Volume 1, Issue 8, November 2016 ISSN: 2456-0006
International Journal of Science Technology Management and Research
Available online at: www.ijstmr.com

Analyzing Determinants for Software Development Projects in Nigeria

Nwokonkwo O.C.
Information Management Technology
Federal University of Technology Owerri
Imo State, Nigeria.

Akpan E.O.
Project Management Technology
Federal University of Technology Owerri
Imo State, Nigeria.

Eheduru G.C.
Information Management Technology
Federal University of Technology Owerri
Imo State, Nigeria.

Nwachukwu C.C.
Project Management Technology
Federal University of Technology Owerri
Imo State, Nigeria.

Abstract: ***This research assesses the determinants for software development projects in Nigeria. These determinants are critical factors for successful software development in Nigeria. Primary data was collected randomly from respondents with in-depth knowledge of software development for use in this research. The aim of this research is to determine the contribution of each of the critical success factors as well as the overall success factors to software development projects in Nigeria. In achieving this aim, multiple regression and correlation analysis was adopted as the analysis tool. The tool was adopted in order to capture the degrees of relationship with respect to significance, similarity and degree of contribution of the critical success factors to software development projects in Nigeria. Eight critical success factors - Project Management Expertise (X1), End User Involvement (X2), Executive Management Support (X3), Suitability of Process Adopted (X4), Project Scope (X5), Project Execution Capacity (X6), Security Consideration (X7), and Availability of Skilled Resources (X8), was regressed against success of software development projects, to enable us test the postulated hypothesis and answer the research questions. The results of the analysis indicate that all the eight (8) factors are collectively and individually significant and critical to successful software development projects in Nigeria. The contributions of the individual critical success factors of software development project are ranked in this order, X3, X5, X4, X1, X2, X8, and X6 while the least is X7. Based on the findings, the study recommends that there should be constructive strategy towards quality project design and scope management for software development projects in Nigeria. Also, executive management support is highly solicited while end users involvement in software project management should be encouraged in order to drive software development to success. In conclusion project execution capacity, availability of skilled personnel and security issues should be considered in managerial decision making for software development projects management.***

Keywords: - Critical Success Factors, Executive Management Support, Software Development, Software Development Projects, End Users Involvement

I. INTRODUCTION

In ensuring success of software development projects, there are certain indicators that define the success of these projects and these indicators must be efficiently managed. These indicators are known as success factors. The ability to manage these indicators, individually and collectively will define software project success (Nwokonkwo, 2016). The major indicator is the ability to manage the project life cycle from the beginning to the end in terms of the time, cost, quality, materials and human resource efforts targeted to accomplishing the set goal or objective. Software development involves a series of iterative processes emboldening problem identification, developing a plan for software development, scheduling the activities, making a design, coding, testing and implementing the developed software. These basic processes are made-up of number of sub-processes, and a balanced consideration of all the above processes is essential for the success of software development

projects (Majarian & Putman, 2015). Software development project is known to have high rate of failure world over and this has attracted our attention to finding solutions to this ugly trend knowing the implications of software development to the world's economy (Majarian & Putman, 2015).

A number of critical factors contributes to successes in software development; these factors can be derived from reviewing related literatures, as well as observing and studying software development environment. In a related work of Nwokonkwo (2016), eight factors analyzed using factor analysis were identified as factors for successful software development project in Nigeria. The eight (8) factors are Project Management Expertise, End User Involvement, Executive Management Support, Suitability of Process Adopted, Project Scope, Project Execution Capacity, Security Consideration, and availability of Skilled Resources. These success factors have been for use in this research.

We cannot achieve a credible and dynamic evolution in science and technology without a sustainable software development project success (McConnell, 2013). The problem is how to remain focused in managing a sustainable software development project in Nigeria.

We will do this by identifying and analysing the success factors that are critical to software development projects in Nigeria. Some of the problems currently faced in software development projects in Nigeria includes:

1. High incidence of failure in software development projects in Nigeria.
2. Loss of fund, time and effort spent on failed projects.
3. High rate of abandonment of software projects in Nigeria.

Having identified the success factors for software development project, the aim of this paper is to determine the critical contributions of these success factors to software development projects in Nigeria. The specific objectives of this research include:

1. To discuss the success factors identified for use in this study.
2. To determine the critical contribution of the overall success factors to software development projects in Nigeria.
3. To determine the critical contribution of each of the success factor to software development projects in Nigeria.
4. To determine the significant relationship between the critical success factors and successful software development projects in Nigeria.

- **Research Questions**

On the basis of the above statement of problems and objectives of the study, the following questions are therefore considered pertinent to guide the study.

