DETERMINANTS OF SUCCESSFUL PROJECT IMPLEMENTATION IN NIGERIA

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Abstract

This paper investigated the critical success factors of project implementation in Nigeria. The study is motivated by the very low success rate of project delivery in the country which has created obvious problems of economic waste and end user unsatisfaction. The study sampled the opinion of fifty selected project professionals presently working in six project sites located in Anambra, Imo and River States. An objective realization instrument developed using twelve (12) factors identified in the literature as possible drivers of success in project implementation based on the Likert five-point scale of ranking. Weighted scores of respondents to the factors were analyzed using factor analysis, while the effects of the quantified weight of the critical factors were analyzed using the regression tool. Results of the analysis among others show that Environmental factors are more critical to the success of project implementation than skills portfolio of the project team. Collective responsibility among project stakeholders is a necessary condition for successful project implementation; Ability of project professionals to generate accurate designs, cost and time estimates will minimize the negative effects of economic instability on successful project delivery. Commitment of Clients to project financing obligations is a necessary condition for contractor commitment to project plans. The recommendation is that there is need for adequate environmental scanning, monitoring and evaluation at the planning stage of projects.

Keywords: Project, Project Management, Project Implementation, Success Factors, Factor Analysis

1. INTRODUCTION

Project management involves project planning and project implementation, organizing, directing and controlling of the company's resources for a relatively short term objective that has been established to complete specific goals and objectives. Therefore, project management is the planning, organizing, directing and controlling of company's resources that has been established to complete specific goals and objectives. One of the major problems confronting any less developed country according to Amachree (1988) is the allocation of its scarce factors of production with the objective of maximizing the net benefits to the populace. Given the limitations especially in the populace and the limitations especially in the current world economic recession choices must be made as a continuum of activities for the identification, preparation, appraisal and realization of projects.

This work is primarily concerned with the implementation stage. Implementation in this context deals with the change (success or failure) of the project due to the capability or
otherwise on the part of project managers/supervisors. There is no doubt about the dominant role that change has played in contemporary society - the organizations (Ntamere, 1995). One of the instruments used in managing change in organization is through the implementation of projects. As Ndiomu (1994) opined "sound development plans require good projects, just as good projects require sound planning". Project is thus the point at which plan becomes action-oriented. From the foregoing, suffice it to say that the proposals for new projects should be drawn from the country's national plan which rest on the explicit or implicit assumption that future demands or needs exist for the output of the project.

Projects are to be implemented in a specially designed organization (i.e. project organization) whose life span is synonymous with the life of the project. Since independence, project abandonment (partially complete or total abandonment) has been more predominant in the public sector, inspite of various attempts at project monitoring and implementation. Research has shown that in general, project possess a specialized set of factors which if favourable can make the project successful. These are called the key success factors or variables by some authors Cousons (2008), Samaras and Yensuang (1989) in their works.

The central objective of this study is to improve the level of project delivery in Nigeria, through the identification and integration of the critical success factors of projects into the project management system of projects, by way of designs, cost and time estimates as well as implementation of the above schedules during project execution.

1.1 OBJECTIVE OF THE PAPER
To this extent the specific objectives of this study includes:

- To assess the extent to which the problem of unsuccessful project delivery can be attributed to environmental, economic, social, regulatory and technical/technological factors.
- Quantify each of the factors of project management and rank them in order of importance to successful project delivery.
- To compare and contrast the criticality of environmental, economic, social, regulatory and technical/technological factors to successful project delivery.
- To assess the importance of client financing capacity, contractor and supplier/vendor commitment to project schedules for successful delivery of projects.

Finding answers to the following questions is of importance to the realization of the stated objectives:

- To what extent are environmental factors more critical to project success than project management skills?
- To what extent is team philosophy more critical to project success than project management skills?
- To what extent is client commitment to project financing requirements more critical to project success than the commitment of the contractor approved plans?
- To what extent has economic instability been a more critical factor for unsuccessful project delivery than the inability of project professionals to generate accurate designs, time and cost estimates?

