it is important to identify and avoid factors associated with telecommunication projects that have the potential to result in millions of dollars of cost overruns. Furthermore, telecommunication infrastructure is the platform on which ICT networks and services are based and the ICT is the sole driving force of globalisation. Every human society, from the most primitive to the most advanced, depends on some form of telecommunications network. ICT makes it possible for people to cooperate, to produce and exchange commodities, to share ideas and information and to assist one another in times of need. Indeed, all of the basic rights of the world's populations are dependent upon telecommunications. Telecommunications facilitate the right to life, the right to personal liberty and dignity, the right of free expression and information and the right to move freely. This study is needed because all of the rights listed here enhance the quality of life of each individual and these rights are facilitated by telecommunications.

LITERATURE REVIEW

It is an accepted fact that Nigeria is the fastest growing telecommunications market in Africa. Ndukwe (2005) observed massive growth in subscriber lines, which grew from less than 25,000 analogue mobile lines in the country in May 2000 to about 12.8 million digital mobile lines between 2000 and 2005. During the same period, fixed lines also grew from about 450,000 lines to over 1.2 million lines. By December 2009, it is expected that the active subscriber to telecommunication services in the country will extend above 80 million lines (Ndukwe, 2009). The Federal Government of Nigeria is aware of the role that ICT plays in national development and the government is committed to ensuring that telecommunication and ICT services (both basic telephony and other essential services, such as internet and broadband) are extended to the over 120 million citizens of Nigeria. Broadband is an accelerator of social and economic development in the modern world. Its applications enable economic and social benefits, which include: public safety, national security, telemedicine, e-government, distance learning and utility applications. In an effort to generate an all-inclusive information society, the Federal Government of Nigeria intends to ensure that telecommunication services are extended to all parts of rural Nigeria.

Telecommunications is both dynamic and capital intensive. There is an urgent need to examine the causes of cost overruns in the development of telecommunications infrastructure in Nigeria. Telecommunications have a catalytic

effect on the development of other sectors of the economy such as agriculture, health, tourism and education. Moreover, it is necessary for the commercial, industrial, socio-economic and political development of the country. Therefore, it is essential that development of the telecommunications infrastructure stays on pace with the development of the other sectors of the economy.

The current research is concentrated on telecommunication projects in Nigeria. However, as observed by Morris and Hough (1987), the findings of this research can be applied to other developing countries that have similar problems associated with time and cost overruns in their construction and infrastructural development projects. Developed countries have lessons to learn from these findings as well since cost and time overruns are a worldwide phenomenon. The findings can be equally extended to other infrastructural projects, such as transportation, power, sanitation and irrigation especially in the construction industry because cost and time overruns are a worldwide phenomenon.

SUMMARY OF PREVIOUS WORKS ON CAUSES OF COST OVERRUNS

A detailed empirical analysis of cost overrun factors for various types of construction and infrastructural projects from various countries is presented in Table 1.

RESEARCH AIM AND OBJECTIVES

The aim of this research is to examine the significant factors that cause cost overruns in the development of telecommunication projects in Nigeria. One objective of this research is to identify the factors that may lead to variances between the initial cost estimates and the final costs at the completion of telecommunication infrastructure projects. A second objective is to examine differences in the perception of the three organisations (clients, consultants and contractors) that are responsible for the development of the telecommunication infrastructure.

RESEARCH METHODS

The present study identified five categories of factors from the existing literature that have been associated with construction cost overruns in other developing countries. From these five categories, we were able to identify 42 factors that resulted in cost overruns. Telecommunication projects are similar to other construction projects. Both types of projects utilise mainly civil works, electrical and mechanical works and involve the same groups of professionals; therefore, it was assumed that the same factors that result in cost overruns in other construction projects, will also affect telecommunication projects. Based on this

Table I. Summary of causes associated with cost overruns that were compiled from previous research

