SEN319 Software Project Management (Fall 2023)

Project Scope Management

Asst.Prof.Dr. Hasan ÇİFCİ

Agenda

- **PM Knowledge Areas**

- **Project Constraints**

- **Project Scope Management**

- **Project Scope Management Processes**

- **Plan Scope Management**

- **Collect Requirements**

- **Define Scope**

- **Create Work Breakdown Structure (WBS)**

- **Validate Scope**

- **Control Scope**

PM Knowledge Areas

Integration	• Coordinate activities across all project management areas and process groups
Scope	• Ensure the project work includes all elements required to complete the work
Schedule	• Ensure the project work is completed in a timely way
Cost	• Plan, estimate, manage and control project finances
Quality	• Ensure the project delivers a quality output that is fit for purpose
Resource	• Secure, manage and monitor use of resources throughout the project
Communications	• Ensure communications on the project are planned and carried out appropriately
Risk	• Identify, assess and manage risk
Procurement	• Carry out purchasing and contracting as required
Stakeholder	• Identify and engage stakeholders throughout the project

Project Constraints

Main Constraints:
- **Scope**
- **Time**
- **Cost**

Additional Constraints:
- **Quality**
- **Resources**
- **Risk**

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.

- Managing the project scope is primarily concerned with defining and controlling what is and is not included in the project.

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

- Project Scope Management ensures that the project team and stakeholders have the same understanding of what products the project will produce and what processes the project team will use to produce them.

Project Scope Management Processes

Project Scope Management				
Initiating	**Planning**	**Executing**	**Monitoring & Controlling**	**Closing**
	1. Plan Scope Management 2. Collect Requirements 3. Define Scope 4. Create WBS		5. Validate Scope 6. Control Scope	

Project Scope Management Processes

1. *Planning scope management* involves determining how the project's scope and requirements will be managed.

2. *Collecting requirements* involves defining and documenting the features and functions of the products as well as the processes used for creating them.

3. *Defining scope* involves reviewing the scope management plan, project charter, requirements documents, and organizational process assets to create a scope statement, adding more information as requirements are developed and change requests are approved.

4. *Creating the WBS* involves subdividing the major project deliverables into smaller, more manageable components.

5. *Validating scope* involves formalizing acceptance of the project deliverables. Key project stakeholders inspect and then formally accept the deliverables during this process. If the deliverables are not acceptable, the customer or sponsor usually requests changes.

6. *Controlling scope* involves controlling changes to project scope throughout the life of the project—a challenge on many IT projects.

Plan Scope Management

- **The first step in project scope management is planning how the scope will be managed throughout the life of the project.**

- **The key benefit of this process is that it provides guidance and direction on how scope will be managed throughout the project.**

- **This process is performed once or at predefined points in the project.**

- **After reviewing the project management plan, project charter, enterprise environmental factors, and organizational process assets, the project team uses expert judgment, data analysis, and meetings to develop two important outputs:**

  - **Scope management plan and**

  - **Requirements management plan.**

Plan Scope Management

Inputs	Tools & Techniques	Outputs

.1 Project charter
.2 Project management plan
  • Quality management plan
  • Project life cycle description
  • Development approach
.3 Enterprise environmental factors
.4 Organizational process assets
	.1 Expert judgment
	.2 Data analysis
	  • Alternatives analysis
	.3 Meetings
		.1 Scope management plan
		.2 Requirements management plan

Plan Scope Management

Product

An artifact or a quantifiable that can either be an end item in itself or a component item.

Project

A temporary endeavor undertaken to create a unique product, service, or result.

Product Scope

The features and functions that characterize a product, service, or result.

Project Scope

The work performed to deliver a product, service, or result with the specified features and functions. The term "project scope" is sometimes viewed as including product scope.

Plan Scope Management

Output-1: Scope Management Plan

Scope Management Plan

Describes how the scope will be defined, developed, monitored, controlled, and validated.

- **How to prepare a detailed project scope statement.**
- **How to create a Work Breakdown Structure (WBS) (Suggestions, samples, and resources for creating a WBS).**
- **How to maintain and approve the WBS.**
- **How to obtain formal acceptance of the completed project deliverables.**
- **How to control requests for changes to the project scope.**

Plan Scope Management

Output-2: Requirements Management Plan

Requirements Management Plan

Describes how project and product requirements will be analyzed, documented, and managed.

Requirement: A condition or capability that is necessary to be present in a product, service, or result to satisfy a business need.

- How requirements activities will be planned, tracked, and reported.

- Configuration management activities.

- Requirements prioritization process.

- Metrics that will be used and the rationale for using them.

- Traceability structure that reflects the requirement attributes captured on the traceability matrix.

Collect Requirements

- **The second step in project scope management is often the most difficult: Collecting requirements.**