In order to test the statistical validity of effects of answers obtained on the above question to successful project delivery, the following hypothetical proposition is tested:

$H_{01}$: Adequate application of the critical success factors of project management does not lead to significant positive improvement in project delivery.

2. CONCEPT OF PROJECT MANAGEMENT
Akpan & Chizea (2002) defined “Project Management as the effective utilization of available human and material resources under time and cost constraints for the satisfactory realization of the pre-determined project objectives”. Ntamere (1995) defined project management as managing and directing time, materials and costs to complete a particular project in an orderly and economical manner, so as to meet established objectives in time, budgeted amount and to achieve technical results. A project has a defined starting point and a technical point. Project management hence, is perceived as having developed out of the growing necessity to deal with the growing complexity of inter-disciplinary transaction in organization.

According to Butler (2003), 'modern executives must be cognizant of the myriad of non-structured undertakings required to complete a project within time, cost and performance parameters'. The status of these projects may vary from conception to completion. As the executive learns that he cannot keep track on all work efforts for which he is responsible.

Ndiomu (1994) opined that 'whatever the size of a project and how properly the project is planned, proper management guarantees the success of the project while Nwankwo (2006) argued that 'a good manager can take a deficient organizational structure work. In reality then, a project is one of several subsystems in an organization.

Samaras and Yensuang (1989) further outlined the responsibilities of the project manager within the project management process to include:

i. Establish project objectives
ii. Defines tasks
iii. Identify interdependencies
iv. Set milestones
v. Allocate resources
vi. Assign responsibility and accountability
vii. Monitor performance

Project management does not operate in a vacuum but in an organizational arrangement. And the task of the project manager is to implement the project objectives within the framework of the organization structure provided for the project.

The project organization is seen here as focal, since it provides total project visibility, it is integrative in nature and becomes the hub of all activities, both internal and external which affects the project. It is a management mechanism and does not replace the functional activities of the various departments; it supplements them.

2.1 THEORY OF PROJECT IMPLEMENTATION

Implementation as Nutt (1996) puts it is a series of steps taken by responsible organizational agents to plan change process to elicit compliance needed to install changes'. Managers use implementation to make planned changes in organizations by creating environments in which changes can survive and be rooted.

Implementation is a procedure directed by a manager to install planned changes in an organization. There is widespread agreement that managers are the key process actors and that the intent of implementation is to install planned changes, whether they be novel or routine. However, procedural steps in implementation have been difficult to specify because implementation is ubiquitous.

Amachree (1988) made several important distinctions pertinent to these processes of planned change, identifying four procedures called the entrepreneurial, exploration, control and implementation sub processes. From this perspective, implementation can be viewed as a procedure used in planning change process that lays out steps taken by the entire stakeholders to support change.

2.2 BENEFITS FROM PROJECT IMPLEMENTATION
The application of project management is rapidly expanding for a number of positive reasons for organizations. Kerzner, (2004) summarized as follows:

a. Identification of function/responsibilities to ensure that all activities are accounted for, regardless of personnel turnover.
b. Minimizing the need for continuous reporting
c. Identification of time limits for scheduling.
d. Identification of a methodology for trade-off analysis.
e. Measurement of accomplishment against plans.
f. Early identification of problems so that corrective action may follow.
g. Improved estimating capability for planning.
h. Knowing when objectives cannot be met or will be exceeded.

Therefore, the project manager has the duty to control the company's resources within time, cost and performance. For some companies, it means manpower, money, equipment (i.e) machine, materials, information and technology, and all these are to be managed by the project manager.