1 What are the success factors critical to software development projects in Nigeria?
2 How do these critical factors collectively contribute to successful software development projects in Nigeria?
3 How do these critical factors individually contribute to successful software development projects in Nigeria?
4 How can these critical factors be ranked in relation to successful software development projects?
5

- **Research Hypothesis**

Based on the statement of problem, specific objectives and research questions, the following null hypotheses were formulated for the study;

$Ho_{1:}$ The success factors collectively are not critical to successful software development projects in Nigeria.
$Ho_{2:}$ The success factors individually are not critical to successful software development projects in Nigeria.
$Ho_{3:}$ There is no significant relationship between the identified critical success factors and successful management of software development projects in Nigeria.

II. THEORETICAL FRAMEWORK OF THE STUDY

Theories and models are foundational bedrock for a sound research. This study on critical factors for successful software development project was inspired by the following theories:

Transaction Cost Theory (TCT)

The main idea of this theoretical perspective is that organizational decision to develop software project is based on transaction costs.

Transactions with high asset specificity are likely to be kept within firm boundaries, while the rest should be outsourced (Williamson, 1991). Dibbern argued that software development is more cost efficient in creating strategic benefits through Information Systems, if the provision of application services requires a high amount of firm specific human assets (Dibbern et al., 2005). The level of uncertainty is the major deterrent to software development project activities (Aubert et al., 2004; Benlian, 2009). Transaction Cost Theory argues that there are costs to conduct transactions through the software industry;

these transaction cost can be reduced through mechanisms other than markets. Specifically, there are costs to drafting, negotiating, and safeguarding any exchange or transaction that are friction impeding smooth transactions. TCT claims that these transaction costs driving economic organization are as important as production costs, or perhaps even more important. While production costs are easier to assess than transaction costs, Transaction costs are an important part of the total costs of a firm; transaction costs comprise the ex-ante costs of (1) searching information, (2) drafting and negotiating an agreement, and (3) costs of safeguarding the agreement. The ex-post costs entail the costs of (1) evaluating the input, (2) measuring the output, and (3) monitoring and enforcement (Marjeta, 2012).

Resource Based Theory

The main idea of the theory is that organizational decision to embark on a software development project is based on available resources. Resource-based thinking considers that a company's resources include all assets, organizational characteristics, processes, aptitudes, information and knowledge controlled by that company and its employees (Barney, 1991).

The most prominent use of the theory is in the preparation phase of software development process for defining the decision making framework and in the vendor selection phase for selecting an appropriate vendor. For the sustainable competitive advantages firms are forced to rely on a multitude of outside suppliers for software and knowhow and in doing so gain access to valuable resources and external capabilities. Kartiwi and MacGregor (2007) pointed out that companies not only reduced cost but also enhanced their core business outcomes by utilizing high level of outsourcing at non critical items.

The resource-based view in software development builds from a proposition that an organization that lacks valuable, rare, inimitable and organized resources and capabilities, shall seek for an external provider in order to overcome that weakness (Peteraf, 1993) and increase organizational flexibility. The level of organizational flexibility reflects the ability of the firm to anticipate, adapt or react to the changes in its environment.

Agency Theory

Consistent with these perspectives, the client firm represents the principal and the vendor represents the agent in outsourced software development projects. The agency problems are indeed more pronounced in outsourced software development projects relative to internal projects (Choudhury and Sabherwal, 2003). Each organization—principal and agent—pursues its own goals while being concerned about its own lack of complete project control and wary of opportunistic behaviour by its partner. Koh et al. (2004) have found that close project monitoring is an important antecedent to successful software development outcomes especially when there is a lack of trust between involved parties.

Technology Acceptance Model (TAM)

The most cited theory is the Technology Acceptance Model (TAM). Davis (1989) presented a theoretical model aiming to predict and explain software development behaviour, that is, what causes potential business organizations to accept or reject a software development project. Theoretically, TAM is based on the Theory of Reasoned Action (TRA). In TAM, two theoretical constructs, perceived usefulness and perceived ease of use, are the fundamental determinants of system use, and predict attitudes toward the use of the system, that is, the user's willingness to use the system. Perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her job performance", and perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort. In these articles TAM was used in three different ways, namely to compare different adoption models, develop extensions of TAM, or replicate the model.

Theory of Reasoned Actions (TRA)

Another theory is the Theory of Reasoned Actions (TRA). The theory originates from social psychology, and it is a special case of the Theory of Planned Behaviour (TPB) (Ajzen, 1991). Fishbein and Ajzen (2010) developed TRA to define the links between the beliefs, attitudes, norms, intentions, and behaviours of individuals as regards software development projects. The theory assumes that a person's behaviour is determined by the person's behavioural intention to perform it, and the intention itself is determined by the person's attitudes and his or her subjective norms towards the behaviour. The subjective norm refers to the person's perception that most people who are important to him think he should or should not perform the behaviour in question.

