A Principal Component Analysis of Factors Affecting Time Performance of Building Projects: Nigeria Perspective

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ABSTRACT

The purpose of this paper is to examine the intrinsic relationships amongst sets of variables of factors affecting time performance of building projects in Nigeria, with a view to reducing them into principal components. The research adopts a data reduction technique using factor analysis statistical technique. Structured questionnaires were administered among construction professionals in Lagos state, Nigeria, being the major hub of construction activities in Nigeria. The respondents were asked to give rating, on a 5 point Likert scale, on factors affecting time performance of building projects. Based on the forty nine factors identified which affect time performance of building projects, factor analysis was used to explore and detect the underlying relationship among the identified variables. Important measures, such as Bartlett's test of sphericity, Kaiser-Meyer-Olkin measure of sampling accuracy and measure of sampling adequacy were used to test the appropriateness of the factor extractions. The data reduction results in the identification of 14-time performance factor components are material shortage and delay issues, technical and cultural approval, health and safety related issues, political and economic condition, site condition and buildability, organizational structure, labour productivity related issues, environmental issues, contractor related factor, method of construction, clients' related factor, site management issues, design related factor and planning issues. The reduced principal components could serve as a guiding framework for an imperative step of consolidating collective movements towards better improvement of time performance of building projects especially in Nigeria working environment. The originality and value of the paper is demonstrated in the use of factor analysis in reducing the complex and multiple cat¬egorizations of factors affecting time performance of building projects into clearly defined principal components.

Keywords: Building projects, Factor Analysis, Nigeria, Principal component, Time performance.

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1. INTRODUCTION

Construction delay has been observed to be a frequent occurrence in developing countries like Thailand, Saudi Arabia and Nigeria respectively (Toor and Ogunlana, 2008). Poourrostam, *et al.,* (2011) posted that construction projects delays are major challenges being faced by construction industry in developing countries. In Nigeria, Ogunsemi and Jagboro (2006) lamented that among the most serious problems the Nigeria construction industry is facing is the project time overrun. More so, in the study conducted by Odusami and Olusanya (2000), it was observed that some construction projects carried out in Lagos metropolis exceeded the planned completion time with an average delay of

51%. Similarly, Ilori and Omopariola (2018) found out that most construction projects executed by indigenous contractors in Kwara State, Nigeria, experienced delay with average mean of 25.74% time overrun.

Although, several authors have identified various factors affecting time performance of construction projects but formal measures of time performance require definition and classification, type and extent. The general literature on time performance illustrates a multiplicity of perspectives on what constitute factors that affect time performance of building projects. A review of the various factors affecting time performance of construction projects reveals that they are very much at variance. There is duplication of categorization and overlapping of definitions. Consequently, the classification and adoption of factors affecting time performance of construction projects are difficult to compare precisely because of diverse definitions. This study attempts to make a useful contribution in this context. Therefore, this study aims at identifying factors affecting time performance of building projects in Nigeria and to reduce the complex and multiple categorizations of these identified factors into clearly defined principal components in order to form an imperative step of consolidating collective movements towards better improvement of time performance of building projects.

2. FACTORS AFFECTING TIME PERFORMANCE OF BUILDING PROJECTS

A successful time performance of any construction projects indicates that such projects are completed on or before the agreed completion dates. Olawale and Sun (2010) stated that the importance of time control is generally recognized by construction professionals in practice, and such project duration has become a vital benchmarking criterion for assessing the performance and efficiency of the project organizations (Chan and Kumaraswamy, 2002). Previous researchers have identified numerous factors affecting the time performance of construction projects. Alaghbari, *et al.,* (2007) identified factors affecting time performance of construction projects to include; financial problems, shortage of materials, poor site management practices, delayed payments, slow decision-making, contract scope changes, poor supervision, slowness to give instructions, lack of experience, poor site conditions and lack of equipment and tools in the market. A similar study of the causes and effects of delay in Malaysia construction industry, Sambasivan and Soon (2007) found out that poor site management, inadequate experience and poor subcontractors are among the major causes of time delays on construction projects.

