# Assessment of Risk Factors Associated with Building Projects in a Developing Country

**Olajide Timothy IBIRONKE, Olufisayo Adewumi ADEDOKUN, Isaac Olaniyi AJE and Oladele Johnson AGBOOLA, Nigeria**

**Keywords:** Building Projects, Construction Practitioners, Developing Country, Project Performance, Risk Factors.

## SUMMARY

The study was undertaken with the aim of assessing key risk factors that affect one or more of the project objectives based on the perceptions of construction practitioners in Rivers State, Nigeria. In other to achieve this, survey research method was adopted and 284 questionnaires were administered on the respondents that were involved in the completed building projects. Percentile, Mean item score (MIS), Analysis of variance (ANOVA) and Kruskal Wallis H test were employed to analyze the data collected via questionnaire survey drawn on a 5-point likert scale. Cronbach alpha test shows a value 0.907 thereby indicating a high degree reliability of the instrument used in collecting the data. The study reveals that failure to complete within stipulated time and cost, coupled with the hostile nature of the host community were the most highly rated significant risk factors impacting building projects performance. It was also evident that financial, political and contractual sources were predominant sources with which risk could emerge. Kruskal Wallis H test confirmed the convergent views of the respondents regarding the occurrence of risk factors and having ascertained the significant risk factors that affect building projects, construction stakeholders are enjoined to pay adequate attention to time and cost performance of projects without jettisoning the host community. Lastly, adequate provision should be made for finance right from the outset of the projects in a bid to ensure a hitch free construction project delivered to time and cost.

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## 1. INTRODUCTION

Construction industry continues to occupy an important position in any nation's economy, though it contributes less than the manufacturing or other service industries (Ademeso & Windapo, 2014). It is almost as old as nature itself and unlike manufacturing sector; it is mostly concerned with one-off project (Oyewobi & Ogunsemi, 2010) or one-of-a-kind production in manufacturing terms (Hao, Shen, Neelamkavil, & Thomas, 2008). Although investment in infrastructure, being one of the six key policy drivers used by government to lift long-term performance of the economy (New Zealand Now, 2012), contributes to the gross development product (GDP) of any nation including Nigeria, yet its shortcoming cannot be undermined when it falls below the overall success expectancy.

The main criteria for measuring the overall success of construction projects are time, cost, quality and safety performance among others (Aiyetan, Smallwood, & Shakkantu, 2012; Ogunsemi, 2002). Out of the aforementioned criteria, cost and time tend to be the most important, visible and always considered as very paramount because of the direct economic implications if they are unnecessarily exceeded (Ogunsemi, 2002). Just as demand balances supply in economics, the initial cost and time of construction projects will equal the final account and duration provided that everything remains unchanged (Adafin, Wilkinson, & Rotimi, 2015), and devoid of the influences of risks which could emanate from internal or external sources (Wang & Liu, 2004). Based on the foregoing, the question is what are the various risk factors encountered during building projects in Rivers state, Nigeria. From the literature, it is evident that some of the risks are controllable, others are uncontrollable (Windapo, Omeife, & Wahab, 2010) within the construction industry. The risks give rise to the degree of dispersion of variability around the expected or "best" value which is estimated to exist for the economic variable in question (Kenneth, 2005).

Construction industry, perhaps more than most, has been plagued by risks (Adafin, Wilkinson, & Rotimi, 2014; Liu, Flanagan, & Li, 2003; Oke, 2013) and diverse problems. These are classified under various groups as financial risk, logistics risk, environmental risk and political risk among others (Adedokun, 2012). Some of the symptoms of risks include project abandonment, building collapse, contractors becoming insolvent, projects not delivered to time, cost and quality, etc. These are symptoms of construction risks which may usually result into disputes among stakeholders, lead to claims and award of damages among others. Despite the assertion of Tar and carr (2000) that construction industry has suffered poor performance as a result of the risk factors, Laryea and Hughes (2008) concluded that the ultimate goal of any project is to be delivered within the shortest realizable time, at the lowest reasonable cost, of the highest possible quality standard without accidents as a measure of project success (Aiyetan et al., 2012), taking cognizance of the existing project risk management practices. This study is therefore aimed at assessing risk factors associated

with building projects in Rivers State, Nigeria. This is consequent upon the fact that construction risks are location based and relative to geography (Odeyinka, 2000).

