Work Breakdown Structure & Schedules

A Work Breakdown Structure (WBS) identifies tasks and deliverables associated with a project. Resources are identified for each item within the WBS that facilitates budgeting as well as assignment of responsibilities. T he WBS can be used to determine the critical path of the project and create the project schedule.

Project activities in which WBS and schedules are useful:

- Drafts are created during the project definition phase of the project then details are flushed out during the planning phase. The WBS and schedules are continuously revisited and updated through the duration of the project.

Other tools that are useful in conjunction with WBS and schedules:

- CMT (Critical Path Method)
- PERT (Program Evaluation and Review Technique)
- Risk Management

Aids

- Microsoft Project™

Introduction

The WBS is the tool that is used to record and communicate the project deliverables (something produced or an outcome) and sub-deliverables as well as the accomplishments (something achieved) and sub-accomplishments. The identification of these elements relies on the experience of the team members as well as consultation with outside experts. Once the deliverables and accomplishments are listed, resources are determined for each element and sub-element.

A schedule is created from the WBS to ensure the project's objective is accomplished in the time allotted. The first step in creating a schedule is an assessment of the critical path or the shortest period in which the project can be completed. Once the critical path has been established, start and end dates are assigned based on their relationship to the critical path.

Application of WBS and Schedules

Work Breakdown Structure

The first step in creating a WBS is identifying the project deliverables and sub-deliverables, and the achievements and sub-achievements. Each deliverable or achievement must equal the sum of its sub-elements. The WBS can be represented either

1.	**Table Designed**
1.1	Dimensions determined
1.2	Drawings completed
2.	**Materials Obtained**
2.1	Material calculated
2.2	Materials purchased
3.	**Table Constructed**
3.1	Parts prepared
3.1.1	Top cut to size
3.1.2	Legs turned
3.1.3	Parts assembled
4.	**Table Finished**
4.1	Table sanded
4.2	Table stained
5.	**Table installed**

as a list or graphically. Figures 1 and 2 provide examples of a WBS for the building of a table.

Figure 1: WBS List Format

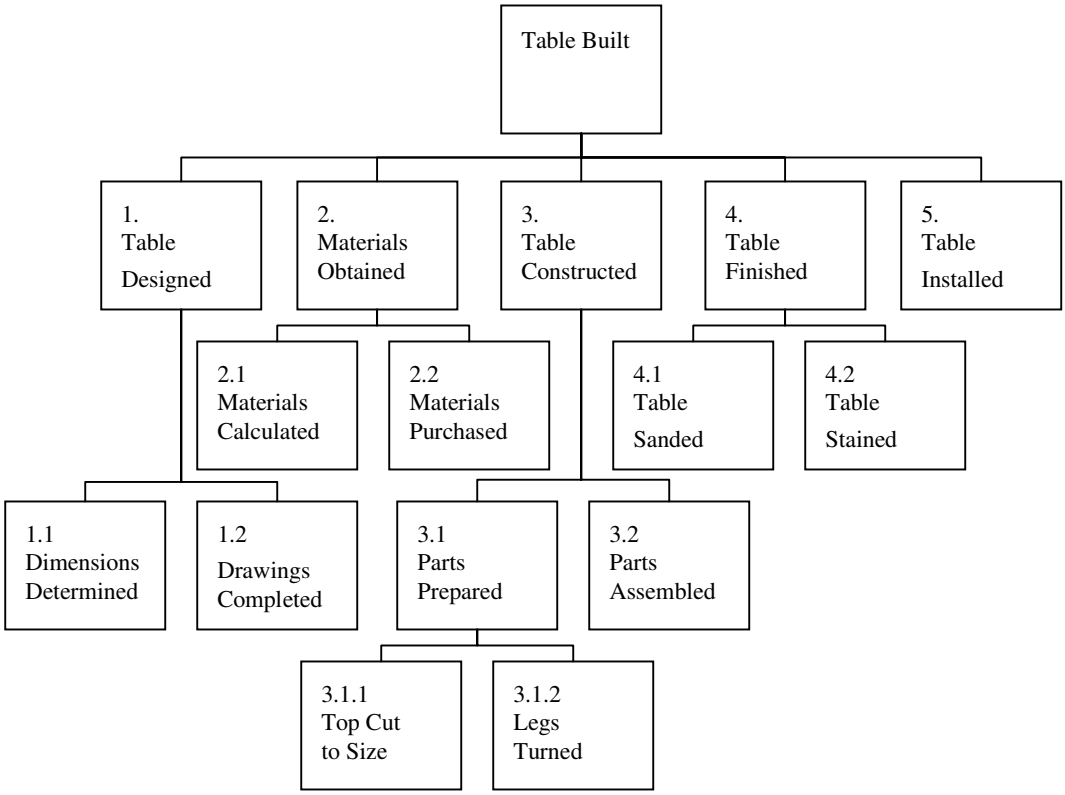


Figure 2: WBS Chart Format

Once the elements of the WBS have been defined, resource requirements are determined for each element. The resources to be identified include:

- Human resources identified as the type of knowledge or skills required
- Equipment resources
- Materials and supplies
- Space and facility requirements
- Special requirements (e.g., not typical energy sources)

For each resource, the type, amount or effort (e.g., number of person hours), and associated costs are determined and recorded in the WBS.

