

Work Breakdown Structure: Simplifying Project Management

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Abstract - The Work Breakdown Structure (WBS) is a powerful tool for project management. It is the cornerstone of effective project planning, execution, controlling, statusing, and reporting. All the work contained within the WBS is to be identified, estimated, scheduled, and budgeted. The WBS is the structure and code that integrates and relates all project work (scope, schedule, and cost).

Keywords - *WBS, work breakdown structure, Project, management tool, Project Management*

1. Introduction

WBS is the grouping of the work involved in a project oriented towards the deliverables that defines the total scope of the project. This scope of the project further breaks down the total work required for the project into separate tasks, and groups them into a logical hierarchy.

2. Purpose

The Work Breakdown Structure separates the complete project into its component elements in order to track the cost, time and technical performance at all levels of the project life cycle.

3. Scope

The WBS is a product-oriented, hierarchical representation of all activities/work elements required to accomplish the complete work scope of the project. Project Managers are responsible for the creation of a WBS.

4. Procedure

4.1 Structure

A project WBS is a product-oriented grouping of project work elements that organizes and defines the total scope of the project. The WBS is a multi-level framework that organizes and graphically represents elements showing work to be accomplished in logical relationships. Each descending level represents an increasingly detailed definition/division of a project component. It is the structure and code that integrates and relates all project work and is used throughout the life cycle of a project to identify, assign, and track specific work scopes. The WBS will be established in sufficient detail so that each control account has a unique WBS element. The WBS is described in the Project Execution Plan (PEP), or attached as an appendix.

4.2 Responsibility

Project Managers are responsible for the creation of a WBS for their assigned projects, with input from other members of the project team.

4.3 Creating the Work Breakdown Structure

Take the committed deliverables from your project charter, statement of work, or other project concept documentation. This list of deliverables becomes your Level 1 (highest level) entries within the WBS. All WBS Entries that directly correspond to deliverables should be named as noun deliverables or adjective/noun deliverables. Examples include "Specification" or "Design Specification". Take each of these highest level entries, and decompose them into their component parts (each becoming a WBS Entry). Each component must be

logically distinct, as everyone who sees the WBS needs to understand what the deliverable or outcome will be from each WBS Entry. Continue the decomposition until you reach an appropriate level of detail. When all committed deliverables have been decomposed to the appropriate level of detail (becoming Activities), examine each WBS Entry and Activity to see if there are required deliverables that are not already in the WBS but that will be needed to create something that already is in the WBS. Take all these required deliverables, and decompose them to the appropriate level of detail, just as you did for the committed deliverables. Level the hierarchy to the extent that it is possible. At this stage of development, the WBS may have some Activities/Tasks at level two, some at level three, and so on. See if the hierarchy can be modified so that the number of levels that Activities/Tasks fall into is reduced to a short range. Do this for every WBS Entry, attempting to get each entry in the WBS to decompose into 5 to 9 lower level entries. You should never make these changes if the merger or split of a WBS Entry does not make logical sense. When you think you have a completed WBS, validate it using a bottom-up approach. A bottom-up validation works like this: - For each WBS Entry that decomposes into Activities, ask yourself the question: "If I had all the deliverables from each of these Activities, would my WBS Entry deliverable be complete?" If the answer is yes, move on to the next WBS Entry. If the answer is no, add in the missing Activities. Once the evaluation of the lowest level WBS Entries and Activities is complete, examine the next higher level of WBS Entries. Keeping with our three-level example, for each Phase ask: "If I had the deliverables from the WBS Entries that are part of this Phase, would the Phase deliverable be complete?" If the answer is yes, move on to the next one, if the answer is no then add in the missing WBS Entries or go back to step 4 and rebalance the hierarchy, or both. When you have completed your bottom-up validation, it is now appropriate to re-evaluate the entire WBS one last time by comparing the currently defined WBS deliverables to the originally defined objectives for the project. Ask yourself the question, "If I had all these deliverables, would I achieve the planned objectives for the project?" If the answer is yes, you can move on to the next step. If the answer is no, you still have a lot of work to do.

4.4 Why Work Breakdown Structure?

The Importance of the WBS Experienced project managers know there are many things that can go wrong in projects regardless of how successfully they plan and execute their work. Component or full-project failures, when they do occur, can often be traced to a poorly developed or

nonexistent WBS. A poorly constructed WBS can result in adverse project outcomes including ongoing, repeated project re-plans and extensions, unclear work assignments, scope creep or unmanageable, frequently changing scope, budget overrun, missed deadlines and unusable new products or delivered features. The WBS is a foundation of project initiating, planning, executing, and monitoring and controlling processes used to manage projects.