### 1.1 Literature Review Overview of risk and the construction industry

The construction industry consists of all businesses involved in the construction of houses, office buildings, highways and bridges (Adedokun, Akinmusire & Aje, 2016). It covers site acquisition, design, contract, site operation (construction), management and all these make the industry has a great impact on the economy of all countries (Leibing, 2001; Szymanski, 2008). Consequent upon the unique nature of the construction projects, risks can arise from a number of different sources (Oyegoke, 2006; Pheng & Chuan, 2006). This then implies that the construction industry is not excluded when it comes to the issue of risk, (Odeyinka, 2000; Adedokun, 2012; Adafin et al., 2016). Some of these risks can arise from the complex and dynamic nature of the industry (Uher & Loosemore, 2004). Risks can also arise from the participants, individuals and organisations, who are actively involved in the construction project, whose interests may positively or negatively be affected by the project execution or project completion (Project Management Institute, (PMI), 2008). These participants also have different experience, skills, expectations and interests (Dey & Ogunlana, 2004), which can naturally create problems and confusion for even the most experienced project managers and contractors (Banaitiene, Banaitis, & Norkus, 2011).

### 1.2 Causes of risks on construction projects

Changes are inevitable on any construction projects (Adedokun, 2016) and it's sin-qua-non to the variability that occurs when the scope of work performed by the contractor differs from the outlined or scheduled scope in the contract. Occurrence of changes is consequent upon the events, situation or variables, that should it occur, will have either positive or negative effects on the construction projects. These variables that could make or mar construction projects objectives are termed risks. This risk is inherent in both the design and construction (Adafin et al., 2016). Therefore, the causes of changes which are occasioned by risk factors are changes in design by consultant, change of plans or scope by owner, errors and omissions in design, owner's financial problems, change in specification by owner, change of schedule by owner, change in economic conditions, ambiguous design details, contractor's lack of judgment and experience, change in government regulations, complex design and technology, lack of strategic planning, differing site conditions (Adedokun & Awodele, 2016; Dairo, 2015).

Others according to Adedokun and Awodele (2016) and Dairo (2015) include inadequate working drawing details, design complexity, lack of communication, contractor's desired profitability, shortage of skilled manpower, poor procurement process, contractor's financial difficulties, inadequate scope of work for contractor, safety considerations, obstinate nature of owner, consultant's lack of judgment and experience, impediment in prompt decision making process, lack of specialized construction manager, weather conditions, lack of contractor's involvement in design, contractor's lack of required data, consultant's lack of required data, lack of consultant's knowledge of available materials and equipment, lack of modern equipment, defective workmanship, fast track construction, inadequate project objectives, conflicts between contract documents, long lead procurement, replacement of materials or procedures, unfamiliarity with local conditions, lack of

coordination, inadequate shop drawing details, technology change and lastly obstinate nature of consultant.

## 2. RESEARCH METHODS

This study adopted the use of questionnaire survey administered on key construction stakeholders. The population for this work included the professionals in the construction industry, which comprised the Quantity Surveyors, Architects, and Engineers, as well as the representatives of clients and contractors totalling seven hundred and sixty two (762) as indicated in table 1.

**Table 1: Total Population of the target Respondents**

| S/N | Respondents | Population | Sample size |
|---|---|---|---|
| 1. | Clients/ representatives | 51 | 34 |
| 2. | Construction firms/ representatives | 156 | 61 |
| 3. | Architects | 123 | 55 |
| 4. | Quantity Surveyors | 148 | 60 |
| 5. | Engineers | 284 | 74 |
| | **Total** | **762** | **284** |

The adequacy of a sample is assessed by how well such sample represent the whole population of participants from which the sample is drawn (Kothari, 2009). In order to achieve this, the lists of relevant construction professionals as at December, 2014 were collected from their respective professional bodies in Rivers State. The list of contractors registered in category A to C was sourced from the state ministry of works while the clients are the various ministries, department and agencies as well as higher educational institutions in Rivers state that had commissioned construction projects within the last 5 years (2010 – 2014). Having ascertained a population of 762, it was reduced scientifically using Yamane's 1967 to sample size of 284 (table 1). The analysis of the collected data was carried out using the following descriptive and analytical scientific methods: percentile, mean item score, analysis of variance (ANOVA) and Kruskal-Wallis H test.

