

# Software Project Management (5 - 20191113)

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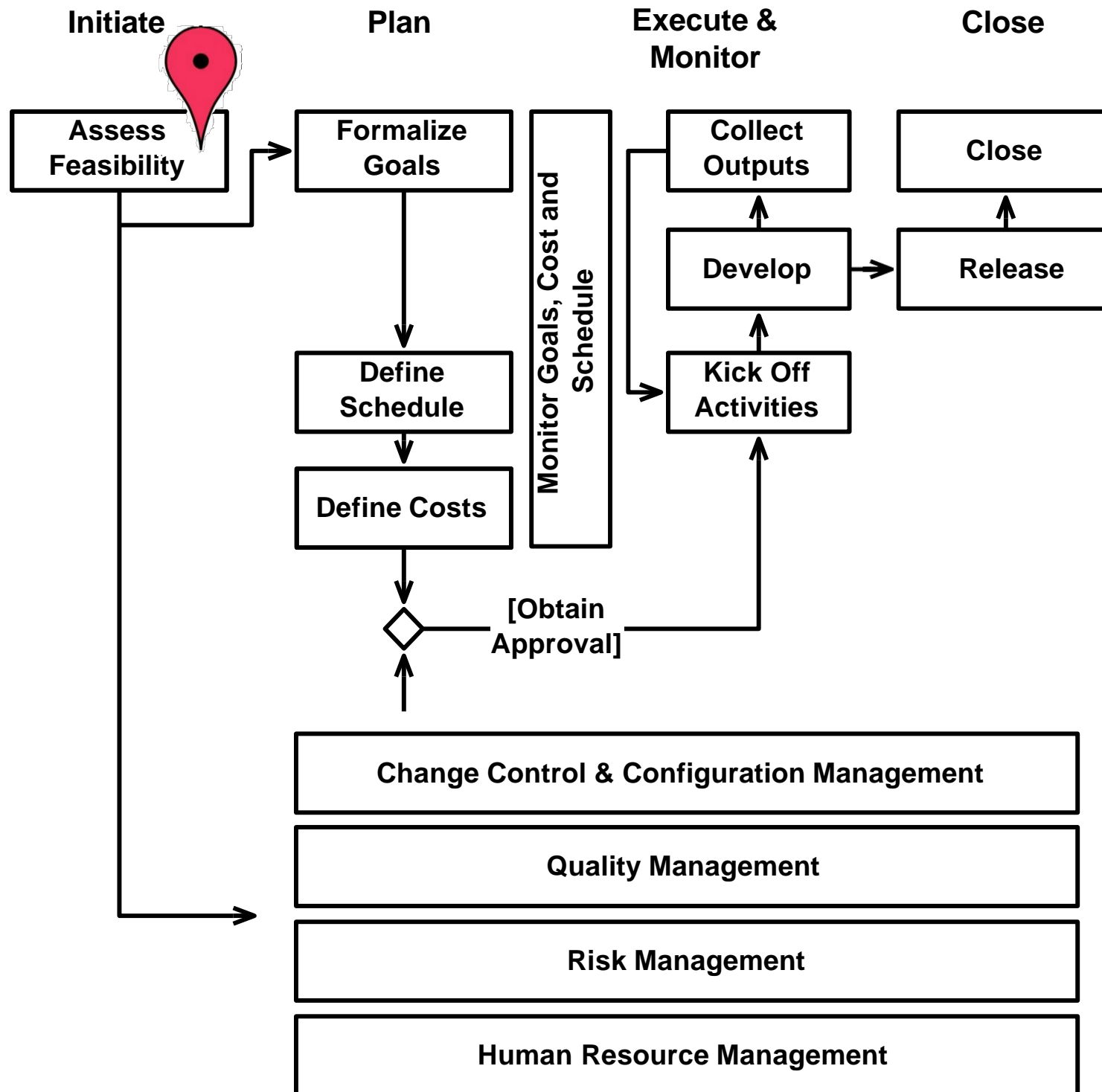
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# Project Initiation: Feasibility and Project Authorization

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Initiating a project



# Project Value and Risks

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# Payback Period

The payback period is the time taken to gain a financial return equal to the original investments

- Measured in months or years
- When using the payback period the projects/options that minimize the payback period are chosen in favor of the others

# Return on Investment (ROI)

ROI calculates the average annual profit and transforms it into a percentage of the total investments

$\text{Profit} = \text{Returns} - \text{Investments}$

$\text{Annual Profit} = \text{Profit} / \text{Duration}$

$\text{ROI} = \text{Annual Profit} / \text{Investments}$

- When using ROI, choose the project with the highest ROI

# Net Present Value

Net Present Value discounts sums in the future in order to provide a more realistic comparison between presents investments and future gains