Theory of Planned Behaviour (TPB)

Another cited theory relevant to our study is the Theory of Planned Behaviour (TPB). Ajzen (1991) presented a theoretical model of TPB, which focuses on cognitive self-regulation. It is very similar to the TRA model, but the difference is that it takes into account an additional construct, namely perceived behavioural control. Perceived behavioural control refers to the perception of control over the performance of a given behaviour. In TRA rational considerations determine the choices and behaviors of individuals, and individual intentions determine behavior. Intentions refer to individuals' plans and motivations

to commit a specific act. Intentions also reflect individual attitudes and the extent to which individuals perceive a specific act as desirable or favourable. The theory suggests that human behaviour is governed by personal attitudes, but also by social pressures and a sense of control.

III. RESEARCH METHODOLOGY AND DESIGN

In conducting this analysis, we ensured that only software development practitioners licensed by Computer Professionals of Nigeria (CPN) were captured. According to CPN register of the 2015 Annual General Meeting and Conference, there are a total of 121 licensed software developers. However, 93 software developers which also include Project Managers, academicians, IT experts and other stakeholders with in-depth knowledge of software industry were targeted.

The primary data for the analysis was collected principally through a well-designed and properly structured questionnaire. The questionnaire was prepared in multiple choice form for the purpose of providing alternative sets of answers that will best represent the actual perception and situation on ground. The likert 5-point scale ranging from Strongly Agree to Strongly Disagree was used to assess the opinions of the respondents on the questions in the well-structured questionnaire.
The well-structured questionnaire was distributed to 83 software developers who actually attended the conference out of which seventy (70) were returned, representing 84.3 percent. These seventy (70) respondents becomes our sample size.

Analysis of Variance (ANOVA)
The Analysis of Variance was used in testing the hypothesis. The test compares each of the factors averages with the hypothesized value to enable us determine if the impact is significant. Analysis of variance (ANOVA) determines or compares the equality of the impact of the factors and thereafter indicate the effects of the overall critical success factors on software development projects.

Multiple Regression and Correlation Analysis
Correlation analysis refers to the technique used in measuring the closeness of the relationship between variables or among variables. This analysis concerning the degree of the closeness is based on the regression equation. Correlation analysis estimates the relationship existing between two or more variables, regardless of the effect they have on one another.
If the relationship between X and Y is linear, a precise quantitative measure of the degree of closeness between the two variables is the product moment correlation coefficient. It is designated by R, and expressed as:

$$R=\frac{n\sum_{i=1}^{n}X_1Y_1-\left(\sum_{i=1}^{n}X_1\right)\left(\sum_{i=1}^{n}Y_1\right)}{\sqrt{\left\{\left(n\sum_{i=1}^{n}X_1^2-\left(\sum_{i=1}^{n}X_1\right)^2\right)\left(n\sum_{i=1}^{n}Y_1^2\left(\sum_{i=1}^{n}Y_1\right)\right)\right\}}},$$

Where n is the number of pair sample X_i, Y_i and the i^{th} observations of the variables being measured.
The correlation coefficient R lies between -1 and 1 such that $-1 \leq R \leq 1$. The closer R is to 1 the stronger the relationships while the farther it is from 1, the weaker the relationship.
In regression analysis, the problem of interest is the nature of the relationship itself between the dependent variable (response) and the (explanatory) independent variable. The analysis consists of choosing and fitting an appropriate model, done by the method of least squares, with a view to exploiting the relationship between the variables to help estimate the expected response for a given value of the independent variable.
The multiple regression models we aim to derive is of the form

$$\gamma = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta n Xn + \epsilon_1$$

where $\gamma =$ Dependent Variable
$X_1\ X_2 \ldots Xn$ are Independent Variables

This study used eight (8) independent predictor variables (X_1 to X_8) to predict the success of software development projects in Nigeria (an outcome Y).
For this study, Y = Successful Software Development Project

X_1 = Project Management Expertise
X_2 = End User Involvement
X_3 = Executive Management Support
X_4 = Suitability o Process Adopted
X_5 = Stable Project Scope
X_6 = Project Execution Capacity
X_7 = Security Consideration
X_8 = Availability of Skilled resource

IV. ANALYSIS, RESULT INTERPRETATION AND DISCUSSION

4.1 Model Estimation and Hypotheses Testing

Testing the Strength of Independent Variables Correlation Combined with the Dependent Variable