Year	Author(s)	Country	Type of project		Cost overrun factors considered
1988	Okpala and Aniekwu	Nigeria	Construction projects		Price fluctuations, additional works, delays, inaccurate estimates, fraudulent practices and kickbacks, shortening of contract period and insurance
1997	Kaming et al.,	Indonesia	High-rise project	construction	Tender price increase due to inflation, change orders, financial constraints, owner's lack of experience, materials, weather, labour, contractor and combination, unpredictable weather conditions, cost increased by inflation, inaccurate quantity take-off, labour cost increased due to environmental restrictions, lack of experience of project location, lack of experience of project type and lack of experience of local regulation
2002	Jackson	UK	Building projects	construction	Poor project management, unexpected ground condition, design development, information availability, design brief, estimating method, design team performance, time limit, claims, commercial pressure, procurement route, external factor and people
2003	Frimpong et al.,	Ghana	Groundwater		Planning and scheduling deficiencies, deficiencies the prepared cost estimates, inadequate control procedures, delays in work approval, waiting for information, mistakes during construction, delays in inspection and testing of work and cash flow during construction, frequent breakdowns of construction plant and equipment, shortages of technical personnel, labour shortage, monthly payment difficulties, poor contract management, shortage of materials, plant/equipment parts, contractor's financial difficulties, low bid, material procurement, imported materials, late delivery of materials and equipment, escalation of material prices, slow decision-making, inflation, difficulties in obtaining construction materials at official current price, ground problem, bad weather and unexpected geological conditions

(continued on next page)

Table I. (continued)

Year	Author(s)	Country	Type of project	Cost overrun factors considered
2005	Creedy	Australia	Highway project	Design/project scope change, contract tender price higher than original estimate, design scope change – drainage, quantity increased measure, design scope change - pavement materials/depth, latent condition - remove and replace unsuitable material, design scope change - environmental issues, constructability - under traffic, services relocation costs, material cost increase – pavement materials, constructability difficulty costs, resumption/accommodation works, project administration cost increase, wet weather effects/rework, latent condition - rock encountered, remote location costs, specification change, extras unspecified, project acceleration requirement, design scope change - safety audit requirement, cultural heritage issues, latent condition - requires design change, material cost increase - principal supplied components or materials, government initiative – contribution by developer, latent condition - additional stabilising, material cost increase – earthworks, design scope change - design error, material/process quality issue, design – reduced scope change saving money, design preload requirement, design change to sub-grade, government initiative - employment continuity, government initiative - contribution by local
2005	Koushki et al.,	Kuwait	Private residential projects	Government, government initiative - contribution by rail, material cost increase – asphalt, material cost increase - bitumen price, contract failure - new contract establishment costs and contract
2006	Omoregie and Radford	Nigeria	Infrastructure project	Price fluctuation, financing and payment for completed work, poor contract management, delay, change in site condition, inaccurate estimate, shortage of materials, imported materials and plant items, additional works and design change

(continued on next page)

Table I. (continued)

Year	Author(s)	Country	Type of project	Cost overrun factors considered
2008	Azhar et al.,	Pakistan	Construction projects	Fluctuation in prices of raw materials, unstable cost of manufactured materials, fraudulent practices and corruption, mode of financing and payment for completed work, improper planning, high interest rates charged by bankers on loans received by contractors, frequent design changes, long period between design and time of bidding/tendering, lack of coordination between design team and general contractor, lack of coordination between general contractor and subcontractors, high machineries costs, high cost of skilled labour, high transport costs, domination of construction industry by foreign firms and aids, contract management, inadequate duration of contract period, inappropriate government policies, inadequate production of raw materials in the country, poor financial control on site, absence of construction cost data, inappropriate contractual procedure, additional works, wrong method of cost estimation, poor relationship between management and labour, stealing and waste on site, labour/skill availability, dispute on site, adverse effect of weather, bureaucracy in bidding/tendering method, lowest bidding procurement method, litigation, numerous construction activities going on at the same time, scope changes arising from redesign and extensive variation occasioned by change in brief, inadequate site investigation, inadequate preconstruction study, work suspensions owing to conflicts. Finally, inadequate quality/Ambiguity of contract documents, inappropriate contractual policies and poor project (site) management/poor cost control.

(continued on next page)

Table I. (continued)

Year	Author(s)	Country	Type of project	Cost overrun factors considered
2009	Kaliba et al.,	Zambia	Road construction projects	Bad weather, inflation, schedule delay, scope changes, local government pressures, strikes, technical challenges and environmental protection and mitigation
2009	Enshassi et al.,	Gaza Strip	Construction projects	Increment of materials prices due to boarder closures, delay in construction, supply of raw materials and equipment, fluctuation in the cost of building materials, project materials monopoly by some suppliers, unsettlement of local currency in relation to dollar value, design changes, contractual claims (such as, extension of time with cost claims), inaccurate quantity take-off; lack of cost planning/monitoring during pre- and post-contract stages and resources constraints - funds and associated auxiliaries not ready.

