Project Scope Management

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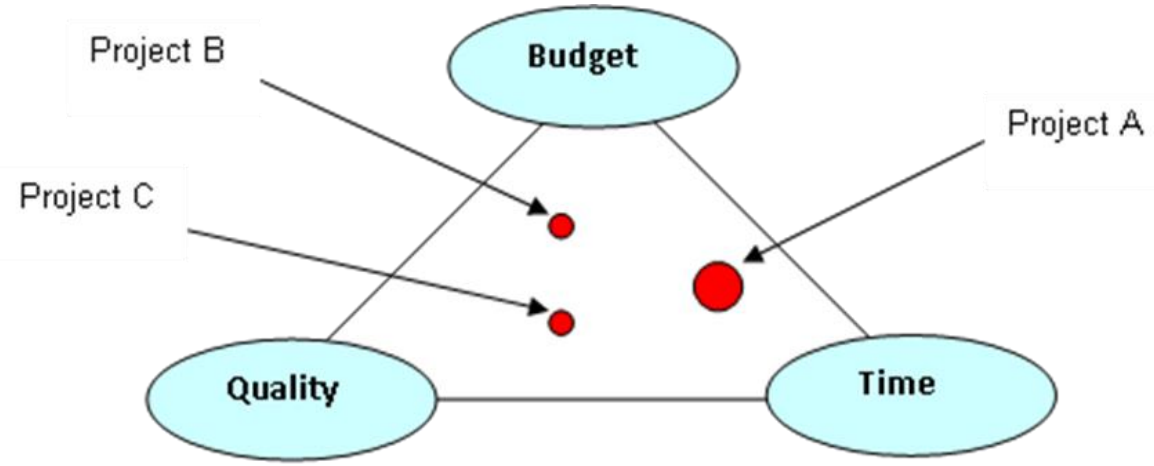
Some of the contents are adapted from "System Analysis and Design" by Dennis, Wixom, &Tegarden.

Course Review: What do Project Managers Manage? The Triple Constraint of Project Management

- **Scope &Quality**
- **Time**
- **Cost**

Course Review: Project Objectives

- Scope & Quality (fitness for purpose)
- Budget (to complete it within the budget)
- Time (to complete it within the given time)
- It is clear that these objectives are not in harmony!



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Course Review: Requirements Analysis and System Specification

- Why is it one of first activities in (software) project life cycle?
  - Need to understand what customer wants first!
  - Goal is to understand the customer's problem.
  - Though customer may not fully understand it!
- Requirements analysis says: "Make a list of the guidelines we will use to know when the job is done and the customer is satisfied."
  - Also called requirements gathering or requirements engineering
- System specification says: "Here's a description of *what* the program/system will do (not how) to satisfy the requirements."
  - Distinguish requirements gathering & system analysis?
  - A top-level exploration into the problem and discovery of whether it can be done and how long it will take.

Learning Objectives: Project Scope Management

- Explain what **scope management** is and the related processes
- Discuss methods for collecting and **documenting requirements**
- Explain the scope definition process and describe the contents of a ***Project Scope Statement***
- Discuss the process of constructing a ***Work Breakdown Structure (WBS)*** using various approaches
- Explain the importance of **scope verification** and control and how to avoid scope problems

What is Project Scope Management?

- ***Scope*** refers to **all** the work involved in creating the products of the project and the processes used to create them.

- A ***deliverable*** is a product produced as part of a project, such as hardware or software, planning documents, or meeting minutes.

- Project scope management includes the processes involved in defining and controlling **what is or is not** included in a project.

Main Processes of Scope Management

- **Requirement analysis**: defining and documenting the features and functions of the products from the users.
- **Define scope**: reviewing the project charter and requirements documents to create a scope statement, adding more information as requirements are developed and change requests are approved.
- **Create the WBS**: subdividing the major project deliverables into smaller, more manageable components.
- **Verify scope**: formalizing acceptance of the project scope.