Table 1: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.814[a]	.663	.618	2.07939

a. Predictors: (Constant), Availability of Skilled Resource, Executive Management Support, End User Involvement, Project Execution, Stable Project Scope, Project Management Expertise, Security Consideration, Suitability of Process Adopted

b. Dependent Variable: Successful Software Development Project

From Table 1, the study found out that the independent variables combined were in a relationship with the dependent variable at the tune of 0.814 which is a very strong relationship. The R Square value tells us how much of the variance in the dependent variable is explained by the model (the predictors). Explicitly, it explains how much the independent variables explain the dependent variable. What this means is that our model, using Project Management Expertise (X1), End User Involvement (X2), Executive Management Support (X3), Suitability of Process Adopted (X4), Stable Project Scope (X5) , Project Execution capacity (X6), Security Consideration (X7), Availability of Skilled Resources (X8), explains about 66.3% of the variance in Successful Software Development Project. This is a very high percentage. It shows that much of the independent variables (X1, X2, X3, X4, X5, X6, X7 and X8) explain the dependent variable (Successful Software Development Project, Y); and only 33.7% is probably explained by other factors. This indicates that our model is a good fit in determining the dependent variable.

Sometimes, the R squared coefficient could be a bit overestimated. In some cases, it is therefore best to report the adjusted R Squared value. The adjusted R Square statistics corrects this over-estimation in the R Square value to provide a better estimate of how much the independent variable predicts and explains the dependent variable. In this case, it is 61.8%. The result helps to validate the pearson correlation result of Table 6 which shows a positive correlation between the independent variables and the dependent variable.

Table 2: ANOVA[a] for the Model

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	518.015	8	64.752	14.975	.000[b]
	Residual	263.756	61	4.324		
	Total	781.771	69			

a. Dependent Variable: Successful Software Development Project

b. Predictors: (Constant), Availability of Skilled Resource, Executive Management Support, End User Involvement, Project Execution, Stable Project Scope, Project Management Expertise, Security Consideration, Suitability of Process Adopted

Table 2 represents the ANOVA report on the general model for successful software development projects in Nigeria. In this ANOVA table, we have an outcome with the Probability value less than 0.05; we would thus say that there is a statistical significance for this model. Thus, the combination of the variables significantly predicts the dependent variable ($F=14.975$; $P=0.000<0.05$). We thus conclude from this model that collectively, the success factors (Project Management Expertise, X1, End User Involvement, X2, Executive Management Support X3, Suitability of Process Adopted, X4, Stable Project Scope, X5, Project Execution capacity, X6, Security Consideration, X7, Availability of Skilled Resources, X8) are critical to successful software development projects. It indicates that the specified model and variables are good fit in explaining the critical success factors for software development projects in Nigeria.

Testing for Relative Contributions of the Individual Independent Variables

Table 3: Coefficients of the contribution of the independent variables

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	18.628	5.003		3.723	.000	8.624	28.632
Project Management Expertise,(X1)	.272	.113	.203	2.406	.019	.046	.498
End User Involvement,(X2)	.265	.131	.181	2.019	.048	.003	.528
Executive Management Support,(X3)	.445	.098	.358	4.541	.000	.249	.642
Suitability of Process Adopted,(X4)	.311	.108	.277	2.879	.005	.095	.528
Stable Project Scope,(X5)	.380	.078	.377	4.858	.000	.223	.536
Project Execution Capacity,(X6)	.188	.098	.278	1.918	.001	1.098	.308
Security Consideration,(X7)	.173	.086	.022	2.012	.000	.325	.420
Availability of Skilled Resource,(X8)	.246	.204	.102	1.205	.003	.654	.162

a. Dependent Variable: Successful Software Development Project

The required Regression Model is expressed as:

$\gamma = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta nXn + \epsilon_1$ …… Eq. 4.1

From Table 3,

$\beta_o = 18.628$; $\beta_1 = 0.272$; $\beta_2 = 0.265$; $\beta_3 = 0.445$; $\beta_4 = 0.311$; $\beta_5 = 0.380$; $\beta_6 = 0.188$; $\beta_7 = 0.173$; $\beta_8 = 0.246$

Therefore the estimated (fitted) regression model is:

$\gamma = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \epsilon_1$ …….. Eq. 4.2

The coefficient table shown in Table 3 evaluates each of the independent variables. We want to know which of the variables in the model contributed most to the prediction of the outcome (Dependent variable). The beta values in the unstandardized coefficient will be used to formulate the multiple regression models as shown in equation 4.2 above. The standardized beta value means that the values of the variables under the unstandardized beta have been converted to the same scale so that we can easily compare them. Under the unstandardized beta coefficient, we look at each of the independent variables to determine which one has contributed more to the outcome/dependent variable. From Table 3, the result shows that independent variable X_3 have the highest coefficient value, followed by X_5, then X_4, X_1, X_2, X_8, X_6, X_7. This means that Executive management support (β_3 = 0.445, t = 4.541, P<0.05) makes the strongest critical contribution to predicting successful software development projects in Nigeria. Next, stable project scope (β_5= 0.380, t = 4.858, P<0.05) makes the next strongest critical contribution to predicting successful software development projects in Nigeria, suitability of process adopted (β_4= 0.311, t = 2.879, P<0.05) makes the third strongest critical contribution to predicting successful software development projects in Nigeria, project management expertise (β_4= 0.272, t = 2.406, P<0.05) makes the fourth strongest critical contribution to predicting successful software development projects in Nigeria, End user involvement (β_2= 0.265, t =