Source: Research (2008).

rationale, we chose to assess the previously identified 42 factors in the present study.

A questionnaire was formulated, based on previously obtained information, which provided respondents with an opportunity to indicate the level of importance of various factors that have contributed to cost overruns in telecommunication projects. The questionnaire respondents based their answers on previous experiences and responded to each question on a scale that ranged from 1–5 (1 = not important; 2 = of little importance; 3 = somewhat important; 4 = important; and 5 = very important).

The Cronbach's Alpha is a statistic that tests the reliability (the scale of the reliability coefficient) of the 5-point Likert scale that was used in this study. The Cronbach's coefficient alpha that was associated with the importance of the causes of cost overruns on telecommunication infrastructural development, is 0.9438 (F statistics = 14.494). This is a high value and provides assurance that the questionnaire is reliable.

The sample population comprised professionals from client organisations, consulting organisations and contracting organisations (mainly indigenous contractors), who were involved in the construction of telecommunication projects. These include architects, builders, civil engineers, quantity surveyors, electrical engineers, mechanical engineers, land surveyors and estate surveyors. Data were obtained on 53 telecommunication projects that were scattered over the six geopolitical zones of the country. The south-west geopolitical zone had 39 projects, which was the highest number of telecommunication projects.

Background information on the respondents was presented using a pie chart and a bar chart. The study utilised Mean Item Scores (MIS) to analyse the data and we ranked the level of importance that each of the three respondent groups attached to the causes of cost overruns. A Kruskal-Wallis test was used to compare significant differences between the three respondent groups.

RESULTS AND DISCUSSION

Figure 1 shows the role in the construction industry for each of the respondents and is based on the organisational affiliation for each respondent. As indicated in Figure 1, the

majority of the respondents (40.6%) were affiliated with consulting organisations, followed by respondents from contracting organisations (36.4%) and respondents in client organisations (23%).

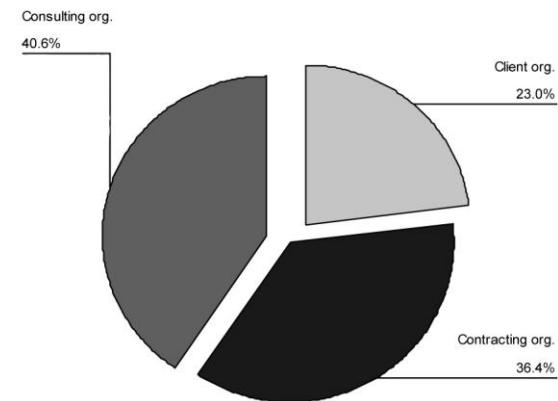


Figure 1. Respondents' organisational type in the construction industry
Source: Research (2008).

Figure 2 shows the cumulative experience of the respondents in construction-related jobs. Telecommunication projects are similar to other construction projects because both types of projects are comprised of mainly civil works (construction in steel and concrete),

electrical works and mechanical works. As indicated in Figure 2, the majority (36%) of the respondents had less than 10 years of professional experience, about 24% had between 11 and 20 years of professional experience and a few (3%) had over 20 years of professional experience. This implies that the respondents had adequate experience in construction-related jobs and were capable of providing reliable information that pertained to the cost variance factors between the initial estimate and the final cost of their respective telecommunication projects.

Figure 3 shows the professional background of the respondents. The respondents fell into the following groups: 23% of the respondents were civil engineers, 13% were electrical engineers, 10% were builders, 9% were quantity surveyors, 4% were estate surveyors, 3% were architects and 1% were mechanical engineers. This is not surprising, since the majority of the respondents were affiliated with consulting and contracting organisations. These organisations are typically dominated by civil engineers and builders. In addition, telecommunication projects are considered prototype projects. Thus, the expertise of builders and civil engineers are required during the construction phase of the telecommunication projects.

Table 2 shows the factors that were associated with variance between the initial cost and the final cost in telecommunication projects. These factors were placed

into five major categories: factors related to the environment, factors related to construction, factors related to construction items, factors related to cost estimates and factors related to financing. The respondents were required to identify variables that they perceived as being likely to contribute to cost overruns in telecommunication projects. These variables were ranked on a scale from 1–5.

