SOFTWARE PROJECT MANAGEMENT

LECTURE # 11

PROJECT SCOPE MANAGEMENT

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Course Information

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Project Scope Management

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- Project Scope Management
- Scope Creep
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- Creating the WBS
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Introduction

- **Scope** refers to *all* the work involved in creating the products of the project and the processes used to create them
- In project management, the term scope has two distinct uses: Project Scope and Product Scope.
- Project Scope "The work that needs to be accomplished to deliver a product, service, or result with the specified features and functions."
- Product Scope "The features and functions that characterize a product, service, or result."
- Notice that Project Scope is more work-oriented, (the hows,) while Product Scope is more oriented toward functional requirements. (the whats.)

Project Scope Management

- Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully

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

- If requirements are not completely defined and described and if there is no effective change control in a project, scope creep may occur.

Scope Creep [5]

- Scope creep is a term which refers to the incremental expansion of the scope of a project, which may include and introduce more requirements that may not have been a part of the initial planning of the project

- According to the PMBOK Version 4, scope creep is defined as adding features and functionality (project scope) without addressing the effects on time, costs, and resources, or without customer approval. This phenomenon can occur when the scope of a project is not properly defined, documented, or controlled. It is generally considered a negative occurrence that is to be avoided.

- **Scope creep causes cost overrun.**

- Scope creep can originate from:
  - ✓ Poor implementation of change control.
  - ✓ Incomplete gathering of requirements before the beginning of project execution.
  - ✓ Insufficient involvement of critical stakeholders (including the customer).
  - ✓ Lack of support from the executive sponsor.

Project Scope Creep Management [5]

- There are two distinct ways to separate scope creep management.

- The first is business scope creep, and the second is called technical/features (also technology) scope creep.

  - ✓ The business scope creep occurs due to external forces that may be beyond the control of project manager. An example might be the continual changes in market trends, which makes previously defined requirements now obsolete.

  - ✓ The technical scope creep can show up when the project team wants to please the customer and is not able to reject the customer's request for a change in the requirements during project execution. Gold-plating is another reason which can cause technical scope creep. In this case, the project team (or development/design team) adds additional features and functionality that are not part of original requirements in order to please the customer, if you think this will always lead to satisfied customers, you may be mistaken, the customer can easily deny the change and say "I have never requested this feature to be added!"

Project Scope Creep Management [5]

- **How to avoid Scope Creep?**

- One can avoid scope creep by managing the scope of project effectively. There are a number of ways to control or avoid scope creep:

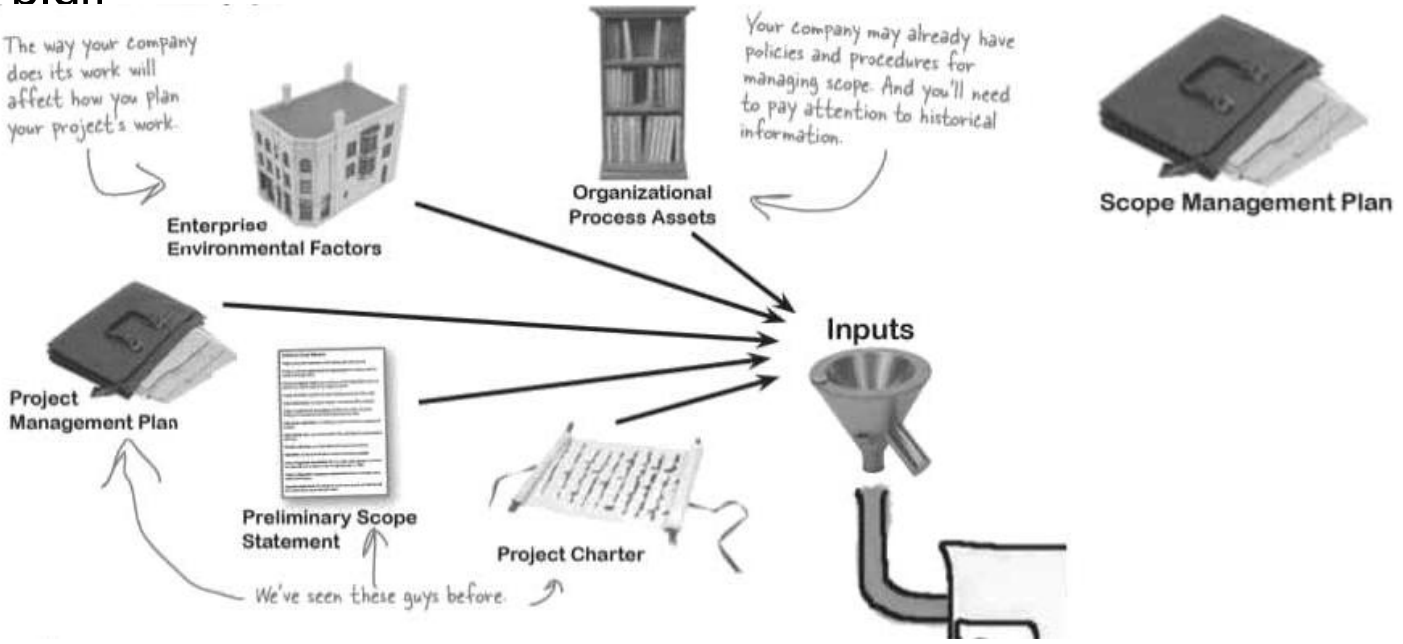
  - ✓ Involve the customer and/or the end users early in the project.
  - ✓ Thoroughly analyze and gather requirements during the initial stages of project.
  - ✓ Introduce a Change Control Board (CCB) team that would evaluate the risk of implementing the changes.
  - ✓ Make sure to involve critical stakeholders throughout the project phases
  - ✓ Avoid **gold-plating** and gain the ability to refuse changes in requirements with proper reasons/support.