2.3 FACTORS AFFECTING PROJECT IMPLEMENTATION

According to Slevin and Pinto (1987), to successfully implement a project is usually difficult and complex. The project manager has to devote more time on human, financial, and technical variables as the key to the realization of project implementation. From available literature, it is apparent that the following determinants are capable of affecting project implementation in the states in review if not handled with care. This in-exhaustive list includes:

1. Escalation of project cost due to inflation
2. Difficulty in payment to contractors due to bureaucracy in government parastatals.
3. Contractors performing below standard and expectation.
4. Frequent changes in government.
5. Increase in the scope of the project.
6. Change in pre-contract consultants such as architects.
7. Ineffective project finance arrangement
8. Reorganization of the parastatals.
9. Change in the original design
10. Indiscriminate award of contracts without reference to funds available, location etc.
11. Projects and contracts determined on political considerations.
12. Poor planning or shoddy work by architects.
13. Specification of costly and imported materials
14. Insufficient working capital

These factors could be due to; Inefficient management, inadequate planning and project complexity, change in technological know-how, business environment/geography or project risk, structure, finance/pricing, empowerment in organizations and restructuring, skilled and competent manpower and customers' specification.

2.4 CRITICAL SUCCESS FACTORS IN SUCCESSFUL PROJECT IMPLEMENTATION

A ten-factor model to successful project implementation has been developed by Slevin and Pinto (1987). These 10 factors form the basis for the diagnostic instrument for measuring relative strength of each factor of the project implementation profile (PIP):

i) Project Mission:
This factor was related to the underlying purpose for the implementation - its importance is clearly defined goals at the initial stages of a project. Are the goals clear, and can they succeed? Project mission has been found to refer to the condition where the goals of the project mission has been found and understood.

ii) Top Management Support:
Schultz and Slevin (1975) noted that management support for a project or any form of implementation has long been considered of great importance in distinguishing between their ultimate success or failure. Beck (1993) considers project management as not only dependent on top management for authority, direction and support, but ultimately the conduit for implementing top management plans, or goals for the organization.

iii) Project Schedule Plan:
It refers to the developing of a detailed plan of the required stages of the implementation process. Pinto and Slevin (1989), has drawn parallels between the stages of the implementation process. The first step in the moving stage. In the PIP model, project schedule/plan refers to the degree to which time, schedule, milestones, manpower and equipment requirement are specified.

iv) Client Consultant:
The need for client consultant has been found to be increasingly important in attempting to successfully implement a project. For instance, Anyanwu (2003) found that the degree, to which clients are personally involved in the implementation process, will cause a great variation in their support for that project. Anyanwu (2003) viewed client consultant as the first stage of a programme to implement change. It is often required throughout the life cycle of the project Schultz, Pinto and Slevin (1987) warns that: it would be dangerous for the project manager to assume that since client consultant was satisfactory at an early stage, this activity could be ignored for the remainder of the project.

v) Personnel:
The view is that the most important assets in the building up and efficiency of any organization, be it private or public, depends to a large extent upon how effectively human resources (personnel) are utilized. (Nwachukwu, 1988).
However, an unfortunate situation could develop, as Pinto and Slevin (1988) observed: in many situations, personnel for the project team are chosen with less-than-full regard for the skills necessary to actively contribute to the success of implementation.

vi) Technical Tasks:
In the words of Pinto and Prescott (1989), 'Technical task refers to the necessity of not only having the necessary personnel for the implementation team, but ensuring that they possess the necessary technical skills and have adequate technology to perform their tasks'.

vii) Client Acceptance
Acceptance is a stage in project implementation that must be managed like any other factor. Locus (2009) as an implementation strategist, discusses the importance of user participation in the early stages of a system development as a way of improving the likelihood of later acceptance. Wilson (2009) opposed the use of intermediaries to act as liaison between the design, or implementation team and the projects potential user as a method to aid in client acceptance.

viii) Monitoring and Feedback:
This refers to the project control process by which at each stage of the project implementation, key personnel receive feedback on how the project is comparing to initial projection. Making allowances for adequate monitoring and feedback channels between the model builder and user.

DETERMINANTS OF SUCCESSFUL PROJECT IMPLEMENTATION IN NIGERIA
ix) Communication:
The need for adequate communication channels is extremely important in creating an atmosphere conducive enough for successful project implementation. Communication as Pinto and Slevin (1988) opined is not only essential within the project team itself, but between the team and the rest of the organization as well as with the client. Communication to provide feedback and technical evaluation to areas outside the project within the host organization tends to be highly specialized for more effectively managed research projects.

x) Troubleshooting:
Regardless of how carefully the project was planned initially, it is impossible to foresee every problem arising from the organizational environment. Pinto and Slevin (1986), it was cautioned that each team should obtain technically competent people with the specific assignment to deal with problems when and wherever they arise, and to foresee, and possibly forestall potential trouble areas in the implementation process.