# Score Matrices

- The financial methods (Payback, ROI, NPV) look only at some of the financial data
- Scoring matrices allow one to take into account other factors
- They are based on a standardized set of criteria and weights, which highlight the relevant features of a project
- A **qualitative** evaluation of how a project scores with respect to each criteria positions the project on a scale and helps compare it with past or competing projects



# Score Matrix Example

Factor	Value	Weight	SUM	Comment
The project aligns with the strategic objectives	YES	2	2	
The project has a profit > 20%	NO	4	0	
Payback period < 2 years	YES	5	5	
Enlarges the customer base	YES	2	2	
The project requires a standard technology	NO	3	0	
The quality constraints are simple to meet	YES	1	1	
The timing is not too tight	NO	4	0	
We have skilled personnel to do the work	YES	5	5	
			15	

- Value can be binary (YES/NO) or a number (e.g. from 1 to 5) and measures how well the project meets the requirement
- The weight measures how important a factor is for the decision

# Discussion

- **Advantages**

- Simple
- It encourages standardization and more objectivity in decision making
- It helps discuss and evaluate the project characteristics
- It widens the range of evaluation
- Not biased toward shorter term projects

- **Disadvantages**

- A simple model may encourage development of long and useless lists
- Different factors have same importance (unless the weight matrix is used)

# Caveat

- Not all score matrices are equally good.
- The following is an example of a bad matrix.  
Why?

Factor	Value	Weight	SUM	Comment
The project has a profit > 20%	YES	3	3	
The project is highly risky	NO	3	0	
			3	

A positive factor (first row) and a negative factor (second row) influence in the same way the matrix  
As a consequence an highly risky project is preferred over a project which is not very risky

SOLUTION

# Caveat

Make sure the questions either all positively influence or all negatively influence the decision or use scores with different signs!

# SWOT analysis

- Technique credited to Albert Humphrey
- Systematic analysis of:
  - Strengths
  - Weaknesses
  - Opportunities
  - Threats

... to understand the feasibility of a project and/or come out with achievable project goals

- Often presented as a 2x2 matrix, with each cell listing all elements of a given type (see next slide)

# SWOT ANALYSIS



Source: [http://en.wikipedia.org/wiki/File:SWOT\\_en.svg](http://en.wikipedia.org/wiki/File:SWOT_en.svg) (cc license)

# SWOT: Some factors to consider

- **Strengths:**

- Competences
- Selling points
- ...

- **Opportunities:**

- Market and Industry trends
- Weaknesses of competitors

- **Weaknesses:**

- Disadvantages
- Methodology
- Timing
- Capability Gaps

- **Threats:**

- Market and Industry trends
- Competing technologies
- Sustainability

# Stakeholder Analysis

- Goal: understanding who are the project stakeholders and the influence they have on the project
- Different techniques available
- One technique organizes stakeholders in a 2x2 matrix in which:
  - one dimension measures the **power** a stakeholder can exert (low or high)
  - the other dimension measures the **interest** a stakeholder has in a project (negative or positive)
- This allows to define specific management policies for the different stakeholders



# Assessing Sustainability

- The analysis is meant to understand the operational costs of a project's output
- Sometimes a specific project activity. A preliminary sustainability analysis, however, can help choose among different project implementations
- Some aspects to consider include the **business model** and the **break-even point**

# The Feasibility Study

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# Feasibility Study

- The feasibility study is the document that allows to formally authorize a project and to link it to the organization's goals
  - Wide range of outputs: from a few to hundreds of pages (according to complexity and formality)
  - The feasibility study can be thought of as a project in the small, drafting the main information we will define in more details during the project
  - Basis for project selection: Management must choose what projects to activate.

# Goals of a Feasibility Study

- Identify:
  - the project goals
  - the project constraints
- Assess value and risks (using the techniques above)
- Ensure the project lines up with
  - the customer objectives
  - the performing organization objectives
- Demonstrate that the project goals
  - can be achieved respecting the quality, cost, and time constraints

# Feasibility Document: Structure

- A **statement of work**, which describes what the project will accomplish.
- The **business objectives (value)** of the project or its outputs and information about the business model, if relevant.
- A **summary of the project budget**, which forecasts expenses and incomes.
- A **summary of the project milestones**, that is, a rough schedule of the project identifying the most important events.
- An **analysis of the stakeholders**.
- The **project risks**.
- Possible **alternatives** to the project, such as a **make or buy** decision.
- An **evaluation** of the project and of the alternatives, using the techniques described above.