Project Scope Management Processes

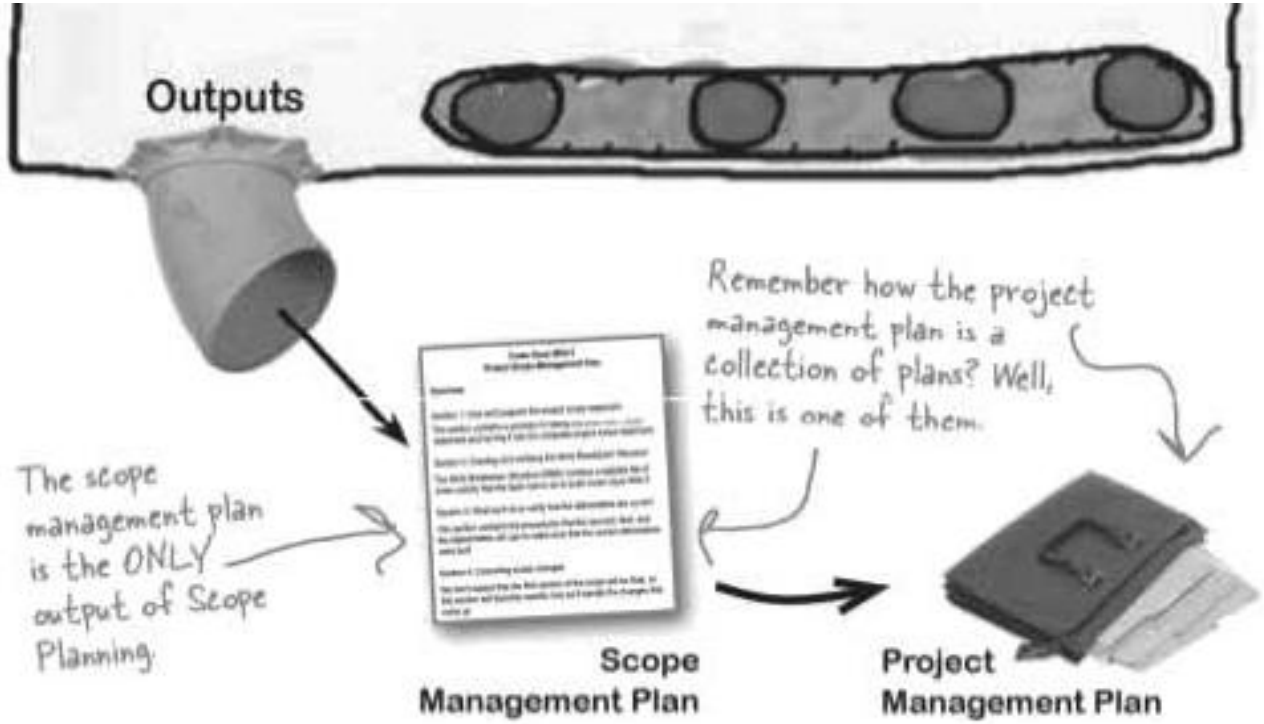
- **Scope planning:** deciding how the scope will be defined, verified, and controlled
- **Requirements Collection:** Collect requirements is the process of defining and documenting stakeholder needs to meet project and product requirements
- **Scope definition:** reviewing the project charter and preliminary scope statement and adding more information as requirements are developed and change requests are approved
- **Creating the WBS:** subdividing the major project deliverables into smaller, more manageable components
- **Scope verification:** formalizing acceptance of the project scope
- **Scope control:** controlling changes to project scope

Scope Planning and the Scope Management Plan

- The Scope Planning process is where you build the scope management plan
- The **scope management plan** is a document that includes descriptions of how the team will prepare the project scope statement, create the WBS, verify completion of the project deliverables, and control requests for changes to the project scope
- Key inputs include the project charter, preliminary scope statement, and project management plan



Scope Planning and the Scope Management Plan



Requirements Collection

- Requirements Elicitation Techniques

  - ✓ **Interviews**
  - ✓ **Questionnaires**
  - ✓ **Background Reading**
  - ✓ **Introspection**
  - ✓ **Social Analysis**
  - ✓ **Requirements Workshops**
  - ✓ **Brainstorming and Idea Reduction**
  - ✓ **Story Boarding**
  - ✓ **Role Playing**
  - ✓ **Prototyping**
  - ✓ **Requirements Reuse**

Scope Definition and the Project Scope Statement

- The preparation of a detailed project scope statement is critical to project success and builds upon the major deliverables, assumptions, and constraints that are documented during project initiation in the preliminary project scope statement

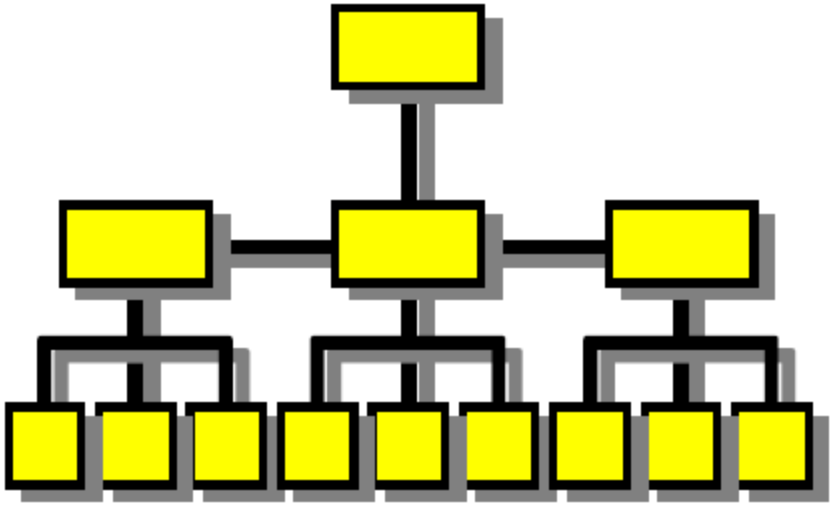
- The preliminary scope statement, project charter, organizational assets, and approved change requests provide a basis for creating the project scope statement