Ubani, *et al.,* (2013) further identified factors responsible for poor time performance of construction projects in Nigeria to include; finance and payment of completed work, client interference, and slow decision-making by clients, unrealistic imposed contract duration, subcontractors, site management, construction methods, improper planning, mistakes during construction, inadequate contractor experience, contract management, preparation and approval of drawings, quality assurance/control, waiting time for approval of test and inspections, quality of materials, shortage in materials, labour supply, labour productivity, equipment availability and failure, major disputes and negotiations, inappropriate organizational structure linking parties, lack of communication between the parties, weather condition, regulatory changes and building code, unforeseen ground conditions, political conditions, economic conditions. Other factors identified to affect time performance of construction projects from previous studies include labour productivity, inadequate contractor experience, number of change orders, financial constraints and owners' lack of experience in construction, ground conditions, planned time for construction project, availability of resources as planned through project duration and average delay in payment from owner to contractor, natural disaster like flood and earthquake, financial and payment problems, improper planning, poor site management, insufficient experience, shortage of materials and equipment (Odeh and Battaineh, 2002; Haseeb, *et al.,* 2011; Mamman and Omozokpia, 2014).

3. RESEARCH METHODOLOGY

This study sought to explore the underlying relationship among the identified variables for factors affecting time performance of building projects within Nigeria context. Survey method was used in eliciting necessary data for the study. The designed structure questionnaire was pre-tested to ensure the appropriateness of the questions in terms of rhetoric and understanding of meanings prior to sending out the final draft to the respondents. The respondents' choices of answers ranged on a 5- point Likert scale from strongly disagree to strongly agree. The questionnaire was divided into two main sections. In section A of the questionnaire, the respondent was asked to fill in the space provided with the appropriate respondent's general information. While, section B of the questionnaire involves the respondent being asked to rate the variables for factors affecting time performance of building projects in Nigeria. The study population within the context of the study is the construction professionals involved in the completed and on-going construction projects in Lagos state, Nigeria. Lagos state was chosen for the study because of its characteristic as the major hub of construction activities in Nigeria.

Decisive convenience sampling technique was adopted due to the submission of Teddlie and Yu (2007), that convenience sampling involves drawing samples that are both easily accessible and willing to participate in a study. One hundred questionnaires were self-administered to the respondents and 76 completed questionnaires were retrieved and found valid for analysis, representing a response rate of 76%. Data processing was done with the aid of Statistical Package for Social Sciences (SPSS 25) software. In exploring the underlying relationship among the identified variables for factors affecting time performance of building projects, factor analysis statistical technique was used to categorize the identified variables into principal components. Various important measures, such as Bartlett's test of sphericity, Kaiser-Meyer-Olkin (KMO) measure of sampling accuracy and Measure of Sampling Adequacy (MSA) were used to test the appropriateness of the factor extraction.

3.1 The Concept and Theory of Factor Analysis (FA)

Factor Analysis (FA) is a statistical technique used to identify a relatively small number of factors that can be used to represent relationships among sets of many inter-related variables. According to Ahadzie, (2007) and Owusu and Badu (2009), factor analysis is a useful analytical tool for finding cluster of related variables and thus ideal for reducing a large number of variables into a more easily understood framework. According to Li, (2003), the mathematical model for factor analysis appears somewhat similar to a multiple regression equation where each variable is expressed as a linear combination of factors which are not actually observed.

In general, the model for the standardized variable is shown below.

$$X_i = Ai_1F_1 + Ai_2F_2 + \ldots\ldots\ldots\ldots + A_k F_k + Ui \quad \text{..... Equ. 1}$$

where
the F's are the common factors, the U unique factor, and the A's are the coefficient used to combine the k factors. The unique factors are assumed to be uncorrelated with each other and with the common factors.However, the general expression for the estimate of the $\mathrm{j_{th}}$ factor is given as

$$F_j = \Sigma W_{jy} X_i = W_{ji}X_1 + W_{j2}X_2 + \ldots\ldots\ldots\ldots + W_{jp}X_p \quad \text{..... Equ. 2}$$

where Wi's are known as factor score coefficients, and p is the number of variables.