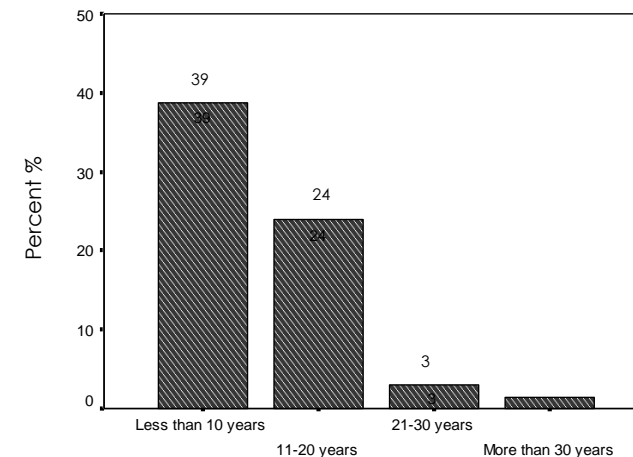


Figure 2. Respondents experience in construction business
Source: Research (2008).

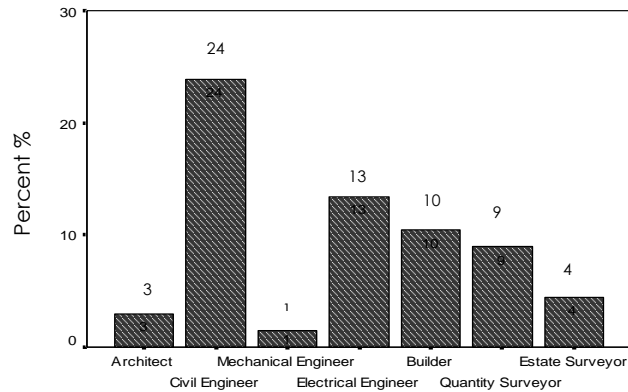


Figure 3. Professional background of respondents
Source: Research (2008).

The factors that ranked the highest under the “Environmental Related Factors” category were the following: economic stability ranked first (mean = 4.34), inadequate production of raw materials by the country (mean = 4.16) and government policies (law and regulations) (mean = 4.09) ranked second and third, respectively. A comparative analysis of the responses from each respondent, which was based on construction organisations and is shown in Table 2, indicated that economic stability was ranked first by both the client and consulting organisations. However, the contracting organisations ranked this variable second. Furthermore,

inadequate production of materials by the country was ranked 1st by contracting organisations, while the client and consulting organisations ranked this variable third and seventh, respectively. Government policy was ranked second by both client and consulting organisations and fourth by contracting organisations.

The result of the Kruskal-Wallis test indicated that significant differences existed between the view points of the three organisations, with respect to the “number of construction projects on-going, at the same time”. The *p*-value equalled 0.035 at *p*<0.05 level of significance.

The factors that ranked the highest in the “Construction-related Factors” category were the following: lack of contractor experience (mean = 4.57), incorrect planning (mean = 4.27) and poor financial control on site (mean = 4.20). The factors are listed in the order of their importance under the “construction-related factor” category. Lack of contractor experience was unanimously ranked first by all three organisations as the dominant factor affecting cost variance under the “construction-related factor” category. Incorrect planning was ranked second by the client organisations and third by both the consulting organisations and the contracting organisations. Kaming et al., (1997) studied the cost variance factors associated with high-rise projects in Indonesia and their findings support the finding, shown

here, that inaccurate material estimates at the planning stage could cause significant cost variance between the initial and the final project cost. Creedy (2005) asserted in a study of highway construction in Australia that the cost variance between the initial and the final estimate could be the result of contract tender prices that are actually higher than the prices originally reported in the cost estimate. Poor financial control, which ranked third overall, was ranked second by both contracting organisations and consulting organisations and was ranked fourth by client organisations.

The dominant variables that caused cost overruns, under the "Construction Item Factors" category were the following: frequent design changes (mean = 4.39), fraudulent practices & kickbacks (mean = 4.30) and additional works (mean = 4.25). A comparative analysis of responses, based on construction organisations, is shown in Table 2. This analysis suggests that there is no agreement between the organisations regarding the rankings of the top three cost variance factors. The results of Kruskal-Wallis test (see Table 2) indicates that there is no significant difference between the three organisations regarding their respective points of view. Hence, there was a significant amount of agreement among the respondents with respect to how they ranked the various factors. However, inadequate labour availability was ranked first by both client and contracting organisations, while this variable

was ranked second by the consulting organisations. The massive rate of telecommunication network expansion across the 36 states and the capital city in Nigeria require a highly technical work force. However, the availability of local technicians is inadequate.