2.019, P<0.05) makes the fifth critical contribution to predicting successful software development projects in Nigeria, Availability of skilled resources (β_8= 0.246, t = 1.205, P<0.05) makes the sixth critical contribution to predicting successful software development projects in Nigeria, Project execution capacity (β_6= 0.188, t = 1.918, P<0.05) makes the seventh critical contribution to predicting successful software development projects in Nigeria, and lastly Security consideration (β_7= 0.173, t = 2.012, P<0.05) makes the eighth critical contribution to predicting successful software development projects in Nigeria. What this means is that increasing Executive Management support, stable project scope, suitability of process adopted, project management expertise and end user involvement by 44.5%, 38%, 31.1%, 27.2% and 26.5% respectively will inherently critically influence successful software development project in Nigeria. The resulting multiple regression equation is given as:

$$\gamma = 18.628 + 0.272X_1 + .0.265X_2 + 0.445X_3 + 0.311X_4 + 0.380X_5 + 0.188X_6 + 0.173X_7 + 0.246X_8$$

This model can also be represented as:

Successful software development project
$= 18.628 + 0.272$Project Management Expertise $+ 0.265$End User Involvement
$+ 0.445$Executive Management Support $+ 0.311$Suitability o Process Adopted
$+ 0.380$Stable Project Scope $+ 0.188$Project Execution Capacity $+ 0.173$Security Consideration
$+ 0.246$Availability of Skilled resource

The equation can thus be readily used to predict the critical success factors for software development projects in Nigeria.
From result of Table 3, it can be stated that all the independent variables individually critically contributes to successful software development projects in Nigeria.

4.2 Hypotheses Testing

In order to test our hypothesis, it is important to refer to table 4 at significance level of 0.05

Table 4: Summary of Multiple Regression Analysis of the collective independent variables on successful software development projects, noting that

R=0.814; R Square=0.663; Adjusted R Square=0.618; Standard Error of the Estimate=2.07939

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	518.015	8	64.752	14.975	.000[b]
	Residual	263.756	61	4.324		
	Total	781.771	69			

a. Dependent Variable: Successful Software Development Project

b. Predictors: (Constant), Availability of Skilled Resource, Executive Management Support, End User Involvement, Project Execution, Stable Project Scope, Project Management Expertise, Security Consideration, Suitability of Process Adopted

4.2.1 Research Hypothesis 1:

Ho_1: The success factors collectively are not critical to successful software development projects in Nigeria.
Ha_1: The success factors collectively are critical to successful software development projects in Nigeria.
In order to test the null hypothesis stated above, we use the F-test based on the Analysis of Variance (ANOVA) on Table 4. The F-test will be used to test the critical impact of the collective success factors on successful software development projects in Nigeria.
The model reaches statistical significance at (sig = .000) which is less than the significance level of 5% (P<0.05). Therefore, we reject the null hypothesis H_o and accept the alternative hypothesis H_a which states that the success factors collectively are critical to successful software development projects in Nigeria

4.2.2 Research Hypothesis 2:

Ho_2: The success factors individually are not critical to successful software development projects in Nigeria.
Ha_2: The success factors individually are critical to successful software development projects in Nigeria.

In order to test this hypothesis, we refer to the significant column of each predictor variable in table .

Table 5: Coefficients of the contribution of the Individual success factors

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	18.628	5.003		3.723	.000	8.624	28.632
Project Management Expertise,(X1)	.272	.113	.203	2.406	.019	.046	.498
End User Involvement,(X2)	.265	.131	.181	2.019	.048	.003	.528
Executive Management Support,(X3)	.445	.098	.358	4.541	.000	.249	.642
Suitability of Process Adopted,(X4)	.311	.108	.277	2.879	.005	.095	.528
Stable Project Scope,(X5)	.380	.078	.377	4.858	.000	.223	.536
Project Execution Capacity,(X6)	.188	.098	.278	1.918	.001	1.098	.308
Security Consideration,(X7)	.173	.086	.022	2.012	.000	.325	.420
Availability of Skilled Resource,(X8)	.246	.204	.102	1.205	.003	.654	.162

b. Dependent Variable: Successful Software Development Project

From Table 5, at a significant level of 0.019 for project management expertise, we reject the null hypothesis Ho_2 because probability level is less than 0.05 (t=2.406; p<0.05) and conclude that project management expertise is critical to successful software development projects in Nigeria. The contribution of project management expertise in successful software development projects in Nigeria is 0.272 (27.2%); hence project management expertise is critical to successful software development projects in Nigeria.