Relative cost to fix bugs, based on time of detection

Ref: NIST
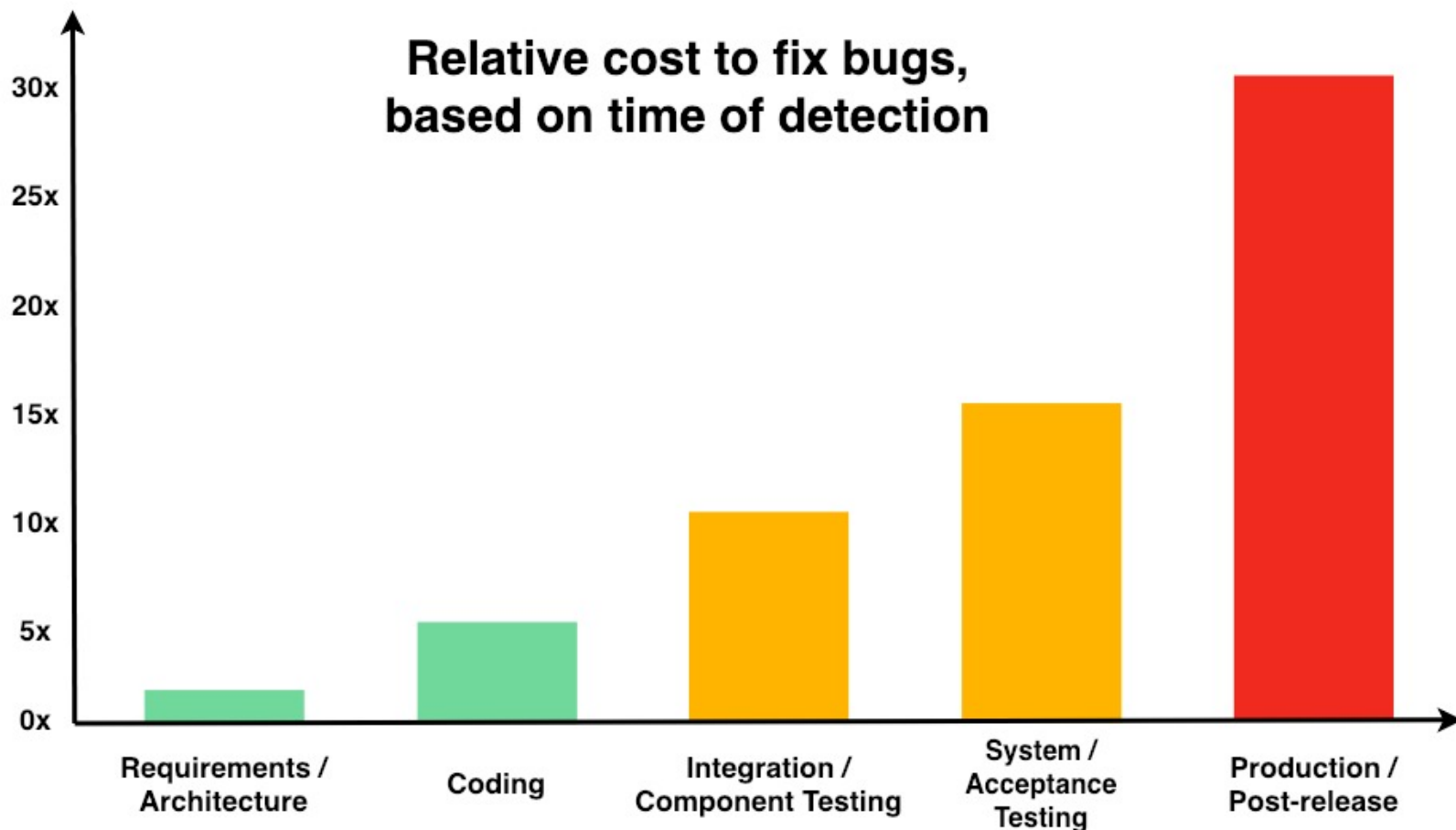
Collect Requirements

- **Collect Requirements is the process of determining, documenting, and managing stakeholder needs and requirements to meet objectives.**
- **The key benefit of this process is that it provides the basis for defining the product scope and project scope.**
- **This process is performed once or at predefined points in the project.**

Collect Requirements

Inputs

.1 Project charter
.2 Project management plan
  - Scope management plan
  - Requirements management plan
  - Stakeholder engagement plan
.3 Project documents
  - Assumption log
  - Lessons learned register
  - Stakeholder register
.4 Business documents
  - Business case
.5 Agreements
.6 Enterprise environmental factors
.7 Organizational process assets

Tools & Techniques

.1 Expert judgment
.2 Data gathering
  - Brainstorming
  - Interviews
  - Focus groups
  - Questionnaires and surveys
  - Benchmarking
.3 Data analysis
  - Document analysis
.4 Decision making
  - Voting
  - Multicriteria decision analysis
.5 Data representation
  - Affinity diagrams
  - Mind mapping
.6 Interpersonal and team skills
  - Nominal group technique
  - Observation/conversation
  - Facilitation
.7 Context diagram
.8 Prototypes

Outputs

.1 Requirements documentation
.2 Requirements traceability matrix

Collect Requirements

Tools & Techniques for Collecting Requirements

- **Expert Judgment**
- **Data Gathering**
  - Brainstorming
  - Interviews
  - Focus Groups
  - Questionnaires and surveys
  - Benchmarking
- **Data Analysis**
- **Decision Making**
  - Voting
  - Autocratic decision making
  - Multi-criteria decision analysis

- **Data Representation**
  - Affinity diagrams
  - Mind mapping
- **Interpersonal and Team Skills**
  - Nominal group technique
  - Observation/conversation
  - Facilitation

Collect Requirements

Tools & Techniques for Collecting Requirements

- **Benchmarking:**

  - Involves comparing actual or planned products, processes, and practices to those of <u>comparable organizations</u> to identify best practices, generate ideas for improvement, and provide a basis for measuring performance.

  - The organizations compared during benchmarking can be internal or external.
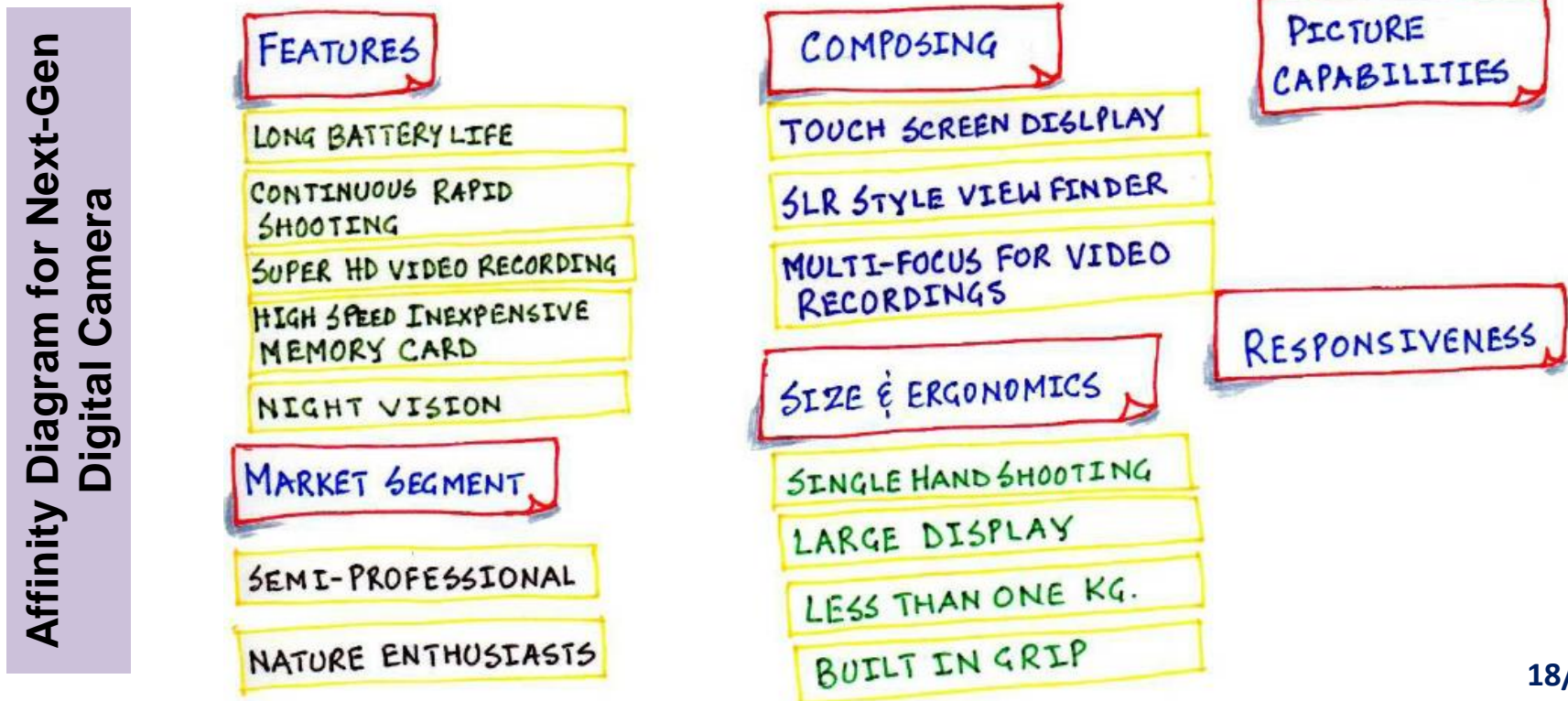
Collect Requirements

