Chapter 4

Part 3

9. WBS Technology

Contents

1. What is WBS

- A **WBS (Work Breakdown structure)** is an **outcome-oriented analysis** of the work involved in a project.
- Usually, **WBS** is a top-down chart or table which represents a **hierarchical** and **static decomposition** of all work to be done in a **project**.
- A **WBS** is foremost a **static decomposition** of activities.
    - It is typically displayed graphically as an **organizational chart**, but can also be displayed in an **outline** form.
- The more detailed the **WBS:**
    - The more accurate the **product estimates**.
    - The better the **project plan**.
    - The more precisely it can be **tracked**.
- **Examples of WBS** (K. Schwalbe, *"Information Technology Project Management", Thomson Learning, Cambridge, 2000*) (Fig. 8.1.a,b,c)

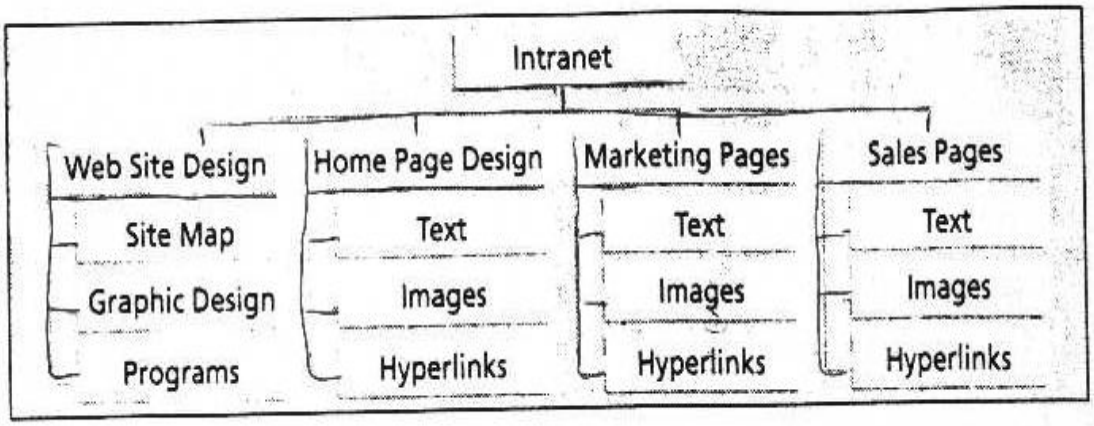

Fig. 8.1.a. Sample Intranet Organized by Product

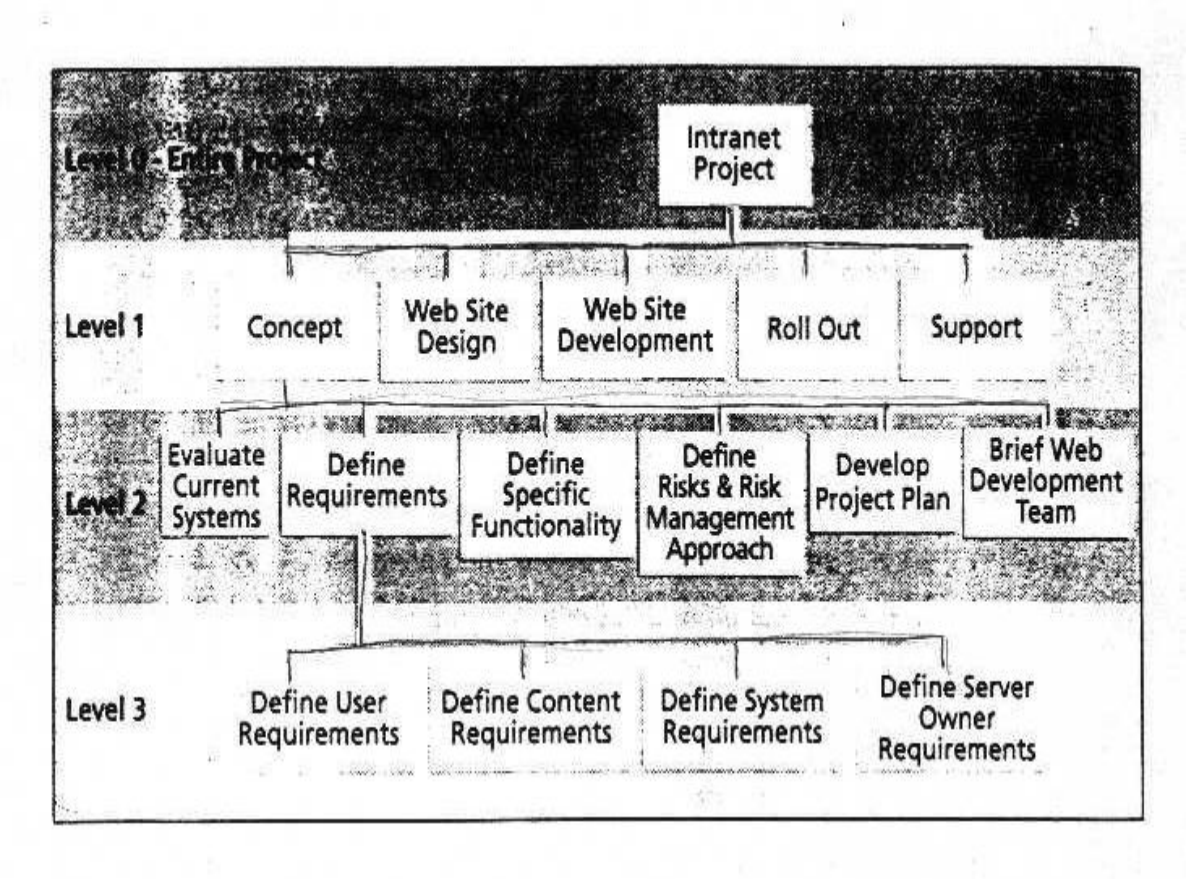

Fig. 8.1.b. Sample Intranet Organized by Phase

1.0 Concept

1.1 Evaluate current systems

1.2 Define Requirements

