Application of the Requirements and Design of the Iterative Model in the Upgrade and Enhancement of Nigeria's National Budget Production System

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Abstract

The development and economic stability of any nation among other factors is predominantly determined by a good budgetary system that is well articulated, with clear definition of Projects, location of the project and allocated capital costs. Enhancement and upgrade of such a system can well be achieved with the iterative model of the System Development Life Cycle (SDLC). This model uses a structured and incremental process that commences with the implementation of the earlier version of the software requirement and enhancing it repeatedly with new features. The National budget presents the projected income and expenditure of government in the form of a financial statement, which is passed by the legislature and approved by the president. Overtime, the budget process has been characterized with many inadequacies due to some lapses in the budget system. This write-up is a case study on the enhancement and upgrade of the existing national budgeting system, which aims at showing the effectiveness of the iterative model in identifying further requirements and repeatedly adding new features to meet information needs of users of the national budget document.

Keywords: *Budget, requirements, capital cost, project, iterative, SDLC.*

1. INTRODUCTION

A budget is a financial plan, which contains the estimates of the projected income and expenditure of government for the coming year. It also details the policies, programs, projects and activities of government to be executed in the current year. The standard and yardsticks for measuring the operations and effective execution of the activities are also clearly stated in the budget.

From a Ministry's point of view, the budget serves as the means of preparing for the operations and decisions necessary for carrying out such operations. Thus, the leadership from the presidency down to

management at the ministry, office or agency level, to the parastatals, public corporations and other public enterprises, which rely on government funding, is able with the consolidated revenue and expenditure estimates to arrive at a planned allocation of resources.

The economists view the budget as a major financial policy tool for the management of the nation's macro-economic objectives. Thus, the government budget serves four main purposes: (a) It represents an economic document which spells out the policies of government aimed at promoting economic growth, development, full employment, poverty alleviation and other goals which are meant to improve the quality of life. (b) It represents a proposed allocation of resources. (c) It represents the President's (executive) request to the National Assembly for approval to collect, distribute and disburse funds and (d) It reports to the citizenry, through the Presidential address at the joint session of the National Assembly, how the executive intends to spend the proposed allocations (Federal Treasury Accounting Manual, 2006) .

For many years now, there has been issues and a lot of debate on the way and manner the National budget of Nigeria is being prepared and presented to the general public and the legislature. The budget is presented and passed into law six months into the year in which it is supposed to be implemented. Furthermore, the budget is presented in such a way that lacks clarity and specific locations where projects with its allocated capital cost are sited. This has affected the monitoring and evaluation of the execution of the projects in some ways that negatively affects the lives of citizens.

The poor preparation and untimely presentation of the National budget has been attributed to the inadequacies of the national budget production system that needs to be enhanced and upgraded to allow for analysis of capital projects based on the six geo-political zones in the country. The enhancement and upgrade of the current national budget production system naturally lends itself to the application of the iterative model of the System Development Life Cycle (SDLC). The SDLC is a methodology consisting of detailed scheme of work on how to develop, add new features to an existing system, which is aimed at satisfying an organization's informational, operational and management requirements (Sahar et al 2015). The SDLC consist of several models, which includes amongst others Waterfall, V-model and the Iterative model. The phases of the SDLC are planning, analysis, design, and implementation.

The Iterative Model allows earlier versions of an existing system to be enhanced or upgraded to include new features that were not contemplated earlier. According to UPEDU (2014), the new features are added through several iterations, incorporating a loosely sequential set of activities in

business modeling, requirements, analysis and design, implementation, testing and deployment, in various proportions depending on where in the development cycle the iteration is located.

The key requirement identified for the enhancement and upgrade of the national budget production system is the creation and inclusion of Location Category table in the database of the national budget production system. This table will facilitate the processing, storage, retrieval and presentation of budget information based on the six geo-political zones in the country.

2. RELATED STUDIES

2.1 THE NATIONAL BUDGET PROCESS

The sole aim of every government, be it the military, or civilian (local, state or federal) is to improve the standard of living of their citizens with the available resources. However, the programs and policies have financial implications and this is communicated in the annual budget of the country from time to time. (Akpa 2008).