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

Work Breakdown Structure (WBS)

- A Work Breakdown Structure (WBS) is a fundamental project management technique for defining and organizing the total scope of a project, using a hierarchical tree structure or in TOC form

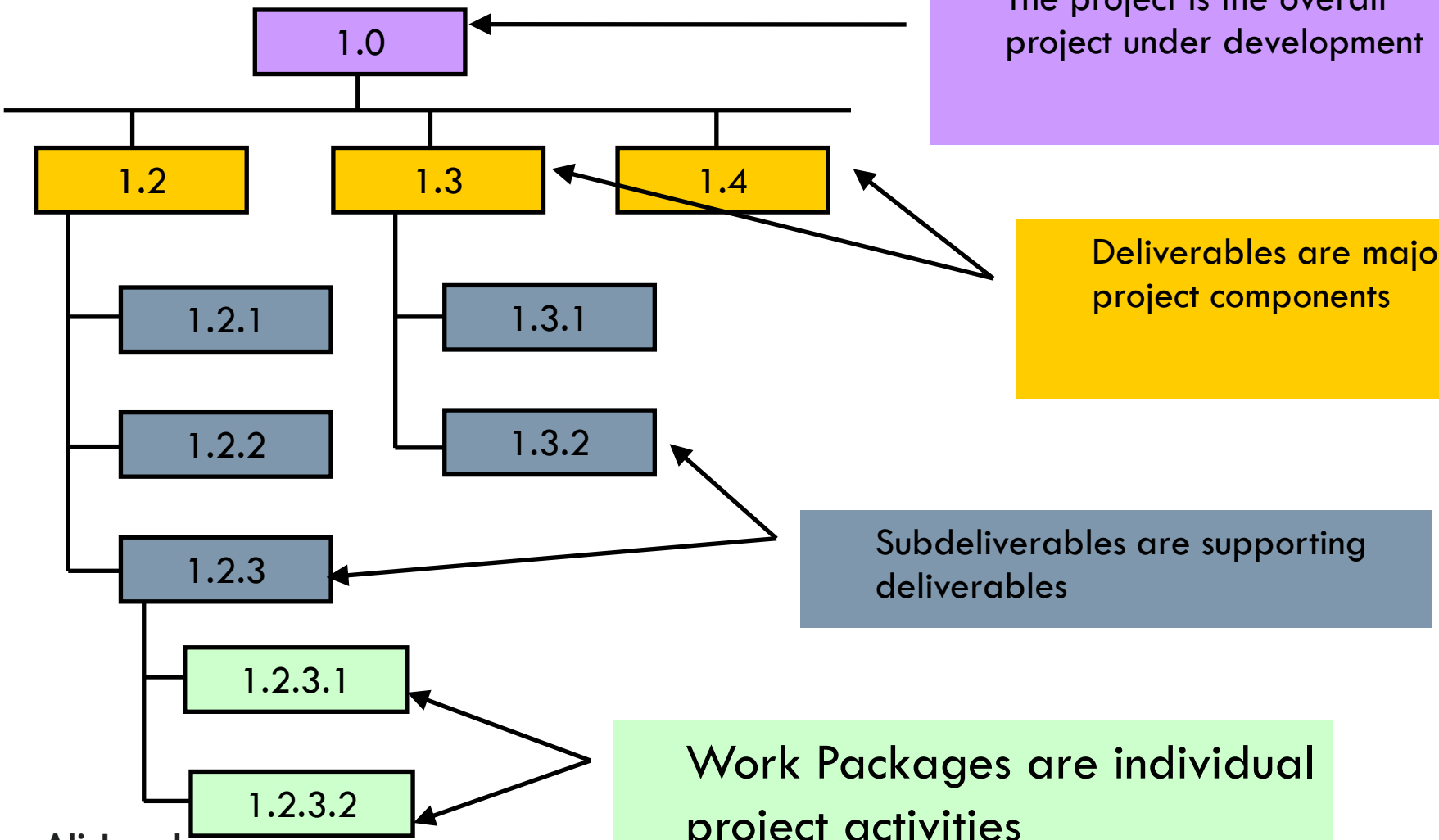
- *At each subsequent level, the children of a parent node collectively and exclusively represent 100% of the scope of their parent node.*



Creating the Work Breakdown Structure (WBS)

- A work breakdown structure is a key project deliverable that organizes the team's work into manageable sections
- 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



Types of WBSs [4]

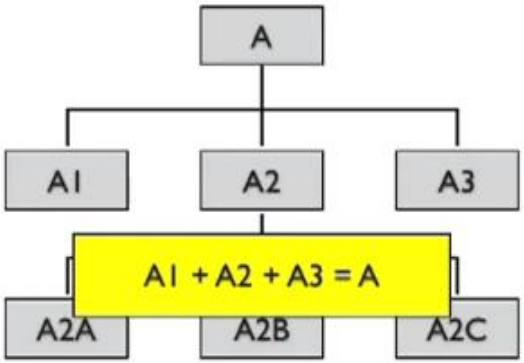
- Verb-oriented WBS: a task-oriented WBS defines the deliverable of project work in terms of the actions that must be done to produce the deliverable. The first word in a given WBS element usually is a verb, such as, design, develop, optimize, transfer, test, etc.