From Table 5, at a significant level of 0.048 for end user involvement, we reject the null hypothesis Ho_2 because probability level is less that 0.05 (t=2.019; p<0.05) and conclude that end user involvement is critical to successful software development projects in Nigeria. The contribution of end user involvement in successful software development projects in Nigeria is 0.265 (26.5%); hence end user involvement is critical to successful development projects in Nigeria.

From Table 5, at a significant level of 0.000 for executive management support, we reject the null hypothesis Ho_2 because probability level is less that 0.05 (t=4.541; p<0.05) and conclude that executive management support is critical to successful software development projects in Nigeria. The contribution of executive management support in successful software development projects in Nigeria is 0.445 (44.5%); hence executive management support is critical to successful software development projects in Nigeria.

From Table 5, at a significant level of 0.005 for suitability of process adopted, we reject the null hypothesis Ho_2 because probability level is less that 0.05 (t=2.879; p<0.05) and conclude that suitability of process adopted is critical to successful software development projects in Nigeria. The contribution of suitability of process adopted in successful software development projects in Nigeria is 0.311 (31.1%); hence suitability of process adopted is critical to successful software development projects in Nigeria.

From Table 5, at a significant level of 0.000 for stable project scope, we reject the null hypothesis Ho_2 because probability level is less that 0.05 (t=4.858; p<0.05) and conclude that stable project scope is critical to successful software development projects in Nigeria. The contribution of stable project scope in successful software development projects in Nigeria is 0.380 (38.0%); hence stable project scope is critical to successful software development projects in Nigeria.The contribution of suitability of process adopted in successful software development projects in Nigeria is 0.188 (18.8%); hence project execution is critical to successful software development projects in Nigeria.

From Table 5, at a significant level of 0.000 for security consideration, we reject the null hypothesis Ho_2 because probability level is less that 0.05 (t=2.012; p<0.05) and conclude that security considerations critical to successful software development projects in Nigeria. The contribution of security consideration in successful software development projects in Nigeria is 0.173 (17.3%); hence security consideration is critical to successful software development projects in Nigeria.

From Table 5, at a significant level of 0.003 for availability of skilled resource, we reject the null hypothesis Ho_2 because probability level is less that 0.05 (t=1.205; p<0.05) and conclude that availability of skilled resources is critical to successful software development projects in Nigeria. The contribution of availability of skilled resource in successful software development projects in Nigeria is 0.246 (24.6%); hence availability of skilled resources critical to successful software development projects in Nigeria.

Having considered the significance level of all of the individual predictor variables (critical success factors), we can confidently reject the null hypothesis and accept the alternative hypothesis which states that the success factors individually are critical to successful software development projects in Nigeria.

4.2.3 Research Hypothesis 3:

Ho_3: There is no significant relationship between the identified critical success factors and successful software development projects in Nigeria.

Ha_3: There is significant relationship between the identified critical success factors and successful software development projects in Nigeria.

Table 6: Pearson Correlation

		Successful Software Development Project	Project Management Expertise	End User Involvement	Executive Management Support	Suitability of Process Adopted	Stable Project Scope	Project Execution	Security Consideration	Availability of Skilled Resource
Pearson Correlation	Successful Software Development Project	1.000	.383	.383	.503	.492	.421	.490	.374	.469
	Project Management Expertise	.383	1.000	.250	.137	.342	.025	.135	-.236	-.232
	End User Involvement	.383	.250	1.000	.140	.239	-.065	.103	.088	-.035
	Executive Management Support	.503	.137	.140	1.000	.218	.207	.170	-.038	-.025
	Suitability of Process Adopted	.492	.242	.239	.218	1.000	.036	.217	.130	-.133
	Stable Project Scope	.421	.025	-.065	.207	.036	1.000	.071	-.026	.128
	Project Execution capacity	.490	.135	.103	.170	.217	.071	1.000	.133	.090
	Security Consideration	.374	-.236	.088	-.038	.130	-.026	.133	1.000	.187
	Availability of Skilled Resource	.469	-.232	-.035	-.025	-.133	.128	.090	.187	1.000

In other to test Hypothesis 3, we refer to Table 6. A careful look at the correlation reveals that there is very little co-relationship existing between the critical success factors (the independent variables) used in the study while there is a much higher co-relationship between the dependent variable and the critical success factors. Using a threshold value of 0.3, Table 6 shows that none of the relationships between the independent variables had a high correlation value (none were above 0.3), while the correlation between the critical success factors and successful software development project was very high. Based on the result of the Pearson correlation, we reject the null hypothesis and accept the alternative hypothesis that states that there is significant relationship between the identified critical success factors and successful software development projects in Nigeria.