Requirements Analysis: A Quick Review

Input to Collect Requirements

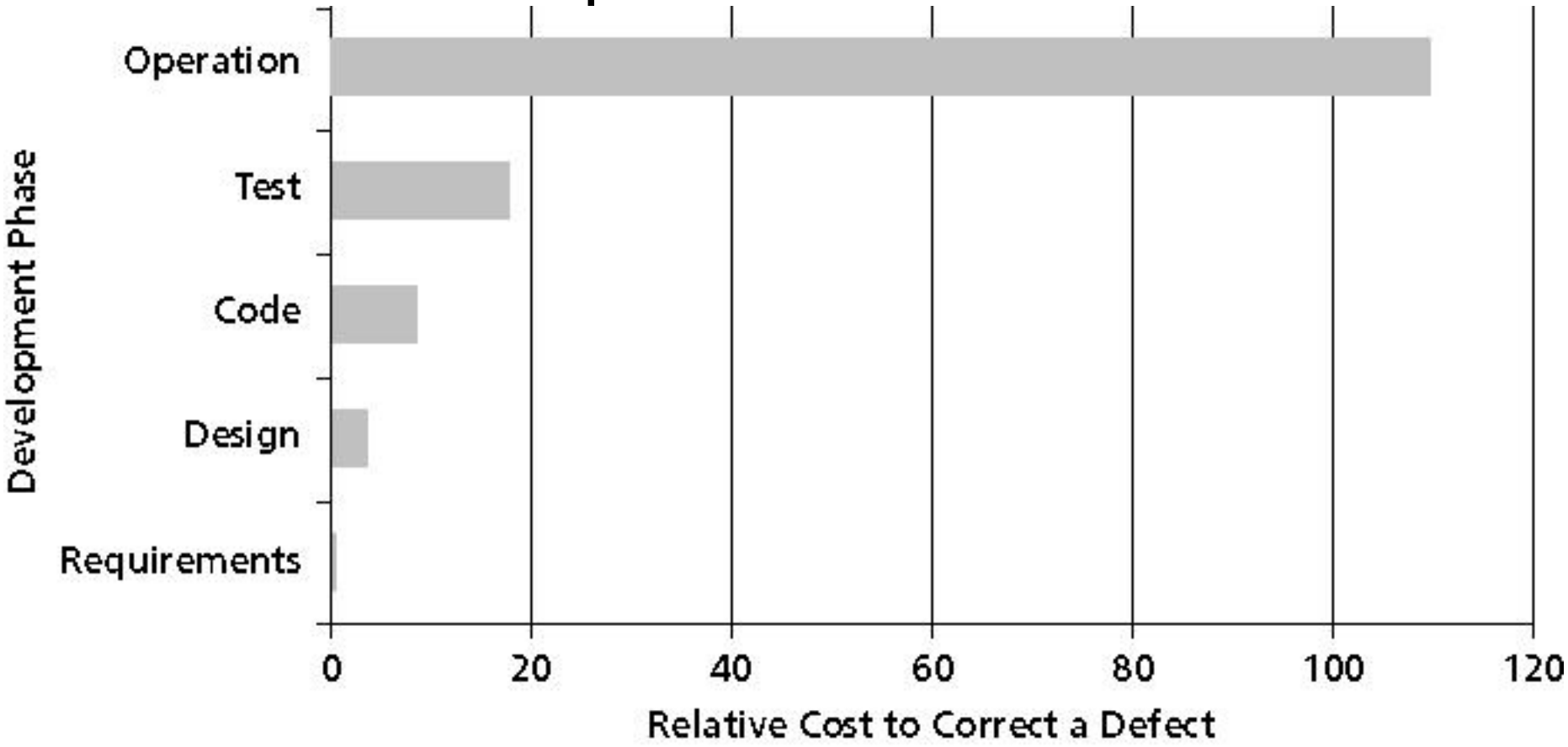
- ***Stakeholder Register***
  - Used to identify stakeholders that can provide information on detailed project and product information

Collect Requirements

- A ***requirement*** is “a condition or capability that must be met or possessed by a system, product, service, result, or component to satisfy a contract, standard, specification, or other formal document” (PMBOK® Guide, 2008).

- Use an **iterative** approach to defining requirements since they are often unclear early in a project.

Relative Cost to Correct a Software Requirement Defect



Source: Robert B. Grady, "An Economic Release Decision Model: Insights into Software Project Management." *Proceedings of the Applications of Software Measurement Conference* (Orange Park, FL: Software Quality Engineering, 1999), pp.227–239.

Methods for Collecting Requirements

- Interviewing
- Focus groups and facilitated workshops
- Using group creativity and decision-making techniques: Joint Application Development.
- Questionnaires and surveys
- Observation
- Prototyping
- Software tools

Documenting Requirements

- Requirement can be broken down into different categories such as functional, service, performance, quality, training requirements, and so on.
- A ***requirements management plan*** describes how project requirements will be analyzed, documented, and managed.
- A ***requirements documentation*** describes how individual requirements meet the business need for the project.
- A ***requirements traceability matrix (RTM)*** is a table that lists requirements, various attributes of each requirement, and the status of the requirements to ensure that all requirements are addressed.

Sample Requirements Traceability Matrix

Requirement No.	Name	Category	Source	Status
R32	Laptop memory	Hardware	Project charter and corporate laptop specifications	Complete. Laptops ordered meet requirement by having 4GB of memory.

Define Project Scope

Define Project Scope

Very Important!

- Outputs the ***Project Scope Statement***

- As time progresses, the scope of a project should become more clear and specific
  - Progressive elaboration

Further Defining Project Scope

Project Charter:

Upgrades may affect servers . . . (listed under Project Objectives)

Project Scope Statement, Version 1:

Servers: If additional servers are required to support this project, they must be compatible with existing servers. If it is more economical to enhance existing servers, a detailed description of enhancements must be submitted to the CIO for approval. See current server specifications provided in Attachment 6. The CEO must approve a detailed plan describing the servers and their location at least two weeks before installation.

Project Scope Statement, Version 2:

Servers: This project will require purchasing ten new servers to support Web, network, database, application, and printing functions. Virtualization will be used to maximize efficiency. Detailed descriptions of the servers are provided in a product brochure in Appendix 8 along with a plan describing where they will be located.

Scope Definition and the Project Scope Statement

- Project scope statements should contain at a minimum:
  - Description of the project – overall objectives, justification
  - Detailed descriptions of all project deliverables
  - Characteristics and requirements of products and services produced as part of the project.

- Other helpful information:
  - Project success criteria
  - Project boundaries
  - Product acceptance criteria
  - Schedule milestones
  - Order of magnitude costs estimates…

Create the Work Breakdown Structure (WBS)

Work Breakdown Structure (WBS)

- A **WBS** is a **deliverable-oriented** grouping of the work involved in a project that defines the total scope of the project.

