Multidisciplinary Projects
in an International Context

Project Management
Module 4,

Project Planning

Co-funded by the
Erasmus+ Programme
of the European Union

PROJECT NUMBER: 2018-1-CZ01-KA203-048151
This project has been funded with support from the European Commission.

Checkpoint 2 - Literature

Project plan including the schedule

- Artto K., Martinsuo M., Kujala J., 2011. Project business. Helsinki, Finland, http://pbgroup.tkk.fi/en/ (ISBN 978-952-92-8535-8). Video lectures based on the book's chapters: YouTube channel Project Business, https://www.youtube.com/channel/UCWXZegKuVxTTH9Sgjy2yuSQ

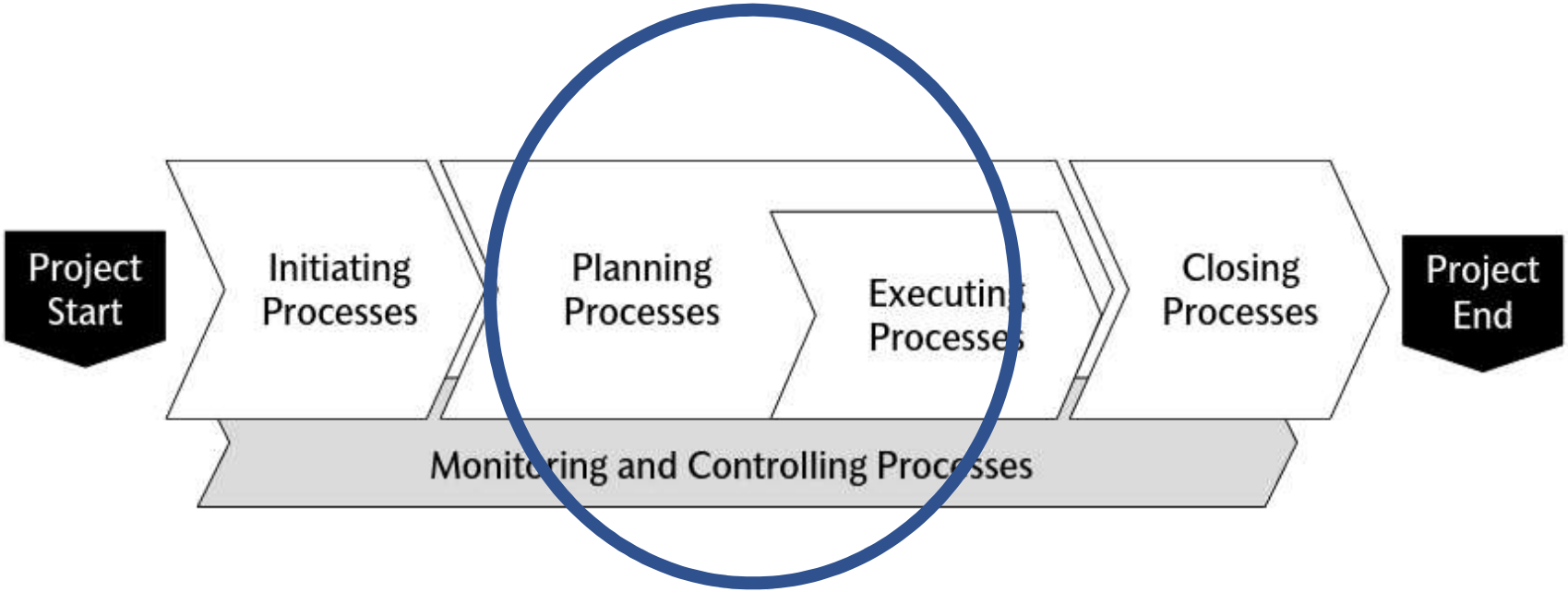
WBS

- Mosaic project White Paper, White Paper Work Breakdown Structures, https://mosaicprojects.com.au/WhitePapers/WP1011_WBS.pdf
- Norman, Eric S., Brotherton, Shelly A. and Fried, Robert T.: Work Breakdown Structures: The Foundation for Project Management Excellence. Hoboken, NJ, USA: John Wiley & Sons, 2011
- http://courses.cecs.anu.edu.au/courses/COMP3120/local_docs/readings/HowToDevelopWBS.pdf

Requirements documentation

- Young, Ralph. Requirements Engineering Handbook. Norwood, MA, USA Artech House, 2003.
- Klaus Pohl, Chris Rupp. Requirements engineering fundamentals: a study guide for the certified professional for requirements engineering exam: foundation level, IREB compliant, Santa Barbara (CA): Rocky Nook, cop. 2011.
- Elizabeth Hull, Ken Jackson, Jeremy Dick. Requirements Engineering, 3rd ed., Springer-Verlag London Limited, 2011.