The factors that ranked the highest on the list of variables that caused cost overruns in the "Cost Estimating Factors" category were as follows: cost of materials (mean = 4.48), fluctuation of prices of materials (mean = 4.43) and high interest rates charged by banks on loans received by contractors (mean = 4.32). As shown in Table 2, there were no agreements regarding the order of importance rankings of the variables under this category. The cost of materials, which was ranked as the dominant cause of cost overruns by the contractors in this category, was ranked third by the consultants and fifth by the clients. Fluctuations in price were also ranked first by the contractors, but ranked second and third by the clients and the consultants, respectively. Results from a literature search support the findings, presented here, that inflationary increases in material cost are a major determinant of cost overruns (Kaming et al., 1997, Omoregie and Radford, 2006). No significant differences were found between the points of view for the three organisations in the Kruskal-Wallis test (see Table 2).

The factors that ranked the highest in the “Financial Related” category, which was based on the cost variance between the initial and the final cost estimate, were the following: mode of financing, bonds and payment (mean = 4.30), inflationary pressure (mean = 4.07) and currency exchange rate (mean = 4.05). This finding is consistent with other studies from Frimpong et al., (2003) and Omoregie and Radford (2006), which observed that the financial related factors is a major source of liquidity problems for contractors.

As presented in Table 2, seven cost variance factors were identified, out of 42 total factors, as the major causes of cost overruns in telecommunication projects in Nigeria. The survey revealed that the lack of contractor experience was the dominant cause of the cost variance between the initial and the final cost of telecommunication projects (mean = 4.57). The lack of contractor experience in telecommunication projects often results in the contractor’s inability to correctly complete project, which results in additional work to correct mistakes. Every item of rework affects the cost of labour, the cost of materials, hiring cost at plants and costs associated with equipment. Each of these additional costs results in increased variance between the initial estimate and the final cost of the project.

After the lack of contractor experience, the cost of materials was the next highest ranked factor affecting cost variance in telecommunication projects (mean = 4.48). This could be attributed to the limitations imposed by the exchange rate of local currency and the US Dollar, because most of the materials used to develop the infrastructure are imported. The limitation that is imposed by the weak power of the local currency against the dollar, in turn, affects the prices of imported materials and general price levels. Another closely related factor, which was ranked as the third most dominant variant affecting cost fluctuations, was price of materials (mean = 4.43). Concrete and steel are significant cost components for telecommunication projects. These materials are also in high demand in other sectors of the industry. Since the demand for these materials far exceeds the supply, material merchants create an artificial scarcity of these materials, which in turn leads to an escalation in cost.

Frequent design changes were ranked as the fourth most dominant cost overrun factor (mean = 4.39). As a result of the prototype nature of most telecommunication projects, contracts are typically awarded without due consideration for specific site conditions. In addition to the prototype nature of the projects, challenges imposed by transportation, logistics, uncertainty about the delivery of ordered materials and inherent construction difficulties in politically volatile cities can also lead to cost overruns.

Table 2. Results from the comparative analysis of significant causes of cost overruns between organisations using the Kruskal-Wallis test

Construction cost factors	Overall Mean (Rank)	Client Mean (Rank)	Contractor Mean (Rank)	Consultant Mean (Rank)	Chi-square χ^2	Degree of Freedom df	p-value	Level of Significance
Environmental Factors								
Economic stability	4.34(1)	4.40(1)	4.32(2)	4.29(1)	0.328	2	0.849	NS
Inadequate production of raw materials by the country	4.16(2)	4.07(3)	4.41(1)	3.57(7)	2.116	2	0.347	NS
Government policies (laws and regulations)	4.09(3)	4.27(2)	3.95(4)	4.14(2)	1.211	2	0.546	NS
Domination of construction industry by foreign firms and aids	3.86(4)	3.47(8)	4.18(3)	3.71(6)	2.084	2	0.353	NS
Project location	3.82(5)	3.80(4)	3.82(6)	3.86(4)	0.240	2	0.887	NS
Absence of construction cost data	3.73(6)	3.67(5)	3.91(5)	3.29(11)	2.539	2	0.281	NS
Supplier's manipulation	3.68(7)	3.53(6)	3.64(8)	4.14(2)	3.110	2	0.211	NS
Lack of productivity standard in Nigeria	3.59(8)	3.53(6)	3.68(7)	3.43(9)	0.322	2	0.851	NS
Level of competitors	3.39(9)	3.20(10)	3.36(10)	3.86(4)	2.219	2	0.330	NS
Effect of weather	3.39(9)	3.00(12)	3.64(8)	3.43(9)	2.349	2	0.309	NS
Number of competitors	3.34(11)	3.27(9)	3.32(11)	3.57(7)	0.816	2	0.665	NS
Social and cultural impacts	3.16(12)	3.13(11)	3.18(12)	3.14(12)	0.020	2	0.990	NS
Number of construction projects going on at the same time	2.70(13)	2.00(13)	3.05(13)	3.14(12)	6.716	2	0.035	S
Labour nationality	2.43(14)	1.93(14)	2.86(14)	2.14(14)	5.537	2	0.063	NS