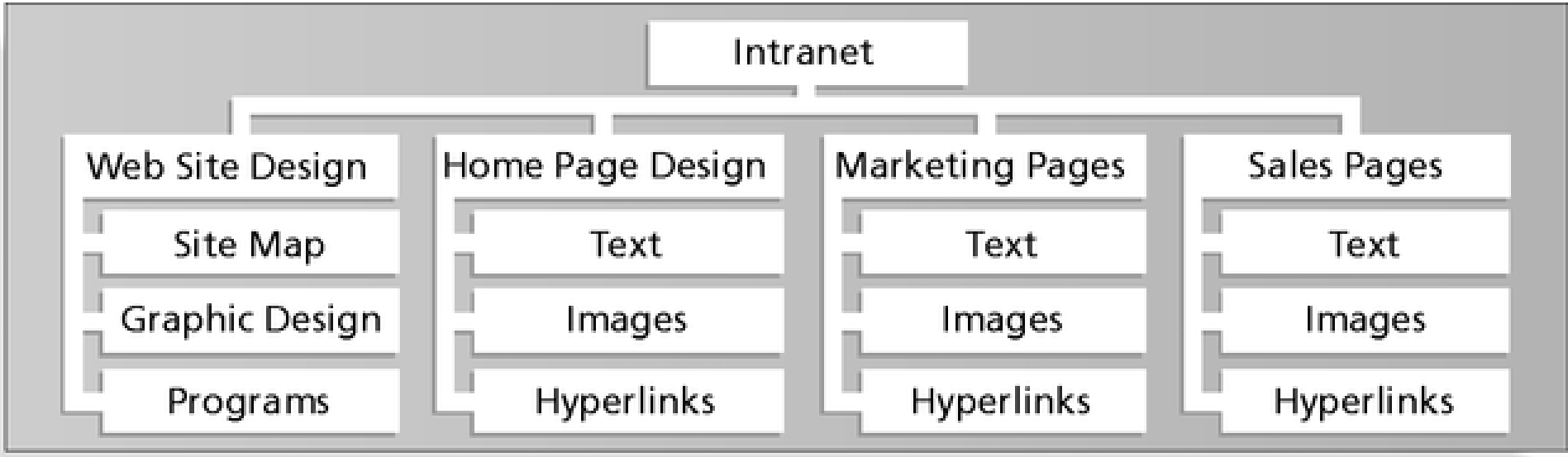
- **WBS** is a foundation document that provides the basis for planning and managing project schedules, costs, resources, and changes.

- **Decomposition** is subdividing project deliverables into smaller pieces. A **work package** is a task at the lowest level of the WBS

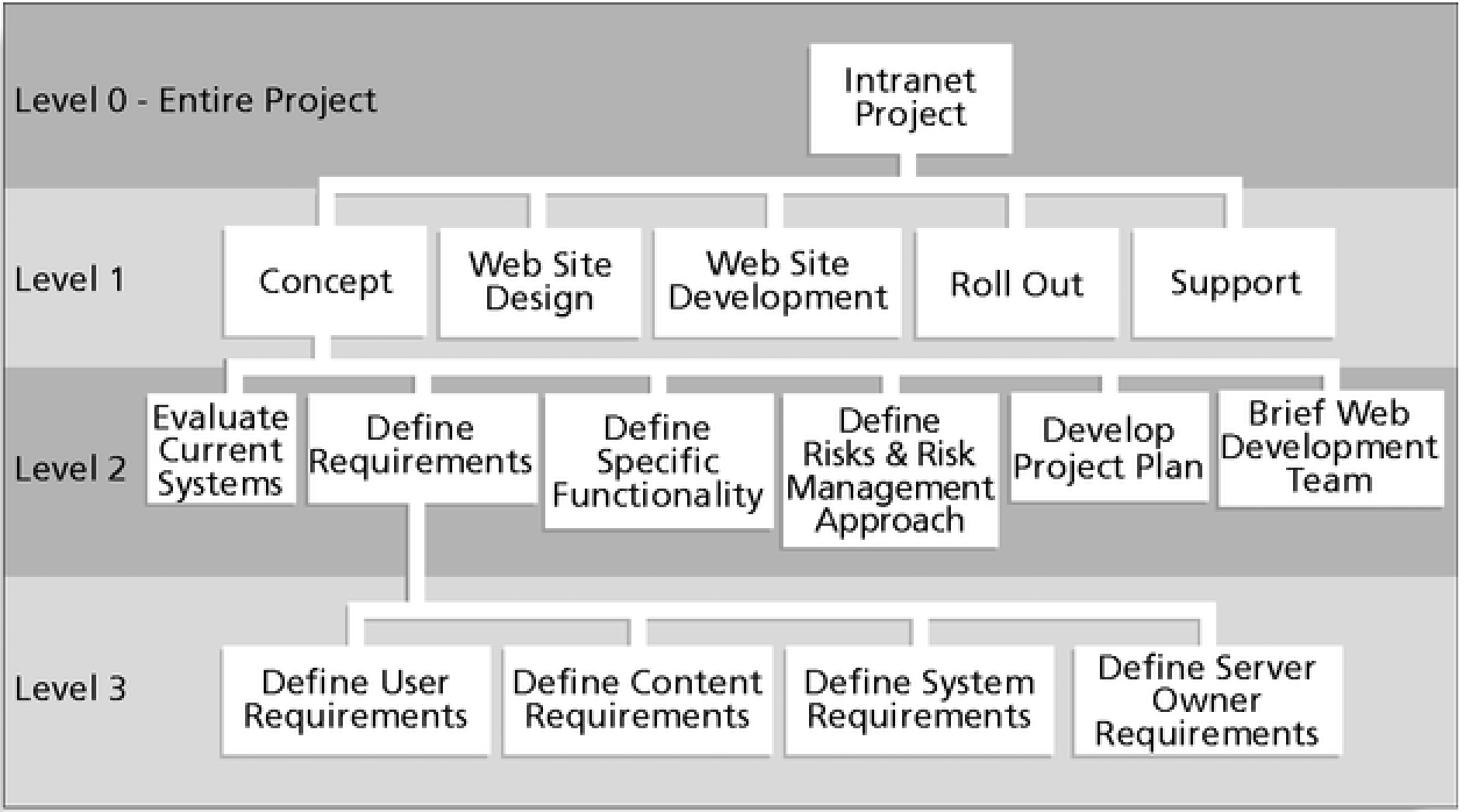
Work Breakdown Structure (WBS)