Process View of Project Management, Project life-cycle



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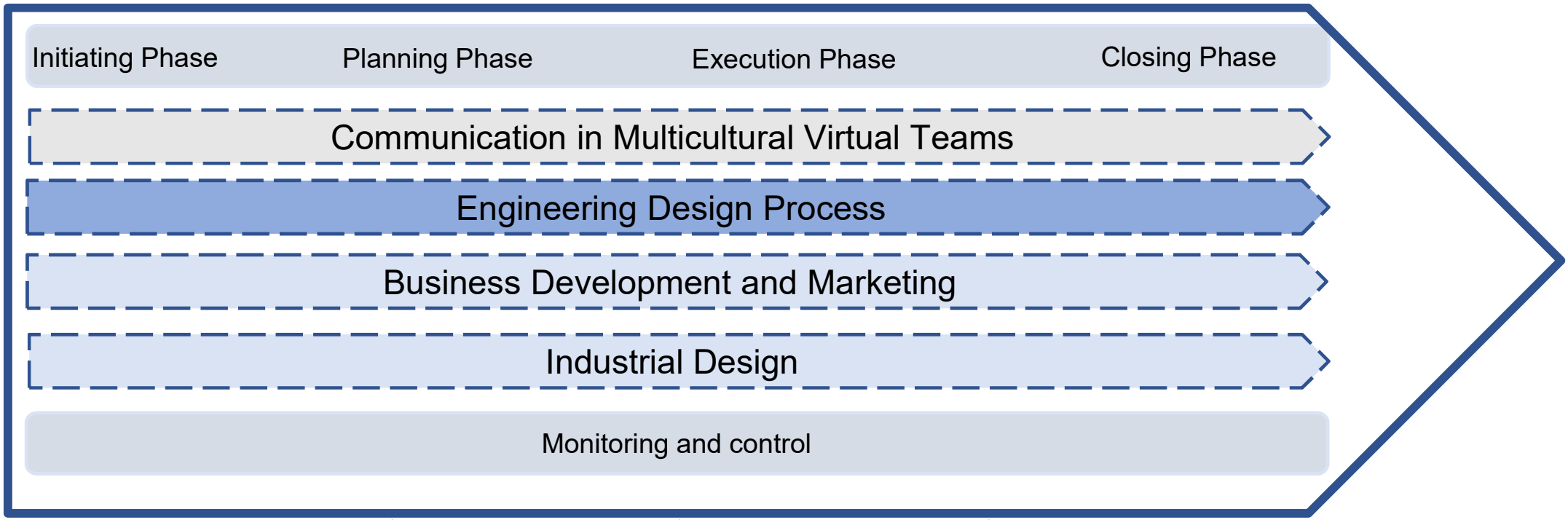
Project Management Institute:
A Guide to the Project Management Body of Knowledge (PMBoK), 2013.

Mupic Project Management View



Project kick-off

CP 1

- Project Charter
- Stakeholder analysis

CP 2

-Detailed plan
-Work Breakdown Structure
- Requirements docs

CP 3

-Project progress report
-Project change management doc

Final Eval.

