Software Project Management (5 – 20191113)

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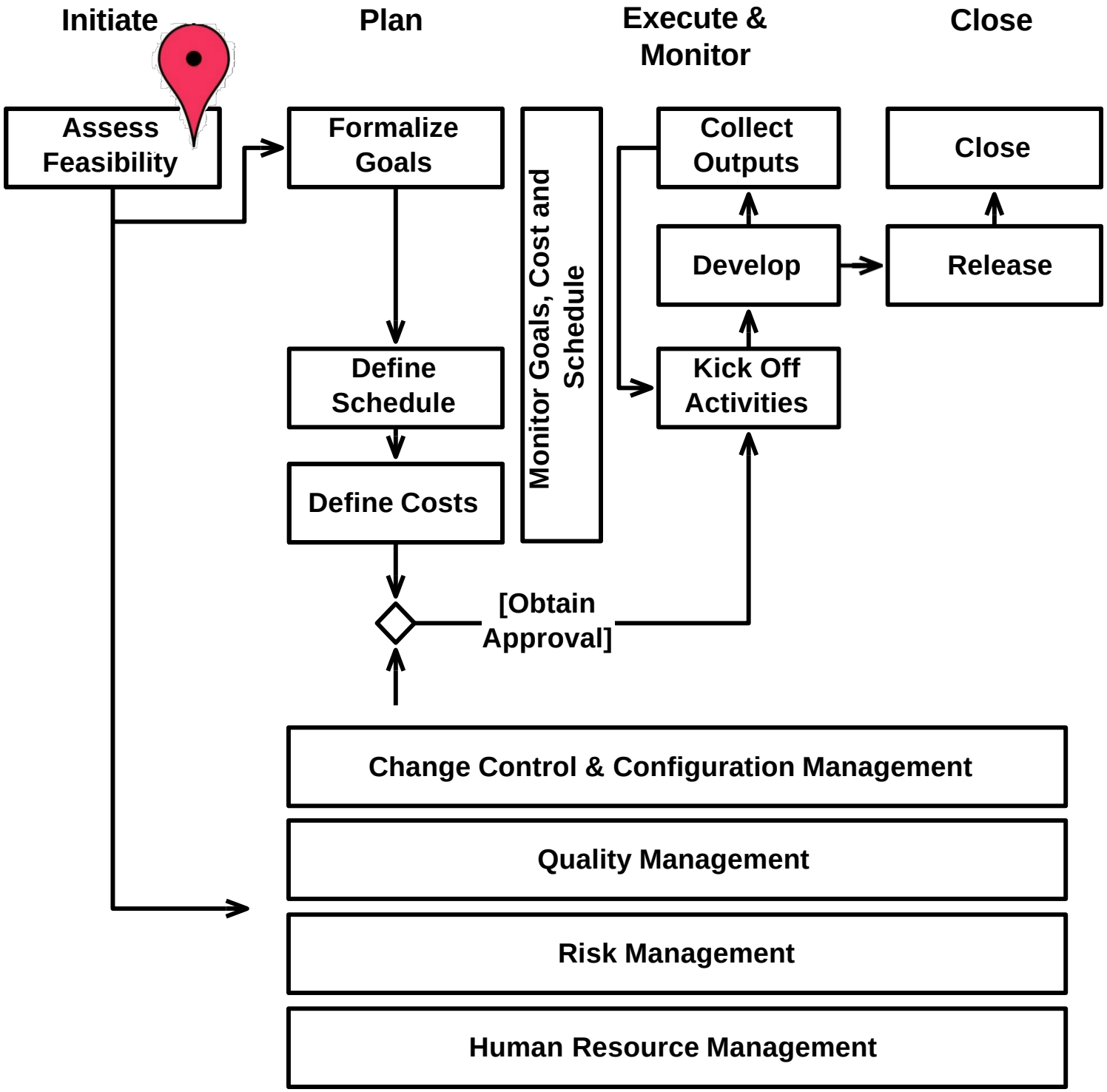
Project Initiation: Feasibility and Project Authorization

