



## The Application of Work Breakdown Structure in Project Implementation in Nigeria

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**ABSTRACT:** The application of Project Management (PM) tools and techniques to project implementation in developing countries like Nigeria is gradually becoming important especially that different sizes and structures of projects are undertaken. Work breakdown structure is generally recognized to be the foundation of planning, estimating, scheduling, and monitoring activities. A complex project is made manageable by first breaking it down into individual components in a hierarchical structure. This paper focused the importance of Work Breakdown Structure (WBS) on prompt delivery of project in Nigeria using Ondo State Capital (Akure) as a case study. The research was carried out in Akure being the capital of Ondo State where much rapid economic growth is going on. One hundred and ten copies of questionnaire were administered to professionals like Civil Engineers, Builders, Quantity Surveyors, Contractors and Architects in the Federal University of Technology Civil servants in the State Ministries, and contractors purposely to generate primary data. One hundred copies of the questionnaire were returned (and found useful). The study used descriptive analysis techniques which include, percentages, frequencies, weighted averages, tables among others for data analysis. The research revealed the benefits of using WBS in executing projects which will make management to achieve project objectives within planned time for project budget limits, effective use of resources and prompt project delivery. It further revealed that there are lack of indepth knowledge of WBS; time wasting among others that are obstacles to the use of work breakdown structure in Nigeria projects. This paper concludes that WBS is an extremely valuable tool to project management methodology because it sets the foundation for the rest of the project planning. It also ensures proper project baseline, estimating, resource use, scheduling, risk analysis and procurement. It therefore recommends that henceforth, the professionals, contractors and project managers' associations in Nigeria should promulgate a policy that "applications of Work Breakdown Structure" is very important and necessary for executing any project especially the complex projects for easy and accurate planning, scheduling, cost estimating, monitoring, and prompt delivery of project.

**Keywords:** Impact, Work-Breakdown Structure, Prompt Delivery and Packages

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### INTRODUCTION

Timely delivery projects require application of tools and techniques of project management. Among these tools and techniques is the Work Breakdown Structure (WBS) analysis. The term work breakdown structure is a tree structure

which shows a subdivision of effort required to achieve an objective: for example program, project, and contract (NASA 2001). Rev E, (2003) sees a WBS as the cornerstone of effective project planning, execution, controlling,

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status and reporting. All the work contained within the WBS is to be identified, estimated, scheduled and budgeted.

For any project to be successfully implemented to time and budget, needs to be sliced into smaller units/segments in a structural manner (Sholomo, 1994). This breaking into smaller segments refers to as Work-Breakdown Structure (WBS). This method WBS has been in existence for very long time in project management. The WBS provides a tool for indentifying what must be done who will do it, how long it will take, and how much it will cost. These make WBS ties the entire project together (James 1999). According to Sholomo, (1994), United States of America demanded for this concept (WBS) in 1962 to be used by all organizations working on federal projects. For a project to be properly managed there is a need to generate its Work Breakdown Structure, to define work packages so that they can be correctly assigned to organisation units. The Work Breakdown Structure (WBS) is the breaking down of the statement of work into smaller elements so that a better visibility and control will be effected. It also goes thus, a vehicle for breaking the work down into smaller elements thus providing a probability that every major and minor activity will be accounted for (Ntamere, 1995), PMBOK (2012) opined that the work break down structure (WBS) is a deliverable oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables with each descending level of the WBS.

The work breakdown structure is a method of project organisation, planning and control because without a Work Breakdown Structure it is difficult to communicate a clear view of the total scope of the project and to organise the various project data in a consistence way. The WBS organizes and defines the total scope of the project, and represents the work specified

in the current approve project scope statement. The work Breakdown structure generally has six levels which are named: programme, project, task, subtask, work place and level of effort or activity.

The smallest element in the WBS is called a 'work package' Work package is the decomposition of a project total work into different activities that will be executed. In Project Management, work package is a subset of a project that can be assigned to a specific part for execution. The proper planning and execution of a project requires the assignment of each work package to a specific organisation Unit.

Other definitions of WBS are: Harrison, (1992) describes the WBS as a method of project organization. Planning and control based on deliverables rather than simple on tasks or activities while Lewis (1999) sees WBS as a lists of all the tasks that must be done in the project to achieve desired results. Wysocki (2009) also saw WBS as a veritable tool for defining work package and developing and tracking the cost and schedule for the project. WBS provides a common framework for the natural development of the overall planning and control of a project and is the basis for dividing work into definable increments from which the statement of work can be developed and technical, schedule cost, and labour hour reporting can be established.