4. FINDINGS AND DISCUSSIONS

4.1 Background Information of the Respondents

The result reveals that Engineers, Architects and Quantity Surveyors are represented by 29.5%, 28.0% and 24.5% respectively while, Builders are least represented by 18.0%. The result expressed the generation of adequate opinion of the construction industry in the study area. In terms of academic qualification, 21.0% hold HND, 32.4% and 25.7% hold B. Sc/B. Tech and M.Sc/M. Tech respectively. While 17.9% hold PGD. The respondents have a combined average of 8.1 years of work experience in the built environment. This gave an indication that the respondents are experienced and that the data provided by the respondents would be reliable.

4.2 Principal Component Analysis (PCA) for Factors Affecting the Time Performance of Building Projects

The objective here is to find the intrinsic relationships among sets of factors affecting time performance of building project in Nigeria context with a view to reducing them into principal components.

4.2.1 Assessment of the suitability of the data for Factor Analysis

The results in Table 1 show the KMO MSA and Bartlett's test of sphericity of variables for factors affecting time performance. It has been evident from the table that the KMO values were greater than 0.6 which according to Kaiser (1958) was deemed satisfactory for FA. In this study, the value of the test statistic forsphericity of variables for factors affecting time performance were found to be large (i.e. Bartlett's test of sphericity = 1758.883). This then implies that FA employed in this study was appropriate for factor extraction.

Table 1: KMO and Bartlett's Test Result of Factors Affecting Time Performance of Building Projects

Test	Values
Kaiser-Meyer-Olkin measure of sampling adequacy	.765
Bartlett's test of sphericity Approx. Chi-Square	1758.883
Df	210
Sig.	.000

4.2.2 Factor extraction

Having proven that the data for the FA are suitable for the analysis; the next step according to Pallant (2010) is factor extraction. This involves determining the smallest number of factors that can be used to best represent the interrelations among the set of variables. According to Pallant, the most commonly used approach is PCA and that there are a number of techniques that can be used to assist in the decision making process concerning the number of factors to retain, namely: (i) Kaiser's criterion or the Eigen value; (ii) The screen test; and (iii) Parallel analysis. In this study therefore, the PCA approach was employed and the results from Kaiser's criterion and the screen test decision criteria were considered when deciding upon the number of factors to be retained.

Under Kaiser's criterion or the Eigen value, only factors with an Eigen value of 1.0 or more are retained for further investigation. Whilst in The screen test, the plot as generated by the SPSS software is inspected to find a point at which the shape of the curve changes direction and becomes horizontal. The next steps are factor extraction and rotation, to obtain reduced numbers of factors to represent the 49 variables, in order to achieve easy interpretation. Initial matrix and rotated matrix results are shown in Table 2 and Figure 1 respectively.

From Table 2, it is obvious that the total variance explained by the 1st component was 24.922%; while the 14th component explained a total variance of 2.248%. Equally, from Table 2, the total variance explained by all of the fourteen factors extracted from the factors affecting time performance were 80.518%. Pallant (2010) asserted that Kaiser's criterion had been criticized for retaining too many factors in some situations, and therefore to be sure that too many factors had not been retained, scree plot inspection was equally carried out. It is evident from Figure 1 that the shape of the curve has changed direction and has become horizontal on the around 14th component. This subsequently implied that the fourteen components extracted could be said to be accurate as there was an agreement between the results of the scree plot and Kaiser's criterion. A cursory look at the communalities (Table 3) between the factors has revealed that all variables had a communality equal or higher than 0.50 which has been deemed the acceptable criterion for factor extraction.