# Feasibility: Additional Considerations

- The feasibility document has a value for:
  - The **client**, since it helps understand the way forward and what are the short and long term perspectives
  - The **performing organization**, since it helps understand whether it makes sense to move on with a project
  - The **project manager**, since it helps understand whether the project will be in the manager's **comfort** zone or not (and take an informed decision on whether the project is worth taking or not)

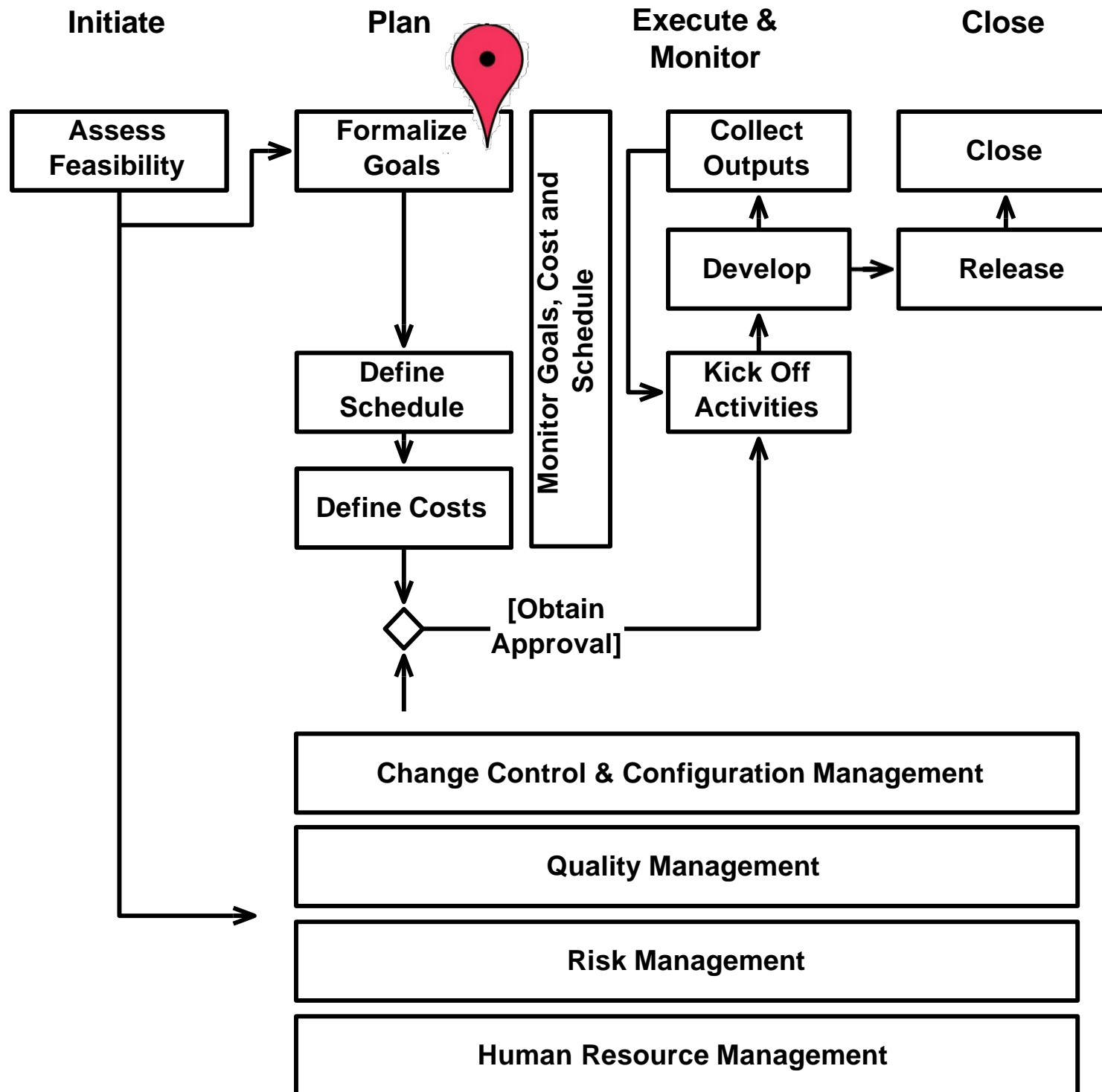
# The Project Approval Process

- The process which brings to the project approval is more or less structured according to the practices of the performing organization
- It is organized in the following steps:
  - Upon receiving a request, identify a (preliminary) project manager
  - The project manager prepares a feasibility study which is agreed with the customer and key stakeholders
  - The project manager submits the document for authorization
  - The document is analyzed and a formal decision is taken
  - The project manager is appointed and the project moves to the planning phase