If a project is to be properly planned and executed, it would involve assigning each work package to a certain organizational unit. From the time a client conceives the proposal for a project, he should be thinking about the contents of the project. The contents of the project can be referred to as the WBS. The WBS that is formulated aids the better defining of the project. It also makes time and resources required for the project complete. The setting up of the Work Breakdown Structure of any project has impact on the configurations, and organizational issues, of the project. The configuration is the technical

functions which the project should achieve while the organization will execute the project to targeted level. Literature reveals that projects fail because technical content of many programmes are not planned well and also not efficiently controlled. (Morris,1988). If a Work Breakdown Structure is used properly, it will contribute significantly to the probability of successful project completion. This was corroborated by the work of Hall (1993) and Sholmo (1994) who reported that “the successful completion of a large scale project costing in the range of N38.25 billion was due to appropriate use of a WBS.

In Nigeria, the application of WBS tool to project execution is not encouraging, it results into failure of project managers and professionals in implementing their responsibilities concerning the budget, specifications and deadlines of the projects awarded. Based on this premises, this project was carried out.

### **Developing and using the work breakdown structure**

The Work Breakdown Structure ties the entire project together because it provides the tool that is used to identify what must be done, who will do it, how long will the task take, how much it will cost, also identifies all tasks, that all stakeholders can review. All projects need Work Breakdown Structure due to its benefits. Whereas not all projects will need (critical path or Gantt Schedule especially if the project is very small (Lewis, 1999).

The concept of Work Breakdown Structure was developed with the programme Evaluation and Review Technique (PERT) by the United States Department of Defence (DOD) in 1957 purposely to support the development of its polarise missile program. (Fleming et al, 1998).

It was in 1962 that NASA published a document for the PERT cost system using work Breakdown approach to describe the document. The use of WBS to describe PERT cost system was

endorsed by the secretary of Defence and also instructed that it should be used in all DOD services (Hamitton, 1964). In 1968, Work Breakdown Structure was made as Defence Materiel items (MIL-STD-881) and a military standard requiring to be used across the DOD. The document of PERT Cost system had been reviewed severally and the latest edition came up in 2011. The current edition of PERT Cost System was found in “Work Breakdown Structure for Defence Material Items (MIL-SID-881C) and it includes definitions for specific defence material commodity systems and addresses WBS elements that are common to all system.

A general work Breakdown Structure has six levels which are named as programme, Project, Task, Subtask, Work package and level of effort or activity.

A programme is a very large job that consists many projects. For instance, designing of a house is a programme while clearing of land, levelling of land, excavation of foundation, setting of foundation blocks among others are projects. A WBS has to be developed before tasks are scheduled and resources allocated. The reason for this action is to identify works to be done first, then know who will do it, how long it will take, and how much it will cost. The development of WBS should be undertaken by individuals who are skilled, vast in it and especially projects that involve a lot of disciplines.

### **WBS Level Names**

Names are used here for the purpose of communication (Figure 1).

### **Reasons why WBS must be used in project execution**

Work Breakdown Structure is referred to as “foundation” of the project, or at least the foundation of project planning and the creation of a quality. WBS requires a substantial amount

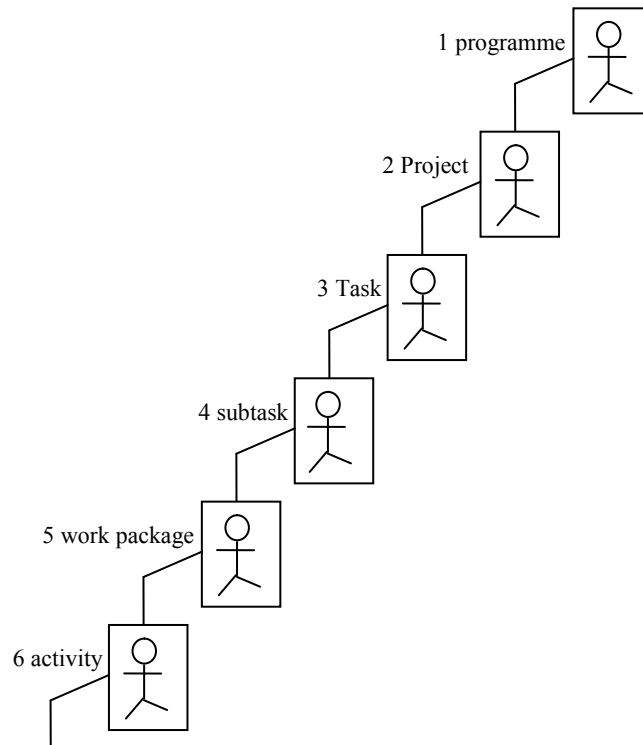


Figure 1: The project Manager's Desk Reference 2<sup>nd</sup> Edition pg 91

Source: Lewis J.P. 1999

of energy, time, and people PMBOK guide (2012) Project Managers waste time writing on post-it notes and drawing charts because of the purpose it serves for projects and project team. The following reasons make the use of WBS necessary and compulsory in project implementation in Nigeria.

