**Lab# 04**

**Designing the Work Breakdown Structure (WBS)**

**of the Software Project**

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# Designing the Work Breakdown Structure (WBS)

# of the Software Project

## 4.1 Objective

* The students should be able to design the WBS for their project
* To identify all products and work elements of the project.
* To integrate the project with the current organization, and to establish a basis for control

## 4.2 Scope

* The students should be able to know how to divide their project into smaller work elements
* They should be able to identify the major deliverables of the project.
* They should be able to identify the work packages of the project

## 4.3 Useful Concepts

Once the scope and deliverables have been identified, the work of the project can be successively subdivided into smaller and smaller work elements. The outcome of this hierarchical process is called the work breakdown structure (WBS). The WBS is a map of the project. Use of WBS helps to assure project managers that all products and work elements are identified, to integrate the project with the cur-rent organization, and to establish a basis for control. Basically, the WBS is an outline of the project with different levels of detail.

**Major Groupings Found in a WBS:**

The figure below shows the major groupings commonly used in the field to develop a hierarchical WBS. The WBS begins with the project as the final deliverable. Major project work deliverables/systems are identified first; then the sub deliverables necessary to accomplish the larger deliverables are defined. The process is repeated until the sub deliverable detail is small enough to be manageable and where one person can be responsible. This sub deliverable is further divided into work packages. Because the lowest sub deliverable usually includes several work packages, the work packages are grouped by type of work—for example, hardware, programming, testing. These groupings within a sub deliverable are called cost accounts. This grouping facilitates a system for monitoring project progress by work, cost, and responsibility.

Chart, diagram

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**Importance of a WBS for a Project:**

* The WBS defines all the elements of the project in a hierarchical framework and establishes their relationships to the project end item(s). Think of the project as a large work package that is successively broken down into smaller work packages; the total project is the summation of all the smaller work packages. This hierarchical structure facilitates evaluation of cost, time, and technical performance at all levels in the organization over the life of the project.

The WBS also provides management with information appropriate to each level. For exampl

* e, top management deals primarily with major deliverables, while first-line supervisors deal with smaller sub deliverables and work packages.
* Each item in the WBS needs a time and cost estimate. With this information itis possible to plan, schedule, and budget your project.
* The WBS also serves as a framework for tracking cost and work performance.
* As the WBS is developed, organizational units and individuals are assigned responsibility for executing work packages. This integrates the work and the organization. In practice, this process is sometimes called the organization breakdown structure (OBS).
* Use of the WBS provides the opportunity to “roll up” (sum) the budget and actual costs of the smaller work packages into larger work elements so that performance can be measured by organizational units and work accomplishment.
* The WBS can also be used to define communication channels and assist in understanding and coordinating many parts of the project. The structure shows the work and organizational units responsible and suggests where written communication should be directed.
* Problems can be quickly addressed and coordinated because the structure integrates work and responsibility.

**WBS Development:**

The figure below shows a simplified WBS for development of a new personal computer project. At the top of the chart (level 1) is the project end item— a deliverable product or service. Note how the levels of the structure can represent information for different levels of management. For example, level 1information represents the total project objective and is useful to top management; levels 2, 3, and 4 are suitable for middle management; and level 5 is for first-line managers. Level 2 shows a partial list of deliverables necessary to develop the personal computer. One deliverable is the disk storage unit (shaded), which is made up of three sub deliverables—external USB, optical, and hard disks. Finally, the hard disk requires four sub deliverables—motor, circuit board, chassis frame, and read/write head. These sub deliverables represent the lowest manageable elements of the project. Each sub deliverable requires work packages that will be completed by an assigned organizational unit. Each deliverable will be successively divided in this manner. It is not necessary to divide all elements of the WBS to the same level. The lowest level of the WBS is called a work package.