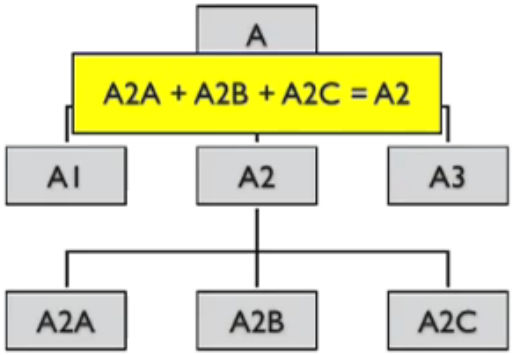
- Noun-oriented WBS: a deliverable-oriented WBS defines project work in terms of the components (physical or functional) that make up the deliverable. In this case, the first word in a given WBS element is a noun, such as, Module A, Subsystem A, Automobile Engine, Antenna, etc. Since the nouns are usually parts of a product, this WBS type is sometimes called a "Product Breakdown Structure (PBS).

- Time-phased WBS: a "time-phased" WBS is one that is used on very long projects. It breaks the project into major phases instead of tasks.

WBS Design Principles

- ***The 100% Rule [4,6]***
  - ✓ One of the most important WBS design principles is called the 100% Rule.
  - ✓ *The 100% Rule…states that the WBS includes 100% of the work defined by the project scope and captures ALL deliverables – internal, external – in terms of the work to be completed, including project management.*
  - ✓ *The 100% rule is one of the most important principles guiding the development, decomposition and evaluation of the WBS.*
  - ✓ *The rule applies at all levels within the hierarchy: the sum of the work at the "child" level must equal 100% of the work represented by the "parent" and the WBS should not include any work that falls outside the actual scope of the project, that is, it cannot include more than 100% of the work*





WBS Design Principles

- ***Planned Outcomes, Not Planned Actions***

  - ✓ If the WBS designer attempts to capture any action-oriented details in the WBS, he/she will likely include either too many actions or too few actions.
  - ✓ Too many actions will exceed 100% of the parent's scope and too few will fall short of 100% of the parent's scope.
  - ✓ The best way to adhere to the 100% Rule is to define WBS elements in terms of outcomes or results.
  - ✓ For new product development projects, the most common technique to assure an *outcome-oriented WBS is to use a product breakdown structure (PBS)*.

WBS Design Principles

- The Four Elements in Each WBS Element

  - ✓ Each WBS element, when completed should contain the following four items:

    1. The scope of work, including any "deliverables."
    2. The beginning and end dates for the scope of work.
    3. The budget for the scope of work.
    4. The name of the person responsible for the scope of work.

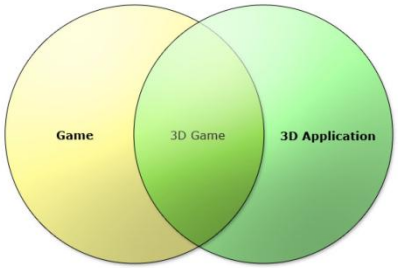
  - ✓ By using a WBS in this manner the project manager can approach a complex project and decompose it into manageable, assignable portions. There is minimal confusion among project members when this technique is used.

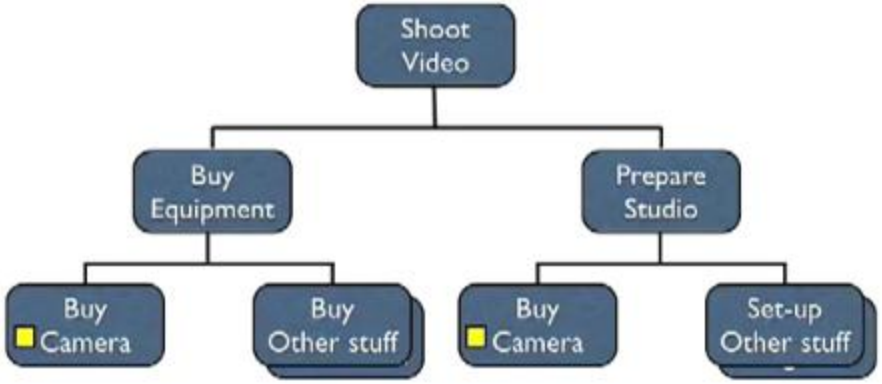
WBS Design Principles

- ***Mutually-exclusive Elements [4,6]***

  - ✓ In addition to the 100% Rule, it is important that there is no overlap in scope definition between two elements of a WBS.
  - ✓ Violating this principle leads to

    - Ambiguity
    - Confusion
    - Duplication of work
    - Miscommunications



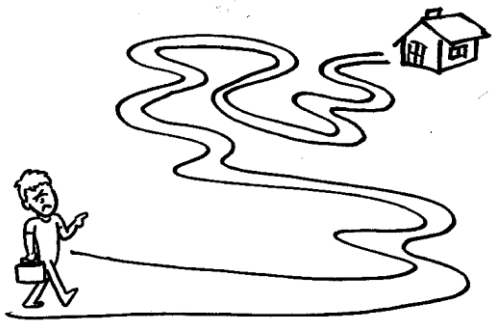


WBS Design Principles

- ***How Far Down?***

  - ✓ The WBS is decomposed down to the work package level. A work package is the lowest level in the WBS, and is the point at which the cost and schedule for the work can be reliably estimated.
  - ✓ A question to be answered in the design of any WBS is when to stop dividing work into smaller elements.