Tools & Techniques for Collecting Requirements

- **Affinity Diagrams:**
 - **Allow large numbers of ideas to be classified into groups for review and analysis.**

Affinity Diagram for Next-Gen Digital Camera

FEATURES

LONG BATTERY LIFE

CONTINUOUS RAPID SHOOTING

SUPER HD VIDEO RECORDING

HIGH SPEED INEXPENSIVE MEMORY CARD

NIGHT VISION

MARKET SEGMENT

SEMI-PROFESSIONAL

NATURE ENTHUSIASTS

COMPOSING

TOUCH SCREEN DISLPLAY

SLR STYLE VIEW FINDER

MULTI-FOCUS FOR VIDEO RECORDINGS

SIZE & ERGONOMICS

SINGLE HAND SHOOTING

LARGE DISPLAY

LESS THAN ONE KG.

BUILT IN GRIP

PICTURE CAPABILITIES

RESPONSIVENESS

Collect Requirements

Tools & Techniques for Collecting Requirements

- **Mind mapping:**

  - **Consolidates ideas created through individual brainstorming sessions into a single map to reflect commonality and differences in understanding and to generate new ideas.**
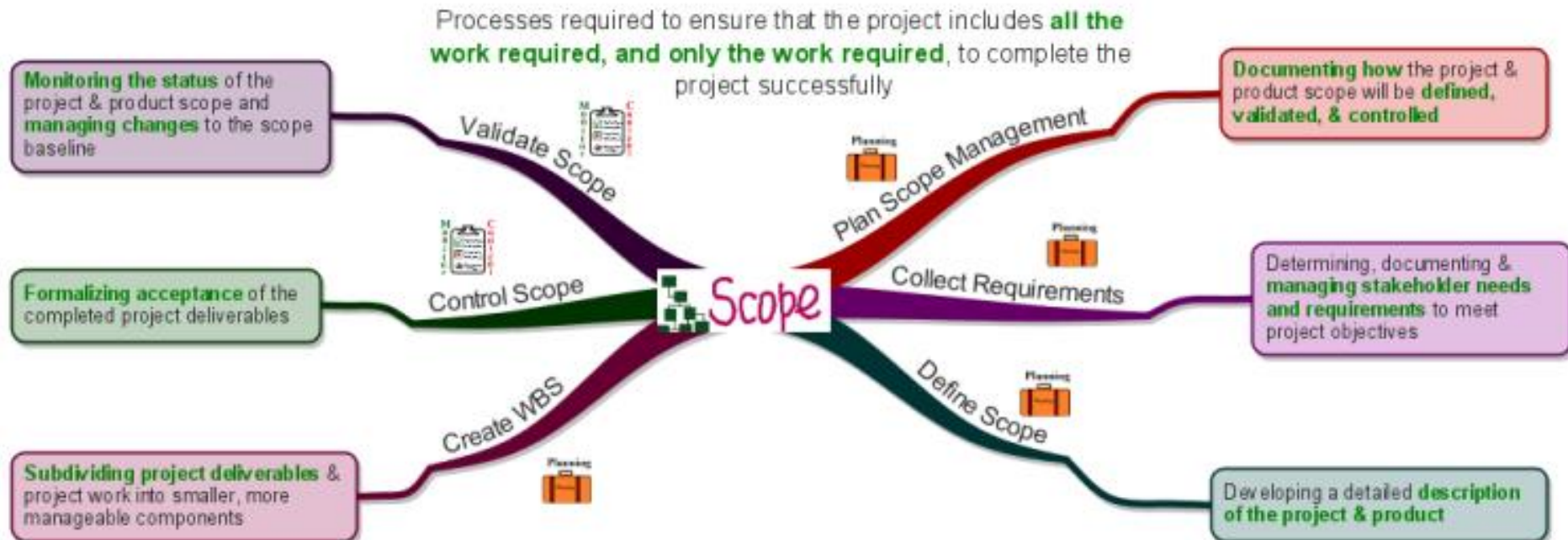
Collect Requirements

Tools & Techniques for Collecting Requirements

- **Nominal Group Technique:**
  - Enhances brainstorming with a voting process used to rank the most useful ideas for further brainstorming or for prioritization.

1. A question or problem is posed to the group. Each person silently generates and writes down their ideas.
2. The moderator writes down the ideas on a flip chart until all ideas are recorded.
3. Each recorded idea is discussed until all group members have a clear understanding.
4. Individuals vote privately to prioritize the ideas. Voting may take place in many rounds to reduce and focus in on ideas. After each round, the votes are tallied and the highest scoring ideas are selected.