1.2.1 Define user requirements

1.2.2 Define content requirements

1.2.3 Define system requirements

1.2.4 Define server owner requirements

1.3 Define specific functionality

1.4 Define risks and risk management approach

1.5 Develop project plan

1.6 Brief Web development team

2.0 Web Site Design

3.0 Web Site Development

4.0 Roll Out

5.0 Support

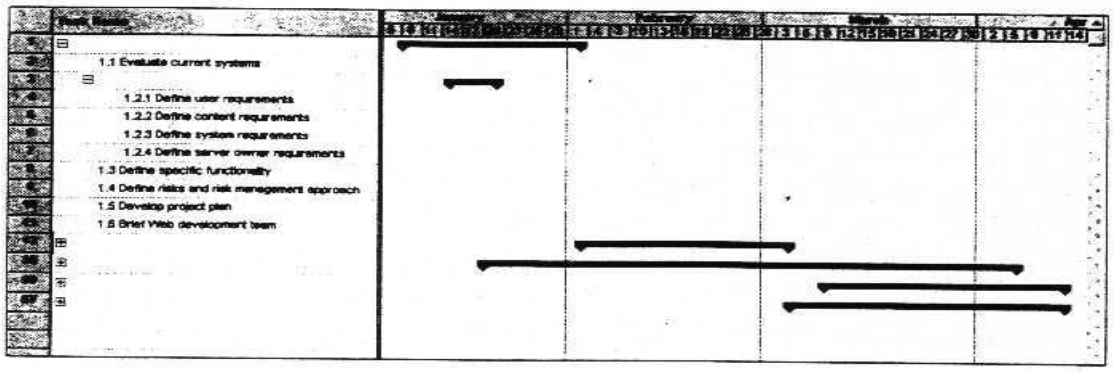

Fig. 8.1.c. Intranet WBS in Tabular Form and Gantt Chart in Microsoft Project 98

- **WBS** It is the **basis** for:
    - (1) Estimating.
    - (2) Budgeting.
    - (3) Pricing.
    - (4) Controlling Costs.
    - (5) Assigning Responsibility.
    - (6) Scheduling.
    - (7) Allocating Resources.
    - (8) Reporting, Monitoring, and Controlling.

2. Purposes of the WBS

- (1) To identify completely the project work elements that must be accomplished to achieve the project goal.
- (2) Roll up detail activity information (Schedule, Cost and Resource Usage).
- (3) Feeds the size estimate.
- In figures 8.2.a-8.2.f, are presented **different types** of **WBS**