### 2.1 Background information of the respondents

Out of the 284 questionnaires that were administered, 158 were returned and found suitable for the analysis. The analyzed questionnaires represent 55.63% of the total questionnaire sent out which is considered sufficient for the study based on the assertion of Moser and Kalton (1999) that the result of a survey could be considered as biased and of little significance if the return rate was lower than 20-30%. As for the years of working experience possessed by the respondents, it can be seen that 14.6% falls within 1 - 5, 59.5% of the respondents are within 6 – 15 years of experience, while 13.9% falls within 16 - 20. The last category of 21 and above accounted for 12.0%. On the average, the respondents had approximately 11 years of working experience. Information supplied by this category of professionals is considered to be adequate and reliable. These set of respondents have executed 25 construction projects on the average. Analysis according to Table 3 reveals that majority of the respondents are BSc/ BTech holder. Table 2 shows that 24.1% of the respondents are working within client organisation while the remaining 38.6% and 37.3% are from contracting and consulting firms respectively. From Table 2, it can be seen that majority of the respondents in this case are Engineers with 45.6% and was closely followed by 33.5% quota, represented by the Quantity Surveyors and the least was Architects with 20.9%. The professional membership status of

the respondents shows that 55 are graduate members, 97 are corporate/ associate members while 6 of them are fellow of their respective professional bodies with 34.8%, 61.4% and 3.8% respectively. In terms of the sectors or firms where the respondents are, Table 2 shows that 24.1% of the respondents are working within client organisation while the remaining 38.6% and 37.3% are from contracting and consulting firms respectively.

**Table 2: Demographics of the respondents**

| *Background Information* | *Frequency* | *Percentage* | *Cum. Percentage* |
|---|---|---|---|
| ***Profession of respondents*** | | | |
| Quantity Surveyors | 53 | 33.5 | 33.5 |
| Architects | 33 | 20.9 | 54.4 |
| Engineers | 72 | 45.6 | 100.0 |
| ***Total*** | ***158*** | ***100.0*** | |
| ***Years of experience*** | | | |
| 1 – 5 | 23 | 14.6 | 14.6 |
| 6 – 10 | 75 | 47.5 | 62.0 |
| 11 – 15 | 19 | 12.0 | 74.1 |
| 16 – 20 | 22 | 13.9 | 88.0 |
| 21 and Above | 19 | 12.0 | 100.0 |
| ***Mean*** | | ***10.8*** | |
| ***Total*** | ***158*** | ***100.0*** | |
| ***Highest Qualifications*** | | | |
| HND | 26 | 16.5 | 16.5 |
| BSc/BTech | 68 | 43.0 | 59.5 |
| PGD | 12 | 7.6 | 67.1 |
| MSc/MTech | 51 | 32.3 | 99.4 |
| PhD | 1 | 0.6 | 100.0 |
| ***Total*** | ***158*** | ***100.0*** | |
| ***Type of firm/ Sector*** | | | |
| Client organization | 38 | 24.1 | 24.1 |
| Contracting firm | 61 | 38.6 | 62.7 |
| Consulting firm | 59 | 37.3 | 100.0 |
| ***Total*** | ***158*** | ***100.0*** | |
| ***Membership grade*** | | | |
| Graduate | 55 | 34.8 | 34.8 |
| Corporate/ Associate | 97 | 61.4 | 96.2 |
| Fellow | 6 | 3.8 | 100.0 |
| ***Total*** | ***158*** | ***100.0*** | |
| ***Professional body of affiliation*** | | | |
| NIQS | 53 | 33.5 | 42.5 |
| NIA | 33 | 20.9 | 66.6 |
| NSE | 72 | 45.6 | 94.2 |
| ***Total*** | ***158*** | ***100.0*** | |
| ***Number of projects executed*** | | | |
| 1 – 20 | 94 | 59.5 | 59.5 |
| 21 – 40 | 33 | 20.9 | 80.4 |
| 41 – 60 | 19 | 12.0 | 92.4 |
| 61 – 80 | 3 | 1.9 | 94.3 |
| 81 and Above | 9 | 5.7 | 100.0 |
| ***Mean*** | | ***24.6*** | |
| ***Total*** | ***158*** | ***100.0*** | |