    - If a WBS terminal elements are defined too broadly, it may not be possible to track project performance effectively.
    - If a WBS terminal elements are too granular, it may be inefficient to keep track of so many terminal elements, especially if the planned work is in the distant future
    - A satisfactory tradeoff may be found in the concept of *progressive elaboration which allows WBS details to be progressively refined before work begins on an element of work.*
    - *One form of progressive elaboration in large projects is called* ***rolling wave*** *planning which establishes a regular time schedule for progressive elaboration.*



WBS Design Principles

- ***The 40-Hour Rule of Decomposition***

  - ✓ Another rule-of-thumb for determining how far down a WBS should be decomposed is called the "40 Hour Rule."
  - ✓ Generally, when a project has been decomposed down to an element that has about 40 hours of allocated direct labor, there is no need to decompose further.
  - ✓ The 40 Hour Rule is based on a 40-hour work week. Because of this, most WBS diagrams are not symmetrical. Some legs may go down to Level-4 while others may go down to Level-5.

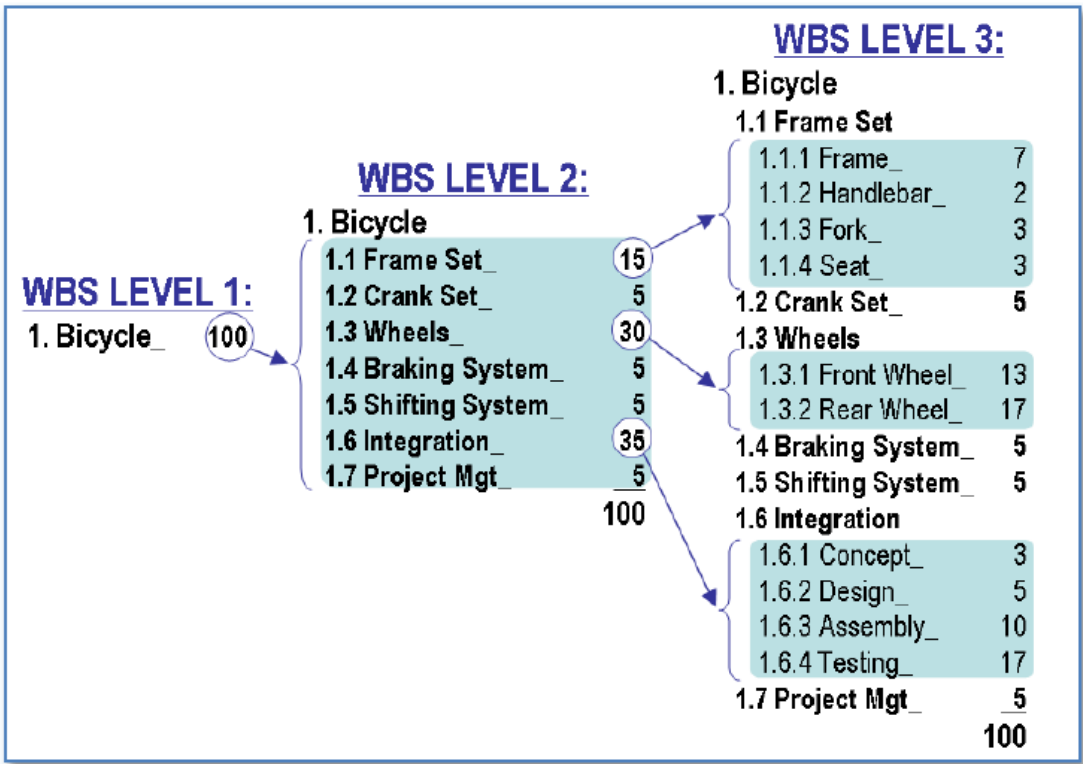
WBS Design Principles

- ***The 4% Rule of Decomposition***

  - ✓ Gary Heerkens suggests a 4% Rule for decomposing a WBS. With this rule a WBS is adequately decomposed when the lowest element is about 4% of the total project.
  - ✓ For a 26-week schedule, the lowest element should be about one week. For a $2.6M project, the lowest level should be about $104K.

WBS Design Principles

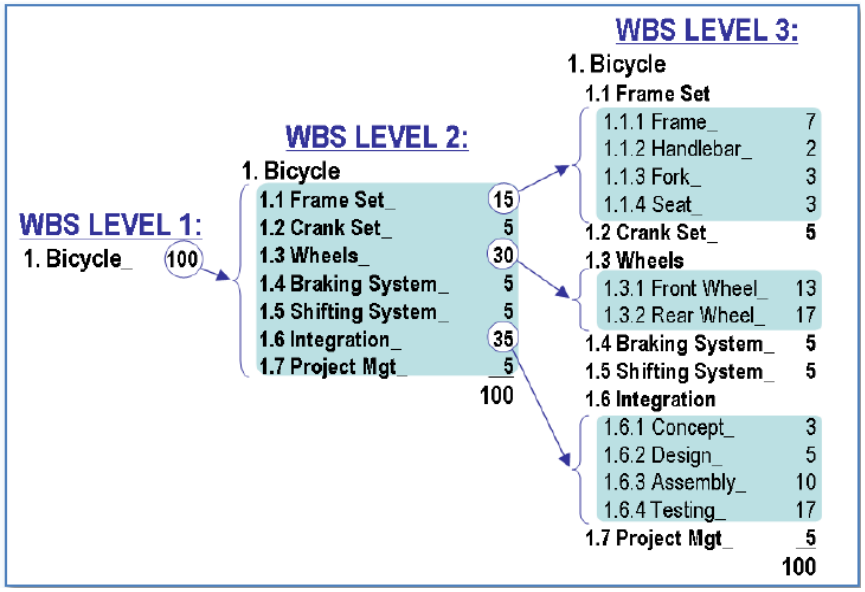
- ***WBS Identification Numbering***
  - ✓ It is common for WBS elements to be numbered sequentially to reveal the hierarchical structure.
  - ✓ For example *1.3.2 Rear Wheel identifies this item as a Level 3 WBS element, since there are three numbers separated decimal point.*