Collect Requirements

Tools & Techniques for Collecting Requirements
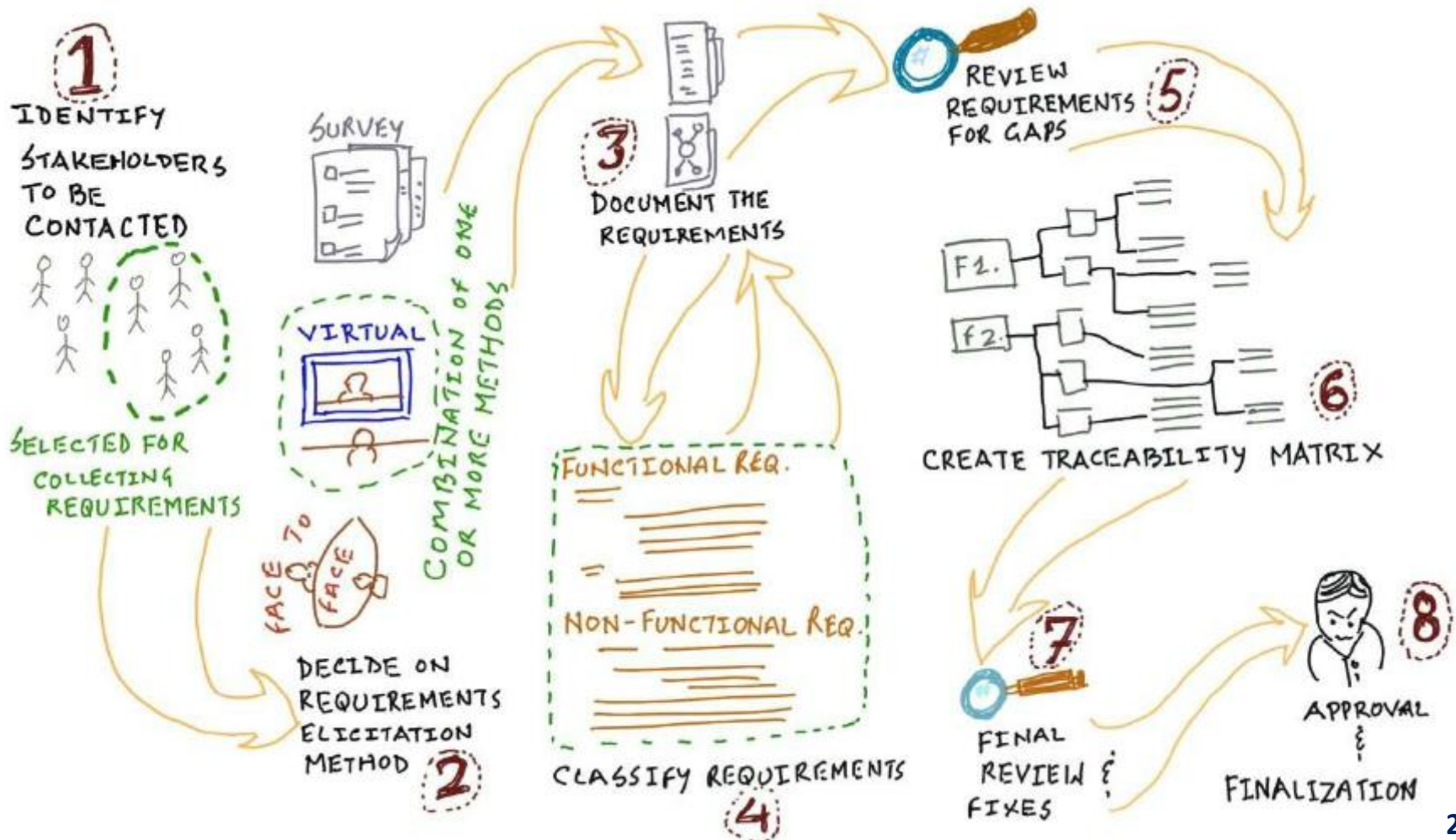
- **Context Diagrams:**

  - **Visually depict the product scope by showing a business system (process, equipment, computer system, etc.), and how people and other systems (actors) interact with it.**

  - **Show inputs to the business system, the actor(s) providing the input, the outputs from the business system, and the actor(s) receiving the output.**
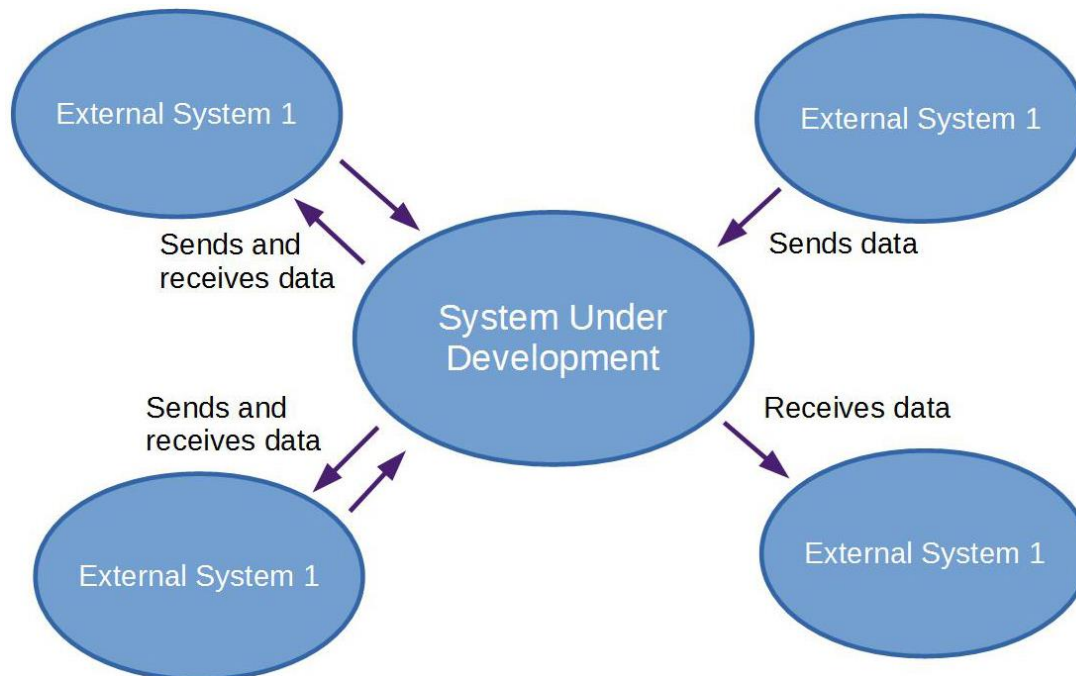
Collect Requirements

Collect Requirements

Output-1: Requirements Documentation

- Requirements documentation describes how individual requirements meet the business need for the project.

- Requirements may start out at a high level and become progressively more detailed as more information about the requirements is known.

- Before being baselined, requirements need to be unambiguous (measurable and testable), traceable, complete, consistent, and acceptable to key stakeholders.