2.5 PROJECT SUCCESS
Project success is among the few most frequently discussed project management concerns, yet it is the least agreed upon. Project managers tag some projects successful even though they have been poorly received by the intended clients and used well below capacity. Yet some projects exist which when first installed, were perceived as failures but have come to be viewed as major successes with time. Dvir (2005) opined in a study that project success are usually measured in terms of meeting planning goals, customer benefitting and overall measure of success. Pinto and Slevin (1988) observed that project managers are constrained either by company policy or personal rule of thumb to resort to simplistic formula in rating project success or failure. Benjamin (1991) in his work also identifies four success factors to consider in designing an effective project management system, they include:

i. Definition of objectives
ii. Allocation of responsibility
iii. Co-ordination of activities
iv. Staffing the project

A study by Baker, et al (1988) strongly confirms the importance of including client satisfaction within any measure of project success. After sampling six hundred and fifty (650) project managers, the researcher concluded that project success is something much more than simply meeting cost, schedules and performance specifications. In fact, client satisfaction with the formal result has a great deal to do with the perceived success or failure of the project. Findings from the above research support the following definitions of project success. "If the project meets the technical performance specifications and or mission to be performed and if there is a high level of satisfaction concerning the project outcome among the people in the client organization and key users or clients of the project effort, the project is considered on the overall successful. Baker, et al, (1988)". Perception plays a strong role in this definition. Therefore, the definition is more appropriately termed 'perceived success of project'; Baker, Fisher, and Murphy hence concluded that 'in the long run what really matters is whether the parties associated with and affected by a project are satisfied. Good scheduled and cost performance means very little in the face of a poor performing end product'.

It may be shown that in many ways, measures of project and implementation success are parallel and complement each other. Consequently, Pinto and Slevin (1988) suggested that a synthesis of the measures of success in the fields has the potential to present a more accurate, comprehensive, and useful model of project success. The researcher’s search of literature revealed two instruments for measuring project success in which internal and external (client) constructs are involving. The internal factors include time, cost, performance
which the project manager and his team exert daily control over and the external dealing with
the client’s satisfaction, use and effectiveness.
The value of this model is that it suggests an alternative to project assessment at a stage just
after the project has been completed and commissioned and a large part of the assessment of
success relates to the importance of the project upon the intended users, the clients.

3. DATA COLLECTION AND ANALYSIS
The study adopted a field survey approach for data collection, which took the researcher to
project organizations and construction project sites namely: Julius Berger Nigeria PLC,
Monier Construction Company Limited, Setraco Nigeria Limited, C & C Construction
Company, Network Projects Nigeria Limited. Besides, the study also adopted a deterministic
approach by way of response weighting, maximum likelihood extraction, and varimax
rotation for iterations, Kaiser Normalization and regression analysis to analyze and rank the
critical issues.

The Objective Evaluation Questionnaire (OEQ) is the Principal Instrument used for
primary data collection. Top and middle-level project officers as well as project managers,
site engineers/supervisors and consultants, architects and quantity surveyors that are highly
experienced were selected. To this end a total of fifty (50) respondents were sampled, and
valid responses were gotten from only forty one (41) of them. This therefore constituted the
sample size for analysis. Twelve (12) factors of project success as identified in the literature
were used in developing the questionnaire. The process of administration is the personal
interview contact, which allows for a one-on -one approach in asking and answering of the
questions.