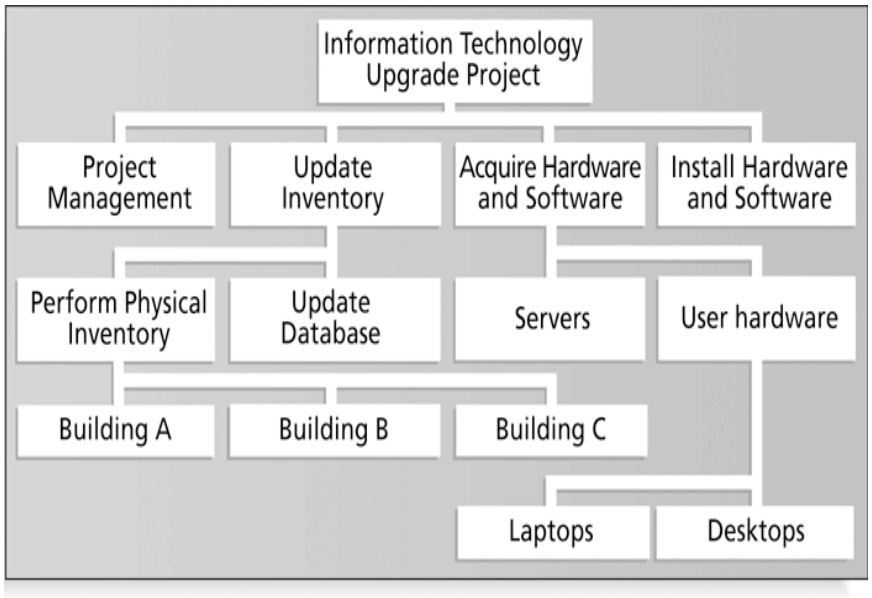


Ways to Draw WBSs

- The two most common ways to communicate a WBS is either a hierarchy diagram or a table of contents (TOC) layout.

- In some cases both formats are used to gain understanding and define the work to be performed.





Approaches to Developing WBSs

- Using guidelines: some organizations, like the DOD, provide guidelines for preparing WBSs

  - ✓ The **analogy approach**: review WBSs of similar projects and tailor to your project

  - ✓ The **top-down approach**:

    - The **top-down approach**: start with the largest items of the project and break them down

    - This approach involves reviewing the major project deliverables which have been subdivided into smaller, more manageable components until the deliverables are defined in sufficient detail to support future project phases

Approaches to Developing WBSs

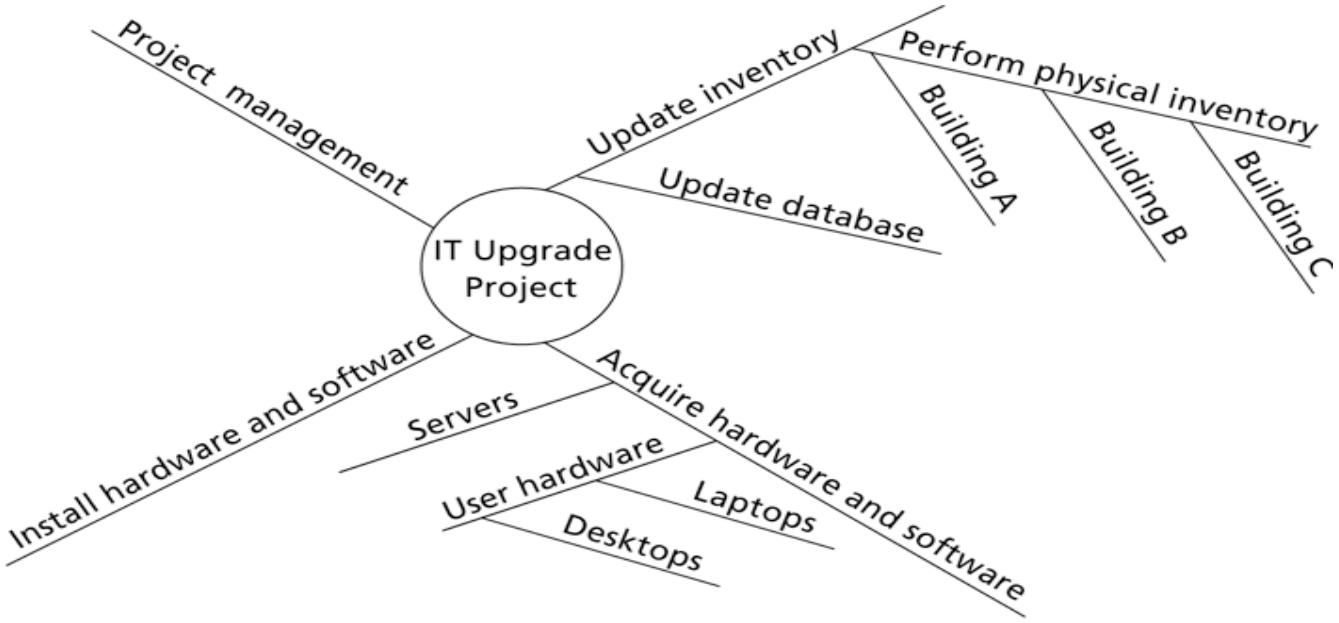
- The **bottom-up approach:**
  - The **bottom-up approach:** start with the specific tasks and roll them up
  - The bottom up approach uses a planning group to brainstorm the work elements that are needed to deliver the major deliverables of the project.
  - A planner then groups the output from the brainstorming sessions into phases, activities and tasks.
  - The bottom up approach involves using a small group of people (5-6) who have some subject matter expertise to plan the project.