# Formalizing the Project Goals

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# Formalizing the Project Goals

- Defining the project goals (project scope) is one of the first and most important activities in a project
- The project scope:
  - Ensures that the project includes all and **only the work** necessary
  - Establishes a **baseline** of the work to be performed.
  - Defines a **reference document** for project acceptance.
- The definition of the project scope starts during the feasibility study
- The project goals and the alignment of a project with its scope continues throughout the lifecycle of a project

# Project Scope Document

- The project scope is fixed in the project scope document, which contains:
  - **Project goals and requirements**, which describe what we intend to achieve with the project and the main characteristics of the project and its outputs
  - **Assumptions and constraints**, which describe the conditions which have to be met for the project to succeed
  - **Project outputs and control points**, which describe the outputs of the project, and in some cases, a rough timing of their delivery

# Project Goals and Requirements

- The project goals and requirements are the basis to define:
  - The **baseline work** to be performed (compare Work Breakdown Structure and Change and Configuration Management)
  - The project **acceptance criteria** (compare Project Closing and Quality Management)
- Sometimes useful to include also what is **outside** the scope of a project

# Project Objectives/Goals

## Make the objectives **SMART!**

- **Specific**
  - Clear and concise
- **Measurable**
  - Easy to obtain measure to understand whether the goal has been reached. Maybe a date or a number, or a formula (but keep it simple!)
- **Agreed-to**
  - Goals must be specific enough that the team can agree on being able to reach them
- **Realistic**
  - Goals must be realistic. Unrealistic goals set unrealistic expectation and make the team apathetic.
- **Time-bound**
  - Must have a begin and an end. If no end can be set, are you sure we are not talking about operational work?

# Project Objectives/Goals

## Make the objectives ... **russian** **(MoSCoW)!**

- **M: Must Have**
  - essential
- **S: Should Have**
  - important, but we can do without
- **C: Could Have**
  - desirable
- **W: Won't Have**
  - we will not do them (next iteration)

# Project Objectives/Goals

- Try and make sure class M success criteria depend on factors under your/or the project's control
- Negative examples (M not under control of the PM):
  - The system will have 1,000 users in the first month.  
(What tools does the PM have to ensure achievement of this goal?)
  - The data entry speed of users will increase tenfold.  
(How can the PM ensure the tenfold increase is actually achieved?)
- ... Sometimes a matter of wording. The consequences might be costly, nevertheless.

# Assumptions

- **Assumptions** are conditions which are considered to be true, but might not in fact be
- Assumptions are not under the control of the project manager, but **they might be under the control of some project stakeholders**
- When this is the case, assumptions can be used to define duties and obligations of project stakeholders
- **Constraints** are known limitations. They explain why we set some goals and not others and why we structure the work in some way rather than another.



# Project Outputs (Milestones and Deliverables)

- The project outputs define what a project will accomplish and when
- **Milestone:** a significant event in the project
  - Identify critical points in the project and in the schedule
  - Often used at “review” or “delivery” times
  - Can be tied to contractual terms, calendar constraints, deliverables
- **Deliverable:** a unique, measurable, and verifiable work product
  - Can be internal or external
  - Can have different dissemination and formality levels
  - In Gantt charts they often interconnect tasks (the output of task is a deliverable which is the input of a subsequent activity)

... in current practice often milestone and deliverable are used interchangeably (both used to identify products - milestones may represent key-products)