-Deliverables
-Project closure report
-Lessons learned

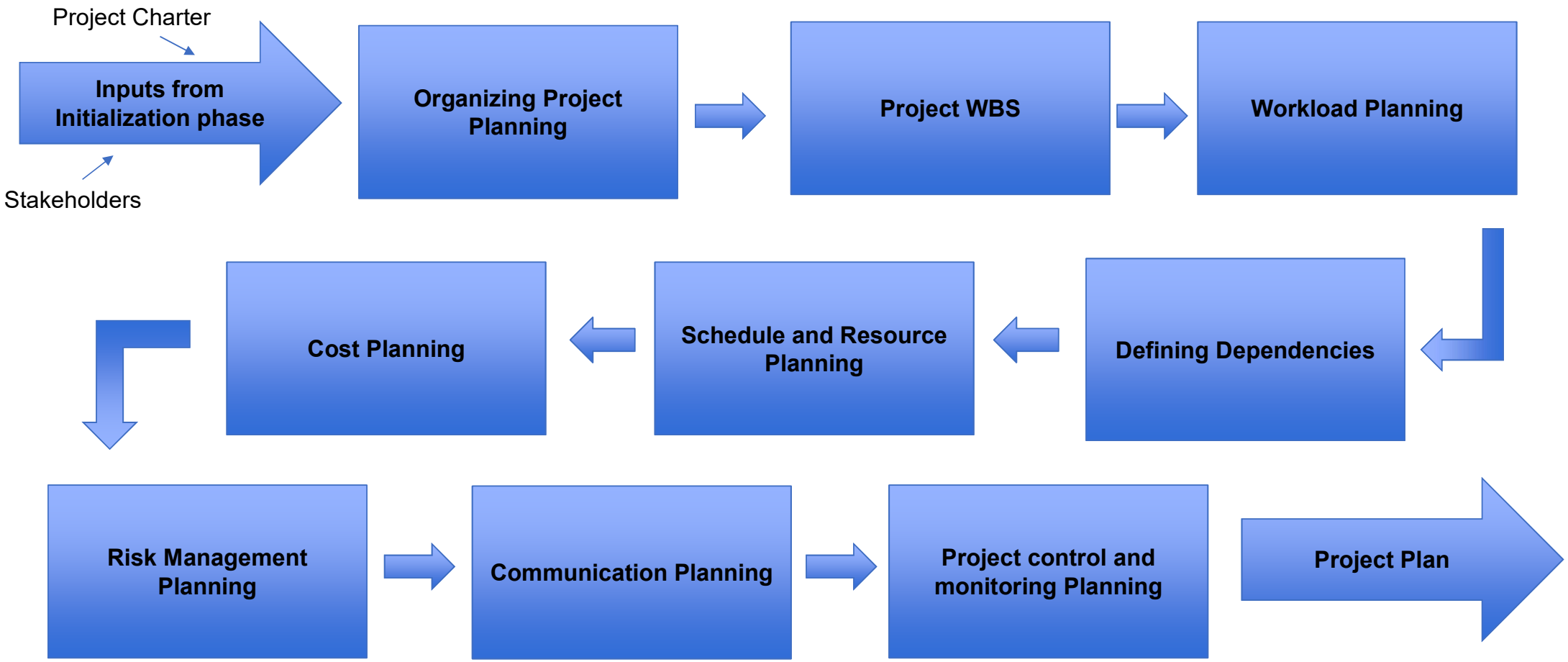
PMBOK – Process Groups & Knowledge Areas

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		

	Project Management Process Groups				
	Initiating	**Planning**	**Executing**	**Monitoring & Controlling**	**Closing**
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

PMI PMBOK Guide 2013: Table 3-1, Project Management Process Group and Knowledge Area Mapping

