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Work Breakdown Instructions

The purpose of a Work Breakdown Structure (WBS) is to convert the description of the project's scope (the *what)* into a list of tasks that have to be done (the *how).* Since this task list is the basis for further planning, it is important to get it right. The WBS technique uses a methodical "divide and conquer" approach to help ensure that no tasks are overlooked. Major advantages of creating a WBS are:

- it helps conquer complexity by breaking the entire project into smaller pieces that are easier to plan, execute, and monitor
- it helps you convert the *what* of the project that was your focus in the Define phase into the *how to* that is the focus of planning
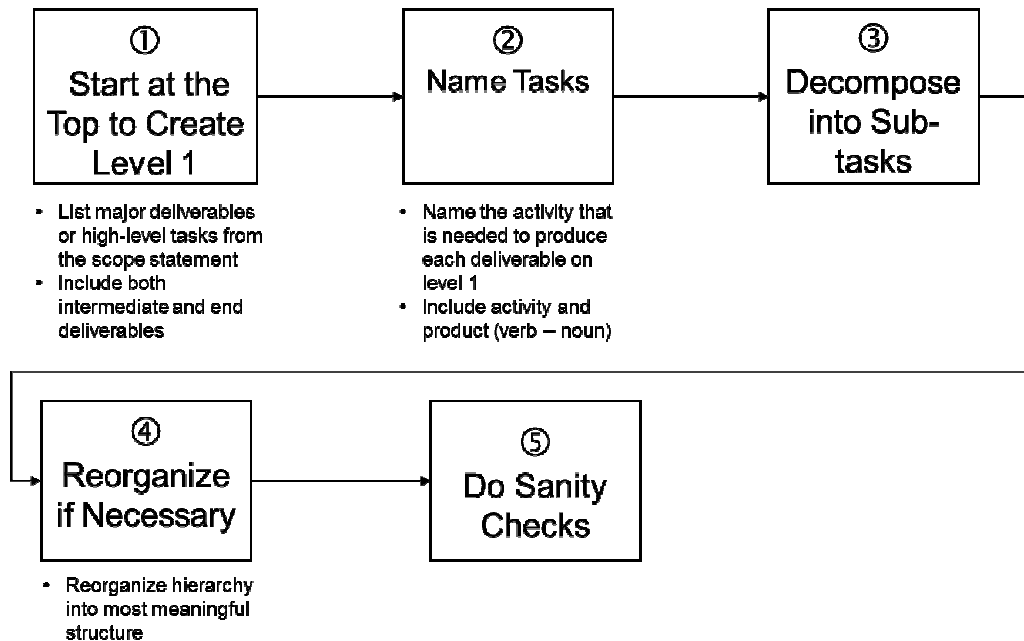- it does a good job at eliminating gaps and redundancies

It can be harder than it looks to build a good WBS, but the results are worth it. Creating the WBS encourages orderly examination of the work that will be required to complete the project, creating a foundation for schedule, budget, and progress tracking. Here is an example of a simple WBS.
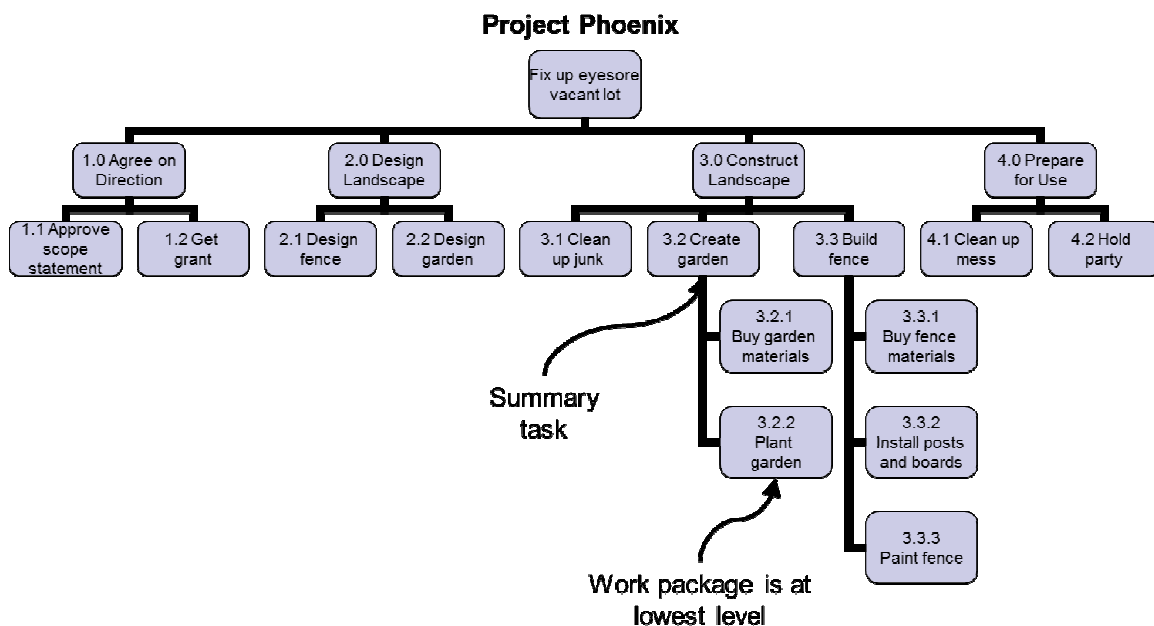
Steps for Creating a WBS