Table 2: Total Variance Explained of Factors Affecting Time Performance

	Initial Eigen values			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.212	24.922	24.922	6.897	14.075	14.075
2	4.646	9.481	34.403	3.520	7.183	21.259
3	3.114	6.355	40.759	3.241	6.614	27.873
4	2.724	5.558	46.317	3.165	6.460	34.333
5	2.390	4.878	51.195	3.079	6.283	40.616
6	2.148	4.384	55.578	2.583	5.272	45.889
7	2.031	4.145	59.723	2.524	5.152	51.040
8	1.898	3.874	63.597	2.516	5.134	56.174
9	1.768	3.608	67.205	2.478	5.056	61.230
10	1.552	3.167	70.372	2.256	4.603	65.834
11	1.388	2.832	73.204	1.903	3.883	69.717
12	1.278	2.608	75.812	1.834	3.744	73.461
13	1.205	2.458	78.270	1.816	3.706	77.167
14	1.101	2.248	80.518	1.642	3.351	80.518

Extraction Method: Principal Component Analysis.

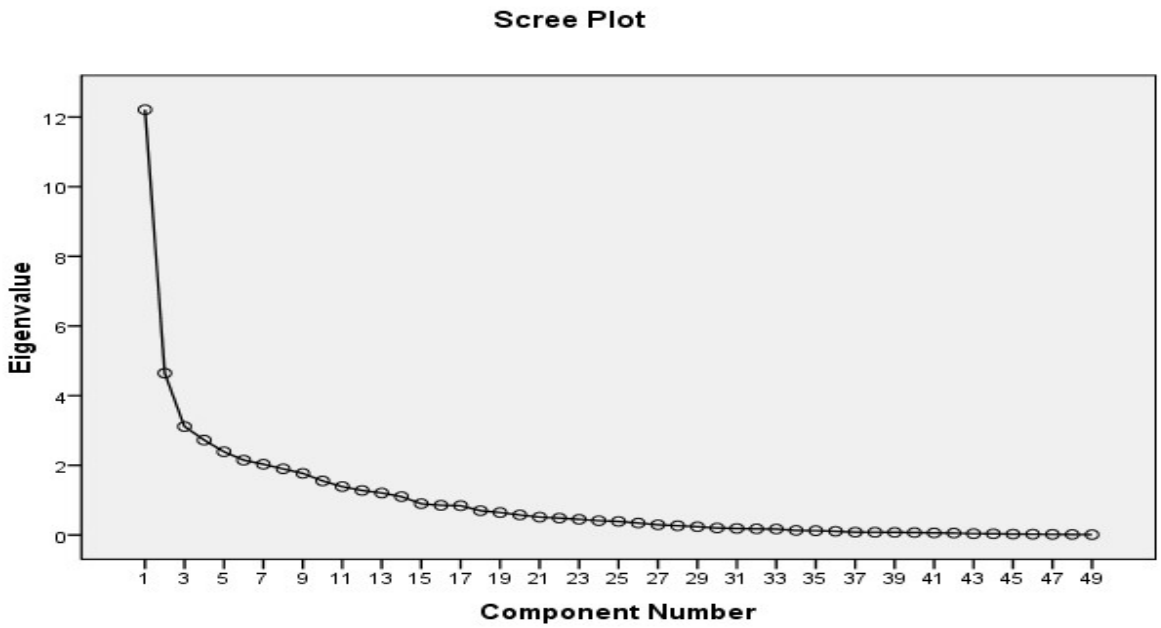

Fig.1 Scree Plot of factors affecting time performance

Table 3: Communalities of Factors Affecting Time Performance of Building Projects

FACTORS	Initial	Extraction
Finance and payment of completed work	1.000	.639
Client interference	1.000	.802
Slow decision-making by clients	1.000	.794
Imposed contract duration	1.000	.763
Subcontractors needed	1.000	.852
Site management	1.000	.736
Construction methods	1.000	.709
Improper planning	1.000	.809
Mistakes during construction	1.000	.754
Contractor experience	1.000	.888
Contract management	1.000	.872
Variation order	1.000	.776
Quality assurance/control	1.000	.787
Preparation and approval of drawings	1.000	.827
Waiting time for approval of test and inspections	1.000	.867
Shortage in material	1.000	.829
Labour supply	1.000	.822
Site preparation time	1.000	.690
Planned time for construction	1.000	.811
Labour productivity	1.000	.782
Equipment availability and failure	1.000	.861
Time needed to rectify defects	1.000	.899
Average delay in claim approval	1.000	.845
Average delay in regular payments	1.000	.795
Major disputes and negotiations	1.000	.794
Materials shortage	1.000	.845
Conformance to specification	1.000	.811
Unavailability of competent staff	1.000	.820
Quality of equipment and raw materials	1.000	.768
Organizational structure linking parties	1.000	.844
Communication between the parties	1.000	.821
Project complexity	1.000	.763
Weather condition	1.000	.835
Government policy	1.000	.794
Absenteeism rate through project	1.000	.734

