Analysis of Work Breakdown Structure for a Construction Project

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Abstract- *Project management and project management planning is a critical task to perform. It involves many methods to execute. Work breakdown structure is the method which analyses the overall project work and divides all project activities into small task. It also helps to define scope and scope management*

Keywords- Activity, Scope management, Stakeholder, WBS

I. INTRODUCTION

A success of construction project has many aspects such as detailed scheduling of tasks or activities, budget of construction and work quality. Project manager has to play a key role to manage, plan and control all this tasks during planning phase and the execution phase of the project. Planning of construction project and management includes many methods to achieve this goal. Work breakdown structure is the widely used technique used for project planning. As we know construction work involves several unwanted possibilities affecting the success of project. These situations or activities can delay the project. That means wrong planning, execution of activities in uncontrolled manner affect the schedule of project and finally cost of the project.

Therefore for detailed planning and controlled execution of activities, a work breakdown structure proves itself advantageous. WBS is the part of scope management and planning process of project activities. WBS plays a vital role for the project management field. It decomposes the complex project activities into the manageable activities. As these activities are manageable the planning of these activities within a control can be done with precision. Also WBS manages the construction team based on the deliverables. It encloses the chart which includes all the critical activities showing relationships among all activities and finally group of these all activities represents the whole project.

II. LITERATURE REVIEW

Youngsoo Jung et. al. (Sept.2004), described the levels of details which deal with the project size, duration and cost. Author proposed the numbering system to analyse the project. Also he suggested that cost account can be controlled by systematic and well-defined numbering system. This numbering system depends upon the hierarchical mechanism of project. Author also illustrated the facets by which classification of construction information can be done such as spaces, work sections, elements and materials. In this illustration combination of facets can be used. Three scenarios were considered based on the case study considered which elaborated the concepts of control account, budget account and operation account. This analysis finally put forward some suggestions in order to improve the cost control and schedule control using flexible work breakdown structure. [1]

Shelly A. Brotherton et. al. (2008), explained the process of work breakdown structure development. Author elaborated the concept of inclusion for designing a work breakdown structure for house project. A study also involves the application of work breakdown structure to the project life cycle. The study shows that according to the dependencies the work packages can be developed. Author also suggested the key attributes related to the work breakdown structure development. Along with the detail study of work breakdown structure and its development author gave some suggestions for effective use of work breakdown structure to run project efficiently. [2]

Elanz Siami Irdmoosa et. al. (July 2015), developed an artificial neural network method to construct a work breakdown structure. Author applied this method to the construction of underground structures such as tunnels. The study focuses on two major requirements of generating work breakdown structure like modelling of relationship between project attributes and work breakdown structure and minimizing complexity of construction work model. From study made and developed structure some suggestions came forward regarding the development of work breakdown structure and its implementation to the project. [3]

Osama Y. Abudayyeh et. al. (April 1993), studied a concept of cost and schedule control using integrated prototype. Study elaborates the prototype of automated cost and schedule control system. This prototype mainly based on work packages and uses barcode for data and information acquisition. The prototype is basically designed with three modules such as data acquisition, data storage and data

processing. A case study of ware house project regarding the prototype was studied by author and based on the analysis done some conclusions and suggestions were made. [4]

William J. Rasdorf et. al. (Sept. 1991), suggested the process of cost and schedule control systems by designing the work packaging model. It was also suggested that data acquisition and data storage mechanism can improve the performance of work packaging model. The study also emphasizes on the issue of data storage. To overcome from this issue a relational data model with support of work packaging model was developed. The author found that the work breakdown structure can increase the capability of construction planning and management and also can be used in preliminary design followed by detailed design. Author analysed the work packing model for the storage of data with data acquisition and cost and schedule control. By the study and analysis made some conclusions and recommendations were done to develop an efficient work packaging model. [5]

Will Y. Lin et. al. (1999), elaborated the problems occurring during construction process. Author studied the problems occurring on site and suggested some techniques to overcome from these. Several errors can contribute in the delay of construction such as site engineer or supervisor does not follow day to day networks and does not update those networks regularly. These factors affect the progress of the project. Author made some analysis and developed a web based technique to enter schedule, to update schedule and to control schedule. From the analysis and study made author concludes through points and gave the real time web based technique for controlling project cost and schedule. [6]

III. PLANNING PROCESS AND PROJECT SCOPE MANAGEMENT

A good scope management is truly responsible for the project success. It ensures that all the project activities which are required to include in the plan to complete the project within time are considered. Project scope statement is a set of only those activities which have to be completed. Project management does not include those activities which are not required to do during the execution of project for project completion. It focuses the project objectives, planning to execute them and verification along with control. Project scope management is the process having five aspects or steps as collect requirements, define scope, create WBS, and verify scope, control scope.