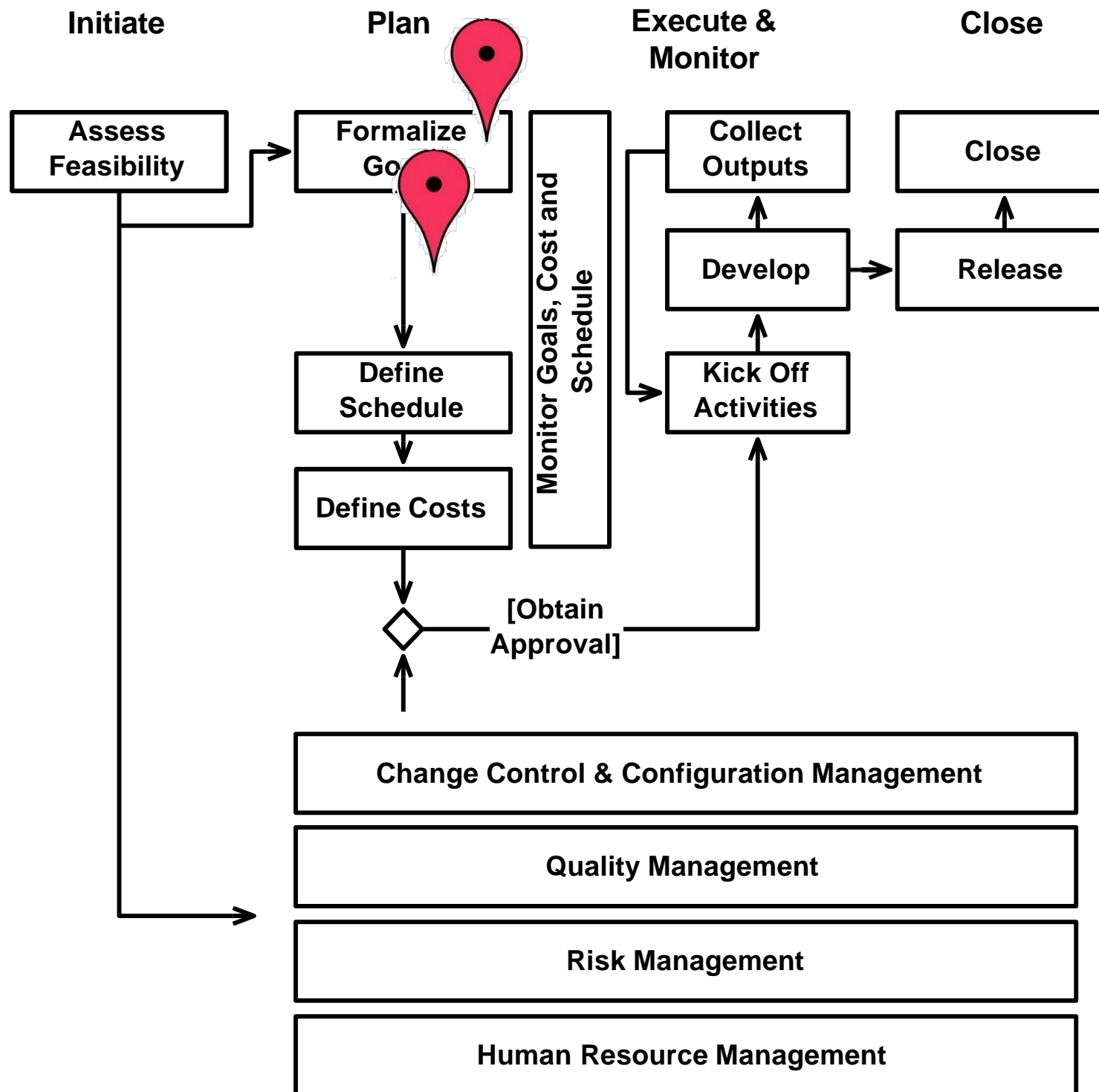
... both have zero duration in the plan

# Project Roster

- The list of people participating in the project, together with their role and other information, such as the contact point.
- Allows the project manager to identify the project stakeholders.