Initiating a project


Initiate
Plan
Execute & Monitor
Close
Assess Feasibility
Formalize Goals
Define Schedule
Define Costs
Monitor Goals, Cost and Schedule
[Obtain Approval]
Collect Outputs
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Kick Off Activities
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Quality Management
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Project Value and Risks

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

Profit = Returns - Investments

Annual Profit = Profit / Duration

ROI = Annual Profit / 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	

SOLUTION

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

Caveat

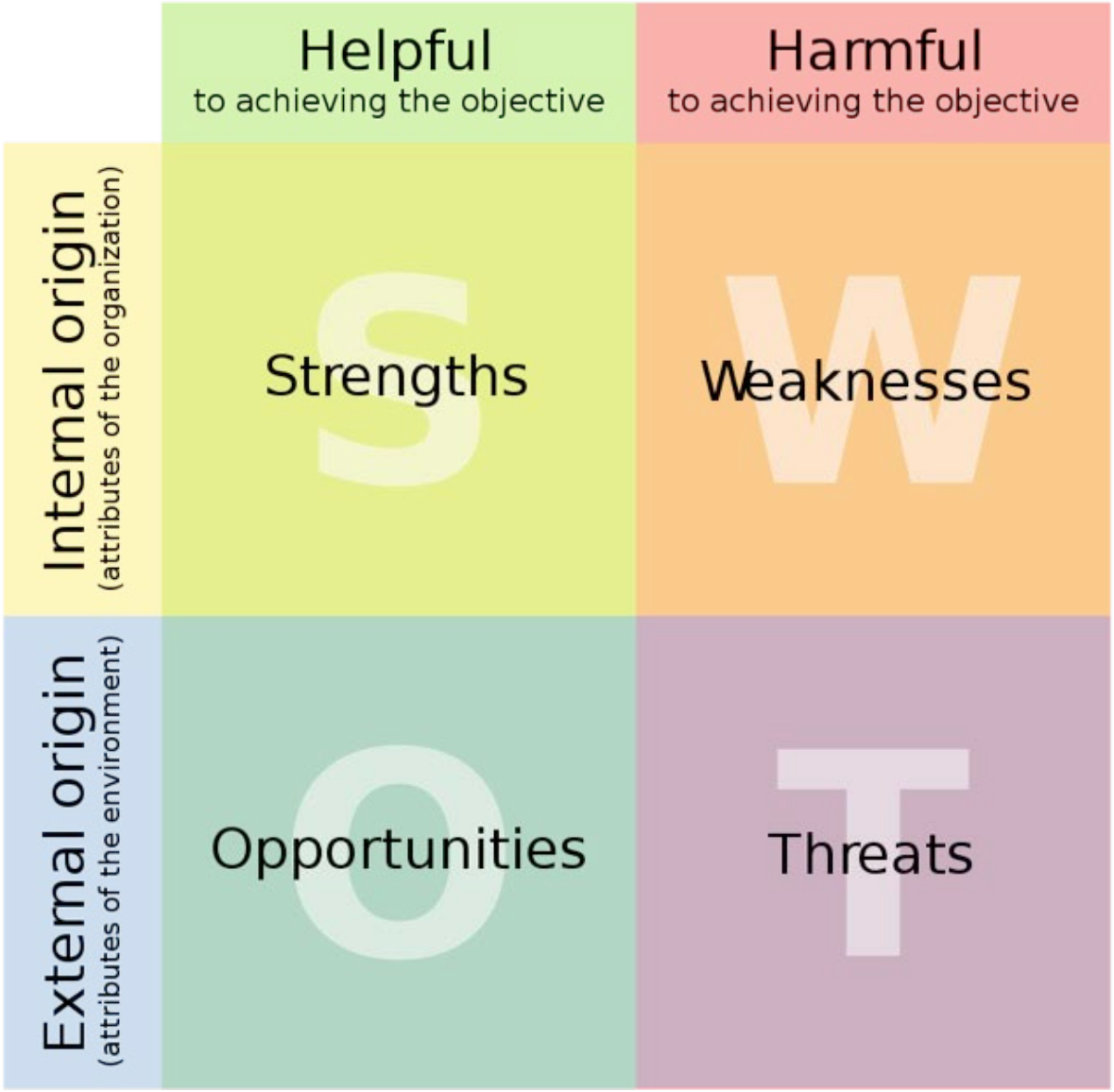
Make sure the questions either all positively influence or all negatively influence the decision or use scores with different signs!