- The project scope statement and project management plan are the primary inputs for creating a WBS.
- The outputs include the WBS itself, the WBS dictionary, a scope baseline and updates to the project scope statement and scope management plan
- The WBS is often depicted as a task-oriented family tree of activities
  - The WBS can be organized around project products, project phases or using the project management process groups

Partial Intranet WBS Organized by Product



Sample Intranet WBS Organized by Phase



Intranet WBS in Tabular Form

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

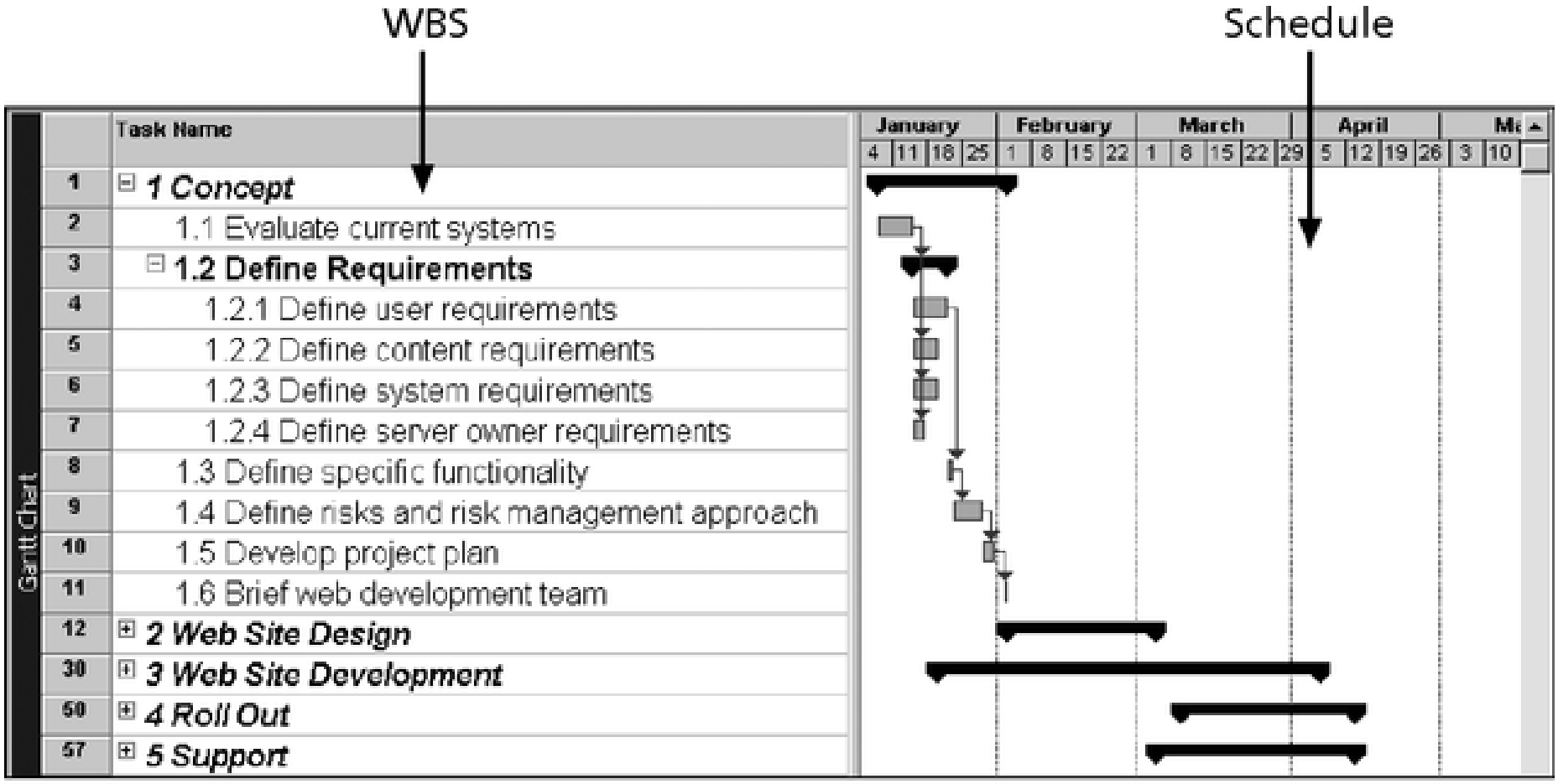
2.0 Web Site Design

3.0 Web Site Development