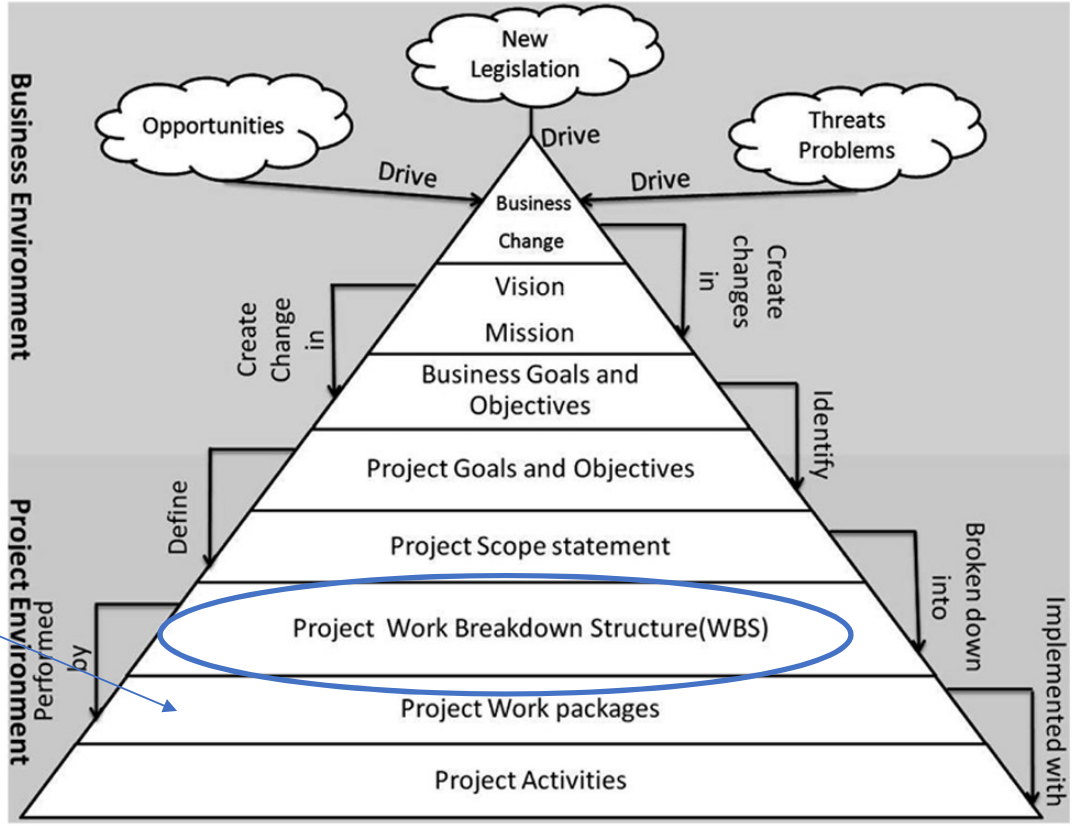
Simplified Diagram of Project Planning Process



Scope Definition Chain Diagram