# Deciding the work to be Performed (Work Breakdown Structure)

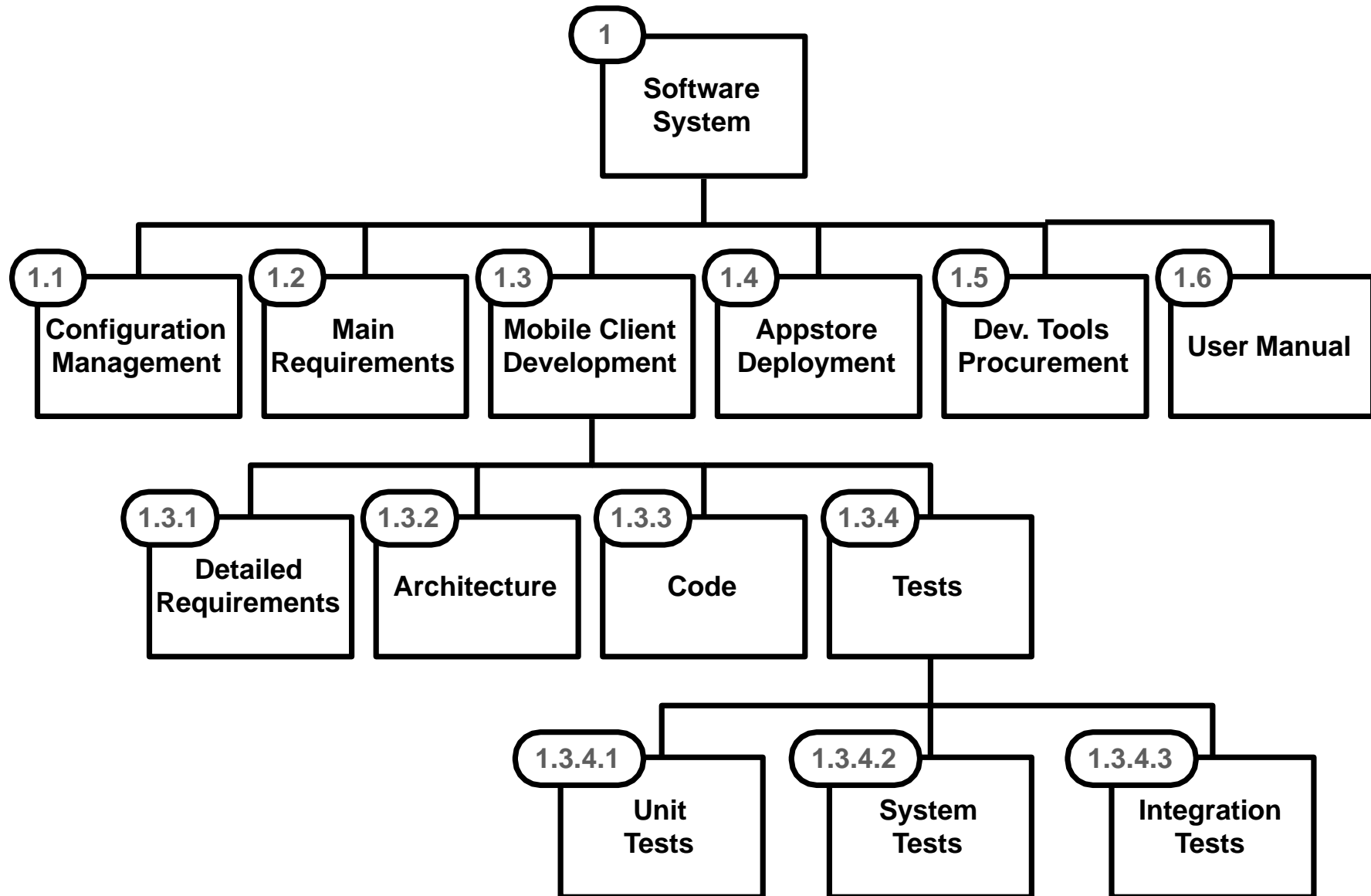
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# What is a WBS?

**A Work Breakdown Structure (WBS** for short) is a (deliverable-oriented) hierarchical decomposition of the work to be executed by the project team to accomplish projects objectives and create the required deliverable

# WBS Example



# WBS: Remarks

- Two formats
  - Graphical tree (Vision, Graffle, LibreOffice, ...)
  - Textual outline (MS Word, Text Editor, Outliner, ...)
- Uses a decimal numbering system to identify elements (Ex: 3.1.5)
- Shows “is contained in” relationships
- Does not show dependencies nor durations

# Why is it useful?

- A WBS establishes the basis for:
  - **Defining the work to be performed** in a project
  - Showing how various **activities are related to the project objectives**
  - Establishing a **framework for defining, assigning, and monitoring work and costs**
  - Identifying the **organizational elements** responsible for accomplishing the work



# WBS Rules of the Thumb

- Everything (and nothing else) is in place:
  - **The 100% rule:** make sure all work items are there (product oriented WBS are better suited for this kind of rule)
  - **The ME rule (Mutually Exclusive rule):** make sure there are no overlaps in the definition of the elements
  - **No need to make it balanced:** all paths do not have to go to the same level

# When do you stop?

- Simple answer: at the **work-package level** (which, btw, could be composed of more elementary activities, which, however, you do not want to trace)
- However: how big is a work-package?
  - According to “DOD and NASA Guide to PERT COST”: leaves of the WBS should be no more than 3 months of work or \$100.000 of expenditure
  - According to other standards: 1-2 weeks for 1-2 people
- Mind you though, the level of details depends on the size of the project...