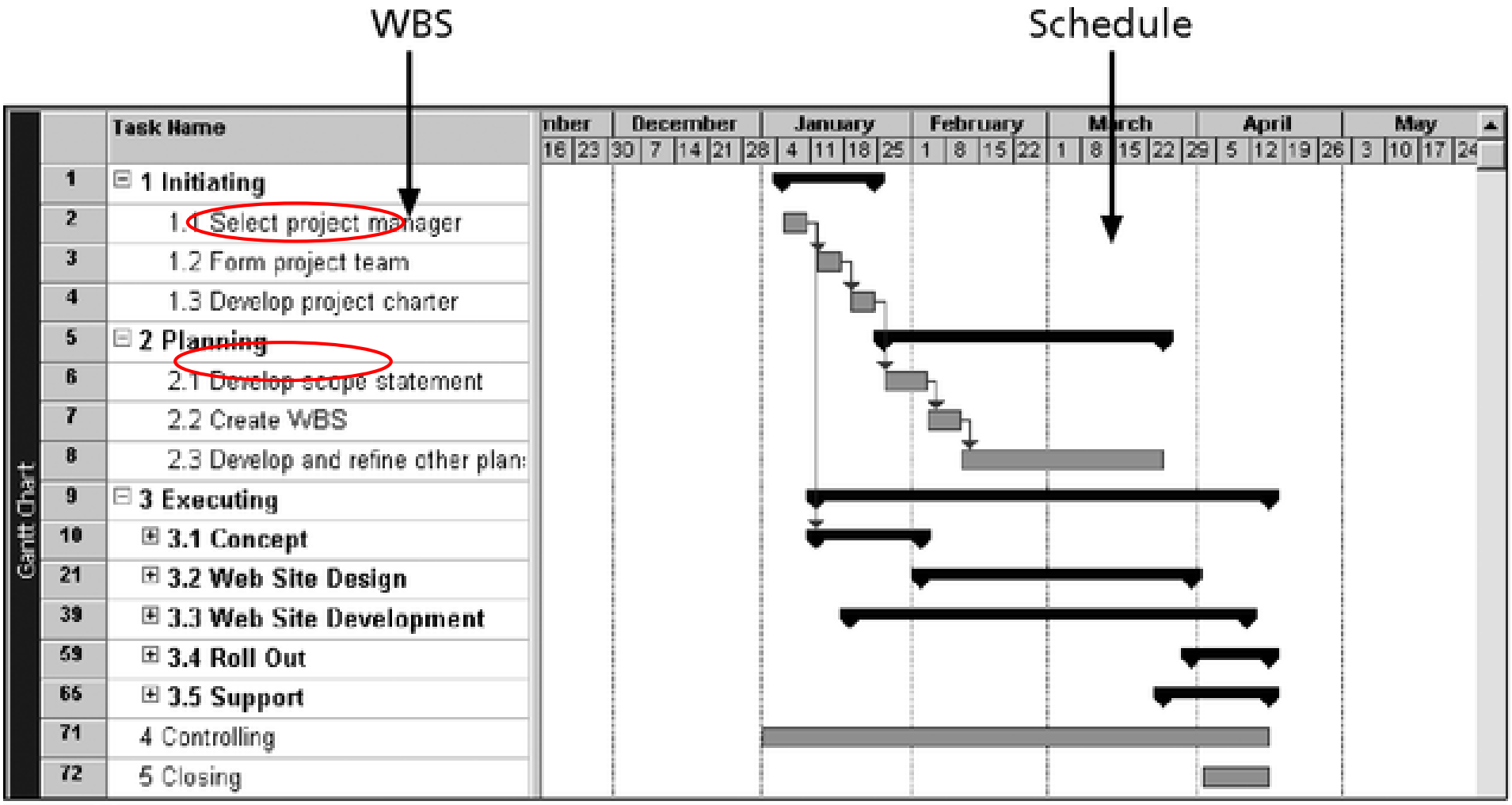
4.0 Roll Out

5.0 Support

Intranet WBS and Gantt Chart in Microsoft Project



Intranet Gantt Chart Organized by Project Management Process Groups



Approaches to Developing WBSs

- Using **guidelines**: some organizations, like the US DOD, provide guidelines for preparing WBSs.
- The **analogy** approach: review WBSs of **similar** projects and tailor to your project.
- The **top-down** approach: start with the largest items of the project and break them down.
- The **bottom-up** approach: start with the specific tasks and roll them up.
- **Mind-mapping** approach: mind mapping is a technique that uses branches radiating out from a core idea to structure thoughts and ideas.