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 (cc license)

SWOT: Some factors to consider

- **Strengths:**
  - Competences
  - Selling points
  - ...
- **Weaknesses:**
  - Disadvantages
  - Methodology
  - Timing
  - Capability Gaps
- **Opportunities:**
  - Market and Industry trends
  - Weaknesses of competitors
- **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

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.

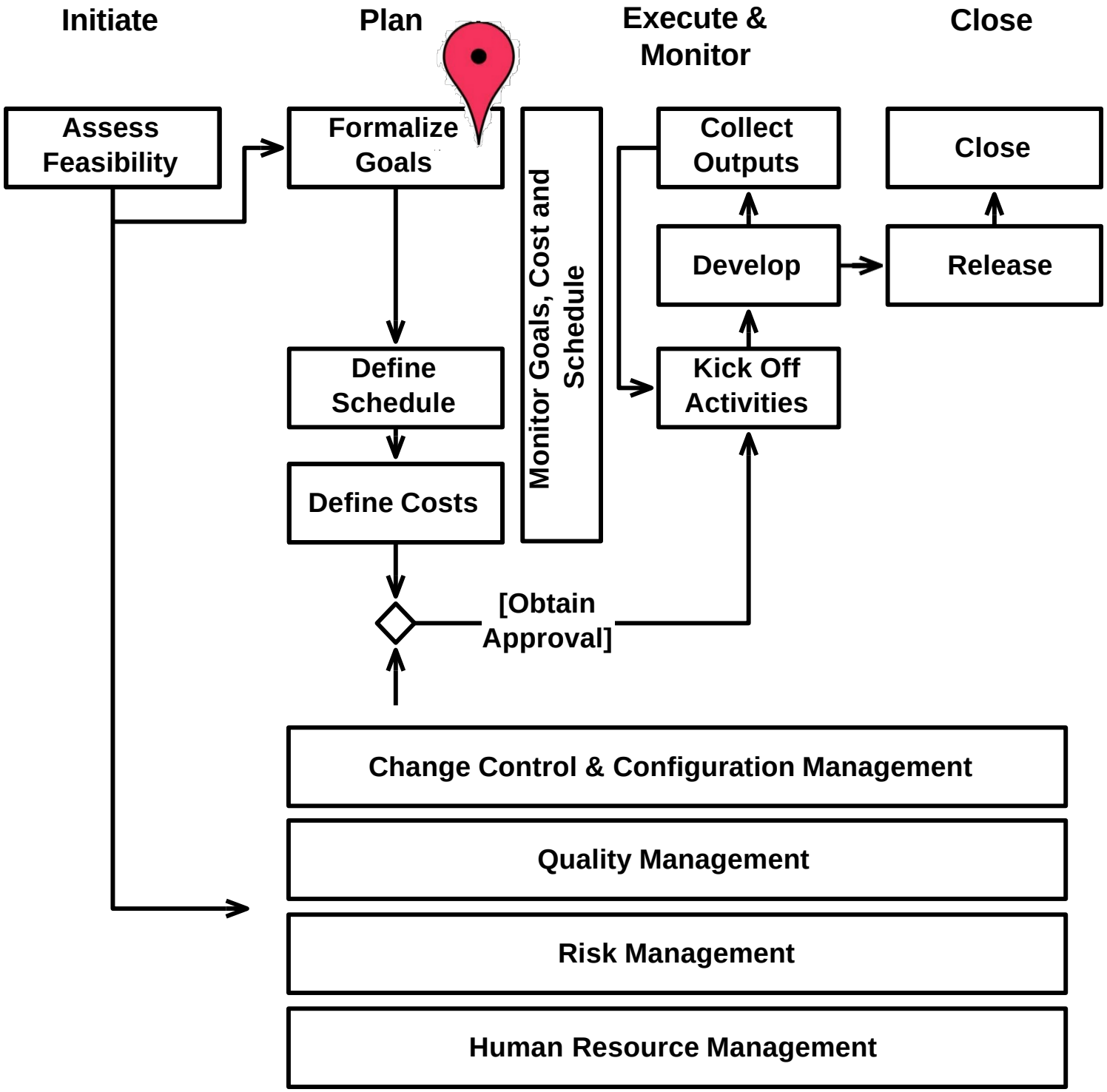
Feasibility: Additional Considerations

- 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)