DEFINITION OF 12 SUCCESS FACTORS FOR PROJECT IMPLEMENTATION

<table>
<thead>
<tr>
<th>S/N</th>
<th>Factors of Project Implementation</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commitment of contracting firms to approved plans</td>
<td>X1</td>
</tr>
<tr>
<td>2</td>
<td>Skills, training and development undertaking by project staff/workers</td>
<td>X2</td>
</tr>
<tr>
<td>3</td>
<td>Existence of the philosophy of collective responsibility among project stakeholders.</td>
<td>X3</td>
</tr>
<tr>
<td>4</td>
<td>Existence of use of scientific Project Management tools and techniques.</td>
<td>X4</td>
</tr>
<tr>
<td>5</td>
<td>Accuracy of project cost estimates</td>
<td>X5</td>
</tr>
<tr>
<td>6</td>
<td>Supplier/vendor commitment to the project specifications</td>
<td>X6</td>
</tr>
<tr>
<td>7</td>
<td>Client commitment to project financing requirements</td>
<td>X7</td>
</tr>
<tr>
<td>8</td>
<td>Environmental factors</td>
<td>X8</td>
</tr>
<tr>
<td>9</td>
<td>Regulatory requirements, standards and laws</td>
<td>X9</td>
</tr>
<tr>
<td>10</td>
<td>Accuracy of designs and specifications.</td>
<td>X10</td>
</tr>
<tr>
<td>11</td>
<td>Economic instability</td>
<td>X11</td>
</tr>
<tr>
<td>12</td>
<td>Accuracy of time estimates for project schedule</td>
<td>X12</td>
</tr>
</tbody>
</table>
Table 3.1

Effects of the critical success factors on level of project delivery is analyzed on the level of success attain by the sampled projects.

In analyzing, the data collected, weighted score of respondents to each of the success factors were generated. For the purpose of this study, factor analytical techniques were adopted to assess the significance of the twelve factors affecting project management success.

Factor analysis is a method of quantitative multivariate analysis with the goal of representing the interrelationships among a set of continuously measured variables (usually represented by their interrelationships) by a number of underlying linearly independent reference variables called factors.

Factor analysis therefore seeks to collapse the numerous operating variables into fewer dimensions of interrelated attributes called principal components. The eigenvalue determines the principal components, which are orthogonally varimax, rotated to obtain more evenly distributed variables among the components.

The mathematical procedure of factor analysis assumes that an n x n matrix A has eigenvalue \( \lambda \) if there exists a non-zero vector x, called an eigenvector associated with \( \lambda \), for which: \( Ax = \lambda x \) ………………..3.1

From the above model, it follows that the matrix \( A - \lambda I \) is singular and therefore that \( \det(A - \lambda I) = 0 \)………………3.2

This is a polynomial equation in \( \lambda \) of degree n from which it follows that A as at most n eigenvalue. The polynomial \( \det(A - \lambda I) \) is called the characteristic polynomial of A. Some roots of this characteristic equation may be repeated and we talk about the (algebraic) multiplicity of the eigenvalue in the same way as the multiplicity of roots of polynomials. In the event that the multiplicity of an eigenvalue is greater than the dimension of the vector space spanned by its associated eigenvalue, then the matrix is said to be defective.

Solving the eigenvalue problem, that is eigenvalues and associated eigenvectors, is, in general best achieved by methods other than solving the characteristic equation.

4. RESULTS AND DISCUSSION

This section undertakes to present the quantification of the primary data collected based on the responses of project officers of selected projects as well as the interpretation of results of the analysis of the data.

DATA ANALYSIS

Analysis of Correlation between the Success Factors

This analysis is carried out to test the extent to which our respondents understood and believe that each of the success factors is independent from one another.