- (i) WBS helps more accurately and specifically define and organize the scope of the total project by using hierarchical free structure. The level of this structure breaks the project deliverables or objectives down to more specific and measurable chunks.
- (ii) WBS helps in assigning responsibilities, resource allocation, monitoring the project, and controlling. WBS makes the deliverables more precise and concrete so that the project team knows exactly what has to be accomplished within each

deliverable. This also allows for better estimating of cost, risk, and time because project managers can work from the smaller tasks back up to the level of the entire project.

- (iii) WBS allows double check on all the deliverables specifics with the stakeholders and make sure there is nothing missing or overlapping.

#### Benefits of WBS to project delivery

NASA (2001) enumerates the benefits of WBS to project delivery as follows:

- It permits project client/executor to sum up the cost of subordinate tasks, and cost of materials of project to delivery level.
- Each element of the work breakdown structure will generate the description of the task to be performed.

- WBS is used to define and organize the total scope of a project
- A well designed WBS makes it easy to assigning each project activity to one and only one terminal element of the WBS.
- WBS also helps map requirements from one level of system specification to another (a requirement cross reference matrix mapping functional requirements to high level or low level design document).

### RESEARCH METHODOLOGY

The study was carried out in Akure South Local Government of Ondo State; South Western Nigeria. This was selected because it is within the heart of Akure town which is the capital of Ondo State. In the town are found government projects, corporate and private constructions with the presence of professionals in the construction industries.

This study made use of a well structured questionnaire administered on the professionals such as project managers, Architects, Civil Engineers, Quantity surveyor among others. About one hundred and ten (110) copies of questionnaire were sent out. A total of one hundred (100) copies of questionnaire were returned and found useful and it amounts to a return rate of 90.8%. The data collected were

### RESULTS AND DISCUSSION

Table 1 presents personal characteristics of the respondents such as qualification, professional qualifications, and working experience. From this table, the respondents with M.Sc/M.Tech ranked highest with 40%. This was followed by WAEC/NECO 20% while OND/HND and Ph.D degree holders constitute 15% each. The B. Sc/BA/B. Tech degree holders of the respondents was 10%. It is also seen on the table that Quantity Surveyor constitute 32% of the professionals that form the respondents.

Further look at the table, majority (36%) of the respondents had worked between 1 and 5 years. This was followed by 26% who had worked between 6 – 10 years. So also 13% of respondents have worked between 15 and 20 years while another 12% of the respondents worked between 11 and 15 years. The remains 10% and 3% respondents worked between 21-25years and above 26 years respectively. From the foregoing, it is evident that the respondents are knowledgeable enough to answer questions in the questionnaire thus the data collected can be relied upon.

Table 2 shows the rate of using WBS in project implementation by the respondents. The table

indicates that majority (45%) of the respondents declared that WBS is never used when carrying out project execution. Further more, the table reveals that 35% of the respondents confirmed that WBS is used sparingly when executing projects while 20% of the respondents accepted the use of WBS whenever they are carrying out project implementation. This shows that WBS is poorly applied to project execution in Nigeria which corroborate Olateju et al (2011) that the implementation of modern project management tools, methods and techniques are still not well established in public sector, this results into failure of public institutions and their contractors in performing their duties concerning the budget, specifications and deadlines of the projects awarded.

Table 3 reveals the opinion of the respondents on the impact of WBS on project planning. Majority (60%) of the respondents declared that WBS makes project planning robust and effective. However 16% of the respondents affirmed that it causes confusion when carrying out project planning. So also 14% said that WBS lengthened project planning time while 10% of the respondents opined that WBS has no effect

**Table 1: Personal characteristics of the Respondents**

Characteristics of the respondents	Frequency	Percentage (%)
<b>Highest Qualification</b>		
WASC/NECO	20	20
OND/HND	15	15
BSC/BA/B.TECH	10	10
MSC/M.TECH	40	40
<b>PhD</b>	15	15
<b>Professional Qualification</b>		
Project Manager	10	10
Architect	28	28
Civil Engineer	10	10
Quantity Surveyor	32	32
Electrical Engineer	2	2
Builder	8	8
Others	10	10
	36	36
<b>Working Experience (years)</b>		
1-5	26	26
6-10	12	12
11-15	13	13
16-20	10	10
21-25	3	3
26 and above		

Field Survey, 2014

**Table 2: Rate of using WBS in project implementation by Nigeria Professionals**

WBS uses	Percentage (%)
Frequently	20
Sparingly	35
None at all	45

Field Survey, 2014

on project planning.