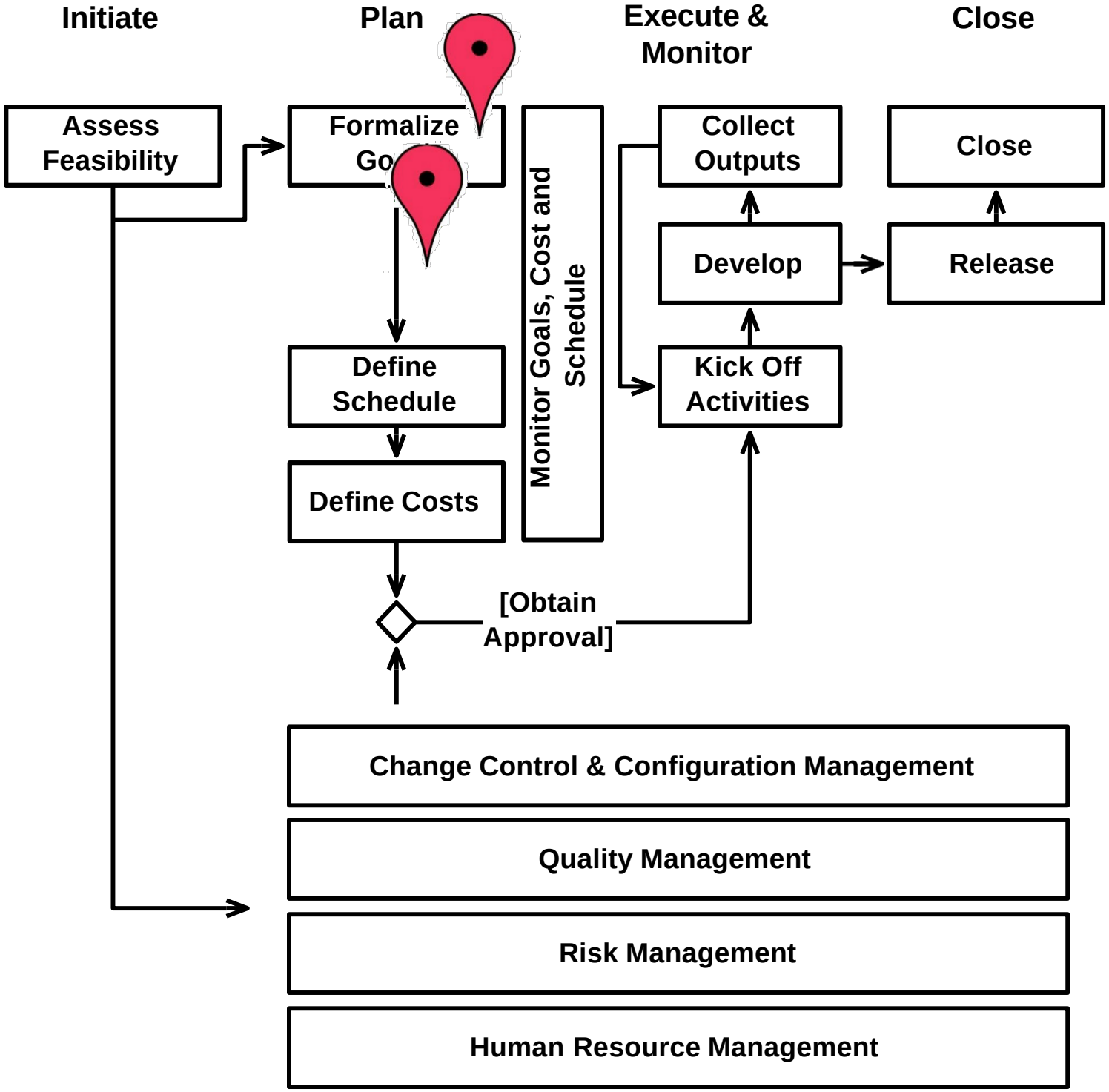
… in current practice often milestone and deliverable are used interchangeably (both used to identify products - milestones may represent key-products)