4.3 Research Questions

1. What are the success factors critical to software development projects in Nigeria?
The identified success factors critical to software development projects in Nigeria from this research work are Project Management Expertise, End User Involvement, Executive Management Support, Suitability of Process Adopted, Stable Project Scope, Project Execution capacity, Security Consideration, and Availability of Skilled Resources. The study concluded that collectively and individually, the success factors are critical to successful software development projects in Nigeria. The findings agrees with the observation of Fincham, (2002), on internal political conflict which takes place as an organization strives to meet its goals and objectives and the result of Standish (1994) report on success criteria ranking which saw executive management support ranking second to user involvement. The result also agrees with Islam and Kumar (2013) observation on the effect improper expression of needs by client can have on project success.

2. How do these critical factors collectively contribute to successful software development projects in Nigeria?
From Table 1, the study found out that the independent variables combined were in a relationship with the dependent variable at the tune of 0.814, which is a very strong relationship. In our model the critical factors, Project Management Expertise, End User Involvement, Executive Management Support, Suitability of Process Adopted, Stable Project Scope, Project Execution capacity, Security Consideration, Availability of Skilled Resources collectively explains and contributes about 66.3% of the variance in successful software development projects in Nigeria. This is a very high percentage and it shows that much of the independent variables (Project Management Expertise, End User Involvement, Executive Management Support, Suitability of Process Adopted, Stable Project Scope, Project Execution capacity, Security Consideration, Availability of Skilled Resource) explain the dependent variable (Successful software development projects). This result is in tandem with the outcome of the studies conducted by Robert (2005), Annie and Anton (2003) and Grossman, (2003), which emphasized on the roles of technical team, suitable skills and expertise, security as well as suitable available resources in a software development project. Their studies also pointed out that good project management principles and proper planning and schedule as well as communication are relevant to the success of a software project as agreed with the result of the study.
West (1998) in his study attributed the success of its software project to clear vision, adoption of a clear and well defined methodology process, and documenting specific objectives. This also is in line with our findings.
Finally, the work of Taylor (2001) posited that among other causes, the main causes of software project failure are poor project management and other things that were not managed properly were resources, organizational factors, project scope and planning. This shows the importance of these success factors to software development project in Nigeria.
3.How do these critical factors individually contribute to successful software development projects in Nigeria?
Table 5 shows that each of the success factors is critical to successful software development project in Nigeria since they all have a significance value less than 0.05; with Project Management Expertise, End User Involvement, Executive Management Support, Suitability of Process Adopted, Stable Project Scope, Project Execution capacity, Security Consideration, Availability of Skilled Resources contributing 27.2%, 26.5%, 44.5%, 31.1%, 38%, 18.8%, 17.3% and 24.6% respectively.
Nasir and Sahibuddin (2011) in their work undertook a comparative study of critical success factors for Software development. Their study discovered that Clear objective/goal/scope, Realistic schedule, Effective project management skills, Support from top management, and User/client involvement were among the top ten ranked factors responsible for software development success. The result of our study also found Executive management support, stable project scope, and User involvement as having high critical contributions to successful software development projects in Nigeria.
Saqib (2012) in his study of success and failures factors for software projects, posited that for an organization to derive significant success in software development, the organization must pay cognizance to getting an experienced project manager with a strong support from the management. In addition, the organization must adopt a reliable project methodology with a well-defined scope and objective. The work further argued that an organization can easily outsource their software development needs in cases of limited resources or unplanned scheduled. This agrees with the result of our study; with availability of skilled resources deemed not having much critical contribution to success of software development projects.

4. How can these critical factors be ranked in relation to successful software development projects?
Ranking of the critical success component factors according to their influence and contribution to successful software development projects in Nigeria is done using the weighted coefficient loadings of each factor analyses as shown in Table 7.

Table 7: Ranking of Critical Success Factors

PREDICTORS (Independent Variables)	Coefficients	Ranking
X_3 (Executive Management Support)	0.445	1
X_5 (Stable Project Scope	0.380	2
X_4 (Suitability of Process Adopted)	0.311	3
X_1 (Project Management Expertise)	0.272	4
X_2 (End User Involvement)	0.265	5
X_8(Availability of Skilled Resources)	0.246	6
X_6 (Project Execution Capacity)	0.188	7
X_7 (Security Consideration)	0.173	8

The ranking obtained from this study is not in agreement with the ranking done by the Standish group (1994) on the success criteria for software development projects. User involvement was ranked first followed by Executive management support which ranked second. This is in contrast with the result of our study which ranked Executive management support first and End user involvement fifth. Software development practices differ within socio-economic environment. The practice of software development to meet the information system need of Nigerian industry differs considerably from those obtainable in other industrialized countries, especially from perspective of requirement gathering.