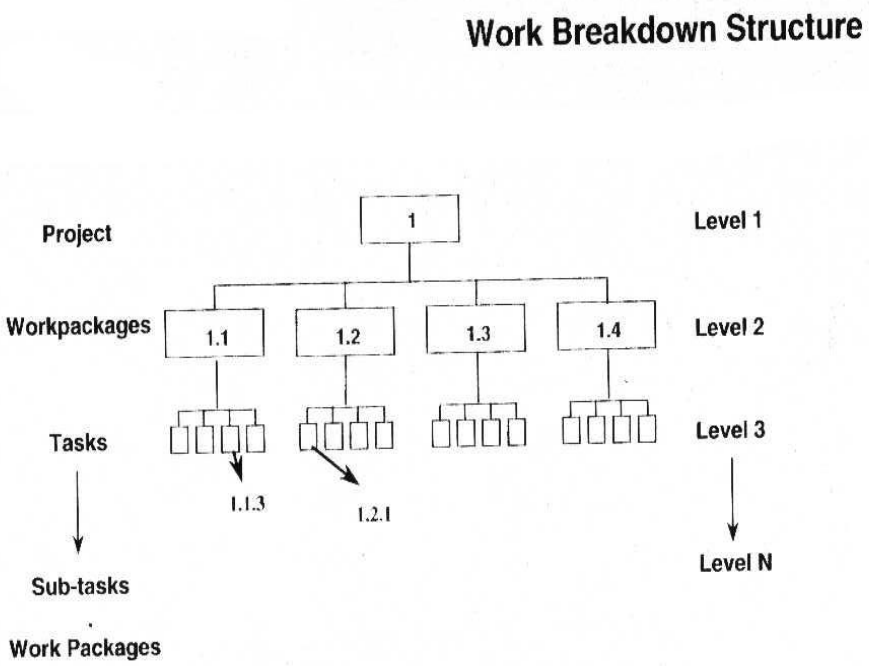

Fig. 8.2.a. Project WBS

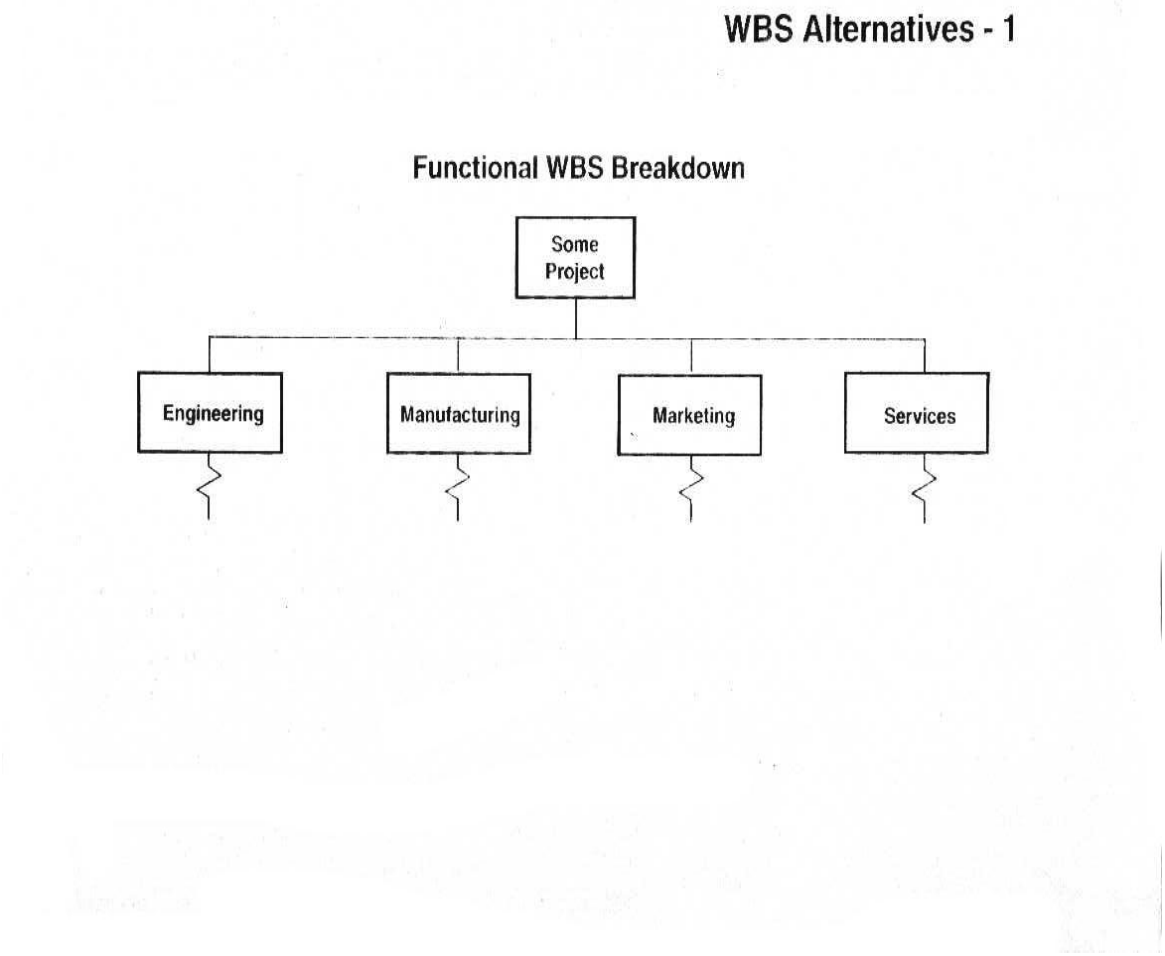

Fig. 8.2.b. Functional WBS Breakdown

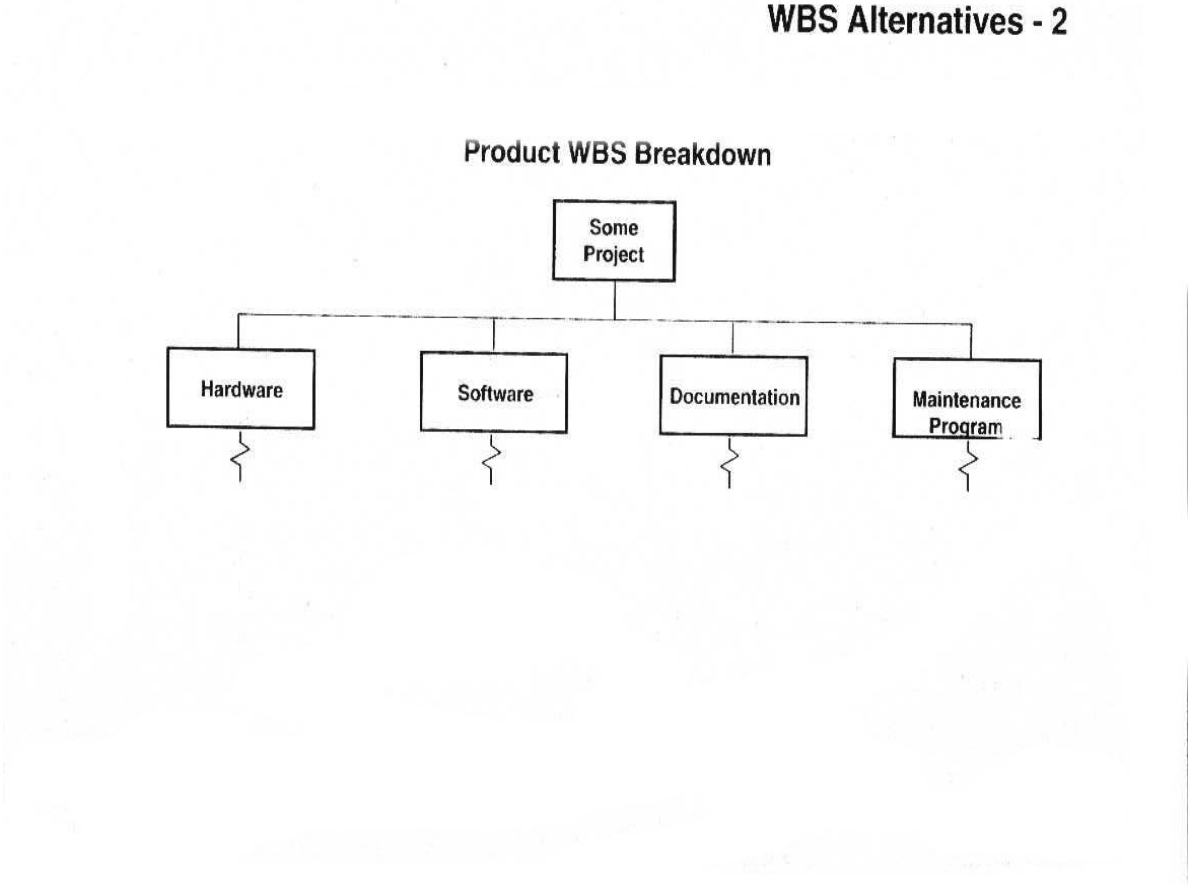

Fig. 8.2.c. Product WBS Breakdown

WBS Alternatives - 3

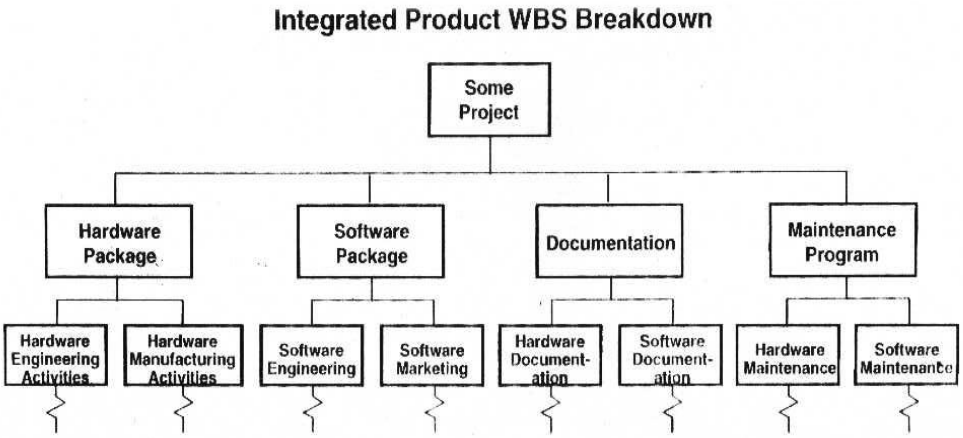

Fig. 8.2.d. Integrated Product WBS Breakdown

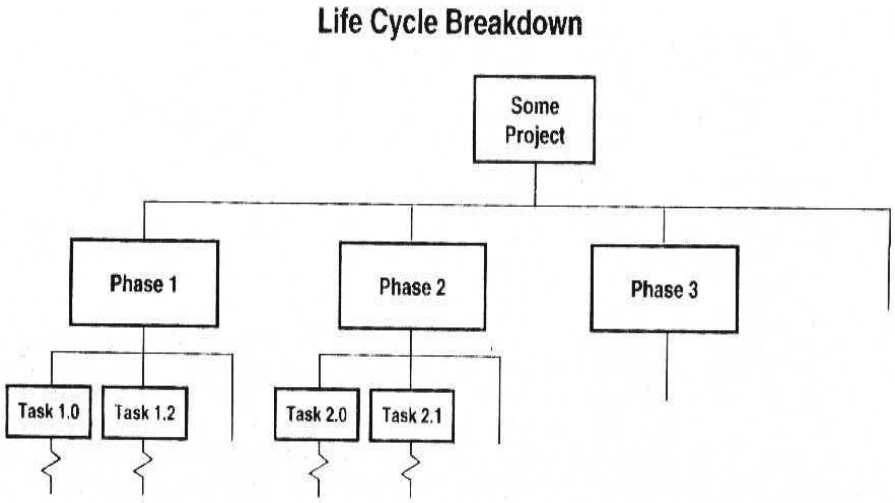

Fig. 8.2.e. Life Cycle Breakdown

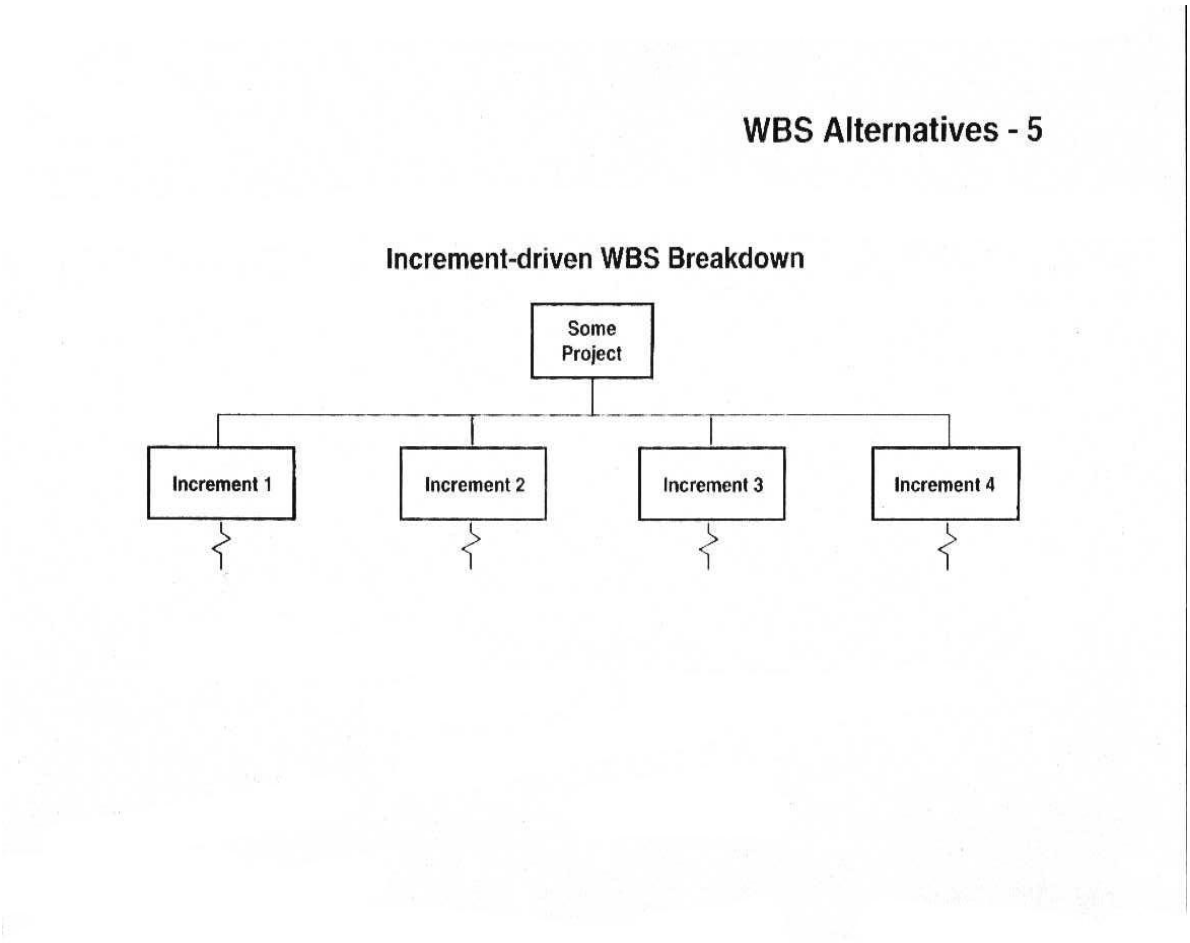

Fig. 8.2.f. Increment-driven WBS Breakdown

3. Approaches to Developing Work Breakdown Structures

- There are several approaches you can use to develop work breakdown structures.
- These approaches include
    - (1) Using guidelines.
    - (2) Analogy approach.
    - (3) Top-down approach.
    - (4) Bottom-up approach.

3.1 Using Guidelines

- If **guidelines** for developing a WBS exist, it is very **important** to follow them.