**Table 3: Risk factors encountered in building projects**

| Risk factors | Group Mean | Group Rank | F-ratio | Sig. (P-value) |
|---|---|---|---|---|
| Failure to complete within stipulated time | 3.911 | 1 | 7.965 | 0.000 |
| Hostility of the host community | 3.696 | 2 | 5.323 | 0.000 |
| Failure to complete within clients budget | 3.639 | 3 | 4.663 | 0.001 |
| Design disapprovals | 3.354 | 4 | 2.414 | 0.051 |
| Peculiar site conditions | 3.291 | 5 | 7.800 | 0.000 |
| Unexpected rises in price of labour and material | 3.215 | 6 | 8.165 | 0.000 |
| Claims for delays by the contractor | 3.127 | 7 | 4.352 | 0.002 |
| Weather condition | 3.089 | 8 | 7.800 | 0.000 |
| Defects in structure due to poor workmanship | 3.019 | 9 | 10.262 | 0.000 |
| Currency restriction and rates of exchange | 3.000 | 10 | 5.141 | 0.001 |
| Changes in cost arising from legislation | 2.703 | 11 | 1.955 | 0.104 |
| Force majeure | 2.696 | 12 | 10.950 | 0.000 |
| Damage to the work | 2.538 | 13 | 7.331 | 0.000 |
| Third party injury and property damage | 2.494 | 14 | 5.398 | 0.000 |
| Strike by labour force | 2.462 | 15 | 2.203 | 0.071 |

**Risk factors encountered in building projects**

Table 3 depicts various risk factors occurring in building projects with failure to complete within stipulated time (Mean Score = 3.911) ranking 1st, the 2nd rated risk factor emerges as the hostility of the host community (Mean Score = 3.696) while failure to complete within clients budget placed 3rd with mean value of 3.639. The least ranked risk factors include damage to the work (Mean Score = 2.538), third party injury and property damage (Mean Score = 2.494) and strike by labour force (Mean Score = 2.462).

**Significance of risk factors encountered in building projects**

From Table 3, ANOVA test was conducted to establish the level of significance of each of the risk factors encountered in building projects based on respondents' years of experience. From the analysis presented in Table 4, it is evident that out of the 15 risk factors encountered in building projects, 12 risk factors were significant (P value is < 0.05), while the remaining risk factors occur per chance. The opinions of the respondents based on the aforementioned were therefore tested in hypothesis form for agreement or otherwise as presented in Table 4.

**Table 4: Significance test of respondents' opinions**

| | Profession | Group | Mean |
|---|---|---|---|
| Chi-square | 8.022 | Quantity Surveyors | 31.25 |
| Df | 2 | Architects | 19.13 |
| Asymp. Sig | 0.018 | Engineers | 19.33 |

**Significance test of respondents' opinions**

From Table 4, Kruskal Wallis test carried out shows that the p value is < 0.05, being 0.018, then null hypothesis, which says that there is no significant agreement in the opinions of the respondents, is rejected and the alternate hypothesis is accepted that there is statistically significant agreement in the opinions of the respondents. Based on the aforementioned, it is evident that the respondents had convergent views concerning the occurrence of risk factors in building projects.

**Table 5: Sources of risks in building projects**

| | Group Mean | Group Rank | **F-ratio** | **Sig. (P-value)** |
|---|---|---|---|---|
| Financial | 4.032 | 1 | 1.278 | 0.281 |
| Political | 3.608 | 2 | 1.177 | 0.323 |
| Contractual | 3.209 | 3 | 2.895 | 0.024 |
| Physical | 3.177 | 4 | 2.455 | 0.048 |
| Environmental | 3.057 | 5 | 2.236 | 0.068 |
| Operational | 3.006 | 6 | 3.880 | 0.005 |
| Logistic | 2.842 | 7 | 2.541 | 0.042 |
| Legal | 2.633 | 8 | 2.325 | 0.059 |

**Sources of risks in building projects**

Of all the various sources from which construction risks could emerge, table 5 reveals that the most highly ranked sources, based on the rating of the respondents, financial (Mean Score = 4.032). This is followed by political and contractual sources with mean scores of 3.608 and 3.209 respectively. The least ranked sources include operational, logistic and legal sources (Mean Scores = 3.006, 2.842 and 2.633).