- The format of the requirements document may range from a simple document listing all the requirements categorized by stakeholder and priority, to more elaborate forms containing an executive summary, detailed descriptions, and attachments.

Collect Requirements

Output-1: Requirements Documentation

Requirements Classification

1. **Business requirements**: Higher-level needs of the organization as a whole, such as the business issues or opportunities, and reasons why a project has been undertaken.

2. **Stakeholder requirements**: Needs of a stakeholders.

3. **Solution requirements**: Features, functions, and characteristics of the product, service, or result that will meet the business and stakeholder requirements. Two groups:

   a. **Functional requirements**: Describe the behaviors of the product. Examples include actions, processes, data, and interactions that the product should execute.

   b. **Nonfunctional requirements**: Supplement functional requirements and describe the environmental conditions or qualities required for the product to be effective. Examples include: reliability, security, performance, safety, level of service, supportability, retention/purge, etc.

Collect Requirements

Output-1: Requirements Documentation

Requirements Classification

4. **Transition and readiness requirements**: Describe temporary capabilities, such as data conversion and training requirements, needed to transition from the current as-is state to the desired future state.

5. **Project requirements**: Describe the actions, processes, or other conditions the project needs to meet. Examples include milestone dates, contractual obligations, constraints, etc.

6. **Quality requirements**: Capture any condition or criteria needed to validate the successful completion of a project deliverable or fulfillment of other project requirements. Examples include tests, certifications, validations, etc.

Collect Requirements

- The requirements traceability matrix (RTM) is a grid (table) that links product requirements from their origin to the deliverables that satisfy them.

- The implementation of a RTM helps ensure that each requirement adds business value by linking it to the business and project objectives.

- It provides a means to track requirements throughout the project life cycle, helping to ensure that requirements approved in the requirements documentation are delivered at the end of the project.

- Finally, it provides a structure for managing changes to the product scope.

Collect Requirements

Output-2: Requirements Traceability Matrix (RTM)

Requirements Traceability Matrix

Project Name:	
Cost Center:	
Project Description:	

ID	Associate ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	WBS Deliverables	Product Design	Product Development	Test Cases
001	1.0							
	1.1							
	1.2							
	1.2.1							
002	2.0							
	2.1							
	2.1.1							
003	3.0							
	3.1							
	3.2							

Sample RTM Contents may vary

Define Scope

- **The next step in project scope management is to provide a detailed definition of the work required for the project.**

- **Since all the requirements identified in Collect Requirements may not be included in the project, the Define Scope process selects the final project requirements from the requirements documentation developed during the Collect Requirements process. It then develops a detailed description of the project and product, service, or result.**

- **Good scope definition is very important to project success because it helps improve the accuracy of time, cost, and resource estimates, it defines a baseline for performance measurement and project control, and it aids in communicating clear work responsibilities.**

- **The key benefit of this process is that it describes the product, service, or result boundaries and acceptance criteria.**

Define Scope

Inputs

.1 Project charter
.2 Project management plan
   • Scope management plan
.3 Project documents
   • Assumption log
   • Requirements documentation
   • Risk register
.4 Enterprise environmental factors
.5 Organizational process assets

Tools & Techniques

.1 Expert judgment
.2 Data analysis
   • Alternatives analysis
.3 Decision making
   • Multicriteria decision analysis
.4 Interpersonal and team skills
   • Facilitation
.5 Product analysis

Outputs

.1 Project scope statement
.2 Project documents updates
   • Assumption log
   • Requirements documentation
   • Requirements traceability matrix
   • Stakeholder register

Define Scope

- **The project scope statement is the description of the project scope, major deliverables, assumptions, and constraints.**

  - **Product scope description: Progressively elaborates the characteristics of the product, service, or result described in the project charter and requirements documentation.**

  - **Deliverables: Any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project. Deliverables also include ancillary results, such as project management reports and documentation. These deliverables may be described at a summary level or in great detail.**

  - **Acceptance criteria: A set of conditions that is required to be met before deliverables are accepted.**

  - **Project exclusions: Identifies what is excluded from the project. Explicitly stating what is out of scope for the project helps manage stakeholders' expectations and can reduce scope creep.**

Define Scope

Project Charter's Scope vs. Scope

Project Charter

Project purpose

Measurable project objectives and related success criteria

High-level requirements

High-level project description, boundaries, and key deliverables

Overall project risk

Summary milestone schedule

Preapproved financial resources

Key stakeholder list

Project approval requirements (i.e., what constitutes success, who decides the project is successful, who signs off on the project)

Project exit criteria (i.e., what are the conditions to be met in order to close or to cancel the project or phase

Assigned project manager, responsibility, and authority level

Name and authority of the sponsor or other person(s) authorizing the project charter

Project Scope Statement

Project scope description (progressively elaborated)

Project deliverables

Acceptance criteria

Project exclusions

- **Although the project charter and the project scope statement are sometimes perceived as containing a certain degree of redundancy, they are different in the level of detail contained in each.**

- **Project charter contains high level information, while the project scope statement contains a detailed description of the scope components. These components are progressively elaborated throughout the project.**

Create Work Breakdown Structure (WBS)

- **After collecting requirements and defining scope, the next step in project scope management is to create a work breakdown structure (WBS).**

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

- **Create WBS is the process of subdividing project deliverables and project work into smaller, more manageable components.**

- **The key benefit of this process is that it provides a framework of what has to be delivered.**

- **This process is performed once or at predefined points in the project.**

Create Work Breakdown Structure (WBS)

- **Because most projects involve many people and many different deliverables, it is important to organize and divide the work into logical parts based on how the work will be performed.**

- **The WBS is a foundation document in project management because it provides the basis for planning and managing project schedules, costs, resources, and changes.**

- **Because the WBS defines the total scope of the project, some project management experts believe that work should not be done on a project if it is not included in the WBS. Therefore, it is crucial to develop a complete WBS.**

Create Work Breakdown Structure (WBS)