1. The top level of a work breakdown structure is called level 0 and is always a single item that represents the scope of the entire project. Sometimes level 0 is omitted for clarity, but it is always assumed to be there.
2. Divide level 0 (the scope of the entire project) into approximately three to eight blocks of work. This is the next level of the WBS and is called level 1.
3. Continue breaking down each block into smaller blocks that go on the next lower (or indented) level.

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4. Label each block with a description of what work it includes, using a *verb-noun* form, such as "Define metallurgy tests."

```
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│       ①         │     │       ②         │     │       ③         │
│   Start at the  │ ──► │   Name Tasks    │ ──► │   Decompose     │
│  Top to Create  │     │                 │     │   into Sub-     │
│     Level 1     │     │                 │     │     tasks       │
└─────────────────┘     └─────────────────┘     └─────────────────┘
```

- List major deliverables or high-level tasks from the scope statement
- Include both intermediate and end deliverables

- Name the activity that is needed to produce each deliverable on level 1
- Include activity and product (verb – noun)

```
┌─────────────────┐     ┌─────────────────┐
│       ④         │     │       ⑤         │
│   Reorganize    │ ──► │   Do Sanity     │
│  if Necessary   │     │    Checks       │
└─────────────────┘     └─────────────────┘
```

- Reorganize hierarchy into most meaningful structure

WBS Tips

1. You should stop breaking down a branch when it meets the tests listed in the "When to Stop Breaking Down" section below.
2. The WBS does not have to be symmetrical. Some branches may have more levels than others have.
3. Remember to include the work of managing the project in the WBS, such as "Communicate Status" or "Update Risk Plans." For convenience, many writers show it as a separate branch of the WBS that begins on level 1.
4. As you create the WBS, you can work from top to bottom, bottom to top, or any combination. Pick a method that works well for your team and remember to use the sanity tests below to check the correctness of your WBS after you are done.
5. Create the WBS as a team activity, possibly after you or a small team has sketched out the framework. The cross-functional interaction identifies work and solves problems that might otherwise be overlooked. It clarifies team roles and builds commitment. A great way to do this is using stickies on flip charts or a whiteboard.
6. Large WBS's can be formatted as an indented outline rather than as a tree.

When to Stop Breaking Down

Stop decomposing a branch of the tree when the work packages (lowest level tasks) in that branch are just small enough to be useful. Useful is subjective, but here are some guidelines:
1. It is *estimatable*. It is small enough to estimate accurately.

2. It is *assignable*. You can reasonably assign this task to a person or small group with assurance that they will understand and complete it.
3. It is *trackable*. Typically, the length of time it will take to complete a work package should be from about 50% to 200% of the status reporting period that you plan to use during execution of the project. This size task can be tracked accurately. For example, if you plan to report progress on the project weekly, most of your work packages will typically be from 3 days to two weeks long. Shorter work packages may be micromanaging, while you won't be able to accurately measure progress on longer work packages.