**Significance of risk sources in building projects**

From Table 5, ANOVA test was carried out to establish the level of significance of each of the risk sources in building projects based on respondents' years of experience. From the analysis presented in Table 5, it is evident that out of the 8 risk sources in building projects, 3 of the sources are significant (P value is < 0.05), while the remaining 5 sources occur per chance. The opinions of the respondents based on the aforementioned were therefore tested in hypothesis form for agreement or otherwise as presented in Table 6.

**Table 6: Significance test of respondents' opinions regarding risk sources**

| | Profession | Group | Mean |
|---|---|---|---|
| Chi-square | 0.558 | Quantity Surveyors | 12.00 |
| Df | 2 | Architects | 11.00 |
| Asymp. Sig | 0.757 | Engineers | 13.70 |

**Significance test of respondents' opinions regarding risk sources**

From Table 6, Kruskal Wallis test carried out shows that the p value is > 0.05, being 0.757, then null hypothesis, which says that there is no significant agreement in the opinions of the respondents, is accepted and the alternate hypothesis is rejected that there is statistically significant agreement in the opinions of the respondents. The implication of this is that the respondents had divergent views in relation to the sources of risks in building projects.

**Discussion of findings Risk factors encountered in building projects**

The risk factors occurring in building projects are failure to complete within stipulated time, hostility of the host community and the failure to complete within clients budget, these risks are at variance with Odeyinka et al. (2012) where some of the 11 significant risk factors includes changes to initial design, inclement weather, variation to works and labour shortage among others. This is not surprising as risk factors are not only project specific but also location based (Odeyinka et al., 2012). Shortage of materials, late deliveries of materials and shortage of equipment were recorded as the most significant risk factors in construction projects according to Abd Karim et al. (2012).

**Sources of risks in building projects**

Of all the various sources from which construction risks could emerge, the most highly ranked source is financial and this closely complement Adedokun (2012) and Dada (2010) where financial source topped the lists. Others include political and contractual sources which are at variance with the works of Adedokun (2012), putting forward logistic and contractual sources and Dada (2010). The variability is not unconnected to the variation in location of the studies. Also Dada (2010) considered the generality of contractors in Nigeria which comprises small, medium and large companies and each company has different perceptions on the risk issue.

## 3. CONCLUSION

Consequent to the forgoing analysis carried out, it is evident that building projects in Rivers State are culpable of being predisposed to risks just like construction works in other parts of Nigeria and beyond. It is hereby concluded that;

1. failure to complete within stipulated time and cost coupled with the hostile nature of the host community are the risk factors impacting the building projects.
2. financial, political and contractual sources are the predominant sources with which risk in building projects could emerge consequent upon the study location.

## RECOMMENDATIONS

In order to accomplish the purpose for which this study was embarked upon, bearing in mind the magnitude of funds committed into construction projects, the following recommendations are proposed for stakeholders in the construction industry so as to achieve hitch free construction process that ensures value for money;

1. adequate assessment and consideration should be accorded time and cost performance of building projects, this is without prejudice to the host community as they were significant and highly rated factors to be reckoned with.
2. adequate provision for finance should be made as finance is the core centre which can affect the project, political influence should be reduced while the contractual obligations of the clients and contractor are to be clearly defined and well spelt out.

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## CONTACTS

Dr. Olajide Timothy IBIRONKE
Federal University of Technology, Akure
Department of Quantity Surveying, School of Environmental Technology
P.M.B. 704, Akure, Ondo State
NIGERIA
+2348145157000
timothyibironke@gmail.com; otibironke@futa.edu.ng

Olufisayo Adewumi ADEDOKUN
Federal University of Technology, Akure
Department of Quantity Surveying, School of Environmental Technology
P.M.B. 704, Akure, Ondo State
NIGERIA
+2348034784642
fisayoadedokun@gmail.com; oaadedokun@futa.edu.ng
Professor Isaac Olaniyi AJE
Federal University of Technology, Akure
Department of Quantity Surveying, School of Environmental Technology
P.M.B. 704, Akure, Ondo State
NIGERIA
+2348034746985
ajeolaniyi@gmail.com; ioaje@futa.edu.ng
Oladele Johnson AGBOOLA
Federal University of Technology, Akure
Department of Quantity Surveying, School of Environmental Technology
P.M.B. 704, Akure, Ondo State
NIGERIA
+2348033408189
johnson_agboola@me.com