For example, the WBS utilizes the Project Charter as its starting point. The high-level elements in the WBS should match, word-for-word, the nouns used to describe the outcomes of the project in the Scope Statement. In addition, the Resource Breakdown Structure (RBS) describes the project's resource organization and can be used in conjunction with the WBS to define work package assignments. The WBS Dictionary defines, details, and clarifies the various elements of the WBS. The Network Diagram is a sequential arrangement of the work defined by the WBS and the elements of the WBS are starting points for defining the activities included in the Project Schedule.

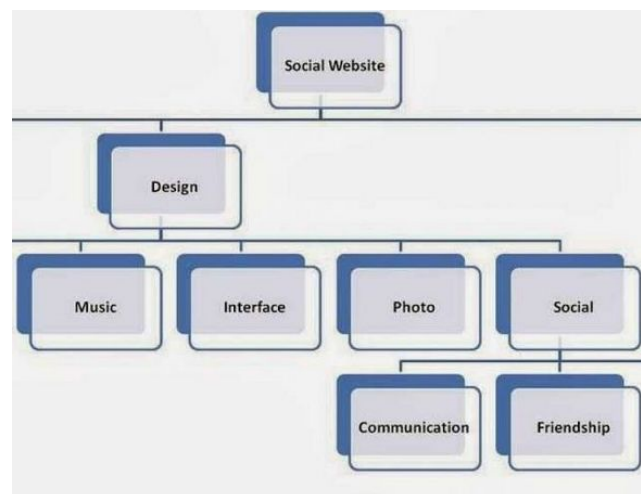


Fig1. The work breakdown structure illustrated in a block diagram

The PERT Coordinating Group (1962) defined a work package (WP) as "The work required to complete a specific job or process, such as a report, a design, a documentation requirement or portion thereof, a piece of hardware, or a service." PMI (1996) states: "[A] work package is a deliverable at the lowest level of the WBS." Unfortunately, there is no accepted definition of the WPs nor accepted approach to link them with other related structures (foremost among them the OBS). In most cases, the WPs are defined in an informal, intuitive manner and without proper feedback loops to verify their definition.

4.4.1 Work breakdown structure and milestones

In the work breakdown structure element (work package, a middle-tier or work breakdown structure) when completed, will output a series of deliverables. However, according to the actual situation of the project, the team can make this unit of work associated with a milestone. Milestone marks one of the results or stages of work completed. Specially, the milestone is closely associated with and deliverables. When reaching milestones, project team members can subscribe to a project summary, reflection. If obstacles are found, you can take the necessary measures. Milestone exists to make specific for team goals, compared with the main objective of the project and deliverables, milestones more easily and control, to reduce project risks. According to the work breakdown structure, a point in the process of the project is running social milestone is meaningful.

4.4.2 Work Breakdown Structure need Project Teams

The work breakdown structure has a number of benefits in addition to defining and organizing the project work. A project budget can be allocated to the top levels of the work breakdown structure, and department budgets can be quickly calculated based on the each project's work breakdown structure. By allocating time and cost estimates to specific sections of the work breakdown structure, a project schedule and budget can be quickly developed. As the project executes, specific sections of the work breakdown structure can be tracked to identify project cost performance and identify issues and problem areas in the project organization. For more information Project work breakdown structures can also be used to identify potential risks in a given project. If a work breakdown structure has a branch that is not well defined then it represents a scope definition risk. These risks should be tracked in a project log and reviewed as the project executes. By integrating the work breakdown structure with an organization breakdown structure, the project manager can also identify communication points and formulate a communication plan across the project organization.

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When a project is falling behind, referring the work breakdown structure will quickly identify the major

deliverables impacted by a failing work package or late sub-deliverable. The work breakdown structure can also be color coded to represent sub-deliverable status. Assigning colors of red for late, yellow for at risk, green for on-target, and blue for completed deliverables is an effective way to produce a heat-map of project progress and draw management's attention to key areas of the work breakdown structure.

4.4.3 Benefits of Work Breakdown Structure

1. A WBS helps the project planners identify the work to be done and determine the best way to decompose the work.

2.