... 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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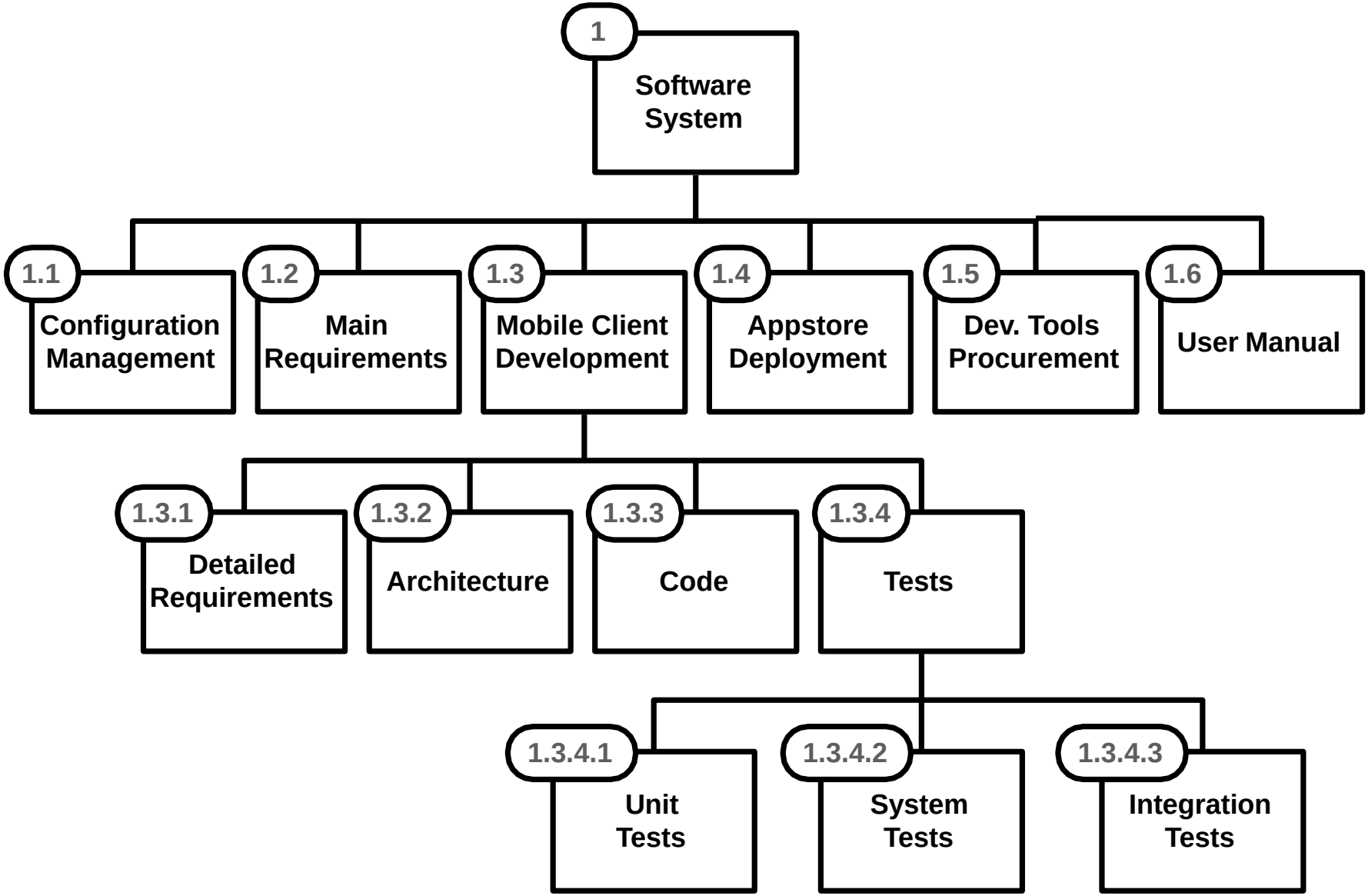
What is a WBS?