Inputs

.1 Project management plan
- Scope management plan

.2 Project documents
- Project scope statement
- Requirements documentation

.3 Enterprise environmental factors

.4 Organizational process assets

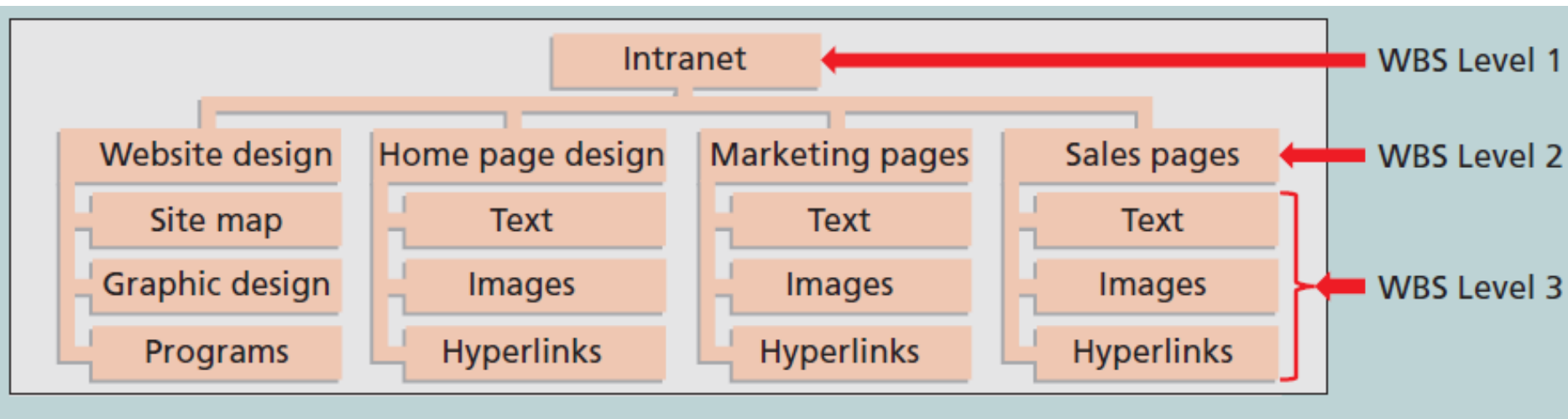## Tools & Techniques

.1 Expert judgment
.2 Decomposition

Outputs

.1 Scope baseline
.2 Project documents updates
- Assumption log
- Requirements documentation

Create Work Breakdown Structure (WBS)

- **The planned work is contained within the lowest level of WBS components, which are called work packages.**

- **A work package can be used to group the activities where work is scheduled and estimated, monitored, and controlled.**

- **In the context of the WBS, work refers to work products or deliverables that are the result of activity and not to the activity itself.**

Sample intranet WBS organized by product

Intranet				WBS Level 1
Website design	**Home page design**	**Marketing pages**	**Sales pages**	WBS Level 2
Site map	Text	Text	Text	
Graphic design	Images	Images	Images	WBS Level 3
Programs	Hyperlinks	Hyperlinks	Hyperlinks	

Create Work Breakdown Structure (WBS)

Sample WBS Organized by Phase
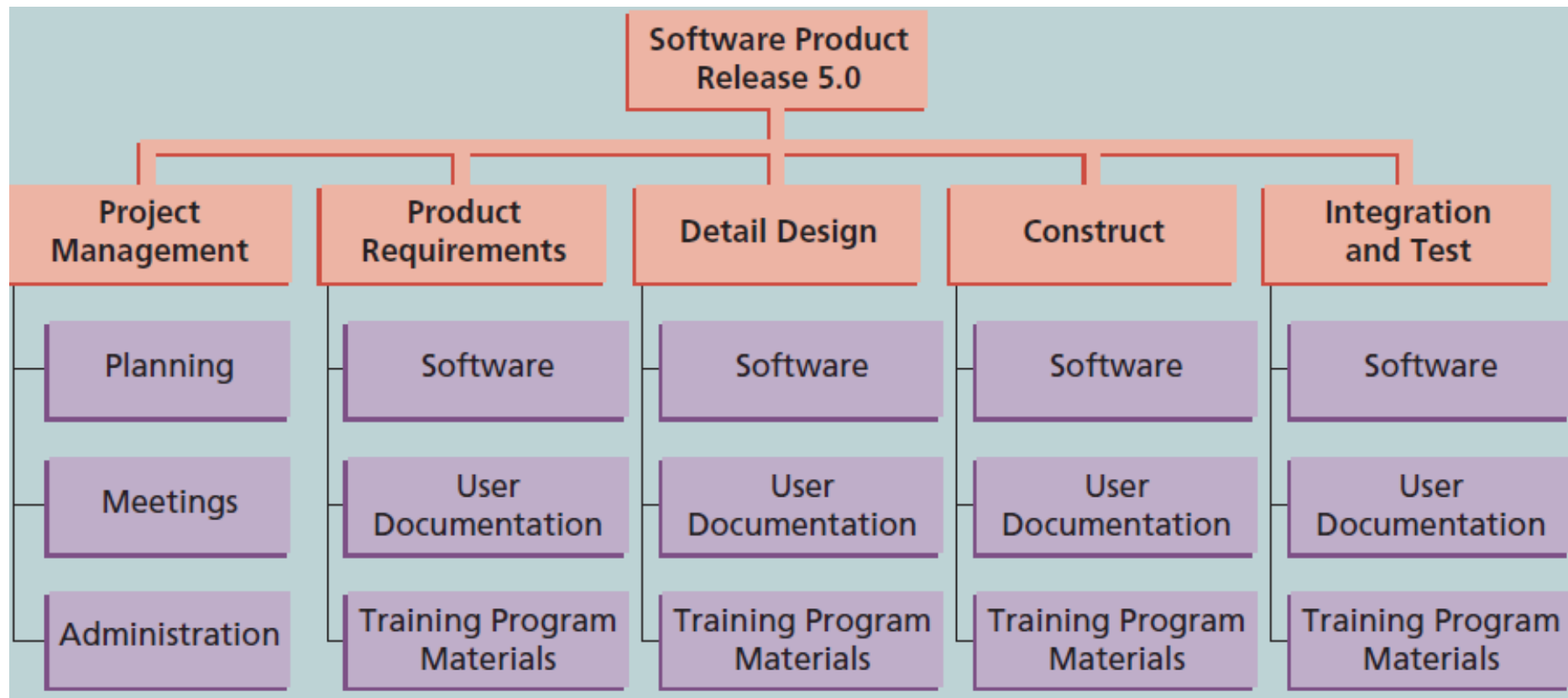
Create Work Breakdown Structure (WBS)

Tabular form of WBS

1.0   Software Product Release 5.0
    1.1   Project Management
        1.1.1   Planning
        1.1.2   Meetings
        1.1.3   Administration
    1.2   Product Requirements
        1.2.1   Software
        1.2.2   User Documentation
        1.2.3   Training Program Materials
    1.3   Detail Design
        1.3.1   Software
        1.3.2   User Documentation
        1.3.3   Training Program Materials
    1.4   Construct
        1.4.1   Software
        1.4.2   User Documentation
        1.4.3   Training Program Materials
    1.5   Integration and Test
        1.5.1   Software
        1.5.2   User Documentation
        1.5.3   Training Program Materials