Table 4 presents the expected benefits of employing WBS tool to project implementation. All the respondents had the opinion that if WBS tool is properly applied, assuredly it will lead to prompt delivery of project within time, budget and quality. According to Table 4, 79.23% of the respondents believed that WBS will spell out time, materials, labour and financial needs of each task in a project from start to complete.

78.46% believed that it will make deliverable more precise and concrete, it will expose all tasks involved in project. 76.92% of the respondents believed WBS will enhance clear communication of the total scope of the project while 76.15% believed it will make project deliverable a reality. The respondents indicated other benefits like: better visibility and control of works opined by 74.61% respondents, 73.84% respondents believed that WBS will fast track deliverables,

**Table 3: Impact of WBS usage on project planning**

Impact	Percentage %	Cumulative %
WBS makes project robust and effective	60	60
WBS causes confusion	16	76
WBS lengthen the delivery	14	90
WBS has no effect	10	100

*Field Survey, 2014*

73.08% also believed that it will have positive impact on the configuration and organizational issues of a project deliverable while 66.92% believed in reduction of project costs if WBS is applied to project implementation properly. The above benefits corroborate with the findings of NASA (2001) as benefits of WBS to project delivery.

Table 5 shows the failure factors in using WBS as a tool in project implementation. The worst

obstacle is lack of in-depth knowledge of WBS (77.69). Another obstacle is that 74.61% of the respondents are not aware of WBS in project implementation while 70% of the respondents believed that there is mis-match between WBS in project and management style of the project managers. Furthermore, 51.54% of the respondents believed that WBS wastes time when it is being implemented.

**Table 4: Benefits of applying WBS in Project Implementation**

Benefits of WBS	Percentage	Ranking
WBS makes deliverable more precise and concrete	78.46	2 <sup>nd</sup>
WBS reduces costs of project	66.92	10 <sup>th</sup>
WBS makes project deliverable a reality	78.46	2 <sup>nd</sup>
WBS has positive impact on the configuration and organizational issue of a project deliverable.	76.15	5 <sup>th</sup>
WBS fast tracks deliverables	73.08	9 <sup>th</sup>
WBS spells out time, materials, and financial Needs of each task in a project to complete	73.84	8 <sup>th</sup>
WBS contributes significantly to project success.	79.23	1 <sup>st</sup>
WBS brings a better visibility and control of works (tasks)	75.38	6 <sup>th</sup>
WBS enhances clear communication of the total scope of the project	74.61	7 <sup>th</sup>
	76.92	4 <sup>th</sup>

*Field Survey, 2014*

**Table 5: Failure Factors in Using WBS in Project Execution**

Drawbacks name	Percentage	Rank
Lack of awareness	74.61	2 <sup>nd</sup>
Lack of in-depth knowledge of WBS	77.69	1 <sup>st</sup>
Mis-match between the project WBS and the management style of the project managers	70	3 <sup>rd</sup>
Wasting of time especially in planning	51.54	4 <sup>th</sup>

*Field Survey, 2014*

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

The WBS is an extremely valuable tool to the Project Management Methodology. It sets the foundation for the rest of the project planning. A solid WBS helps ensure proper project baseline estimating, resource use, scheduling, risk analysis and procurement. Despite the enormous benefits WBS offers to project delivery, many Nigeria professionals do not apply the tool in project execution probably they lack the knowledge, this fact was revealed by the respondents.

This study advises Nigeria project managers and professionals to take the application of WBS tool and techniques into project execution. If properly applied, WBS tool and techniques would result in concrete benefits in all aspects of project planning, scheduling and controlling the cost, time quality and prompt delivery.

### Recommendations

- Nigeria governments (Federal, State and local councils) and professionals in public and private sectors should rule out policies on the establishment of modern project management tools, methods and techniques in the course of implementing project in order to enhance performance of the duties of professionals and contractors concerning the budget, specifications and deadlines of the projects awarded.
- Nigeria governments should make it compulsory for their contractors to include WBS in any project work quoted for. This step of action will make contractors and professionals always aware of the importance and use of WBS in project implementation.

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