FACTORS	Initial	Extraction
Sequencing of work according to schedule	1.000	.865
Site condition problems	1.000	.867
Political conditions	1.000	.849
Economic conditions	1.000	.883
Number of dispute between owner project and parties	1.000	.829
Employees attitudes	1.000	.798
Application of health and safety factors in organization	1.000	.843
Project location and access to the site	1.000	.811
Review of failures and solving it	1.000	.751
Air quality/ pollution	1.000	.853
Climatic condition	1.000	.770
Design change	1.000	.827
Interface issues in projects	1.000	.715
Social and cultural impact	1.000	.751

Extraction Method: Principal Component Analysis.

4.2.3 Factor rotation and interpretation

As suggested by Pallant (2010), the next step in FA after factor extraction is factor rotation and interpretation. It has been argued by researchers who have used or written about FA, that in this form or analysis an unrotated PCA factor matrix only indicates the relationship between individual factors and the variables; and that sometimes it can be very difficult to interpret the pattern (Akintoye, 2000 and Pallant, 2010). In order to easily interpret the results generated from the second step, the factors were subsequently rotated. It worth mentioning that this rotation does not change the underlying solution but presents the pattern of loadings in a manner which are easier to interpret. Therefore, the study employed the varimax method which attempted to minimize the number of variables that had high loadings on each factor. The assumption here is that the underlying constructs are independent i.e. not correlated.

The factor grouping based on the varimax rotation is shown in Table 4. Each variable weighs heavily onto only one of the factors, while the loading on each factor exceeds 0.50.Each component is labeled and interpreted as follows: Component 1 - material shortage and delay issues, Component 2 – technical and cultural approval, Component 3 – health and safety related issues, Component 4 – political and economic condition, Component 5 – site condition and buildability, Component 6 - organizational structure, Component 7 - labour productivity related issues, Component 8 – environmental issues, Component 9 – contractor related factor, Component 10 - method of construction, Component 11 - clients' related factor, Component 12 - site management issues, Component 13 – design related factor and Component 14 – planning issues. The label given to each component was generated based on the interrelated characteristics and coupled with the value of loading.

Component 1 – Material Shortage and Delay Issues

This principal factor accounts for 24.922% of the observed total variance and it contains ten items. The items are: materials shortage (sig.= 0.839), unavailability of competent staff (sig. =0.814),major disputes and negotiations(sig.=0.780), average delay in regular payments (sig. = 0.750), time needed to rectify defects(sig.=0.639), average delay in claim approval (sig. = 0.634), conformance to specification (sig. = 0.611), mistakes during construction (sig. = 0.606), number of dispute between owner project and parties (sig. = 0.543) and project complexity(sig.=0.507).

Those that received higher loading are: materials shortage, unavailability of competent staff, major disputes and negotiations, average delay in regular payments and time needed to rectify defects. Usually, when there is material shortage on site, delays on the projects are likely to ensued which often lead to negative time performance of construction projects.

Component 2 – Technical and Cultural Approval

The second principal factor is labeled "technical and cultural approval". This factor accounts for 9.481% of the total observed variance and contains five items which are regarded as technical and cultural. The items are: waiting time for approval of test and inspections (sig.=0.860), shortage in material (0.750), preparation and approval of drawings (0.681), social and cultural impact(0.615), quality assurance/control (0.471).These variables are related to technical and cultural approval issues. At times, it takes longer time for contractors to get required approval from project consultants which can affect time performance of that particular project.