(continued on next page)

Table 2. (continued)

Construction cost factors	Overall Mean (Rank)	Client Mean (Rank)	Contractor Mean (Rank)	Consultant Mean (Rank)	Chi-square χ^2	Degree of Freedom df	p-value	Level of Significance
Construction Factors								
Lack of contractor experience	4.57(1)	4.47(1)	4.59(1)	4.71(1)	0.498	2	0.780	NS
Incorrect planning	4.27(2)	4.33(2)	4.27(3)	4.14(3)	1.132	2	0.568	NS
Poor financial control on site	4.20(3)	3.90(4)	4.36(2)	4.29(2)	0.388	2	0.824	NS
Disputes on site	3.98(4)	4.27(3)	3.82(5)	3.86(5)	2.207	2	0.332	NS
Lack of coordination between designers and contractors	3.93(5)	3.80(5)	4.00(4)	4.00(4)	0.792	2	0.824	NS
Relationship between management and labour	3.64(6)	3.53(6)	3.82(5)	3.29(6)	1.634	2	0.442	NS
Construction Item Factors								
Frequent design changes	4.39(1)	4.07(4)	4.36(3)	3.86(7)	0.811	2	0.667	NS
Fraudulent practices and kickbacks	4.30(2)	4.07(4)	4.45(2)	4.25(5)	0.939	2	0.625	NS
Additional works	4.25(3)	4.13(2)	4.32(4)	4.29(2)	0.679	2	0.712	NS
Contract management	4.20(4)	4.13(2)	4.27(5)	4.14(6)	0.331	2	0.848	NS
Inadequate labour availability	4.18(5)	4.40(1)	4.59(1)	4.29(2)	1.966	2	0.374	NS
Duration of contract period	4.09(6)	3.93(6)	4.09(7)	4.43(1)	1.546	2	0.462	NS
Contractual procedure	4.09(6)	3.93(6)	4.14(6)	4.29(2)	1.331	2	0.514	NS
Cost Estimating Factors								
Cost of materials	4.48(1)	4.00(5)	4.59(1)	4.29(3)	0.263	2	0.877	NS
Fluctuations in the prices of materials	4.43(2)	4.33(2)	4.59(1)	4.14(4)	0.240	2	0.887	NS

(continued on next page)

Table 2. (continued)

Construction cost factors	Overall Mean (Rank)	Client Mean (Rank)	Contractor Mean (Rank)	Consultant Mean (Rank)	Chi-square χ^2	Degree of Freedom df	p-value	Level of Significance
High interest rates charged by banks on loans received by contractors	4.32(3)	4.43(1)	4.27(4)	4.14(4)	0.255	2	0.880	NS
High cost of labour	4.23(4)	4.27(3)	4.32(3)	3.86(8)	0.367	2	0.832	NS
High cost of machinery	4.18(5)	3.93(6)	4.27(4)	4.43(1)	1.499	2	0.473	NS
Wrong method of estimation	4.07(6)	4.07(4)	4.09(6)	4.00(7)	0.198	2	0.906	NS
High transportation cost	4.00(7)	3.80(7)	4.00(7)	4.43(1)	2.613	2	0.271	NS
Long period between design and time of tendering	3.93(8)	3.39(12)	3.86(9)	4.14(4)	0.765	2	0.682	NS
Waste on site	3.77(9)	3.80(7)	3.73(10)	3.86(8)	0.679	2	0.712	NS
High cost of machinery maintenance	3.73(10)	3.47(10)	3.95(8)	3.57(10)	1.608	2	0.448	NS
Insurance cost	3.55(11)	3.40(11)	3.68(11)	3.43(11)	0.900	2	0.638	NS
Bureaucracy in tendering method	3.50(12)	3.60(9)	3.45(12)	3.43(11)	0.074	2	0.964	NS
Financing Factors								
Mode of financing, bonds and payments	4.30(1)	4.07(3)	4.45(1)	4.29(1)	0.713	2	0.700	NS
Inflationary pressure	4.07(2)	4.13(2)	4.09(2)	3.86(3)	0.149	2	0.928	NS
Currency exchange	4.05(3)	4.20(1)	3.95(3)	4.00(2)	0.497	2	0.780	NS