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


1
Software System
1.1
Configuration Management
1.2
Main Requirements
1.3
Mobile Client Development
1.4
Appstore Deployment
1.5
Dev. Tools Procurement
1.6
User Manual
1.3.1
Detailed Requirements
1.3.2
Architecture
1.3.3
Code
1.3.4
Tests
1.3.4.1
Unit Tests
1.3.4.2
System Tests
1.3.4.3
Integration Tests

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

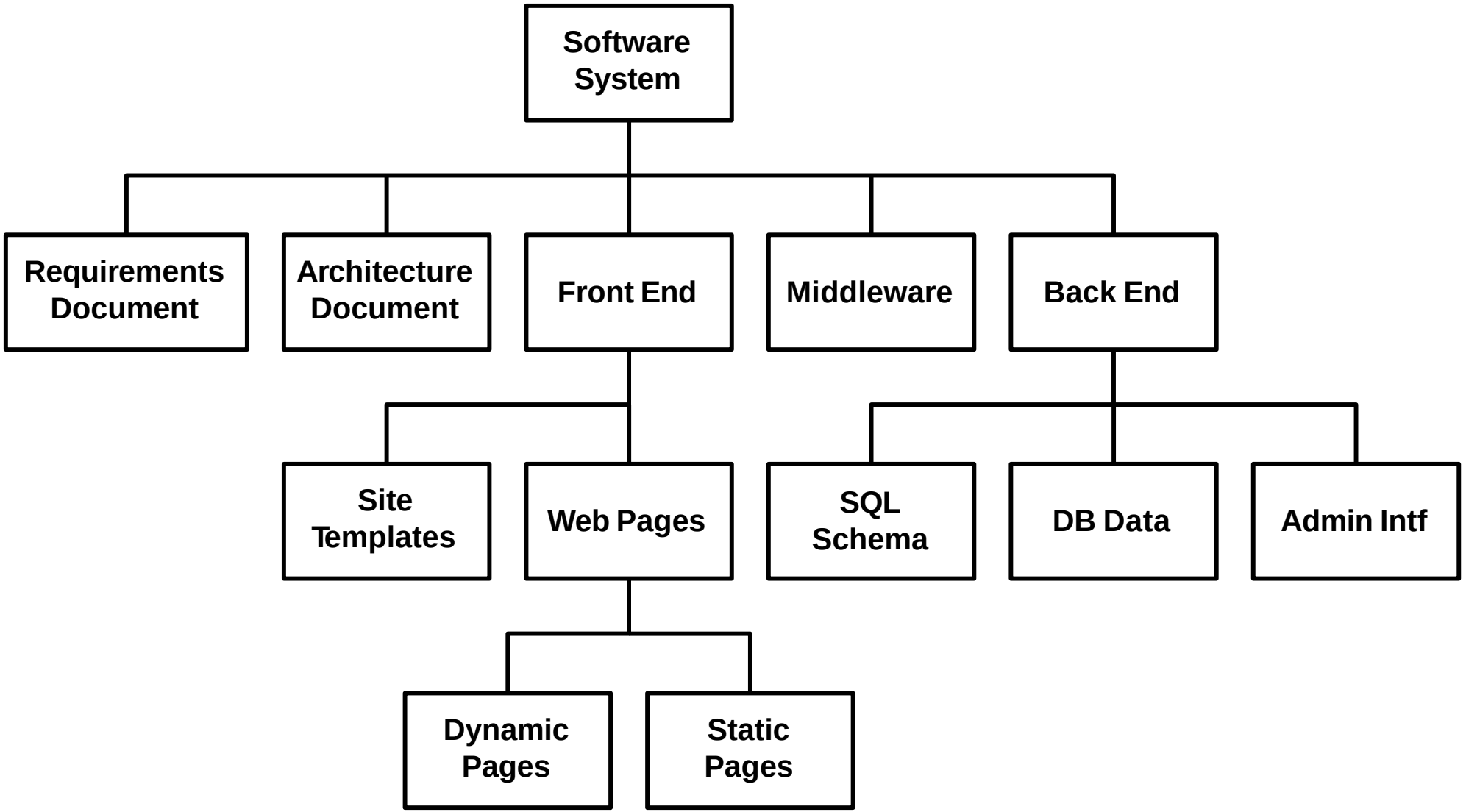
When do you stop?