Component 3 – Health and Safety Related Issues

The third principal factor is categorized health and safety related issues. The factor accounts for 6.355% of the total observed variance and contain four items. The reported factor loadings for the variables are application of health and safety factors in organization (0.827), employees' attitudes (0.764), project location and access to the site (0.660), and review of failures and solving it (0.592).Health and safety issues require adequate attention because non-attendant could affect the time performance of building projects especially on project with reported cases of injuries.

Component 4 – Political and Economic Condition

The fourth principal factor is tagged political and economic condition. This factor is considered very crucial going by higher rating indicated in Table 4. The factor contains two items and accounts for 5.558% of the total observed variance. The items listed in this principal factor are: political conditions (sig. =0.811) and economic conditions (sig. = 0.747). This implies that stable political and economic environments are needed to enhance a better time performance of building projects.

Component 5 – Site Condition and Buildability

The fifth principal factor is tagged "site condition and buildability" which contains factors such as site condition problems (sig. =0.647) and construction methods(sig.=0.484). This factor is also considered very crucial from the indication in the general ranking of factors affecting time performance of building projects in Table 4. This principal factor accounts for 4.878% of the total observed variance. The condition of a site often determines which and best construction method to be used in order to achieve the objective of the project, and which invariably affect the time performance of such projects.

Component 6 – Organisational Structure

The sixth principal factor is labeled "organizational structure". This factor accounts for 4.384% of the variance and contains three variables: organizational structure linking parties, communication between the parties and quality of equipment and raw materials with loading of 0.855, 0.797 and 0.614 respectively. These three variables under this component were revealed by factor analysis to be among the highly rated factors affecting time performance of building projects in Nigeria.

Component 7 – Labour Productivity Related Issues

The seventh principal factor is tagged "labour productivity related issue" which contains factors such as labour productivity (sig. =0.803), planned time for construction (sig.=0.663) and equipment availability and failure (sig.=0.563). This factor is also considered very crucial from the indication in the general ranking of factors affecting time performance of building projects in Table 4. This principal factor accounts for 4.145% of the total observed variance.

These factors are capable of influencing time performance of building project in that when there is no proper time planning for operations on site, labour productivity drops and more time will be required to accomplish tasks. Also, in a situation of failure or inability to obtaining necessary equipment for operation on site, the duration set for the project might likely be exceeded.

Component 8 – Environmental Issues
This principal factor accounts for 3.874% of the observed total variance and it contains three items. The items are: weather condition (sig. =0.842), government policy (sig. =0.699) and climatic condition (sig. =0.692). Weather condition received the highest loading in this component which indicates that, weather condition is a very significant factors affecting time performance of building projects.

Component 9 – Contractor Related Factor
The ninth principal factor is labeled "contractor related factor". This factor accounts for 3.608% of the total observed variance and contains three items which are regarded as factors usually emanate from the contractors. The items are: contract management (sig.=0.856), contractor experience (sig.=0.711) and variation order (sig.=0.667).These variables are related to contractor cause issues. Contractors are expected to manage the projects effectively using their professional experiences and skills which will in turn improve the time performance of the project.

Component 10 – Method of Construction
The tenth principal factor is categorized method of construction. The factor accounts for 3.167% of the total observed variance and contain two items. The reported factor loadings for the variables are sequencing of work according to schedule (sig.=0.863) and absenteeism rate through project (sig.=0.581).When the arrangement of building project operations is in order and there is reduced rate of absenteeism on site, there is tendency of improved time performance of such projects, that is, there is possibility of executing such building project within the time frame stipulated for it.

Component 11 – Clients' Related Factor
The eleventh principal factor is tagged clients' related factor. This factor is also considered very important by sharing higher rating indicated in Table 4. The factor contains three items and accounts for 2.832% of the total observed variance. The items listed in this principal factor are: client interference (sig.=0.853), slow decision-making by clients (sig.=0.702) and finance and payment of completed work (sig.=0.611). All these factors are majorly of client related cause. Continuous client interference on projects and client's slow decision making in respect of the projects will of course affect time performance of the projects.