Source: Research (2008).

Notes:

NS means Not Significant at $p < 0.05$ S mean Significant at $p < 0.05$

Economic stability was ranked as the fifth most dominant factor that causes cost overruns (mean = 4.34). Several factors contribute to the economic stability of a nation. These include monetary policies, inflationary trends and security. High interest rates, which are charged by banks, on the loans that are received by contractors (mean = 4.32) was ranked as sixth most dominant factor that results in cost overruns. Since telecommunication projects are capital intensive, contractors are not able to purchase materials and hire the necessary equipment to execute the projects without some form of financial assistance, which is typically in the form of loans. The high interest rate is a function of the instability of the local currency in relation to US Dollar. There is a general agreement between the client respondents and the contractor organisation respondents on this factor. This indicates that clients and contractors focus more on this element than the consultants do.

The mode of financing, bonds, payments, fraudulent practices and kickbacks were each ranked equally (mean = 4.30) as dominant factors that influence cost overruns. This result is consistent with Frimpong et al., (2003), who identified that monthly payment difficulties from agencies was the major cause of delays and cost overruns in developing countries. Corruption, in the form of fraudulent practices and kickbacks, is a major source of concern in developing countries.

Table 3 presents the mean scores of the causes that were associated with cost overruns and is organised into defined categories and ranked according to significance. Overall, construction-related items are the most dominant causes of cost overruns. The contractor and consultant groups have the same view of this factor category. The viewpoints held by the different organisational groups, regarding the significance of the categorised causes of cost overruns, are summarised in Table 3.

Table 3. Overall mean score and ranking of categorised causes of cost overruns for different organisations

Category of causes of cost overruns	Overall Mean (Rank)	Client Mean (Rank)	Contractor Mean (Rank)	Consultant Mean (Rank)
Construction item-related	4.21(1)	4.09(2)	4.32(1)	4.22(1)
Finance-related	4.14(2)	4.13(1)	4.16(2)	4.05(2)
Construction-related	4.10(3)	4.05(3)	4.14(3)	3.96(4)
Cost estimating-related	4.02(4)	3.87(4)	4.07(4)	3.98(3)
Environment-related	3.55(5)	3.38(5)	3.67(5)	3.55(5)

Source: Research (2008).

CONCLUSION

Information and communication technology can provide tremendous benefits to economic development. However, cost overruns are a significant threat to the development of telecommunication infrastructure, which is the platform for ICT development. The global economic crisis has had a negative impact on the economic fortunes of most of the developing countries. As a result of this, the telecommunication infrastructure of these countries, which are capital intensive in nature, has suffered serious setbacks. These setbacks have resulted in a multiplier effect on other sectors of the economy, such as security, education and health care delivery.

The results of this study indicate that issues associated with construction items are the dominant factors that result in cost overruns in telecommunication projects in Nigeria. The factors under this category include the following: frequent design changes, fraudulent practices and kickbacks, additional works, poor contract management, inadequate labour availability, duration of contract period and contractual procedure. The prevailing causes of cost overruns were ranked in order of importance. Our results indicate that the prevailing causes of cost overruns include the following: cost overruns associated with the lack of contractor experience in telecommunication projects; overruns that are associated with the high cost of imported

materials; overruns that are associated with fluctuations in material prices; overruns that are associated with frequent design changes due to inadequate site and environmental information and overruns that are associated with the mode of financing, bonds and payments. The results further indicate that there is no significant difference between the points of view of the three organisations that responded to this study, with the exception of one factor. A significant difference was found between the three organisations for the "number of construction going on at the same time", which was a factor listed under the environmental related category.