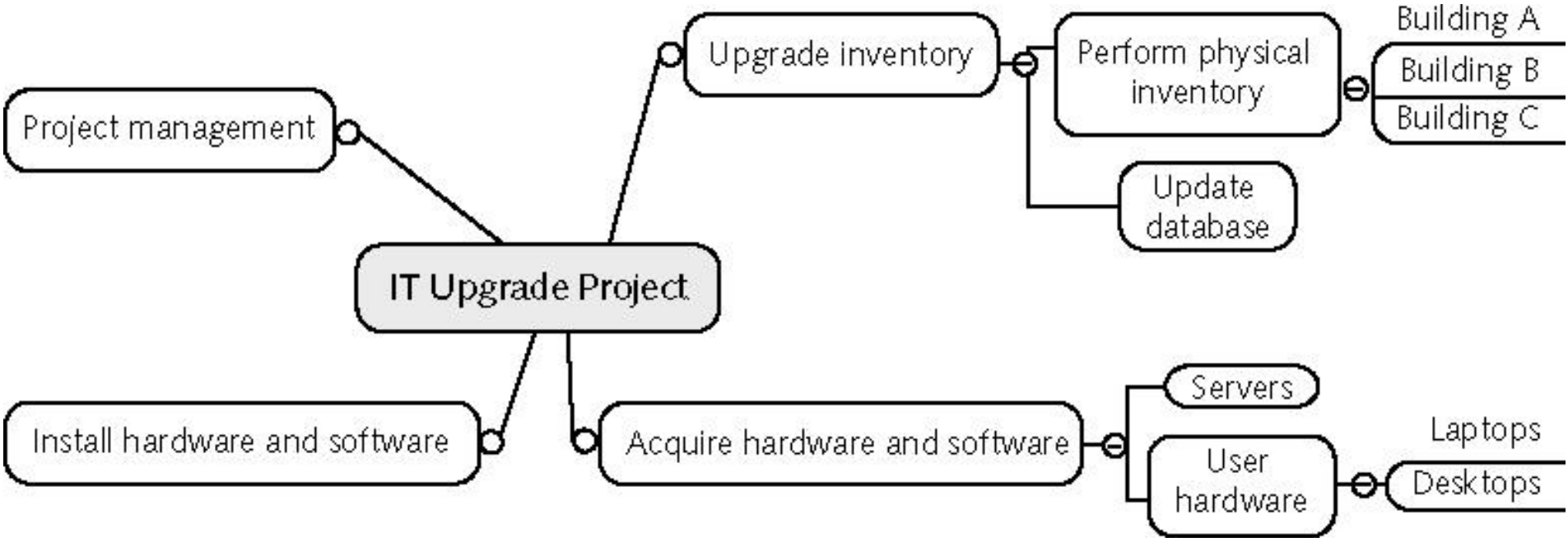
Mind Mapping

- Mind Mapping is a way of creating pictures that show ideas in the same way that they are represented in your brain.
- Your brain uses words, pictures, numbers, logic, rhythm, color and spatial awareness to build up unique pictures of information.
- The ideas are linked together in a way that makes it easy to understand and remember.
- http://www.novamind.com/mind-mapping/
- http://www.youtube.com/watch?v=MlabrWv25qQ