Determination of the Critical Path

The exercise to determine the critical path of a project explores the dependencies or relationships between the elements within the WBS. The critical path examines the duration to complete tasks rather than the effort. This ensures that issues such as delivery lead time are taken into account when planning the project.

First, extract the steps to complete the project from the WBS. These will generally be the lower level elements of the WBS. Next, determine precedence or dependencies. It may be useful to sketch a diagram to help determine these dependencies. Figure 3 provides a very simple example where turning the legs of the table is considered to be one of the determining factors over the cutting of the table top.

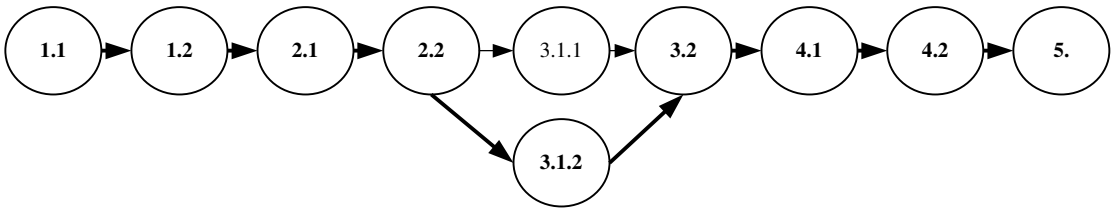


Figure 3: Critical Path Diagram

Review the critical path and the task durations to identify if any tasks will fall within a time period during which they cannot be completed. For example, if task 2.2 Materials Purchased would begin on a weekend during which time the supplier is closed, you would insert an idle period into your critical path.

Based on the critical path, determine the overall duration required to complete the project. If the duration calculated exceeds the duration allotted, negotiation may be required to increase the allotted time, increase the resources or reduce the scope of the project.

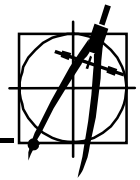
Creating the Schedule

Once the WBS has been created and the critical path is determined, all the components are in place to create the schedule. Software such as Microsoft Project™ can be used to help develop the schedule but is not necessary.

If manually creating a schedule, list all of the project tasks roughly in order of precedence. For each task, indicate:

- Start date;
- End date;
- Effort;
- Precedence relationship; and
- Name of person responsible for completing the task.

If desired, create a Gantt chart to graphically represent the schedule. A Gantt chart uses horizontal bars in a linear-type calendar. Figure 4 provides an example of a schedule.

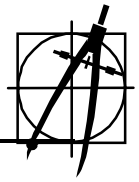


Task	Start	Finish	Effort (days)	Responsibility	Precedence	Nov | | | | Dec | | | | Jan |
1.1 Dimensions determined	Nov 1	Nov 2	0.5	John S.		--
1.2 Drawings completed[1]	Nov 3	Nov 9	1	Alana B.	1.1	----
2.1 Materials determined	Nov 10	Nov 10	0.5	John S.	1.2	--
2.2 Materials purchased[2,3]	Nov 12	Dec 12	.5	John S.	2.1	----------
3.1.1 Top cut to size	Dec 13	Dec 14	1	Andrew F.	2.2	----
3.1.2 Legs turned	Dec 13	Dec 16	2.5	Karen P.	2.2	------
3.2 Parts assembled[4]	Dec 17	Dec 21	1	Andrew F.	3.1.1, 3.1.2	------
4.1 Table sanded[5]	Dec 21	Jan 2	2	Andrew F.	3.2	------
4.2 Table stained[4]	Jan 3	Jan 5	1.5	Andrew F.	4.1	-----
5. Table installed	Jan 6	Jan 6	0.5	Stewart B.	4.2	--

Figure 4: Example Schedule & Gantt Chart

Notes:

1. Turn around time within the drafting department has been included although the effort is only 1 day.
2. A one month lead-time allotted for materials.
3. Remembrance Day (November 11) not included in schedule as it is a holiday.
4. Time allowed for glue and stain to dry.
5. Time allotted for shop closure due to Christmas holiday.



Prior to finalising the initial schedule, calculate the effort required by each person assigned responsibilities to ensure that they have not been over allocated on the project. Take into consideration other responsibilities outside of the project. Distribute the final (baseline) schedule and obtain agreement from all those with responsibilities as well as the stakeholders.

Revisions

Projects are at risk of failing when there are changes to the tasks or timelines, and the WBS and schedule are not revisited and updated in light of these changes. It is important to maintain a revision history, not only to provide explanation of project progress, but also as a learning tool to refine planning skills for future projects.

References

Project Management, Kepner-Tregoe, Inc.®, 1987.