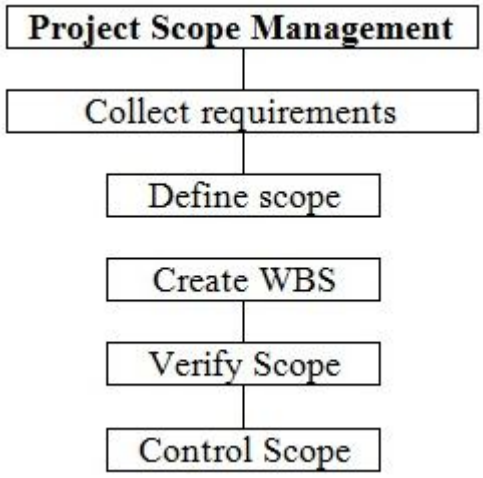

Fig. 1 Project scope management process

As stated above first step of project scope management is the collection of necessary requirements it's a primary stage. For this purpose basic information such as project charter and stakeholder register are required. A project team member discusses the project objectives according to the project charter and stake holder and identifies the requirements. In this step after identification of project requirements, team prepares a document which includesdetailed requirements. Defining the project scope is difficult task as it describes the detailed characteristics and information of the final product. In this step a project manager and a team construct a framework within which project has to be executed.

After this creation of WBS has to be done. It decomposes the project scope into small components which can be easily managed and controlled. It is managed in a hierarchical structure which is easily accessible. It controls the project schedule, project cost, and also it monitors the all activities. Verifying and controlling the scope is the monitoring tools of the project scope management process. It receives acceptance from owner or customer and stakeholders. Also it controls the changes which occur during the execution of the project.

IV. PREPARATION OF WORK BREAKDOWN STRUCTURE

Work breakdown structure divides overall project activities into manageable task according to the various aspects. Work breakdown structure and work breakdown dictionary are two parts of WBS process which defines the project scope statement. A construction site involves the following activities for a construction of foundation,

Table I. WBS for foundation construction

Sr. No.	Activity	Duration (Days)
1.	FOUNDATION	27
1.1	Preparation of site	4
1.1.1	Site Cleaning	0.5
1.1.2	Layout	0.5
1.1.3	Excavation	2
1.1.4	Anti-Termite Treatment	1
1.2	Footing Construction	9
1.2.1	Footing PCC	1
1.2.2	Footing Binding	2
1.2.3	Footing Shuttering	2
1.2.4	Footing Casting	1
1.2.5	Footing Deshuttering	1
1.2.6	Backfilling/ Compaction	1
1.2.7	Anti-Termite Treatment	1
1.3	Column below plinth construction	6
1.3.1	Column Binding	1
1.3.2	Column Shuttering	1
1.3.3	Column Casting	1
1.3.4	Column Deshuttering	1
1.3.5	Backfilling/ Compaction	1
1.3.6	Anti-Termite Treatment	1
1.4	Plinth beam construction	5
1.4.1	Plinth Beam PCC	1
1.4.2	Plinth Beam Binding	1
1.4.3	Plinth Beam Shuttering	1
1.4.4	Plinth Beam Casting	1
1.4.5	Plinth Beam Deshuttering	1
1.5	Plinth filling	3
1.5.1	Murum Filling	2
1.5.2	Soling	1
1.5.3	Plinth PCC	1

As listed above foundation construction involves various construction activities. Some of these activities may be critical. As at the start of project and in a foundation construction all the activities depend on each other, these activities can be critical.

V. ANALYSIS AND DISCUSSION

Work breakdown structure helps to decompose the overall project. These small tasks can be managed and controlled easily. Work breakdown structure plays a key role for task management, cost management, and schedule management. It emphasis on the small task due to this these task can be controlled with ease according to the economical point of view. As the project delays the budget of the project gets affected. That means work breakdown structure can manage tasks and also cost of the project.

ACKNOWLEDGMENT

I would like to express my gratitude to my teachers, my guide Prof. P. M. Attarde for valuable contribution.

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