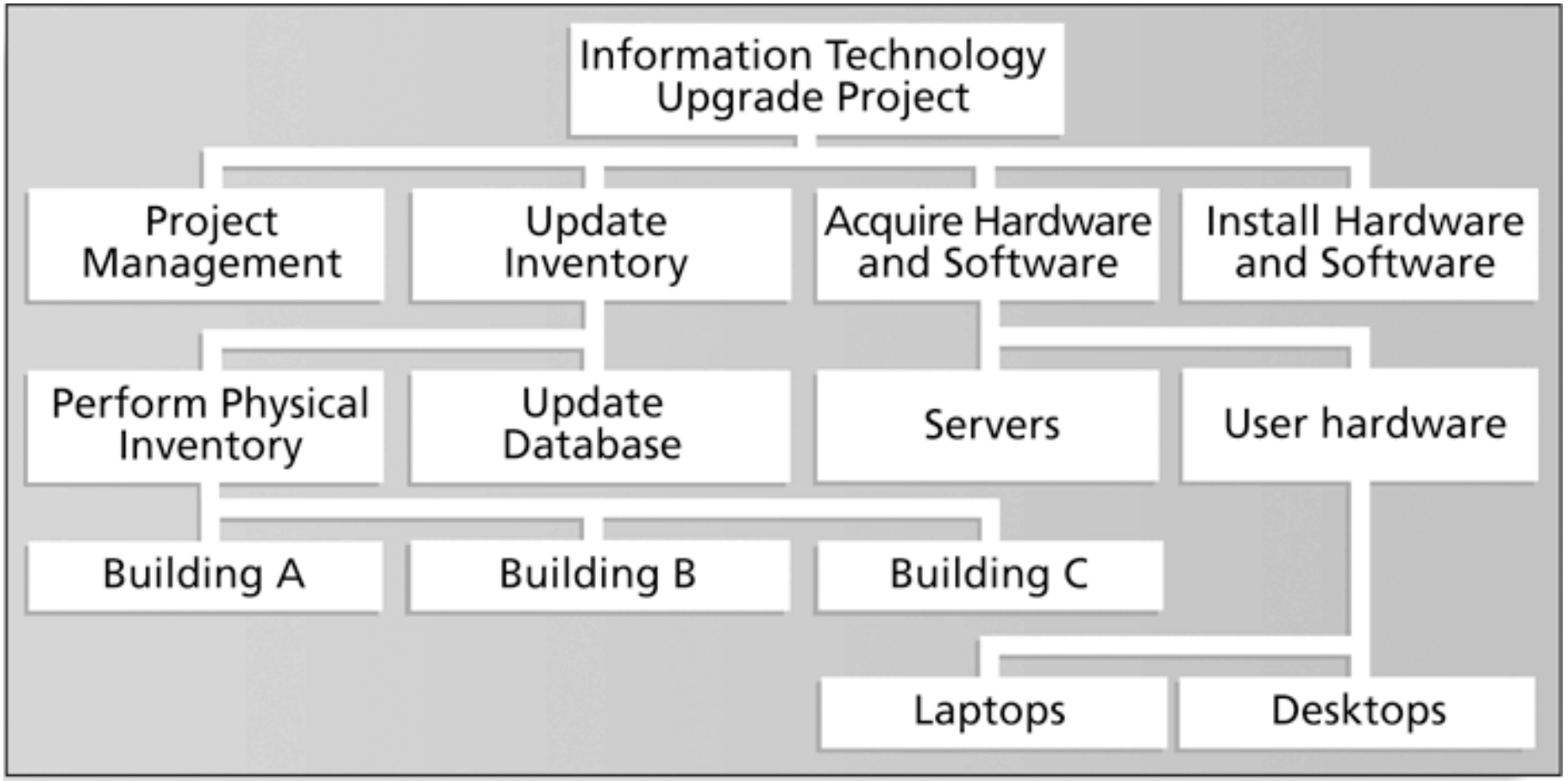
Mind Mapping

- Use just key words, or wherever possible images.
- Start from the center of the page and work out.
- Make the center a clear and strong visual image that depicts the general theme of the map.
- Create sub-centers for sub-themes.
- Put key words **on** lines. This reinforces structure of notes.
- Print rather than write in script. It makes them more readable and memorable. Lower case is more visually distinctive (and better remembered) than upper case.
- Use color to depict themes, associations and to make things stand out.
- Anything that **stands out** on the page will stand out in your mind.
- Think three-dimensionally.
- Use arrows, icons or other visual aids to show links between different elements.
- Don't get stuck in one area. If you dry up in one area go to another branch.
- Put ideas down as they occur, wherever they fit. Don't judge or hold back.
- Break boundaries. If you run out of space, don't start a new sheet; paste more paper onto the map. (Break the 8x11 mentality.)
- Be creative. Creativity aids memory.
- From http://www.peterrussell.com/MindMaps/HowTo.php

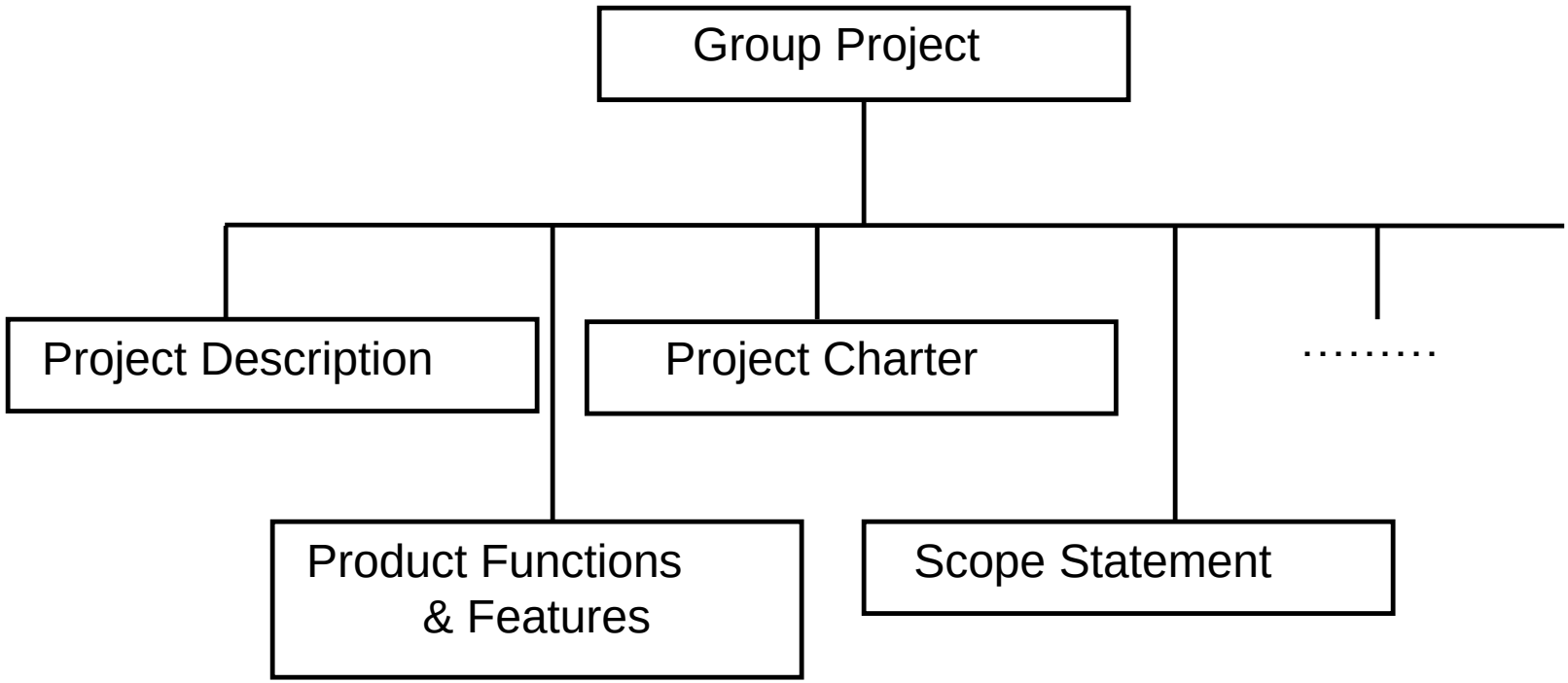
Sample Mind-Mapping Approach for Creating a WBS



Resulting WBS in Chart Form



WBS for Your Group Project ?