Component 12 – Site Management Issues
The twelveth principal factor is tagged "site management issues" which contains factors such as site management (sig. =0.775) and subcontractors needed (sig. =0.558). This principal factor accounts for 2.608% of the total observed variance. The implication of higher loadings of these items is that they are among the significant factors that affect performance of building projects.

Table 4: Rotated Component Matrix of Factors Affecting Time Performance of Building Projects

	Component													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Materials shortage	**.839**													
Unavailability of competent staff	.814													
Major disputes and negotiations	.780													
Average delay in regular payments	.750													
Time needed to rectify defects	.639													
Average delay in claim approval	.634													
Conformance to specification	.611													
Mistakes during construction	.606													
Number of dispute between owner project and parties	.543													
Project complexity	.507													
Waiting time for approval of test and inspections		**.860**												
Shortage in material		.750												
Preparation and approval of drawings		.681												
Social and cultural impact		.615												
Quality assurance/control		.471												
Application of health and safety factors in organization			**.827**											
Employees attitudes			.764											
Project location and access to the site			.660											
Review of failures and solving it			.592											
Political conditions				**.811**										
Economic conditions				.747										

Table 4: Rotated Component Matrix of Factors Affecting Time Performance of Building Projects Cont'd

	Clomponent							
	1	2	3	4	5	6	7	8
Site condition problems		**.747**						
Construction methods		.704						
Organizational structure linking parties			**.855**					
Communication between the parties			.797					
Quality of equipment and raw materials			.614					
Labour productivity				**.803**				
Planned time for construction				.663				
Equipment availability and failure				.563				
Weather condition					**.842**			
Government policy	.				.699			
Climatic condition					.692			
Contract management						**.856**		
Contractor experience						.711		
Variation order						.667		
Sequencing of work according to schedule							**.863**	
Absenteeism rate through project							.581	
Client interference								**.853**
Slow decision-making by clients								.702
Finance and payment of completed work								.611
Site management							**.775**	
Subcontractors needed							.558	
Interface issues in projects								**.707**
Design change								.656
Imposed contract duration								**.769**
Improper planning								.721

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 13 iterations.

Component 13 – Design Related Factor

The sixth principal factor is labeled "design related factor". This factor accounts for 2.458% of the variance and contains two variables: interface issues in projects and design change with loading of 0.707 and 0.656. These two variables are also considered to be among significant factors affecting time performance of building projects in Nigeria.

Component 14 – Planning Issues

The last principal factor is tagged "planning issues" which contains factors such as imposed contract duration (sig. =0.769) and improper planning(sig.=0.721). These items are also considered very crucial from the indication in the general ranking of factors affecting time performance of building projects in Table 4. This principal factor accounts for 2.248% of the total observed variance. Inappropriate imposition of contract timeframe by the client and by the way, improper planning from both the client and contractor will in turn influence time performance of building projects.

5. CONCLUSION AND RECOMMENDATIONS

This research sought to identify factors affecting time performance of building projects in Nigeria and to reduce the complex and multiple categorizations of these identified factors affecting time performance into clearly defined principal components. The multiplicity of perspective in definition and categorization of factors affecting time performance has placed great emphasis on the need to explore the underlying and intricate relationship among these factors affecting time performance. A review of the various classifications and definition of factors affecting time performance reveals that they are very much at variance. There is duplication of categorization and overlapping of definitions. Consequently, classification and adoption of factors affecting time performance are difficult to compare precisely because of diverse definitions. Factor analysis was used in reducing the identified factors affecting time performance into more meaningful components.

The identified factors affecting time performance were reduced into fourteen(14) principal components, which are, material shortage and delay issues, technical and cultural approval, health and safety related issues, political and economic condition, site condition and buildability, organisational structure, labour productivity related issues, environmental issues, contractor related factor, method of construction, clients' related factor, site management issues, design related factor and planning issues. The study has also contributed to knowledge in the use of factor analysis in reducing the complex and multiple categorizations of factors affecting time performance into clearly defined components for easy understanding and interpretation. This brings into a quick and simple guiding framework that can be used to form an imperative step of consolidating collective movements towards better improvement of time performance of building projects.

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