Create Work Breakdown Structure (WBS)

Sample WBS with Major Deliverables
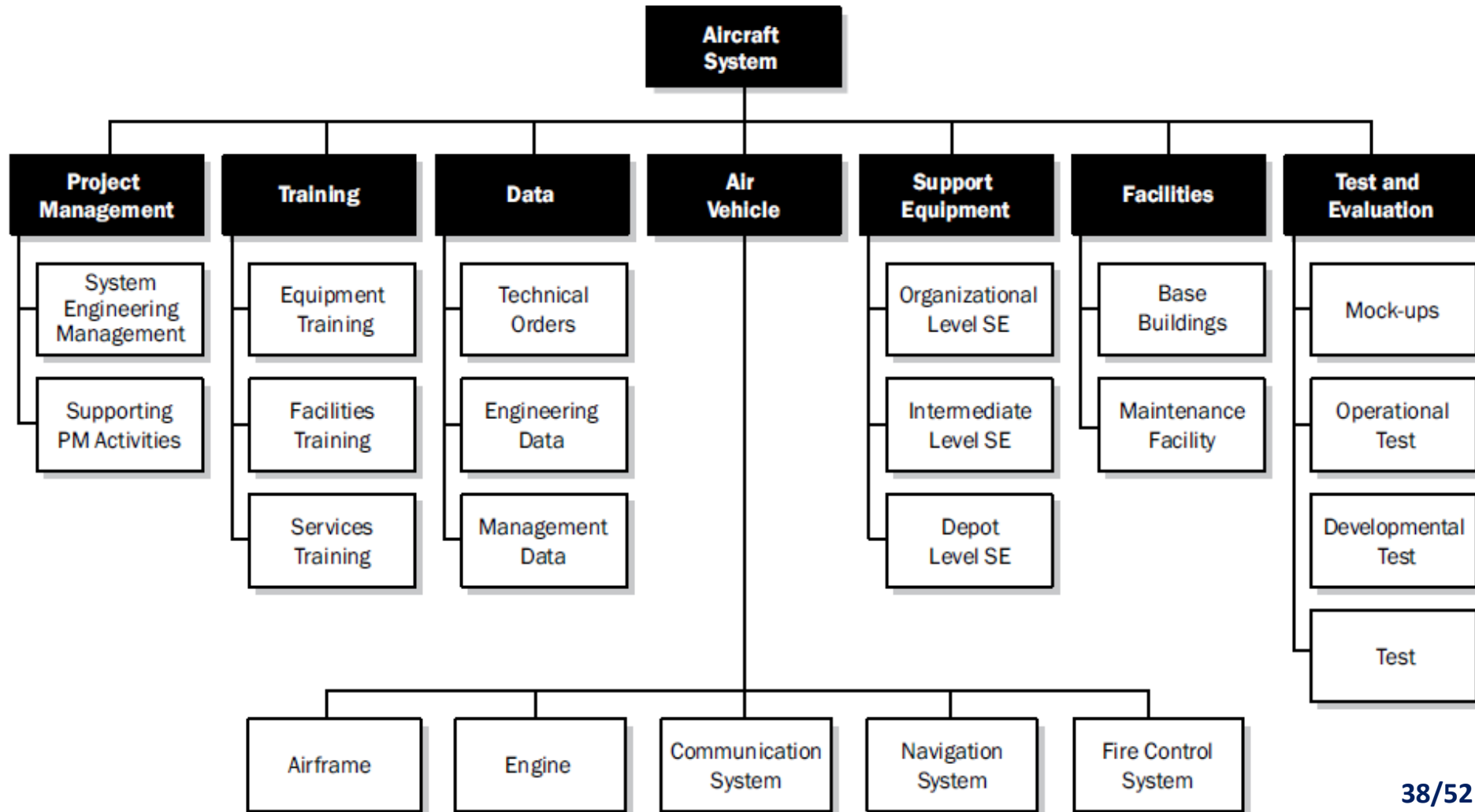
Create Work Breakdown Structure (WBS)

- **It is very difficult to create a good WBS.**

- **To create a good WBS, you must understand the project and its scope and incorporate the needs and knowledge of the stakeholders.**

- **The project manager and the project team must decide as a group how to organize the work and how to include many levels in the WBS.**

- **Approaches to Developing WBSs:**

  - **Using guidelines**

  - **The analogy approach**

  - **The top-down approach**

  - **The bottom-up approach**

  - **The mind-mapping approach**

Create Work Breakdown Structure (WBS)

Using Guidelines

- **If guidelines exist for developing a WBS, it is very important to follow them.**

- **Having a prescribed WBS helps contractors to prepare their cost proposals and helps customers to evaluate them.**

- **Many organizations provide guidelines and templates for developing WBSs, as well as examples of WBSs from past projects.**

- **Microsoft Project 2016 comes with several templates, and more are available on Microsoft's website and other sites.**

- **PMI developed a WBS Practice Standard to provide guidance for developing and applying the WBS to project management.**

  - **The Practice Standard includes sample WBSs for a wide variety of projects in various industries, including projects for Web design, telecom, service industry outsourcing, and software implementation.**

Create Work Breakdown Structure (WBS)

The Analogy Approach

- **In the analogy approach, you use a similar project'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.**

- **Project 2016 and many other software tools include sample files to assist users in creating a WBS and Gantt chart.**

- **Viewing examples of WBSs from similar projects allows you to understand different ways to create a WBS.**

Create Work Breakdown Structure (WBS)

## The Top-down and Bottom-up Approaches

- To use the top-down approach, start with the largest items of the project and break them into subordinate items. This process involves refining the work into greater and greater levels of detail. After finishing the process, all resources should be assigned at the work package level.

- In the bottom-up approach, team members first identify as many specific tasks related to the project as possible. They then aggregate the specific tasks and organize them into summary activities, or higher levels in the WBS.