Don't go smaller than necessary, but don't allow long, broadly defined tasks. Applying these tests often results in work packages that are 1 - 2 weeks long.

Sanity Tests for Your WBS

When you have completed the WBS, use these tests to verify that it is well-constructed.
1. 100% Rule: Each child task is a subset of the summary task above it, and the complete set of child tasks adds up to the summary task. Thus, the summary task merely summarizes the collection of children and becomes redundant once all children are specified.
2. "Everything" Rule: All work that will be done on the project must have a home somewhere in the WBS. Remember to include the work of project management.
3. "Activity -> Product" Rule: Every summary task and work package names an activity that produces a measureable result. Avoid ambiguous and open ended activities.
4. Work packages (lowest level tasks) are decomposed to an appropriate level of detail as described in a previous section.

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Task Information Sheet

A project team can use this worksheet to gather detailed information about the tasks in their project. The best time to use this form is generally after the team has created a WBS and is starting to work on creating a schedule and other detailed plans.

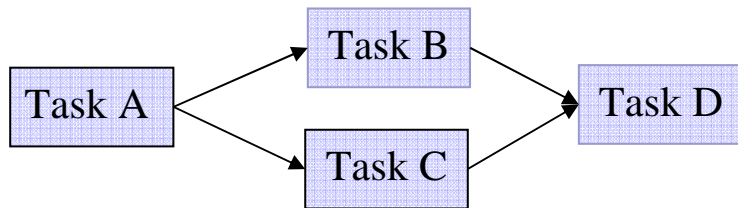| WBS ID and name of task |
| --- |
| |
| **What will it deliver? (Activity -> Deliverable format)** |
| |
| **Who will do it and at what level of effort?**
(list names, e.g. Fred Flintstone 50%; or skill sets, e.g. 2 CAD Engineers at 100%) |
| |
| **What else is needed to do it?**
■ From other groups
■ Equipment and materials
■ Special skills
■ Special costs |
| **What tasks come before and after it?** |
| |
| **How long will it take? (optimistic, mostly likely, and pessimistic range)** |
| |
| **Key assumptions** |
| |
| **Risks** |
| |

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Instructions for Creating a Schedule

Sequence the Tasks

1. Gather up the collection of work packages from the WBS. These are the tasks that must be done to complete the project. (Summary tasks – the tasks with children – are not work packages. Do not include summary tasks in the following steps because in a properly constructed WBS they are redundant with their children.)
2. As a project team, decide the order in which the tasks will be done.
   a. Write the short description of each task in verb-noun form on the top third of a sticky. Include stickies for START and FINISH. You may already have these stickies from the work breakdown that you did in the "Create tasks …" step.

Task Description		
(VERB – NOUN form)		
People	Duration	Resources
Start	Finish	

   b. Arrange the stickies in the sequence that will most effectively get the project done. Draw arrows indicating the sequence. Some projects will have a very simple sequence where almost all tasks must be done in serial order (the preceding task must be completed before the following task can begin). Other projects may be able to speed things up by doing some tasks in parallel. The example diagram shows that tasks B and C can be done in parallel once task A is completed. Task D can't start until both B and C are done.

   c. This diagram showing the sequence of tasks for a project is technically known as a *network diagram*.

Estimate the Tasks

3. Estimate how many working days and people each task will take. Write this in the "Duration" and "People" sections of the sticky. Then list other important resources that will be necessary to do the task, for example time on a piece of equipment or an expenditure of money. The example shows that task C, "Research coolant

C. Research Coolant Options		
1. George 50% 2. Equipment tech 25%	12 days	1. $2000 travel 2. Use of lab 2 50%

options," is expected to take 12 working days. George will work on it approximately 50% of his time and an equipment technician (to be named later) 25% of her time.

Thus, the task will require a total of 9 person-days of effort, spread over 12 working days of time. The task will also require spending $2,000 for travel expenses to visit a potential supplier, as well as use of Lab 2, which is in very high demand.