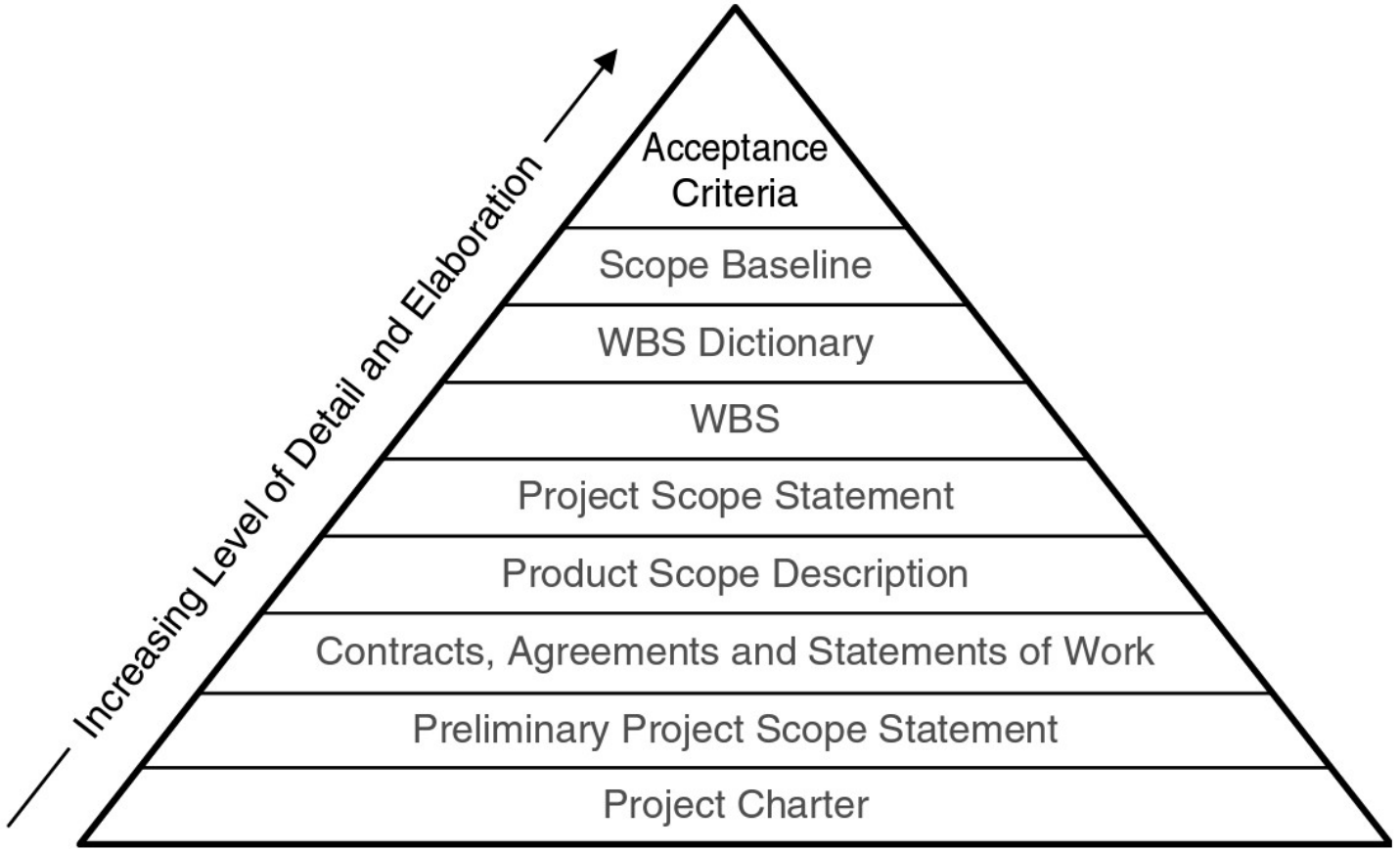
Turner, Rodney, ed. Gower Handbook of Project Management (5th Edition)