Table 4.1

<table>
<thead>
<tr>
<th></th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
<th>X7</th>
<th>X8</th>
<th>X9</th>
<th>X10</th>
<th>X11</th>
<th>X12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation Matrix</td>
<td>1.000</td>
<td>0.404</td>
<td>0.490</td>
<td>0.519</td>
<td>0.343</td>
<td>0.379</td>
<td>0.554</td>
<td>0.495</td>
<td>0.577</td>
<td>0.399</td>
<td>0.285</td>
<td>0.322</td>
</tr>
<tr>
<td>xi</td>
<td>0.404</td>
<td>1.000</td>
<td>0.410</td>
<td>0.377</td>
<td>0.311</td>
<td>0.284</td>
<td>0.301</td>
<td>0.465</td>
<td>0.441</td>
<td>0.387</td>
<td>0.189</td>
<td>0.349</td>
</tr>
<tr>
<td></td>
<td>0.490</td>
<td>0.410</td>
<td>0.000</td>
<td>0.619</td>
<td>0.604</td>
<td>0.573</td>
<td>0.534</td>
<td>0.689</td>
<td>0.649</td>
<td>0.492</td>
<td>0.238</td>
<td>0.314</td>
</tr>
</tbody>
</table>
Table 4.1 shows that all the correlation coefficients are positive. The highest correlation of 0.722 exists between X7 and X9, while the least correlation coefficient of 0.028 exists between X5 and X12. The conclusion therefore is that our respondents agree that each of the 12 factors is distinct from the others and are likely to impact positively to successful delivery of projects.

**Estimation of the Possible Intensity of the Success Factors**

The estimation of the possible intensity of the success factors to projects process is done using the communality extraction as shown on Table 4.3. The least extraction of 0.771 is associated to factor X3, while the highest extraction of 0.932 factor X12. It therefore follows that each of the factors has indicated high potential of affecting the success of projects.

**Table 4.2.** Communalities

<table>
<thead>
<tr>
<th>Initial</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>1.000</td>
</tr>
<tr>
<td>X2</td>
<td>1.000</td>
</tr>
<tr>
<td>X3</td>
<td>1.000</td>
</tr>
<tr>
<td>X4</td>
<td>1.000</td>
</tr>
<tr>
<td>X5</td>
<td>1.000</td>
</tr>
<tr>
<td>X6</td>
<td>1.000</td>
</tr>
<tr>
<td>X7</td>
<td>1.000</td>
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<tr>
<td>X8</td>
<td>1.000</td>
</tr>
<tr>
<td>X9</td>
<td>1.000</td>
</tr>
<tr>
<td>X10</td>
<td>1.000</td>
</tr>
<tr>
<td>X11</td>
<td>1.000</td>
</tr>
<tr>
<td>X12</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

**Variance in Level Application of the Success Factors to Projects**

Using the cumulative weighted score generated across the phases of the construction process based on the maximum likelihood extraction of the Factor Analysis tool of SPSS.

**Table 4.3** Total Variance Explained

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Variance</td>
<td>Cumulative %</td>
<td>% of Variance</td>
</tr>
<tr>
<td>Total</td>
<td>5.910</td>
<td>49.250</td>
<td>5.910</td>
</tr>
</tbody>
</table>

**DETERMINANTS OF SUCCESSFUL PROJECT IMPLEMENTATION IN NIGERIA**
Extraction Method: Principal Component Analysis.

A total of six (6) principal components have been extracted. These six components generated cumulative variance explanation of 84.108% as shown by the extracted sums of square loading. When the above varimax is rotated, it generated the same sums of squares loading.

**FACTOR LOADING MATRIX**

### Table 4.4 Component Matrix a

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>X9</td>
<td>.834</td>
<td>-.078</td>
<td>.002</td>
<td>-.150</td>
<td>-.235</td>
<td>-.037</td>
</tr>
<tr>
<td>X8</td>
<td>.832</td>
<td>-.233</td>
<td>-.083</td>
<td>.063</td>
<td>.008</td>
<td>.182</td>
</tr>
<tr>
<td>X3</td>
<td>.812</td>
<td>-.153</td>
<td>-.116</td>
<td>.123</td>
<td>.237</td>
<td>-.064</td>
</tr>
<tr>
<td>X7</td>
<td>.775</td>
<td>-.094</td>
<td>.009</td>
<td>-.434</td>
<td>-.190</td>
<td>.113</td>
</tr>
<tr>
<td>X10</td>
<td>.732</td>
<td>.153</td>
<td>.368</td>
<td>.066</td>
<td>-.102</td>
<td>.299</td>
</tr>
<tr>
<td>X1</td>
<td>.693</td>
<td>.140</td>
<td>-.212</td>
<td>-.170</td>
<td>-.346</td>
<td>-.430</td>
</tr>
<tr>
<td>X6</td>
<td>.692</td>
<td>-.221</td>
<td>-.171</td>
<td>-.301</td>
<td>.337</td>
<td>.260</td>
</tr>
<tr>
<td>X5</td>
<td>.678</td>
<td>-.281</td>
<td>.358</td>
<td>.387</td>
<td>.128</td>
<td>-.178</td>
</tr>
<tr>
<td>X2</td>
<td>.572</td>
<td>.256</td>
<td>-.346</td>
<td>.502</td>
<td>-.309</td>
<td>.259</td>
</tr>
<tr>
<td>X12</td>
<td>.393</td>
<td>.739</td>
<td>-.328</td>
<td>-.039</td>
<td>.349</td>
<td>-.024</td>
</tr>
<tr>
<td>X11</td>
<td>.467</td>
<td>.530</td>
<td>.609</td>
<td>-.095</td>
<td>.044</td>
<td>-.042</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