    - Some organizations, for example the **U.S. Department of Defense (DoD)**, prescribe the **form** and **content** for WBSs for particular projects.
- Many **DoD** projects require contractors to prepare their **proposals** based on the **DoD-provided WBS.**
    - (1) These proposals must include **cost estimates** for each task in the **WBS** at a detailed and summary level.
    - (2) The **cost** for the entire project must be calculated by **summing** the costs of all of the lower level WBS tasks.
    - (3) When **DoD** personnel evaluate cost proposals, they must **compare** the contractors' costs with the DoD's estimates.
- A large **variation** in costs for a certain WBS task often indicates **confusion** as to what work must be done.

3.2 The Analogy Approach

- Another approach for constructing a WBS is the **analogy approach**.
    - In the **analogy approach,** you use a **similar product**'s WBS as a **starting point**.
- Some organizations keep a **repository** of WBSs and other project documentation on file to **assist** people working on projects.
    - Viewing examples of other similar projects' WBSs allows you to understand different ways to create a WBS.

3.3 The Top-Down Approach

- Most project managers consider the **top-down approach** of WBS construction to be **conventional**.
- To use the **top-down approach:**
    - (1) Start with the **largest items** of the project and break them into their subordinate items.

    - (2) This process involves **refining** the work into greater and greater levels of detail.
    - (3) After finishing the process, all resources should be **assigned** at the **work package level**.
- The **top-down approach** is best suited to **project managers** who have **vast technical insight** and a **big-picture perspective**.

3.4 The Bottom-up Approach

- In the **bottom-up approach,** team members:
    - (1) First **identify** as many **specific tasks** related to the project as possible.
    - (2) Then **aggregate** the specific tasks and **organize** them into summary activities, or higher levels in the WBS.
- **For example**:
    - *A group of people might be responsible for creating a WBS to create an Intranet.*
    - *Instead of looking for guidelines on how to create a WBS or viewing similar projects' WBSs, they could begin by listing detailed tasks they think they would need to do in order to create an intranet.*
    - *After listing detailed tasks, they would group the tasks into categories.*
    - *Then, they would group these categories into higher-level categories.*
- The bottom-up approach can be very **time-consuming**, but it can also be a very **effective** way to create a WBS.
- Project managers often use the **bottom**-up **approach** for projects that represent:
    - Entirely **new systems**, or
    - **Approaches** to doing a job, or
    - To help create **buy-in** and synergy with a project team.