# WBS Types (1/2)

- **Product WBS**

- It develops according to the structure of the **outputs** that need to be produced
- It can start from a Product Breakdown Structure, when defined

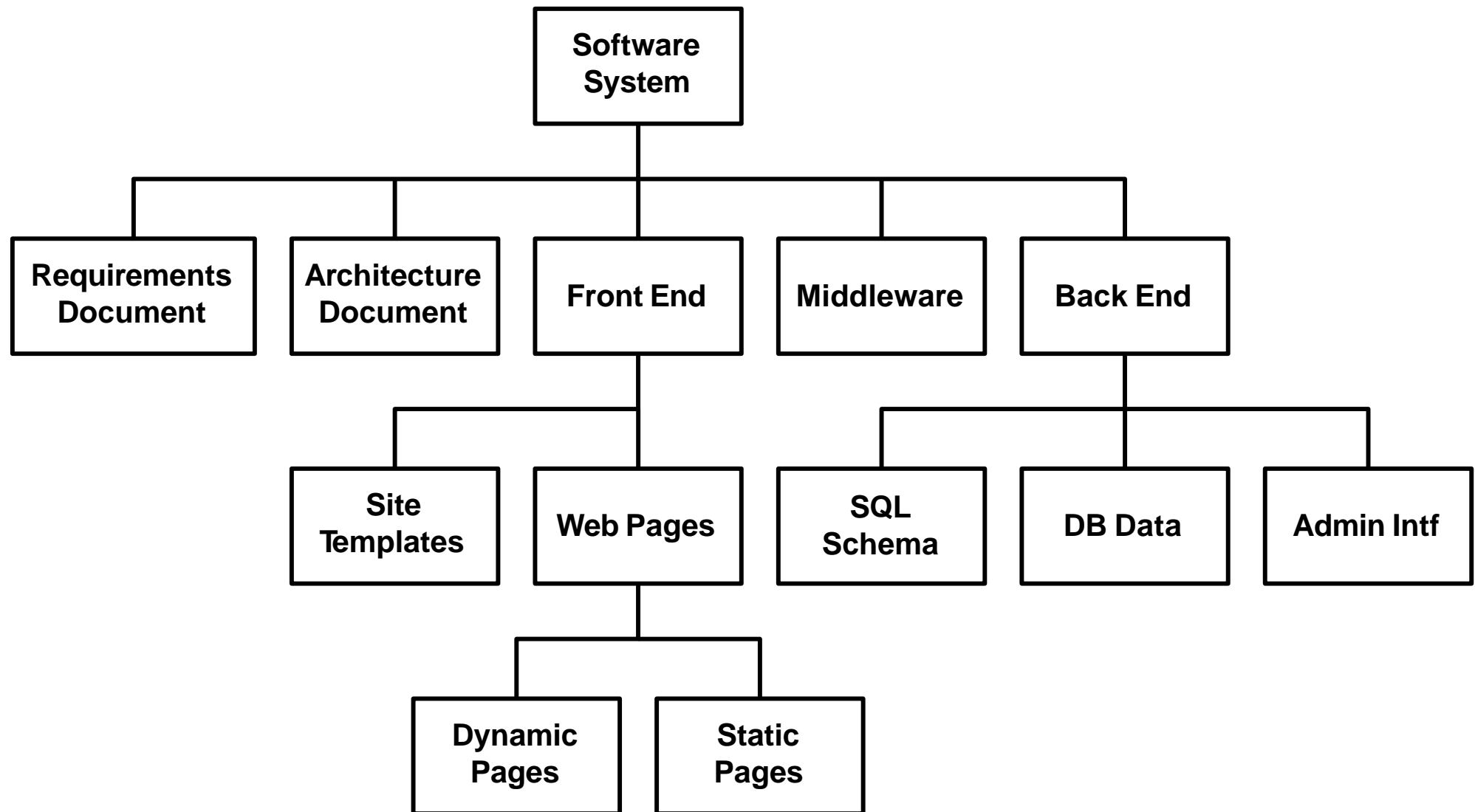
- **Process WBS**

- It develops according to the **phases** in which a project is organized
- For instance: Requirements, Analysis, Design, Testing