Work Packages –
The lowest level of
WBS hierarchy

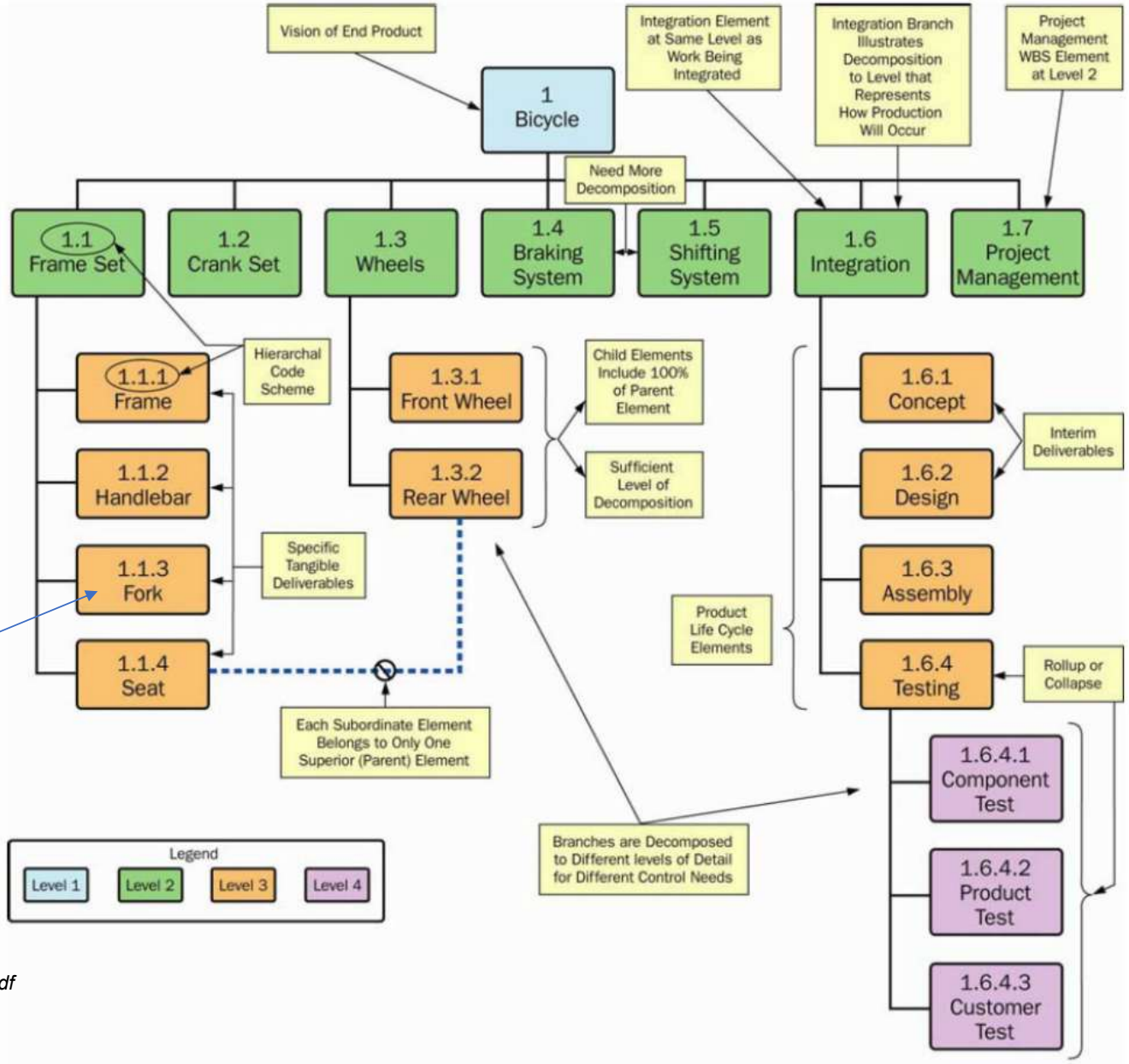


Project Scope Definition and Elaboration

Work breakdown structures : The Foundation for Project Management Excellence / Eric S. Norman, Shelly A. Brotherton, Robert T. Fried.



WBS Example



"Deliverable oriented" =
Plan outcomes, not actions

https://mosaicprojects.com.au/WhitePapers/WP1011_WBS.pdf

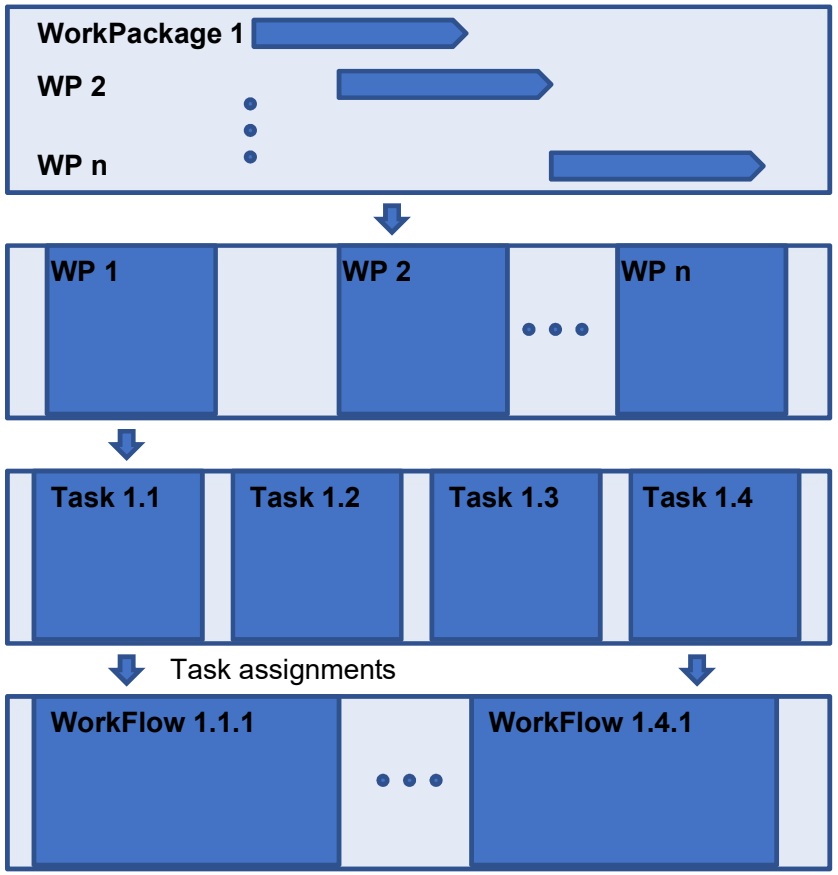
WBS and Work Packages

"Deliverable oriented hierarchical decomposition of the work to be executed by the project team." (PMI) *See detailed WBS Core Characteristics from: Norman, Eric, Work Breakdown Structures: The Foundation for Project Management Excellence. 2011, page 20-21*