WBS Dictionary

- Do you know what exactly needs to be done by looking at the WBS? Eg. Check inventory?
- A ***WBS dictionary*** is a document that describes **detailed** information about each WBS item.
- Project team members should be involved in developing the WBS to ensure consistency.

The WBS Dictionary and Scope Baseline

- Many WBS tasks are vague and must be explained more so people know what to do and can estimate how long it will take and what it will cost to do the work.

- The approved project scope statement and its WBS and WBS dictionary form the **scope baseline**, which is used to measure performance in meeting project scope goals

Main Components of a WBS Dictionary

- A list of activities
- Responsible organizations
- Resource requirements
- Dependencies between activities
- Cost estimates
- Milestones

Sample WBS Dictionary

Project Title: IT Upgrade Project

WBS Item Number: 2.2

WBS Item Name: Update Database

Description:

- The IT department maintains an online database of hardware and software on the corporate Intranet. However, we need to make sure that we know exactly what hardware and software employees are currently using and if they have any unique needs before we decide what to order for the upgrade.
- This task will involve reviewing information from the current database, producing reports that list each department's employees and location, and updating the data after performing the physical inventory and receiving inputs from department managers.
- Our project sponsor will send out a notice to all department managers to communicate the importance of this project and this particular task. In addition to general hardware and software upgrades, the project sponsors will ask the department managers to provide information for any unique requirements they might have that could affect the upgrades.
- This task also includes updating the inventory data for network hardware and software. After updating the inventory database, we will send an email to each department manager to verify the information and make changes online, as needed.
- Department managers will be responsible for ensuring that their people are available and cooperative during the physical inventory.
- Completing this task is dependent on WBS Item Number 2.1, Perform Physical Inventory and must precede WBS Item Number 3.0, Acquire Hardware and Software.

Another Sample WBS Dictionary

2.1 **Inspection and Identification** (work package)

Statement of work: Inspect the building for asbestos and identify all areas where it's found. Update the plan for remove (WBS 2.2) with each location identified.

Responsible organization: Adrian in Facilities will hire and oversee a contractor to perform this work

Schedule milestones: Inspection and identification to start after contractor is identified and hired (no later than July 1.) Work to be completed no later than Sep 15.

Contract information: Two contractors have been identified as qualified and experienced in this type of work. Contract process to close no later than Jun 12.

Revisit Scope Baseline

- ***Scope baseline*** =
  - The approved project scope statement +
  - WBS +
  - WBS dictionary

- It is used to measure performance in meeting project scope goals

Story about McDonald – Scope Creep

- A project scope that is **too broad** can cause severe problems
  - In 2001, McDonald's fast-food chain initiated a project to create an intranet that would connect its headquarters with all of its restaurants (all **30,000 of them in 120 countries**) to provide **detailed operational information** (down to store level) in real time.
  - After spending $170 million on consultants and initial implementation planning, McDonald's realized that the project was too much to handle and terminated it.

Scope Verification

- It is very difficult to create a good scope statement and WBS for a project.
- It is even more difficult to verify project scope and minimize scope changes.
- **Scope verification** involves formal acceptance of the completed project scope by the stakeholders.
- Acceptance is often achieved by a customer inspection and then sign-off on key deliverables.

Additional Suggestions: Best Practices for Avoiding Scope Problems

- Keep the scope **realistic**.
- **Involve users** in project scope management.
  - Assign key users to the project team
  - Give them ownership of requirements definition
  - Use techniques such as use case modeling
  - Put requirements in **writing**

Suggestions for Improving User Input

- Develop a good project selection process and insist that sponsors are from the user organization
- Have users on the project team in important roles
- Have regular meetings with defined agendas, and have users sign off on key deliverables presented at meetings
- Deliver something to users and sponsors on a regular basis
- Don’t promise to deliver when you know you can’t
- Co-locate users with developers

Suggestions for Reducing Incomplete and Changing Requirements

- Develop and follow a requirements management process.
- Use techniques such as prototyping, use case modeling, and JAD to get more user involvement.
- Put all requirements in writing, keep them current and readily available.
- Create a requirements management database for documenting and controlling requirements (CASE tools).

Suggestions for Reducing Incomplete and Changing Requirements

- Provide adequate testing and conduct testing throughout the project life cycle.
- Review changes from a systems perspective
  - Project scope changes must include associated cost and schedule changes
  - Focus on approved scope goals and don't get side tracked
- Emphasize completion dates to help focus on what's most important
  - What should we drop in order to add something new?
- Allocate resources specifically for handling change requests/enhancements.

Using Software to Assist in Project Scope Management

- Word-processing software helps create several scope-related documents.
- Spreadsheets help to perform financial calculations and weighed scoring models, and develop charts and graphs.
- Communication software like e-mail and the Web help clarify and communicate scope information.
- Project management software helps in creating a WBS, the basis for tasks on a Gantt chart.

Possible Outputs of Project Scope Management/Analysis

- Stakeholder register
- Requirements analysis documentation
- Requirements traceability matrix (RTM)
- Scope Baseline
  - Project Scope Statement
  - WBS – Work package (lowest level)
  - WBS Dictionary