- 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...

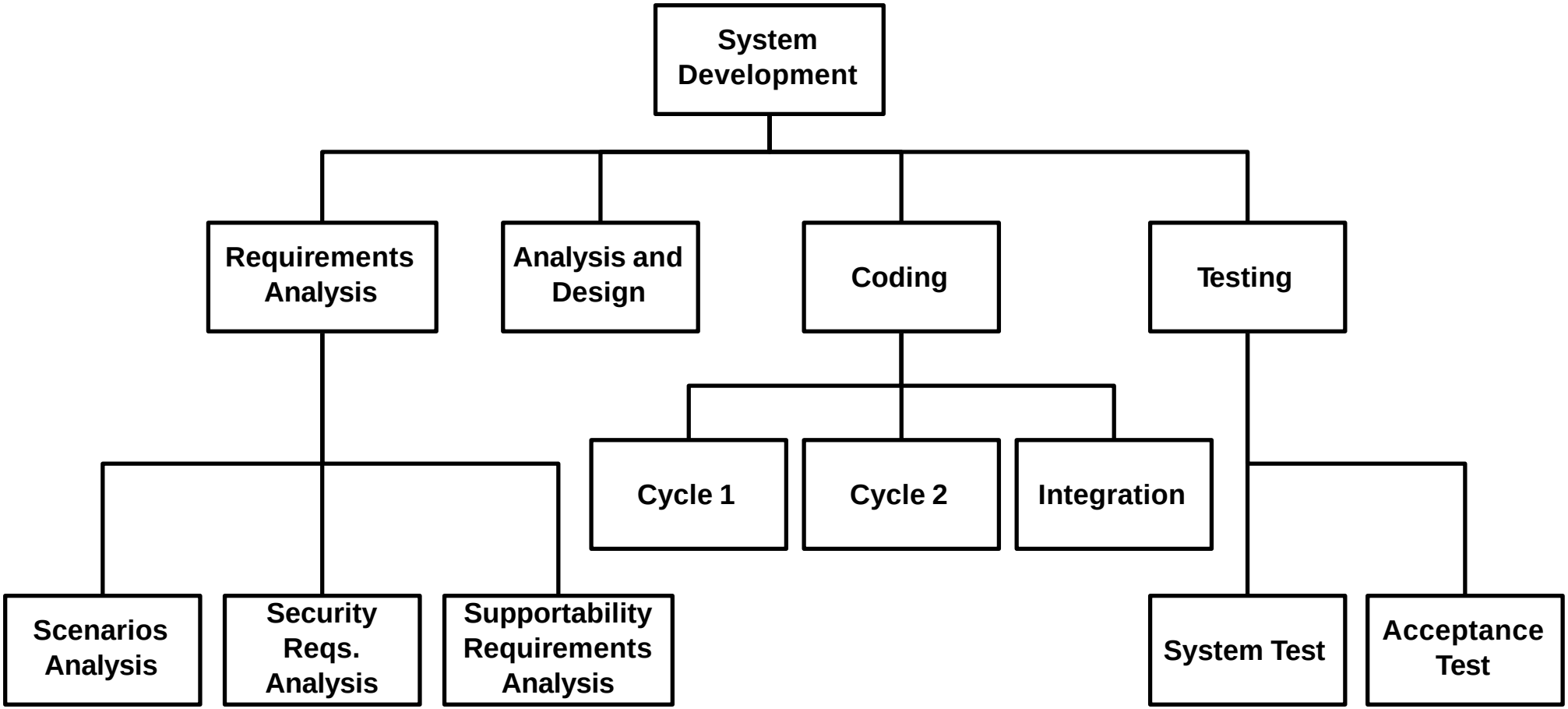
WBS Types (1/2)

- 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

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

Questions