- WBS - Hierarchical structure
- Work Packages – The lowest level of the WBS hierarchy
  - → Activities
  - → Tasks
- WBS is the most important input for detailed project planning including *schedule, cost* and *recourse* planning

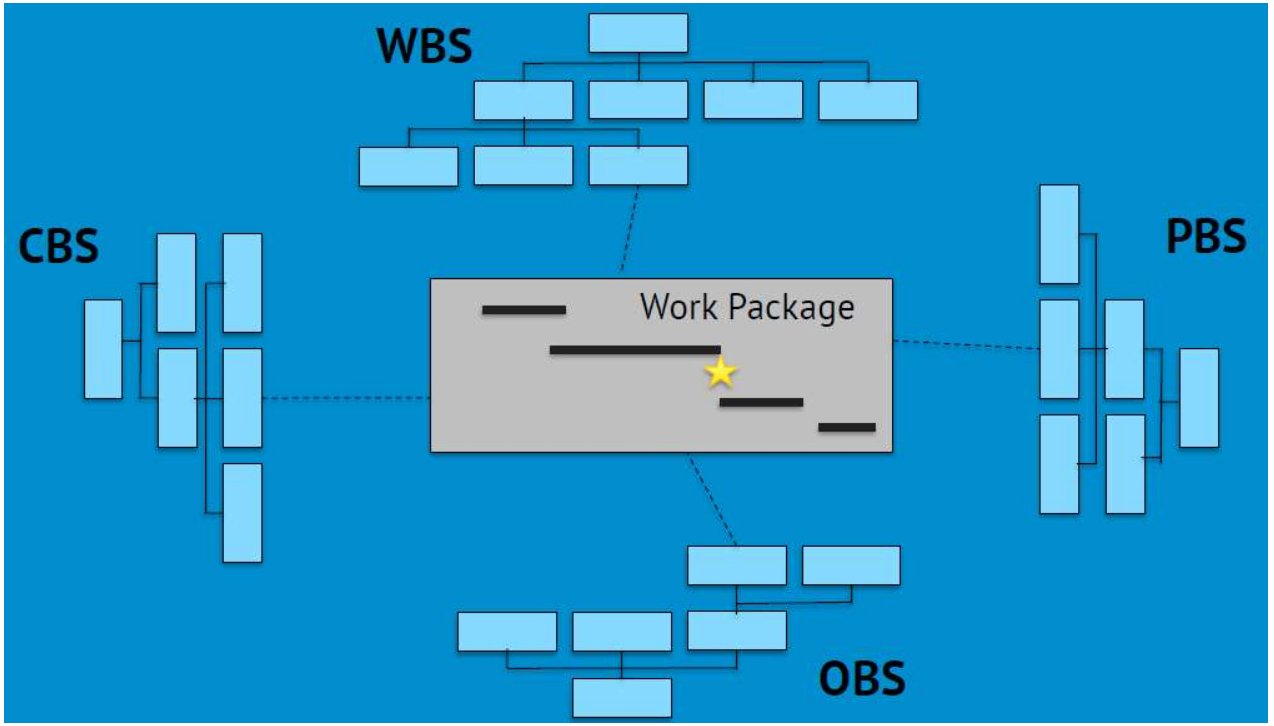
Work package:
- ✓ can be realistically and confidently estimated (start date – end date)
- ✓ makes no sense practically to break down any further;
- ✓ can be completed in accordance with one of the heuristics defined above;
- ✓ produces a deliverable which is measurable
- ✓ forms a unique package of work which can be outsourced or contracted out.