A WBS provides an overview of the project, which stakeholders can review at any level of detail they want.

3.

A scope statement is only a high-level view of the boundaries of a project. A WBS exposes the detailed tasks that comprise the overall project scope.

4. Team members appreciate clear instructions about what they are supposed to deliver. A work package communicates the extent of an assignment. The relationship of the work package to the rest of the WBS increases workers' commitment by showing how their efforts contribute to success.

5. Project deliverables that don't have corresponding summary tasks or work packages in the WBS are a warning that you haven't yet identified all the work that the project requires.

6. Work Breakdown Structure helps the planners develop more accurate estimates of a project schedule and costs

7. Once you begin executing the project, work packages and summary tasks are not yet started, in progress, or complete. By breaking work into smaller components, you have more points at which you can accurately measure progress.

5. Facts and Information

A WBS is not an exhaustive list of work. Rather it is a comprehensive classification of project scope. A WBS is not a project plan or a project schedule and it is not a chronological listing. It is considered poor practice to construct a project schedule before designing a proper WBS. It is very difficult to follow the 100% Rule at all levels of the WBS hierarchy. It is not possible to recover from an improperly defined WBS without starting over, so it is worthwhile to finish the WBS design before starting a

project plan or project schedule. A WBS is not an organizational hierarchy. Some practitioners make the mistake of creating a WBS that shadows the organizational chart. While it is common for responsibility to be assigned to organizational elements, a WBS that shadows the organizational structure is not descriptive of the project scope and is not outcome-oriented. Short-term memory capacity should not dictate the size and span of a WBS tree structure. Some reference material suggests that each WBS level be limited to 5-9 elements because that is a theoretical limit to short-term memory. It is far more important to construct a logical grouping of planned outcomes than to worry about the limits of short term human memory. WBS updates, other than progressive elaboration of details, require formal change control. This is another reason why a WBS should be outcome-oriented and not be prescriptive of methods. Methods can and do changes frequently, but changes in planned outcomes require a higher degree of formality. If outcomes and actions are blended, change control may be too rigid for actions and too informal for outcomes.

5.1. Avoid Common Mistakes

The process of creating a WBS should be considered as a team building activity. For projects of normal size, a WBS cannot be created by one team member. It needs various team members to take-up each high level requirement within the given scope, the whole team and then each lead team members need to come-up with the activity/work-package break-up details related to that specific requirement. Likewise, the activity details are arrived at the other lead team members and the project team consolidates all the deliverables information received and collates back to a fully blown WBS which can then further be used for the next steps of project planning and scheduling. A WBS is not a project plan or a project schedule. It only provides detailed information on the given initial scope and on the final deliverables that need to be implemented to achieve the project goals and objectives. It should be understood that WBS helps in giving an accurate input for creating a project schedule by way of the activity/work package information. Project teams typically assume that as part of a WBS creation, they need to go into details of the high-level requirement – which is correct. But one needs to understand that this drilling down of the high-level requirement should not be taken down to the lowest level of the detail which makes it cumbersome for the project team members itself to monitor and it also leads to micro-management from a project managers perspective which is not healthy for any project. Project teams should start thinking of WBS as an instrument which can be twisted to suit the specific project

scope needs. There is no hard and fast rule that one needs to break-up a requirement into three levels or four levels. It is up to the project teams and the project manager to decide on the degree to which a particular requirement/scope needs to be broken-down to in order to make it meaningful and reasonable for successful implementation, monitoring and delivery. There might be some requirements that are straightforward and which would not take a couple of weeks to implement- then in that case the requirement itself can be assumed as a work package spanning across two weeks duration and the output of the final deliverable also is clearly understood since the original requirement defines it with precision. One other vital aspect that projects teams need to bear in mind is to ensure that they always keep an open communication channel with the Customer/Client and the various stakeholders of the project throughout the process of WBS creation. One should not assume that since the team is breaking-up scope into smaller elements and creating a WBS, discussion with the stakeholders is not necessary – that would be one of the biggest blunders. Bottom line is that how can one break-up a larger scope into the required smaller elements unless they are clear on the final product change or the functionality that is expected from the project. Breaking-up scope into smaller activities is not going to help unless one is clear on the actual output desired from the given requirements.

7. Conclusion

WBS is an effective tool for Project Management in the planning and execution of a successful project. It is very useful in tacking cost, schedule and quality failures in project management life cycle.

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