CONCLUSION

The research identified the critical success factors of software development project in Nigeria**.** It also highlighted the trend in software development industry in Nigeria, regarding the growth of workforce in the industry and the booming technology. The study established project management expertise, end user involvement, executive management support, suitability of process adopted, stable project scope, project execution capacity, security consideration and availability of skilled resource as critical success factors of software development projects in Nigeria.

RECOMMENDATIONS

To improve the success rate of software development project in Nigeria, there should be a constructive strategy towards quality project design and scope management for software development projects in Nigeria. Also executive management supports are highly solicited while end users involvement in software project management should be encouraged in order to drive software development to success.
The project development team should ensure that a stable project scope is attained before carrying out software development project, or applying effective requirement and scope management techniques during the development activity.
Finally, project execution capacity, availability of skilled personnel and security issues should be considered in managerial decision making for software development projects management.

REFERENCE

1. Ajzen I. (1991) “The Theory of Planned Behavior”: Organizational Behavior and Human Decision Process.
2. Annie I. Anton,Colin Potts, Kenji Takahanshi (1994), inquiry based requirement analysis", IEEE.
3. Aubert, B. A., Rivard, S. and Patry, M. (2004) “A transaction cost model of IT outsourcing”: Information and Management.
4. Barney, J. B. (1991) “Firm resources and sustained competitive advantage”: Journal of Management.
5. Benlian, A. (2009) “A transaction cost theoretical analysis of Software-as-a-Service (SaaS)-based sourcing in SMBs and enterprises”: Proceedings of the 17th European conference on information systems, Verona.
6. Choudhury, V., and Sabherwal, R. (2003) “Portfolios of control in outsourced software development projects”: Information Systems Research.
7. Davis, F.D. (1989) “Perceived usefulness, perceived ease of use, and user acceptance of Information technology”: MIS Quarterly, Vol. 13, No. 3.

8. Dibbern, J., Chin, W. W. and Heinzl, A. (2005) "The impact of human asset specificity on the sourcing of application services": European Conference of Information Systems, Regensburg.
9. Fincham R. (2002), "Narratives of Success and Failure in System Development", British Journal of Management, vol. 13.
10. Fishbein M. and Ajzen I. (2010),"predicting and changing behaviour: the reasoned action approach",psycology press, taylor francis group New York.
11. Grossman, I. (2003). Why so many IT Projects fail and how to find Success, Financial Executive, ABI/INFORM Global.
12. Islam K. and Kumar S. (2013),"Project success criteria in contracting situations", academicresearchjournals.com/serialjournalmanager/pdf/1364627738.pdf.
13. Kartiwi, M. and MacGregor, R.C. (2007) "Electronic Commerce Adoption Barriers in Small to Medium-Sized Enterprises (SMEs) in Developed and Developing Countries: A Cross-Country Comparison": Journal of Electronic Commerce in Organizations. 5(3), 35-51
14. Koh, C., Ang, S. and Straub, D. (2004) "IT outsourcing success: A psychological contract Perspective": Information Systems Research, 15(4), 356–373.
15. Magarian, T.P. and Putman, D. (2015). The Most Common Reasons Why Software Projects Fail. www.infoq.com/articles/software-failures-reasons
16. Marjeta, M. (2012) "Factors impacting the adoption of Software as a Service in Slovenian SMEs": Maribor University Press.
17. McConnell, Steve. "7: Lifecycle Planning". Rapid Development. Redmond, Washington: Microsoft Press.
18. Nasir M. and sahibuddin (2011), "critical success factors for software project: A comparative study". Scientific research essays vol. 6(10). http://www.academicjournals.org/sre. Nwokonkwo O.C (2016) "Assessing success factors for software development projects in Nigeria: A factor analysis approach" International journal of trend in research and development. ISSN 2394-9333 Vol3 issue 4
19. Peteraf, M.A. (1993) "The Cornerstones of Competitive Advantage: A Resource-Based View": Strategic Management Journal, 14 (3), 179-191.
20. Robert, N. Charette, (2005). Why Software Fails, we waste billions of dollars each year on entirely preventable mistakes. Retrieved June 6, 2008 from http://www.spectrum.ieee.org/sep05/1685/failt1
21. Saqib, M. (2012),"Causes of software project failure", ezine articles.ezinearticles.com
22. Standish Group, (1994). The Chaos Report. Retrieved October 15, 2008 from http://www.standishgroup.com/sample_research/chaos_1994_4.p
23. Taylor, A (2001) IT Project Sink or Swim, British Computer Society, Review 2001.
24. West, D. (1998). The systems Failure Method and its Potential Use in Information Systems Analysis: Computing and Information Systems, 5, pp. 135-38.