4. Some Basic Principles to Create a Good WBS

- As stated previously, creating a good WBS is no easy task and usually requires several iterations.
    - Often, it is best to use a **combination of approaches** to create a project WBS.
- There are some **basic principles** that apply to creating any good WBS.
    - (1) A **unit of work** should appear at **only one place** in the WBS.
    - (2) The work content of a **WBS item** is the **sum of the WBS items below it**.
    - (3) A **WBS item** is the **responsibility** of **only one individual**, even though many people may be working on it.
    - (4) The **WBS** must be **consistent** with the way in which work is actually going to be performed.
        - It should serve the **project team** first and other purposes only if practical.
    - (5) **Project team members** should be involved in developing the WBS to ensure **consistency** and **buy-in**.
    - (6) **Each WBS** item must be **documented** to ensure accurate understanding of the scope of work included and not included in that item.
    - (7) The WBS must be a **flexible tool** to accommodate **inevitable changes** while properly maintaining control of the work content in the project according to the scope statement

5. How to establish the WBS

- (1) The WBS needs to be **established** under the responsibility of the Project Manager with the input and commitment of all related groups and individuals.
- (2) In general, it is better to keep the **upper part** of the WBS stable and to choose the **policy** accordingly.
    - What do you want to give visibility on?
    - What do you want to enforce (e.g. choose Incremental strategy when you want to enforce a given number of increments).

- (3) The WBS can **match** as closely as possible the product and the task decomposition so as to be most useful in the estimating and planning activities.
- (4) The WBS format can be chosen so as to correspond with any other methodology being applied (e.g., based on the objects rather than the functionality in an OO environment).
- (5) The WBS should be defined based on the requirements analysis and decomposition (e.g., matching the bubbles in a bubble view).
- (6) Several scenarios should be built to represent different cases.
    - A choice on one of them or on a combination is to be made.
- (7) WBS construction is **normal static** by essence.
    - Introducing **dynamics** (schedule-dependent aspects) should normally come after the **static construction**, to avoid degrading the good **scenario** too quickly.
- (8) Use a **milestone-driven** WBS or add timely activities conversely as leaves of the WBS.

6. The Work Packages

- The Work Packages are the lowest **elements** of the WBS.
- The Work Packages are the basis for **team/individual assignment**.
- The Work Packages are the basis for **cost/schedule/budget estimation**.