The National Assembly uses an Integrated National Budget Production System, which produces the summary of the Total Capital Allocation of the Federal Ministry of Power, Works and Housing with its parastatals. The total capital allocation in 2017 Appropriation Act is ₦434, 431,887,448.00 (Nigeria's 2017 Appropriation Act)

The Total capital cost of ₦434,431,887,448 are broken down by five (5) sub-groups of economic classification namely, Purchase of Fixed Assets, Construction/Provision of Fixed Assets, Rehabilitation/Repairs of Fixed Assets, Preservation of the Environment and Acquisition of Non-Tangible Assets. The total capital cost is also broken down into projects to be executed in the ensuing year.

During the debate of the 2017 budget in the national assembly, senators representing each of the 109 senatorial zones in the country were unable to identify projects located in their domain in the budget document. Furthermore, the capital cost cannot be directly linked to the projects as presented in the budget document. Consequently, the existing national budget production system need to be upgraded and enhanced to be able to present breakdown of the capital cost by Projects, States, Geo Political Zones and Local Government Wards in Nigeria.

3. METHODOLOGY

The design process to be applied for the proposed enhancement and upgrade of the Nigeria national budget production system is the Iterative model. Figure 1 is the diagram of the Iterative model.

The iterative model conforms to a recurrent process whereby after an initial planning stage, a miniature number of stages are repeated recurrently with the completion of each cycle marginally improving and impacting on the usefulness of the earlier version of the software. Enhancements are easily identified, and implemented all through each iteration, allowing the outcome of the next increment to be better than the last.

The steps carried out in the development of the Nigerian National Budget Production System

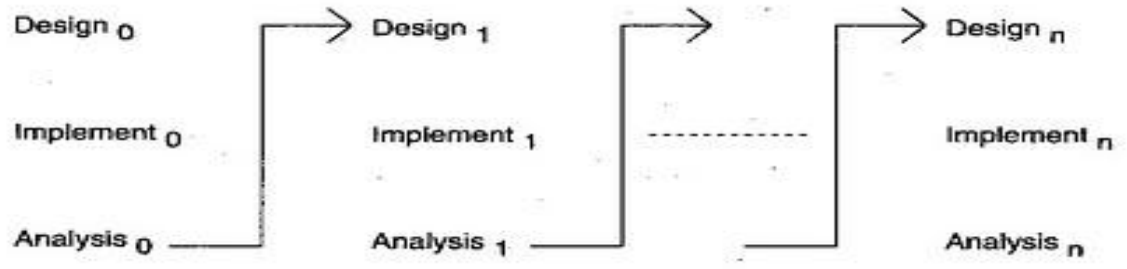

Figure 1: Diagram of Iterative model **(** http://ISTQBExamCertification.com**)**

The development of the next version of the Nigeria national budget production system will go through the under listed cyclical procedures in order to deliver an incrementally better system than the earlier version. The existing version of the system will be completed, tested and evaluated at Implement$_0$ in figure

i. Planning & Requirement: The next enhancement and upgrade of the existing national budget production system will go through an initial planning phase where the specifications of the budget documents are elicited from the users, the software and hardware requirements are identified to prepare for the next stage which is the Analysis and Design phase.

ii. Analysis and Design: Immediately the planning phase is completed, an Analysis is done to establish the appropriate database models, modules and business logic that will be required at this stage of the system enhancement and upgrade. The design process is also undertaken to determine the technical system specifications and how the system will work including the output in order to meet the requirement of the analysis phase.

iii. Implementation: This is the stage when the new national budget production system is constructed. The actual coding or programming of the system is undertaken. All the specification of the budget document and software requirements earlier identified are implemented into the earlier version of the Nigeria national budget production system which is

located at $Implement_0$ in figure 1. The result of this exercise produces a new system that needs to be tested and evaluated, designated at $Implement_1$ in figure 1.

iv. Testing: After the completion of the construction of the new national budget system, the next stage is to undertake series of test to identify any bugs that may negatively impact on the efficiency and other deliverables of the new system which is located at $Implement_1$ in Figure 1.

v. Evaluation: With the completion of the current iteration processes, an evaluation of the new version of the software located at $Implement_1$ in figure 1 is undertaken. This process allows feedbacks, suggestion from all the parties or teams involved including the members of the national assembly to examine and determine what further changes needs to be done.