4. Insert milestones into the sequence of tasks. Milestones have zero duration and zero effort. They are valuable for several reasons:

    a. They will help you monitor the project's progress because you can see whether milestones are achieved on the date you planned for them. This is called a *tracking baseline.*
    b. They will help you communicate project status to other people.
    c. They will become a synchronization point, both within and outside your project team.
    d. They give people concrete intermediate goals to shoot for.

You should have a milestone for each key accomplishment or deliverable in your plan, as well as one for each gate in your project management process. Generally, you should have one or more milestones every month.

Create a Schedule Chart

5. Determine the earliest dates that each task can be started and completed *based on the information from the stickies and the network diagram.* Use the sequence information from the arrows in the network diagram to determine when a task can start, based on the finish dates of the tasks

C. Research Coolant Options		
3. George 50% 4. Equipment tech 25%	12 days	1. $2000 travel 2. Use of lab 2 50%
Start 12/4/06	Finish 12/19/06	

that immediately precede it. Given the start date and the duration of a task as shown on its sticky, determine what its earliest finish date is. Going from start to finish through the network diagram, do this for every sticky and enter the dates in the appropriate boxes.

6. Create a schedule chart (also known as a Gantt chart) using the information on the stickies. The schedule chart plots the tasks in your project against a timeline, so that people can easily see when things are supposed to happen. Units of time are shown as columns. Each row contains the information for one task, with a bar showing when the task is expected to occur. Transcribe this information directly from the network diagram and stickies that you created in previous step. As the example schedule chart below shows, you can also chart how people and resources on the project will be used over time. This is the basis for a budget.

Task	Names	Resources	27-Nov	4-Dec	11-Dec	18-Dec	25-Dec	1-Jan	8-Jan	15-Jan
A Write plan	Tom 100%	$1,000								
B Construct new room	George 75% Mary 50%	$50,000								
C Rsch coolant opts	George 50% E tech 25%	$2,000 Lab 2 50%								
D Procure equipment	Mildred 10% George 50%	$20,000								
Names	Tom		100%							
	Mary			50%	50%					
	George			125%	125%	50%	50%	50%	50%	50%
	E tech			25%	25%	25%				
	Mildred						10%	10%	10%	10%
Resources	Expenses		$1,000	$25,000	$27,000		$10,000			$10,000
	Lab 2			50%	50%	50%				

Fix Conflicts

7. Your schedule chart may show some problems. In the example schedule chart, 125% of George's time is allocated to the project during the first two weeks in December. You may see problems such as
   a. Over allocation of people or resources
   b. Using a resource when it is not available
   c. Milestones not achieved on target
   d. Unacceptable cash flow

   Fix these problems by modifying the schedule. You may have to change the sequence of tasks, durations, assignments of people and resources, or other parts of your plan.

Tips

- You can use software to assist with many of these steps. Microsoft Project® supports all the above steps, but some people don't have access to it. Another option is to use the Excel spreadsheet template in the *Resource Kit* to automate most of the graphing work in step 6.
- See Eric Verzuh's *Fast Forward MBA in Project Management* for more details on how to do good scheduling and estimating.
- Involve the project team in creating the schedule. Get estimates and inputs from the people who are most familiar with the work that will be done. One person may propose a first draft, for example of the task sequencing, but the project will get a better quality schedule as well as more enthusiastic commitment if you involve the people who will do the work.
- Understand the *critical path* of your schedule. The critical path is the path or paths through the network diagram that have the longest duration, starting at the start node

and ending at the finish node. (It is good practice to have a single start node and a single finish node in the network diagram.)   The critical path reveals several important things:

- o The shortest length of time that the project can complete in, if everything goes according to the plan.
- o Tasks that you should focus the project team's attention on. Any task on the critical path that slips even a little bit will delay the end date of the entire project. Conversely, a decrease in the duration of a task on the critical path will shorten the entire project. Therefore, pay a lot of attention to critical path tasks!

- Related to critical path, the *slack* of a task is the amount of time that a task can be delayed without delaying the project's finish date. Tasks that are on the critical path have a slack of zero. Non-zero slack usually means flexibility, because you can reallocate resources or priority from a task with slack to a task on the critical path, thereby reducing the total project length or preventing a critical task from slipping. If most tasks in your schedule have zero slack, your schedule is probably risky.

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