Work packages are short-duration tasks that have a definite start and stop point, consume resources, and represent cost. Each work package is a control point. A work package manager is responsible for seeing that the package is completed on time, within budget, and according to technical specifications. Practice suggests a work package should not exceed 10 workdays or one reporting period. If a work package has a duration exceeding 10 days, check or monitoring points should be established within the duration, say, every three to five days, so progress and problems can be identified before too much time has passed. Each work package of the WBS should be as independent of other packages of the project as possible. No work package is described in more than one sub deliverable of the WBS.

Diagram

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There is an important difference from start to finish between the last work breakdown sub deliverable and a work package. Typically, a work breakdown sub deliverable includes the outcomes of more than one work package from perhaps two or three departments. Therefore, the sub deliverable does not have a duration of its own and does not consume resources or cost money directly. (In a sense, of course, a duration for a particular work breakdown element can be derived from identifying which work package must start first [earliest]and which package will be the latest to finish; the difference from start to finish becomes the duration for the sub deliverable.) The higher elements are used to identify deliverables at different phases in the project and to develop status reports during the execution stage of the project life cycle.

Thus, the work package is the basic unit used for planning, scheduling, and controlling the project. To review, each work package in the WBS

* Defines work (what).
* Identifies time to complete a work package (how long).
* Identifies a time-phased budget to complete a work package (cost).
* Identifies resources needed to complete a work package (how much).
* Identifies a single person responsible for units of work (who).
* Identifies monitoring points for measuring progress (how well)

**Components of a Work Breakdown Structure:**

Following are the elements of a work breakdown structure and the common terms that you may come across when creating one.

* **Work packages:** These are the lowest parts in a work breakdown structure. They define the work, duration, and costs for the tasks that need to be carried out to complete the deliverables. They shouldn’t be dependent on other work packages and should not exceed more than 10 days to complete.
* **Deliverables:** Outcomes of the activities or the products or measurable outcomes you’ll have created at the end of each milestone.

**Rules You Need to Stick by When Designing a WBS**

Following are the principles you need to adhere to when designing a work breakdown structure.

* **The 100% rule:** This rule helps the manager to ensure that all project efforts are captured and nothing unrelated is included in the structure. According to it the sum of the “child” tasks (on any level) must equal to 100% of the parent tasks.
* All deliverables and sub-deliverables must be mutually exclusive, which means they shouldn’t appear twice within the work breakdown structure. This helps avoid miscommunication and duplication of tasks.
* **The 8/80 rule:** According to this rule, the work packages or the work required to create the deliverables should not take less than eight hours and more than eighty hours.
* The work breakdown structure must be focused on outcomes or deliverables and not the activities you need to complete to get there. Focus on the what and not the how.

**How to Create a Work Breakdown Structure**

Following we have listed the steps you need to take to create a work breakdown structure from scratch.

* **Step 1:** Get your team together to identify the deliverables and sub-deliverables of the project. This would include the project managers and the subject matter experts.
* **Step 2:** Gather the necessary documents such as the project charter, project scope statement, and project scope management plan.
* **Step 3:** Identify the key deliverables of the project. These should come at the second level of your WBS. Key deliverables will be essential to the completion of the project, and they will be carried out by independent teams – meaning the same team won’t be working on completing another deliverable.
* **Step 4:** With the help of the subject matter experts, break the key deliverables into smaller parts of work (work packages) or in other words identify the work that is necessary to complete each deliverable.
* **Step 5:** Create a WBS dictionary which is a document that includes the definition and the scope of the different elements in your work breakdown structure. The WBS dictionary would include information such as work package name and ID, name of the person it is assigned to, due date, estimated cost, etc. This will help the team understand work packages better.
* **Step 6.** You can create a WBS using different formats like text-based work breakdown structures, tabular structures, or more visual ones like flowcharts. Once it is complete, share it with the team.

## 4.4 Exercise:

* Develop a WBS for a project in which you are going to build a bicycle. Try to identify all the major components and provide three levels of detail.

## 4.5 Homework Assignment

* Develop a WBS for the selected for this course project in which you are going to build a bicycle. Try to identify all the major components and provide three levels of detail