Sample Mind-Mapping Approach for Creating a WBS

- Mind-mapping approach

  - **mind mapping** is a technique that uses branches radiating out from a core idea to structure thoughts and ideas

  - Write tasks in a non-linear, branching format and then create the WBS structure.

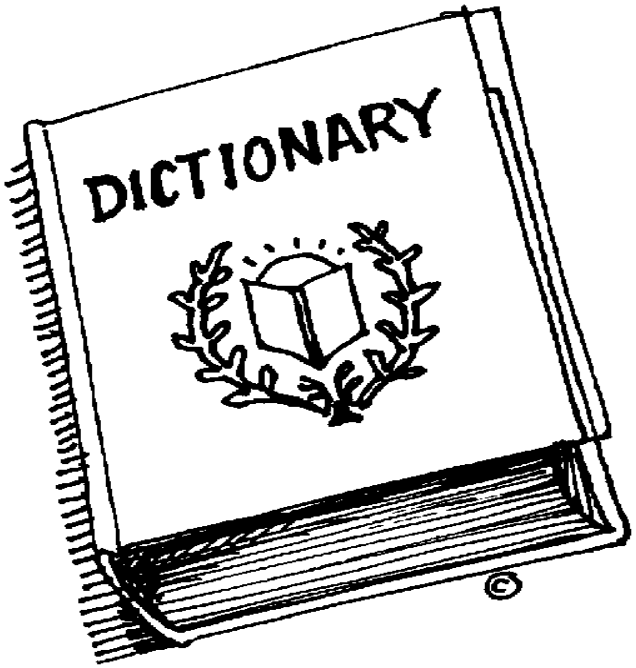


The WBS Dictionary and Scope Baseline

- 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

- A **WBS dictionary** is a document that describes detailed information about each WBS item

- 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



Advice for Creating a WBS and WBS Dictionary

- A unit of work should appear at only one place in the WBS
- The work content of a WBS item is the sum of the WBS items below it
- Project team members should be involved in developing the WBS to ensure consistency
- Each WBS item must be documented in a WBS dictionary to ensure accurate understanding of the scope of work included and not included in that item
- 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

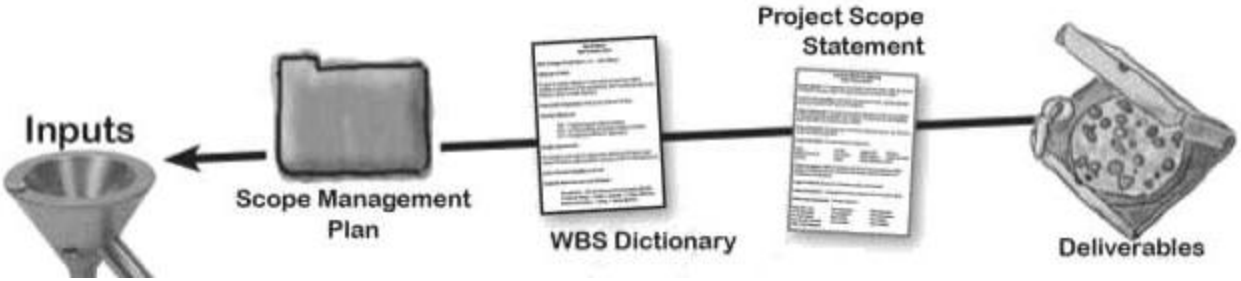
WBS Dictionary Entry

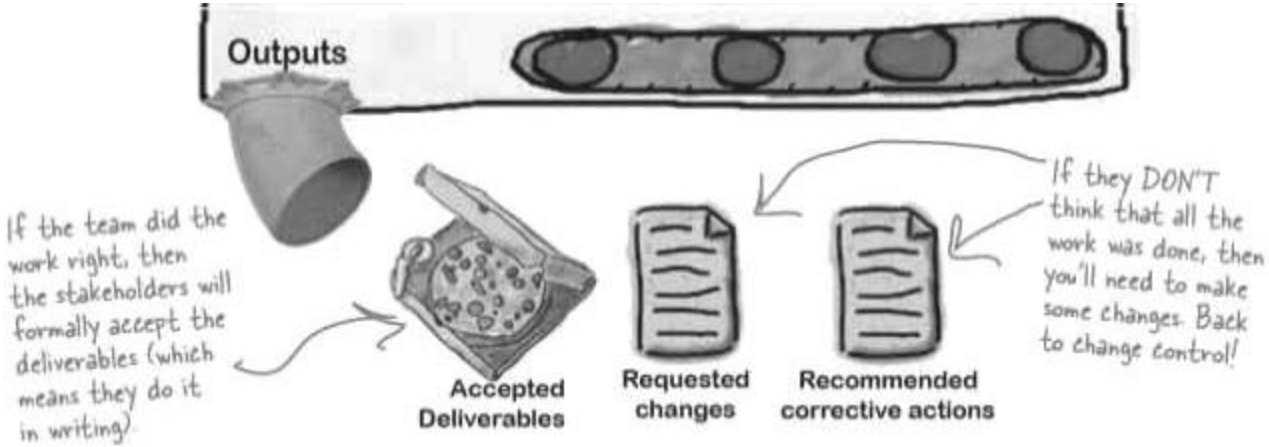
Project Title: Just-In-Time Training Project
WBS Item Number: 3.1.1.1.2
WBS Item Name: Administer survey
Description: The purpose of the survey for the supplier management training is to determine the learning objectives for the executive, introductory, and advanced supplier management courses (see WBS item 3.1.1.1.1 for additional information on the survey itself). The survey will be administered online using the standard corporate survey software. After the project steering committee approves the survey, the IT department will send it to all employees of grade level 52 or higher in the purchasing, accounting, engineering, information technology, sales, marketing, manufacturing, and human resource departments. The project champion, Mike Sundby, VP of Human Resources, will write an introductory paragraph for the survey. Department heads will mention the importance of responding to this survey in their department meetings and will send an e-mail to all affected employees to encourage their inputs. If the response rate is less than 30% one week after the survey is sent out, additional work may be required.