The results show that the above 12-factors can be grouped in six decision matrix (components) for successful project management. However, 3-principal component were extracted for effectiveness. In the first component, 10 factors (X9, X8, X3, X4, X7, X10, X1, X6, X2) in that order loads positively maximally, one factor (X12), loads positively maximally in component 2, while factor(X11) loads positively maximally in component 3.

**Test of Reliability**

### Table 4.5 Goodness-of-fit Test

<table>
<thead>
<tr>
<th>Chi-Square</th>
<th>Df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.225</td>
<td>24</td>
<td>.177</td>
</tr>
</tbody>
</table>

DETERMINANTS OF SUCCESSFUL PROJECT IMPLEMENTATION IN NIGERIA
The 84.108% variance explanation in success factor application to construction process is tested for reliability using the Chi-Square test. The result of the test shows that within maximum error limits of 17.7% level, the predicted level of variance is reliable.

**ANSWERS TO RESEARCH QUESTIONS**

The factor loading matrix (Table 4.5) is used to provide answers to the research questions earlier stated.

**Research Question one:**  
*To what extent are environmental factors more critical to project success than project management skills?*

The higher loading of $X_9$ (Environmental factors) in component 1 to the maximum of 0.834 as compared to the 0.572 loading of $X_2$ (level of skill, training and development project staff/workers) is a confirmation of the fact that based on expert opinion availability of favourable operating environment is a more critical factor that will lead to project success than availability of adequate project management skills in the project team.

**Research Question two:**  
*To what extent is team philosophy more critical to project success than project management skills?*

The higher loading of $X_3$ (Existence of the philosophy of collective responsibility among project stakeholders.) in component 1 to the maximum of 0.812 as compared to the 0.572 loading of $X_2$ (level of skill, training and development project staff/workers) is a confirmation of the fact that based on expert opinion that Existence of the philosophy of collective responsibility among project stakeholders is a more critical factor that will lead to project success than availability of adequate project management skills in the project team.

**Research Question three:**  
*To what extent is client commitment to project financing requirements a more critical to project success than the commitment of the contractor approved plans?*

The higher loading of $X_7$ (Client commitment to project financing requirements) in component 1 to the maximum of 0.775 as compared to the 0.693 loading of $X_1$ (commitment of contracting firm to approved plans) is a confirmation of the fact that based on expert opinion that client commitment to project financing obligations is a more critical to project success than the commitment of the contractor, though the two of them are equally important for successful project delivery as they all loaded maximally in component 1.

**Research Question four:**  
*To what extent has economic instability been a more critical factor to unsuccessful project delivery than the inability of project professionals to generate accurate designs, time and cost estimates?*

The higher loading of $X_5$ (Accuracy of project Cost estimates) to the maximum of 0.678 as well as $X_{10}$ (Accuracy of designs and specifications) to the maximum of 0.732 in component 1 as compared to 0.739 loading of $X_{12}$ (Accuracy of time estimates for project schedule) in component 2 as well as 0.609 loading of $X_{11}$ (Economic instability) in component 3 is a confirmation of the fact that based on expert opinion that inability of project professionals to generate accurate designs, cost and time estimates have been the more critical factors for unsuccessful project delivery than economic instability.