After the accomplishment of the evaluation phase, the newly built version of the Nigeria national budget production system, as well as all the feedback is returned to the planning and requirement stage and the process is repeated all over again until the system requirements elicited from users are met. The cyclical iteration process of system development beginning from Planning to Evaluation and repeating itself over and over again producing better system than the earlier one is the main idea behind the Iterative model.

Techniques in Development of Nigerian National Budget Production System

3.1.1 Figure 2 is the diagram of the overview of the steps and techniques involved in the development of the next version of the Nigeria national budget production system starting from Requirements gathering to the completion and maintenance of the system.

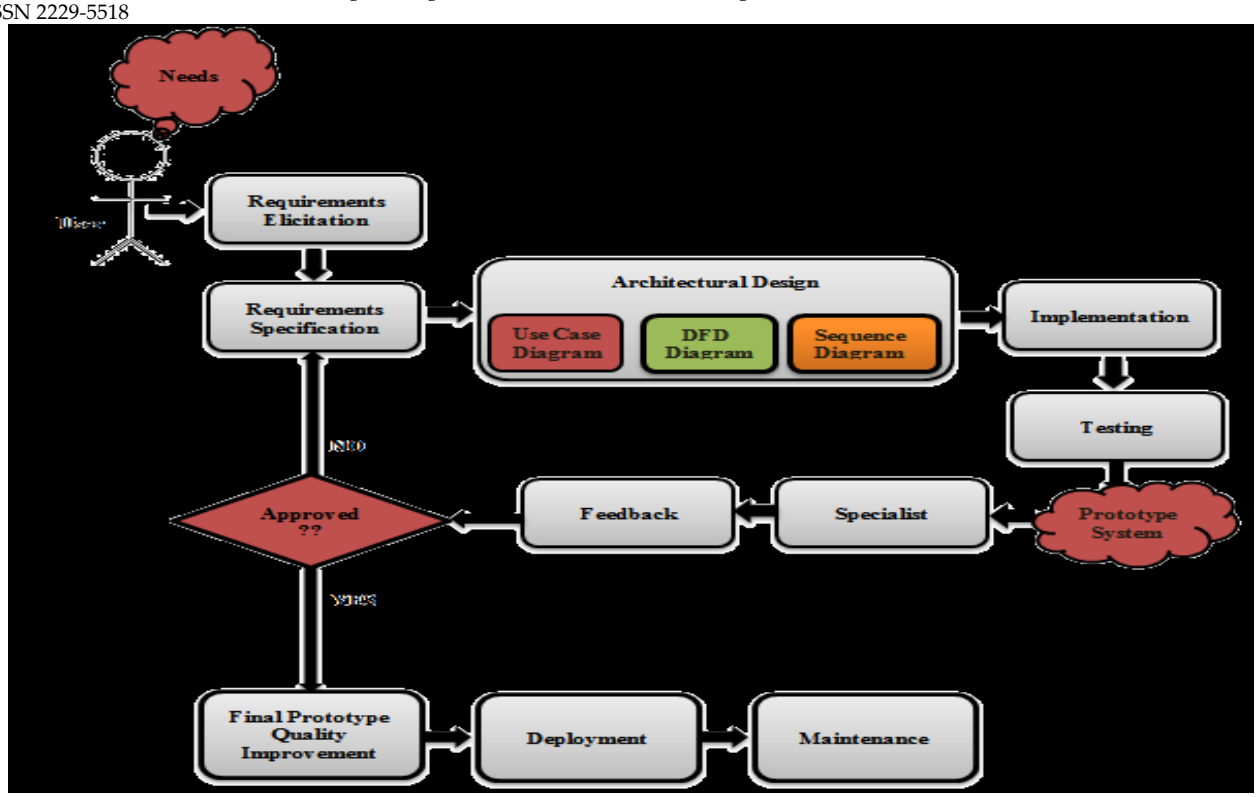

Figure 2: Flow diagram of the Algorithm (Sahar et al 2015)

i. Requirements Elicitation:

This is the initial step in the collection of information about the next iteration (new system to be built). Several requirements elicitation techniques are available. These are Brainstorming, Document Analysis, Focus Group, Interface Analysis, Interviews, Observations, Prototyping and Requirements Workshops. The requirements elicitation techniques used for this project are interview and observation method and were conducted at the Budget Office of the Federation. After the interview and observations, the following requirements were elicited; the breaking down of the capital cost by project, states and senatorial zone; the need to amend the existing System to accommodate Project Description, Project Code, Budget Amount, State, Geo Location and Senatorial Zones.

ii. Requirements Specification

At this stage, the requirements gathered are deeply studied on the basis of feasibility of each requirement. The nature of the project was established; the scope, functional and nonfunctional requirements are determined; the user interface was also determined; the software and hardware

requirement were also identified. As the budgeting system is already existing, it was determined that the under listed modules and sub-modules are to be included in the system as shown in Figure 3:

1. Location Table - comprising of; Category, Code and Description.
2. Project Table – Also comprising of; Category, Code and Description.
3. Budget Table – Comprising of; Period (January – December), Current Amount, Next Year Amount.

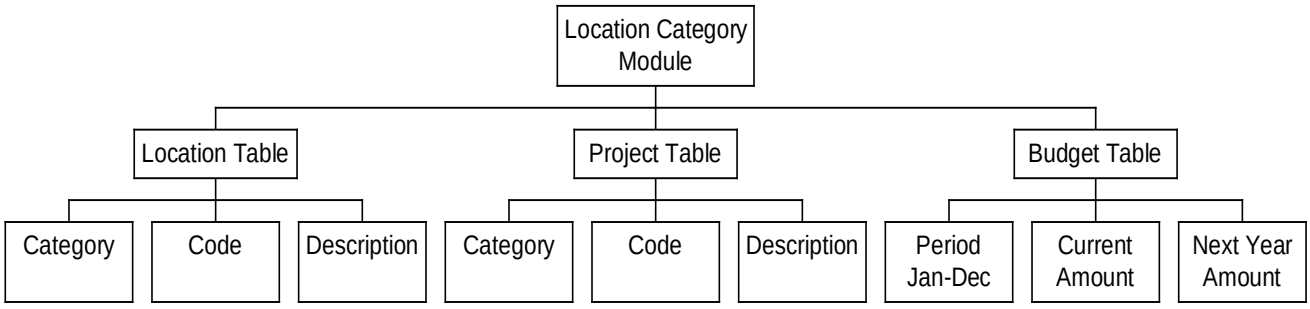

Figure 3: Division of Modules and Sub-Modules

iii. System Design

With the detail specification at hand, the design of the next version of the Nigeria national budget production system is undertaken. This involves the design of interfaces, modules, database and files including data size estimation, the system architecture – hardware, software and communications protocols through which the system will satisfy the specified requirements.

iv. Implementation

The new build of the Nigeria national budget production is constructed. This involves coding of the program, with the details obtained from the Requirement specifications and System design phases

v. Testing

Once the coding of the new build (iteration) is completed, the new system under goes series of tests to determine if there are bugs that will hinder the effective operation of the new build to deliver the expectations of the users. If the test shows that the new build will not satisfy user requirements, then, the iteration process starts all over again from the requirement elicitation.

vi. Deployment

The newly built system is deployed. This involves installing and configuring the newly built system in the associated hardware and related network environment and getting the users trained on how to use the system to deliver the reports expected to be generated from the system.

vii. Maintenance

The support plan is established. The ways and manner for resolving problems are determined.

4.0 DISCUSSION

The newly built Nigerian national budget production system was developed and implemented based on the Iterative model. The Iterative model allowed amendment to an earlier version of the software to be made by following series of phases and steps commencing from Planning and Requirement, Analysis and Design, Implementation, Testing and Evaluation in a repetitive manner until the user requirements elicited during the planning stage are incorporated into the existing system.