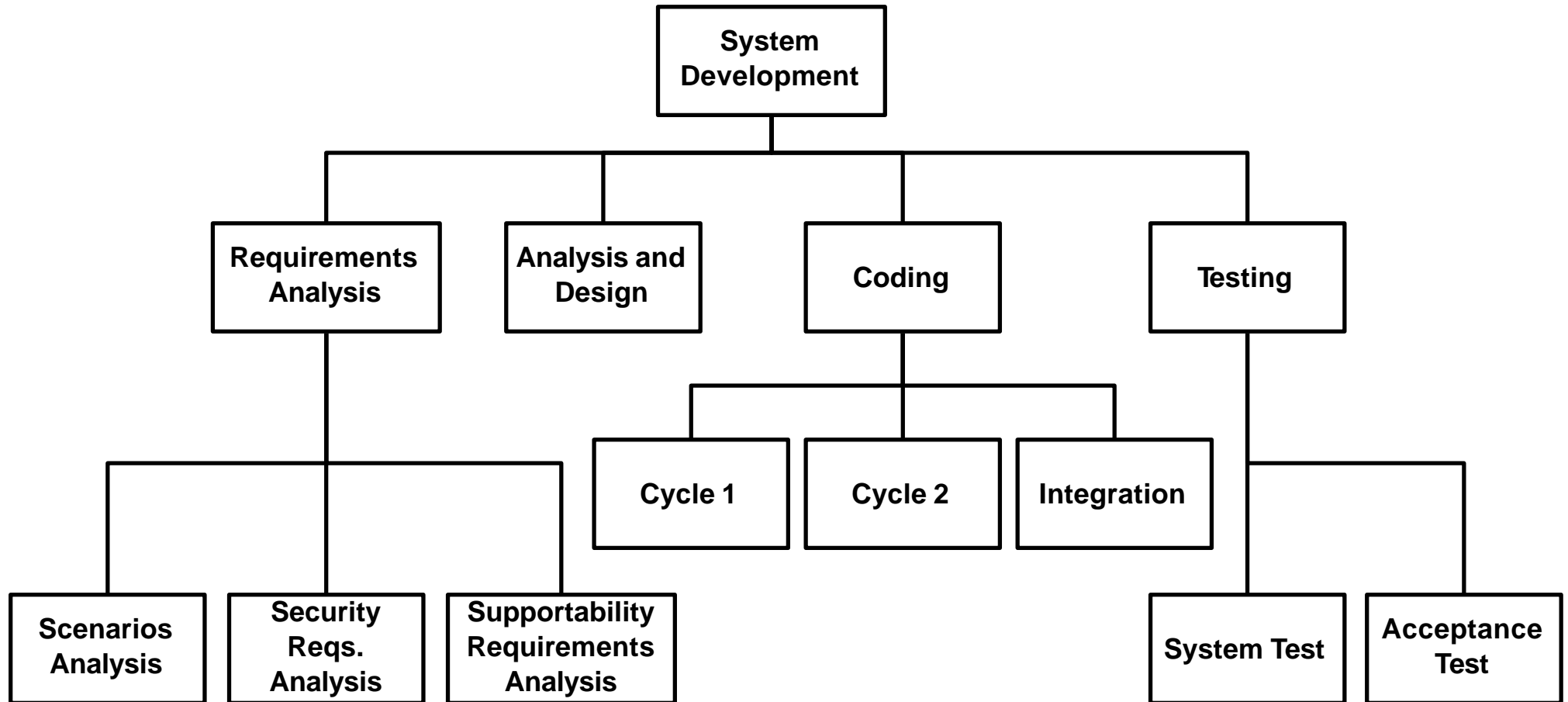
- **Hybrid WBS: both of the above**

- **It mixes process and product**
- For instance: life-cycle phases at higher levels; component at lower levels

# Product WBS Example



# Process WBS Example



# WBS Types (2/2)

- Organizational WBS

- Higher levels are organizational units
- Lower levels collect the work which is under the responsibility of a Unit.
- Can be useful for highly cross-functional projects

- Geographical WBS

- Higher levels are geographically distributed teams (e.g. NY team, Trento Team)
- Lower levels collect the work under the responsibility of a team

- Remarks: according to the PMBOK, these are not WBS's. In any case, they are less commonly used.

# WBS Dictionary

- A WBS dictionary helps further specify the entries of a WBS
- It might contain title, number, detailed description of the element, quantities, associated work, contractual items
- Rules of the thumb:
  - it can be done for each entry in the tree.
  - follow the definition: increase the details as you move down the tree
  - a good practice is doing it for the leaves (work-packages)

# WBS Dictionary

<b>Work package number</b>	1	<b>Start date or starting event:</b>				Month 1					
<b>Work package title</b>	Case Study Requirements and Experimentation Site Assessment										
<b>Activity type</b>	RTD										
<b>Participant number</b>	1	2	3	4	5	6	7	8			
<b>Participant short name</b>	P1	P2	P3	P3	P4	P5	P6	P7			
<b>Person-months per participant</b>	1	0	0	9	6	0	2	0			
<b>Objectives</b>											
<b>Description of work</b>	Task 1. Task 2. ...										
<b>Deliverables</b>	D1.1. D1.2.										
<b>Milestones</b>	M1.1. M1.2.										



# Questions