**ANALYSIS OF EFFECT OF CRITICAL SUCCESS FACTORS ON PROJECT SUCCESS**
The effects of the critical success factors on successful project delivery is analyzed using the association between the quantified weight of critical success factors (X) and the weighted score of level of Successful project delivery (within time, cost and quality) (Y) attain based on the opinion of our respondents. This analysis is carried out using the regression tool of SPSS.

**Table 4.6**  
Results Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R-square</th>
<th>Adj. R-square</th>
<th>Std. Error of Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.7513</td>
<td>0.564</td>
<td>0.552</td>
<td>0.688</td>
</tr>
</tbody>
</table>

a. **Predictor:** (Constant), quantified weight of critical success factor (X)

Based on the above results 75.1 % correlation exists between quantified weight of critical success factors (X) and achievement of successful project delivery (Y) as indicated by the R value of 0.751 in the result summary.

Also 56.4% of the variation in successful project delivery (Y) is explained by variation in the quantified weight of critical success factors (X). When the above level of variance explained is adjusted for possible errors due to estimation, it is reduced marginally to 55.2%. The R Squared and adjusted R Square values respectively indicates these.

**Assessment of Effect of Critical Success factors on Project Delivery**

**Table 4.7**  
Coefficients/Parameter Estimates

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standard Coefficients</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>3.488</td>
<td>0.107</td>
<td>32.483</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Dependent Variable: Level of Success in project delivery.

The effect of critical success factors further captured in equation 4.1, which can be used to do the assessment.

\[ Y = 3.488 + 0.386X \]  

**Testing of Hypothesis**

The hypothesis earlier stated is tested using the analysis of variance for equation 4.1.

**Table 4.8**  
Analysis of Variance

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Square</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>23.809</td>
<td>1</td>
<td>23.809</td>
<td>50.367</td>
<td>0.0001</td>
</tr>
<tr>
<td>Residual</td>
<td>18.435</td>
<td>39</td>
<td>0.473</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>42.244</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. **Predictor:** (Constant), qualified weight of critical success factors (X)
b. **Dependent:** Variable: Level of success in project delivery.
H₀₁: Adequate applicant of the critical success factors of project management does not lead to significant positive improvement in project delivery.

Equation 4.1 shows that a positive relationship exist between X and Y. Also the F value of 50.357 shows that the effect of the model is significant at 0.05 levels. From the equation, the t value of 7.097 is significant at 0.0001 level. We therefore reject the null hypothesis, with a conclusion that adequate application of the critical success factors of project management does have significant positive effect on project delivery.

5. CONCLUSIONS

Based on the results of our analysis the following findings were made:

- Twelve potential factors categorized into economic, environmental, technical and human can affect the delivery of a project either negatively or positively.
- Availability of favourable operating environment is a more critical factor that will lead to project success than availability of adequate project management skills in the project team.
- Existence of the philosophy of collective responsibility among project stakeholders is a more critical factor that will lead to project success than availability of adequate project management skills in the project team.
- Client commitment to project financing obligations is a more critical to project success than the commitment of the contractor.
- Inability of project professionals to generate accurate designs, cost and time estimates have been the more critical factors for unsuccessful project delivery than economic instability.
- 75.1% correlation exists between quantified weight of critical success factors (X) and achievement of successful project delivery (Y) as indicated by the R value of 0.751 of our regression result.
- 56.4% of the variation in successful project delivery (Y) can be explained by variation in the quantified weight of critical success factors (X), the R-Square value of 0.564 indicates this.

Based on the above findings the following conclusions are made:

- Environmental factors are more critical to successful project management than skills portfolio of the project team.
- Collective responsibility among project stakeholders is a necessary condition for successful project management.
- Ability of project professionals to generate accurate designs, cost and time estimates will minimize the negative effects of economic instability on successful project delivery.
- Commitment of Clients to project financing obligations is a necessary condition for contractor commitment to project plans.
REFERENCES