The requirements for the newly built Nigeria national budget production system were elicited from the users through interview, observation and examination of the documents used in the budget office of the Federation. Based on the in-depth assessment of the documents, feedback of system evaluation from various stakeholder including the members of the national assembly, the format of the presentation of the budget document, which summarizes the budget information by project, geo location, and economic classification, was prepared and approved by the stakeholders as shown in Figure 4.

The Iterative model of system development life cycle has several advantages. The most important advantage is that it allows the release of a new version of software, which is incrementally better than the previous one. If the new system is not able to meet the real-life situation, the previous system can be reverted without much difficulty. Another advantage of this model is that it allows the development of new system, which meets the ever-changing needs of clients.

One of the key disadvantage of the Iterative model is that it requires constant user engagement in order to ensure that user requirements are met without loss of time. In this circumstance, the Iterative Model becomes very expensive to implement.

Analysis of Capital Expenditure by Geo Location and Economic Classifications

Senatorial Zone	Location Code	State	Economic Codes and Description					
			23010100	23010200	23010300	23010400	23010500	
			Purchase of Fixed Assets	Construction/ Provision of Fixed Assets	Rehabilitation & Repairs of Fixed Assets	Preservation of the Environment	Acquisition of Non Tangible Assets	Total Budgeted Expenditure by Geo Location
			Budget 2017	Budget 2017	Budget 2017	Budget 2017	Budget 2017	Budget 2017
North Central			**186,666,813,307**	**502,960,078,597**	**122,086,675,597**	**1,324,172,043**	**536,987,194,565**	**1,350,024,934,109**
	107000	Benue State	186,583,376	1,705,463,929	4,289,550,233	41,297,862	188,000,000	6,410,895,400
	122000	Kogi State	251,267,549	2,043,266,371	157,865,207	30,000,000	66,187,924	2,548,587,051
	123000	Kwara State	345,239,349	5,398,928,351	1,394,237,133	88,625,531	623,273,066	7,850,303,430
	125000	Nassarawa State	110,380,409	1,918,054,201	179,764,370		204,361,265	2,412,560,245
	126000	Niger State	401,184,965	2,551,996,849	3,610,423,676	15,000,000	736,421,089	7,315,026,579
	131000	Plateau State	1,471,814,188	1,668,102,224	1,862,964,903	33,074,800	527,233,082	5,563,189,197
	737000	FCT Abuja	183,900,343,471	487,674,266,672	110,591,870,075	1,116,173,850	534,641,718,139	1,317,924,372,207
North East			**1,130,773,588**	**19,287,676,931**	**8,769,183,747**	**285,479,914**	**1,147,499,004**	**30,620,613,184**
	202000	Adamawa State	271,973,073	6,328,260,570	123,993,520	88,255,600	432,922,208	7,245,404,971
	205000	Bauchi State	173,721,869	3,964,104,786	1,699,906,496		141,932,177	5,979,665,328
	208000	Borno State	182,388,663	1,354,019,997	5,499,607,176		402,984,436	7,439,000,272
	215000	Gombe State	193,916,578	5,128,381,405	658,670,614	65,893,505	92,301,750	6,139,163,852
	234000	Taraba State	212,623,405	1,238,331,877	45,226,030	124,727,149	51,058,433	1,671,966,894
	235000	Yobe State	96,150,000	1,274,578,296	741,779,911	6,603,660	26,300,000	2,145,411,867
North West			**3,884,765,742**	**37,220,477,235**	**15,274,469,555**	**396,638,892**	**5,779,494,435**	**62,555,845,859**
	317000	Jigawa State	93,420,000	4,165,889,228	145,732,000	100,102,505	343,821,400	4,848,965,133
	318000	Kaduna State	2,427,060,604	8,020,640,265	3,869,193,245	122,368,457	3,974,186,072	18,413,448,643
	319000	Kano State	505,440,782	19,888,964,032	689,655,721	4,658,385	544,073,844	21,632,792,764