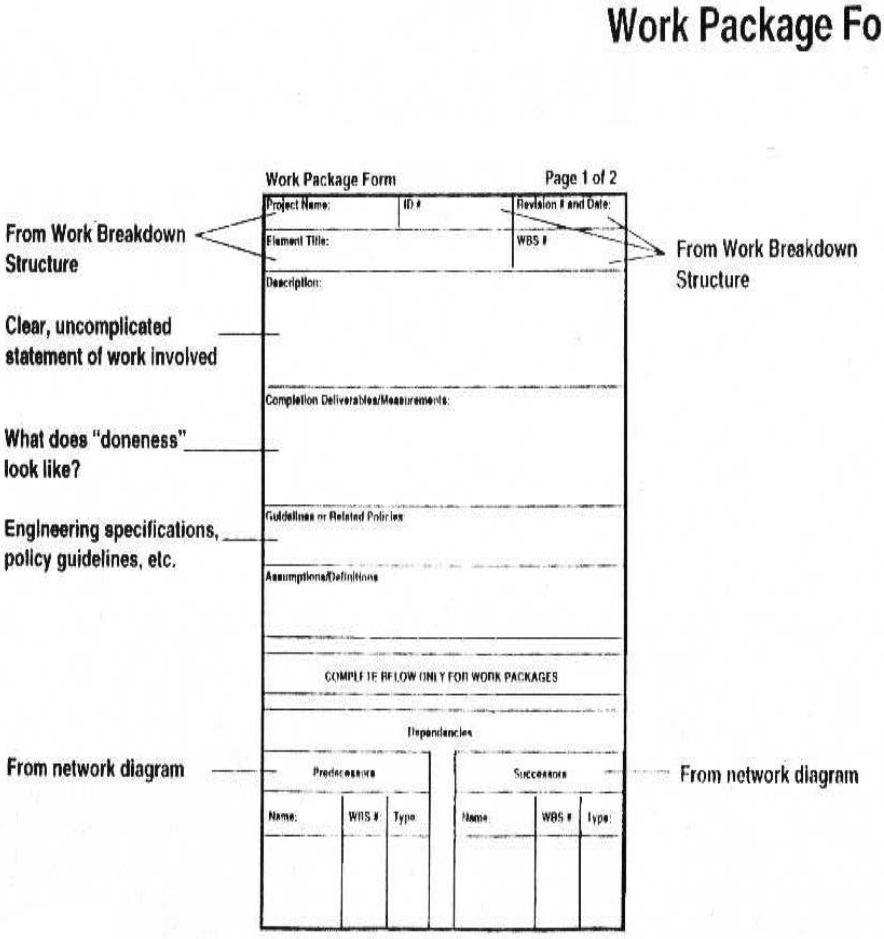

Fig. 8.6.a. Work Package Form (page1)

Work Package Form - 2

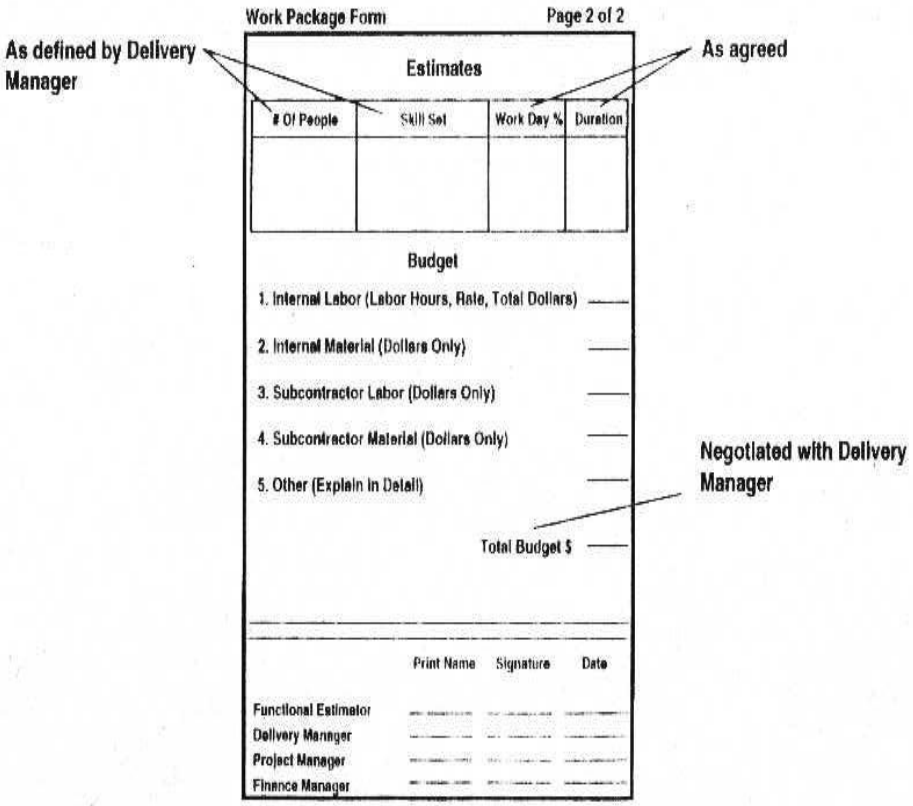

Fig. 8.6.b. Work Package Form (page2)

Example: TCS Work Package

Project Name:	Alcacity TCS	**ID #** STCS	**Revision # and Date:** V1.0 1-2-96
Element Title:	Code Scheduler		**WBS #:** 1.3.1.1
Description:	Code the Scheduler Module for the Alcacity Traffic Control System.		
Completion Deliverables/Measurements:	Develop C code as documented in the STCS Design specification V1.0. The program must be written and compiled and submitted for Peer Review.		
Guidelines or Related Policies:	TSC V3.3 Coding Stds, V2.1 SQA Stds		
Assumptions/Definitions			

Fig. 8.6.c. Work Package Form example

7. Conclusions

- (1) The WBS is the **basis** for **project management**, including estimating, scheduling, budgeting.
- (2) The WBS can be based on a number of easy to understand concepts, such as the lifecycle, functional components, and different deliverables.
- (3) The Work Packages as lowest elements of the WBS are the **basis** for **team/individual assignments**.

Exercise #7

1. What is a *WBS*? Give some *examples* of WBS.
2. Which are the main *approaches* to develop WBS structures?
3 What are the *basic principles* of a good WBS?
4. What is a *Work Package* and what is its role in a WBS structure?