Create Work Breakdown Structure (WBS)

The Mind-mapping Approach

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

- **Instead of writing down tasks in a list or immediately trying to create a structure for tasks, mind mapping allows people to write and even draw pictures of ideas in a nonlinear format.**
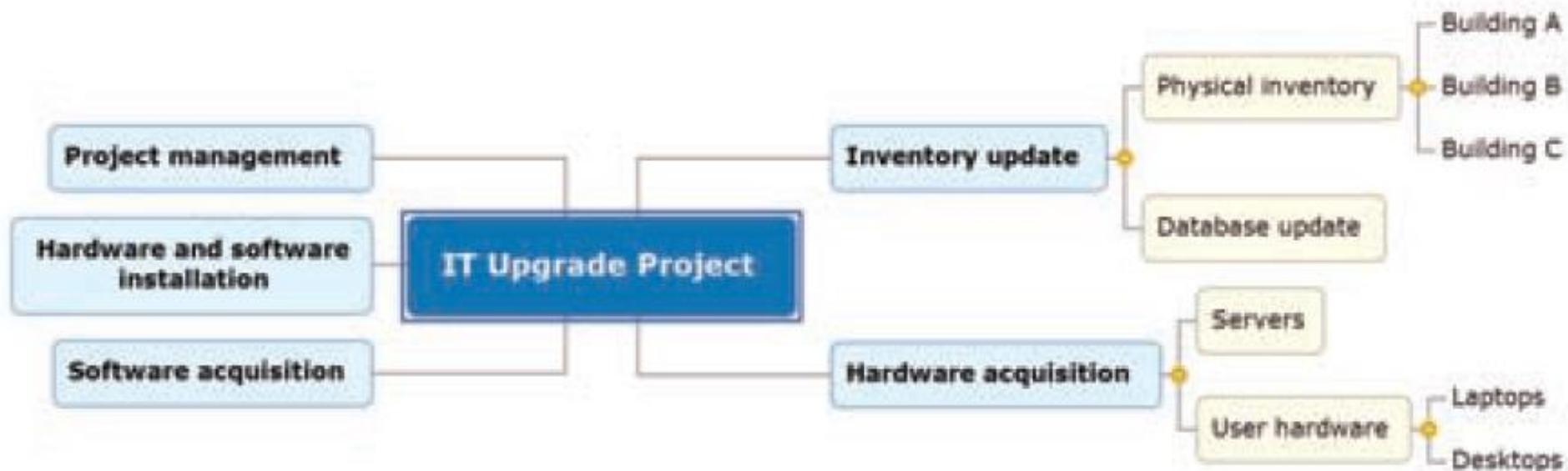
Create Work Breakdown Structure (WBS)

Best Practices for Creating a WBS

- A unit of work should appear in only one place in the WBS.
- Only Work / Deliverables are broken down further and further into smaller deliverables and not activities. Use «nouns» not «verbs».
- The work content of a WBS item is the sum of the WBS items below it.
- A WBS item is the responsibility of only one person, even though many people might be working on it.
- The WBS must be consistent with the way work actually will be performed; it should serve the project team first, and serve other purposes only if practical.
- Project team members should be involved in developing the WBS to ensure consistency and buy-in.
- 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.
- Work packages are not activities, no portion of WBS can show any kind of sequencing of work. It only shows the hierarchical decomposition.
- Each of the components of the WBS has to be suitably numbered.
- Each of the major deliverables of the WBS may get broken down to different levels.
- Anything not mentioned in the WBS is officially not a part of the project.

Validate Scope

- **Validate Scope is the process of formalizing acceptance of the completed project deliverables.**

- **The key benefit of this process is that it brings objectivity to the acceptance process and increases the probability of final product, service, or result acceptance by validating each deliverable.**

- **This process is performed periodically throughout the project as needed.**

Validate Scope

Inputs

.1 Project management plan
- Scope management plan
- Requirements management plan
- Scope baseline

.2 Project documents
- Lessons learned register
- Quality reports
- Requirements documentation
- Requirements traceability matrix

.3 Verified deliverables

.4 Work performance data

Tools & Techniques

.1 Inspection
.2 Decision making
- Voting

Outputs

.1 Accepted deliverables
.2 Work performance information
.3 Change requests
.4 Project document updates
- Lessons learned register
- Requirements documentation
- Requirements traceability matrix

Validate Scope

- Even when the project scope is fairly well defined, many IT projects suffer from **scope creep** -the tendency for project scope to keep getting bigger and bigger.

- Scope validation involves formal acceptance of the completed project deliverables.

- This acceptance is often achieved by a customer inspection and then sign-off on key deliverables.

- To receive formal acceptance of the project scope, the project team must develop clear documentation of the project's products and procedures to evaluate whether they were completed correctly and satisfactorily.

Validate Scope

- **The main tools for performing scope validation are inspection and decision-making techniques. The customer, sponsor, or user inspects the work after it is delivered and decides if it meets requirements.**

- **The main outputs of scope validation are accepted deliverables, change requests, work performance information, and project documents updates.**

Control Scope

- **Control Scope is the process of monitoring the status of the project and product scope and managing changes to the scope baseline.**

- **The key benefit of this process is that the scope baseline is maintained throughout the project.**

- **This process is performed throughout the project.**

- **Scope control involves managing changes to the project scope while keeping project goals and business strategy in mind.**

Control Scope

Inputs

.1 Project management plan
- Scope management plan
- Requirements management plan
- Change management plan
- Configuration management plan
- Scope baseline
- Performance measurement baseline

.2 Project documents
- Lessons learned register
- Requirements documentation
- Requirements traceability matrix

.3 Work performance data

.4 Organizational process assets

Tools & Techniques

.1 Data analysis
- Variance analysis
- Trend analysis

Outputs

.1 Work performance information

.2 Change requests

.3 Project management plan updates
- Scope management plan
- Scope baseline
- Schedule baseline
- Cost baseline
- Performance measurement baseline

.4 Project documents updates
- Lessons learned register
- Requirements documentation
- Requirements traceability matrix

Workshop

- **Create a WBS for the development of a company's website.**
- **Prepare this in 3 levels.**

Thank you…

Hasan ÇİFCİ

Possible Answer for Workshop

Company Website Development → **Level 1**

1. Website Design → **Level 2**

Level 3 ←
1. Logo and Branding Elements
2. User Interface Design
3. User Experience Layouts

2. Content Creation
1. Written Content
2. Multimedia Content (Images, Videos)
3. SEO Keywords and Metadata

3. Website Development
1. Frontend Development (HTML/CSS/JavaScript)
2. Backend Development (Server, Database)
3. Integration of Content Management System

4. Testing and Quality Assurance
1. Functional Testing
2. Performance Testing
3. Security Audits

5. Launch and Go-Live
1. Deployment to Live Environment
2. Final Cross-Browser Check
3. Launch Announcement Campaign