	320000	Katsina State	113,779,981	1,611,621,329	257,321,374		764,613,119	2,747,335,803
	321000	Kebbi State	183,253,956	1,150,635,856	137,317,289	56,099,164	36,300,000	1,563,606,265
	333000	Sokoto State	181,198,116	1,943,454,897	9,981,040,598	103,442,500	105,300,000	12,314,436,111
	336000	Zamfara State	380,612,303	439,271,628	194,209,328	9,967,881	11,200,000	1,035,261,140
South East			**1,254,608,435**	**17,377,979,336**	**19,266,969,064**	**647,543,244**	**2,209,263,650**	**40,756,363,729**
	401000	Abia State	145,489,540	1,089,333,475	4,656,584,502	111,347,584	648,401,889	6,651,156,990
	404000	Anambra State	417,504,060	1,458,550,565	13,566,165,538	333,500,000	180,196,800	15,955,916,963
	411000	Ebonyi State	238,182,215	919,337,523	139,713,080	101,000,000	240,000,000	1,638,232,818
	414000	Enugu State	353,927,092	12,807,863,704	693,273,256	30,000,000	1,064,049,934	14,949,113,986
	416000	Imo State	99,505,528	1,102,894,069	211,232,688	71,695,660	76,615,027	1,561,942,972
South South			**1,244,573,319**	**26,614,075,544**	**1,017,861,795**	**290,455,620**	**1,194,036,617**	**30,361,002,895**
	503000	Akwa-Ibom State	84,592,040	6,503,912,817	350,000,000	136,880,567	129,938,280	7,205,323,704
	506000	Bayelsa State	99,691,816	872,157,440		20,000,000	93,101,725	1,084,950,981
	509000	Cross River State	492,232,182	2,065,205,480	129,313,133	49,325,053	217,256,236	2,953,332,084
	510000	Delta State	198,153,238	3,646,937,561	232,228,214		184,000,000	4,261,319,013
	512000	Edo State	197,467,280	12,072,770,213	173,716,249		389,740,376	12,833,694,118
	532000	River State	172,436,763	1,453,092,033	132,604,199	84,250,000	180,000,000	2,022,382,995
South West			**2,987,141,297**	**19,555,666,200**	**44,304,631,279**	**588,471,367**	**2,803,885,053**	**70,239,795,196**
	613000	Ekiti State	94,376,335	941,013,246	64,410,479	14,556,566	123,693,149	1,238,049,775
	624000	Lagos State	1,335,606,262	6,416,942,844	43,271,563,180	126,198,032	1,159,465,332	52,309,775,650
	627000	Ogun State	198,233,636	1,047,799,594	94,462,748	237,855,141	47,104,538	1,625,455,657
	628000	Ondo State	497,433,530	1,372,301,680	109,473,258	95,441,255	167,465,832	2,242,115,555
	629000	Osun State	49,228,720	1,603,559,762	564,540,400	91,268,373	70,000,000	2,378,597,255
	630000	Oyo State	812,262,814	8,174,049,074	200,181,214	23,152,000	1,236,156,202	10,445,801,304
Total Expenditure by Economic			**197,168,675,688**	**623,015,953,843**	**210,719,791,037**	**3,532,761,080**	**550,136,849,824**	**1,584,574,131,472**

Figure 4: Sample of Capital Expenditure Analysis by Geo Location and Economic Classification

CONCLUSION

This paper examined the use of the Iterative Model to add new features to the existing Nigeria national budget production system. The Iterative model allows the enhancement and upgrade of an existing system through a repetitive process that begins with; Planning, Analysis and Design, Implementation, Testing and Evaluation.

The model facilitates the incremental development of a system that is better than the earlier one. The users of the system are constantly engaged in order to obtain up to date information on their requirements. The main beauty of the model is, with the completion of the evaluation phase, the newly built version of the Nigeria national budget production system, is brought back to the planning and requirement stage and the process repeats itself all over again until the system requirements elicited from users are met. This cyclical iteration process of system development beginning from Planning to Evaluation and repeating itself over again, producing a better system than the earlier one is the main idea behind the Iteration model.

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