The findings presented in this study could provide insight regarding proactive, measures that could be instituted to avert cost overruns. These findings apply to both the development of telecommunication infrastructure and other infrastructural projects that are being undertaken in developing countries. Foreign construction companies and investors, who intend to do business in developing countries, will also benefit from the findings presented in this study.

RECOMMENDATIONS

Based on this study, the following recommendations are proposed:

In order to eliminate additional costs associated with design changes and additional works, it is important that careful consideration be given to issues in the preliminary stages, such as site and environmental conditions, design specifications, methods of construction and the availability of labour.

Since most of the materials used for construction are imported and considering the declining values of the currencies of developing countries against major currencies like the US Dollar, extra care should be taken during the cost estimating stage. In addition, adequate arrangements should be made for transportation logistics.

Many developing countries are politically unstable. Permission from law enforcement agencies should be sought in advance to beef up on site security. There may be a need for public enlightenment campaigns that are focused on the economic benefits of infrastructure development in the host community. This enlightenment campaign should be conducted before embarking on infrastructure development.

The issue of corruption is a predominant factor that affects most developing countries. It is important that the contractor make his stand on corruption known from the inception of the project. This will avoid contract officials demanding bribes and kickbacks from the contractor as

construction progresses. This will also ensure that the contractor will not be forced to pay royalties to the host community.

REFERENCES

- Azhar, N., Farooqui, R.U. and Ahmed, S.M. (2008). Cost overrun factors in construction industry in Pakistan. Proceeding of first International Conference on Construction in Developing Countries (ICCIDE-1), Karachi, Pakistan, 4–5 August 2008. p. 499–508. [Online]. Available at: www.neduet.edu.pk/Civil/ICCIDC-1/...papers/051.pdf [Accessed on 1 September 2009].
- Creedy, G. (2005). Risk factors leading to cost overrun in highway projects. Sidwell, A.C. (Ed.). Proceeding of Queensland University of Technology Research Week International Conference, Brisbane, Australia, 4–8 July 2005.
- Enshassi, A., Al-Najjar, J. and Kumaraswamy, M. (2009). Delays and cost overruns in the construction projects in the Gaza Strip. *Journal of Financial Management of Property and Construction*, 14(2): 126–151.
- Frame, J.D. (1997). *Establishing project risk assessment teams, managing risks in projects*. London: E & FN Spon.
- Frimpong, Y., Oluwoye, J. and Crawford, L. (2003). Causes of delays and cost overruns in construction of groundwater projects in developing countries; Ghana as a case study. *International Journal of Project Management*, 21(5): 321–326.

- Jackson, S. (2002). Project cost overrun and risk management. Proceedings of Association of Researchers in Construction Management 18th Annual ARCOM Conference, Newcastle, Northumber University, UK, 2–4 September 2002.
- Kaliba, C., Muya, M. and Mumba, K. (2009). Cost escalation and schedule delays in road construction projects in Zambia. *International Journal of Project Management*, 27(5): 522–531.
- Kaming, P.F., Olomolaiye, P.O., Holt, G.D. and Harris, F.C. (1997). Factors influencing construction time and cost overruns on high-rise projects in Indonesia. *Construction Management and Economics*, 15(1): 83–94.
- Koushki, P. A., Al-Rashid, K. and Kartam, N. (2005). Delays and cost increases in the construction of private residential projects in Kuwait. *Construction Management and Economics*, 23(3): 285–294.
- Morris, P.W.G. and Hough, G.H. (1987). *The anatomy of major projects*. New York: John Wiley and Sons.
- Ndukwe, E.C.A. (2005). Telecommunications in Nigeria: The next frontier. Being a paper presented at the New Age/NCC seminar held at the Golden Gate Restaurant, Ikoyi, Lagos, 31st May 2005.
- Ndukwe, E.C.A. (2009). Private sector's investment in Nigeria's telecommunications industry. [Online]. Available at: www.guardianonline.com [Accessed on 16 June 2009].
- Omeregje, A. and Radford, D. (2006). Infrastructure delays and cost escalation: Causes and effects in Nigeria. Proceeding of Sixth International Postgraduate Research Conference, Delft University of Technology and TNO, the Netherlands. 3rd-7th April 2006.
- Okpala, D.C. and Aniekwu, A.N. (1988). Causes of high costs of construction in Nigeria. *Journal of Construction Engineering and Management*, 114(2), 233–244.
- World Bank (1990). *Annual review of project performance results*. World Bank: Operations Evaluation Department.