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
- Tools and Techniques
  - ✓ Inspection includes activities such as measuring, examining, and verifying to determine whether work and deliverables meet requirements and product acceptance criteria.

Scope Verification

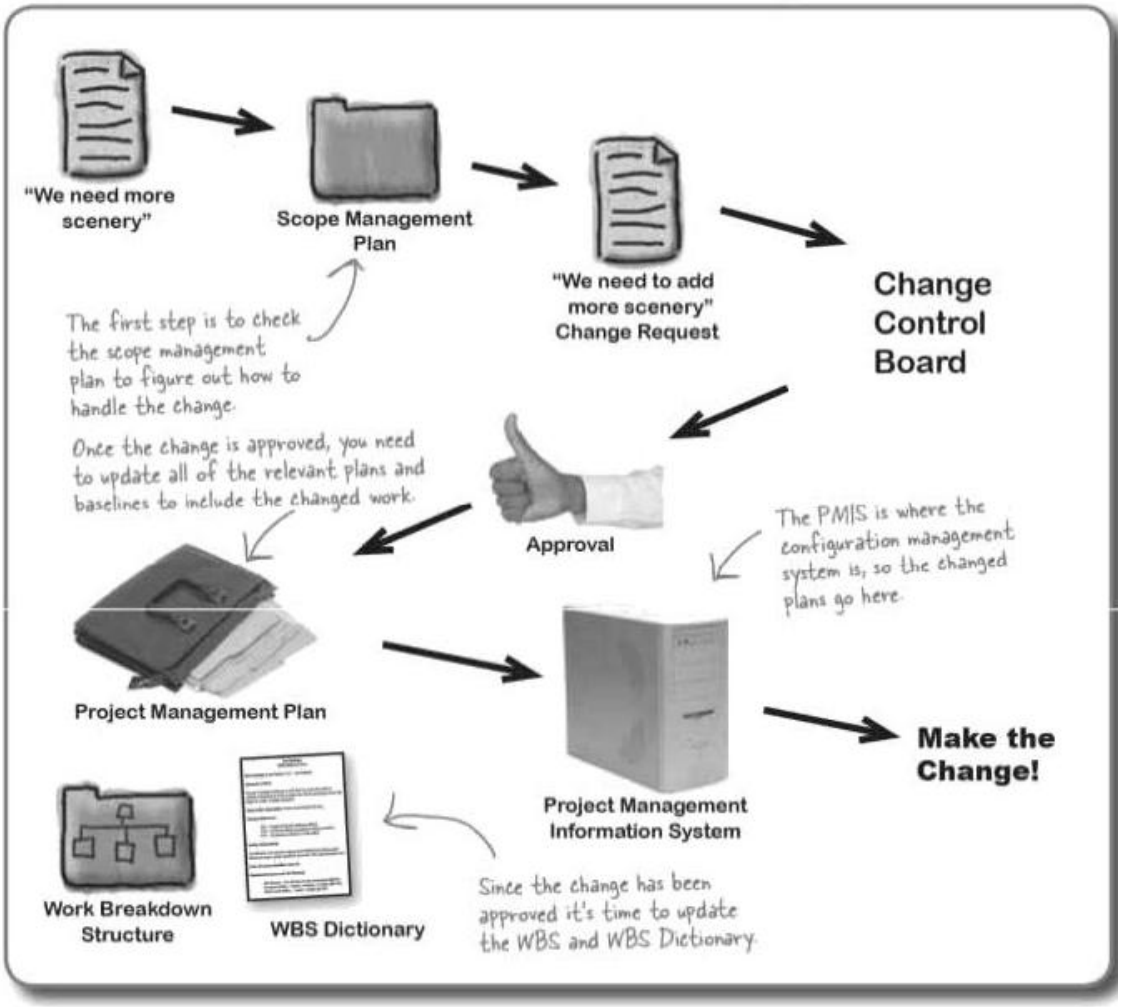




Scope Control

- **Scope control** involves controlling changes to the project scope
- Goals of scope control are to:
  - ✓ Influence the factors that cause scope changes
  - ✓ Assure changes are processed according to procedures developed as part of integrated change control
  - ✓ Manage changes when they occur
- **Variance Analysis**
  - ✓ Project Performance measurements are used to access the magnitude of variation from the original scope baseline
  - ✓ Important aspects of project scope control include determining the cause and degree of variance relative to the scope baseline and deciding whether preventive or corrective action is required

Scope Control



Best Practices for Avoiding Scope Problems

1. Keep the scope realistic: Don't make projects so large that they can't be completed; break large projects down into a series of smaller ones

2. Involve users in project scope management: Assign key users to the project team and give them ownership of requirements definition and scope verification

3. Use off-the-shelf hardware and software whenever possible: Many IT people enjoy using the latest and greatest technology, but business needs, not technology trends, must take priority

4. Follow good project management processes

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
- MatchWare MindView is a professional Mind Mapping software that allows you to optimize brainstorming sessions and present ideas visually. [9]

References

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6. http://www.youtube.com/watch?v=5DyjLFVMVso

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