https://en.wikipedia.org/wiki/Work_breakdown_structure



WBS Methods / Types

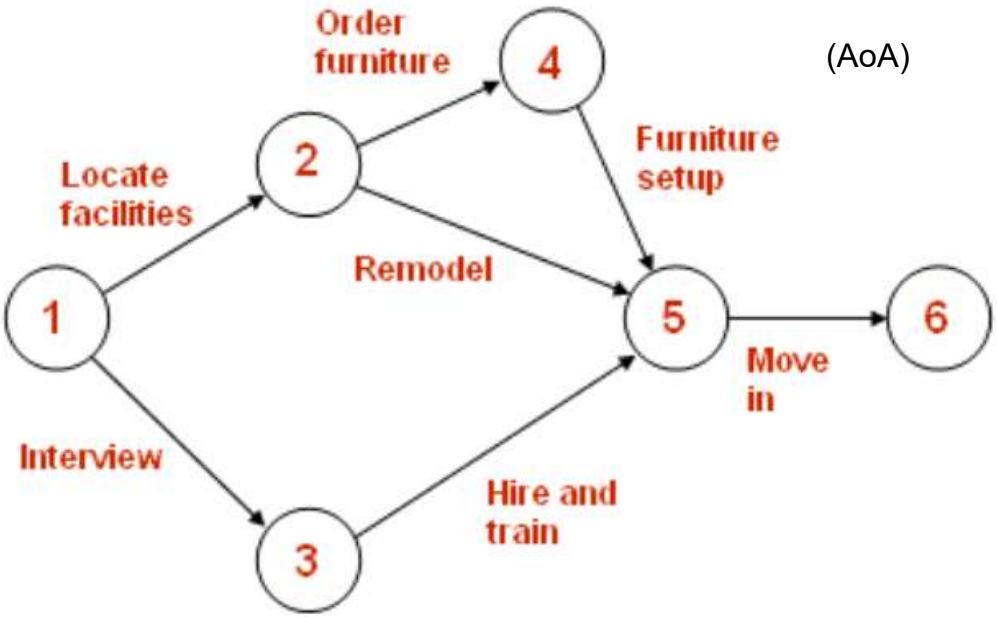
- WBS – basic structural
- Based on project phases
- Based on systems
- Based on work type
- Based on costs (CBS)
- Based on organization (OBS)
- Based on product structure (PBS)

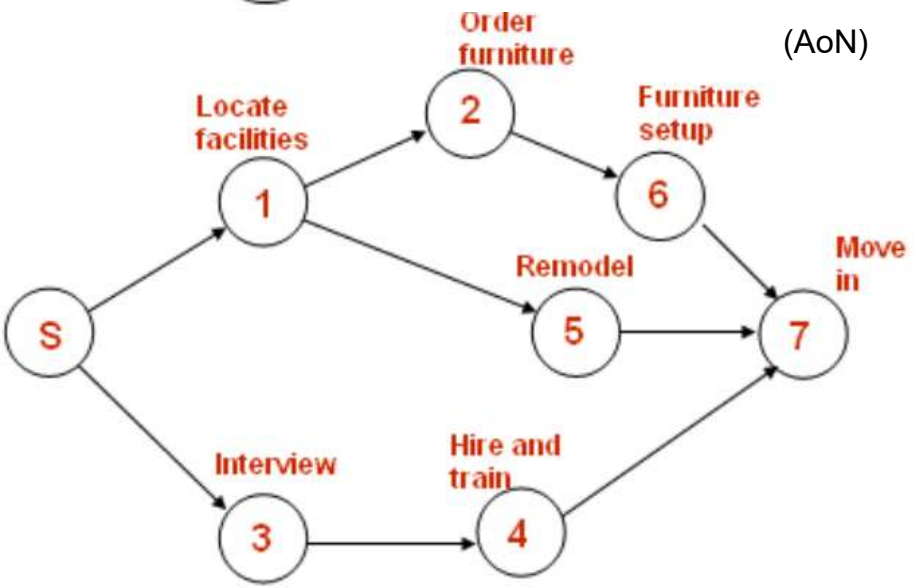


Different WBSs integrate via Work Packages

Scheduling, Sequencing and Network Diagrams

- During the scheduling process activities are described in a network diagram
- Network diagram is a graphical presentation of activities intended to show
  - Dependencies of activities
  - Successors and Predecessors of activities
  - Execution paths for activities
- There are two methods for activity definitions in the diagram
- Activity on Arrow (AoA)
  - All the activities are defined in arrows
  - Nodes represent independence points or important milestones for the project
- Activity on Node (AoN) -- this is more used
  - All the activities are defined as nodes
  - For the dependencies and for the order of the activities arrows are used

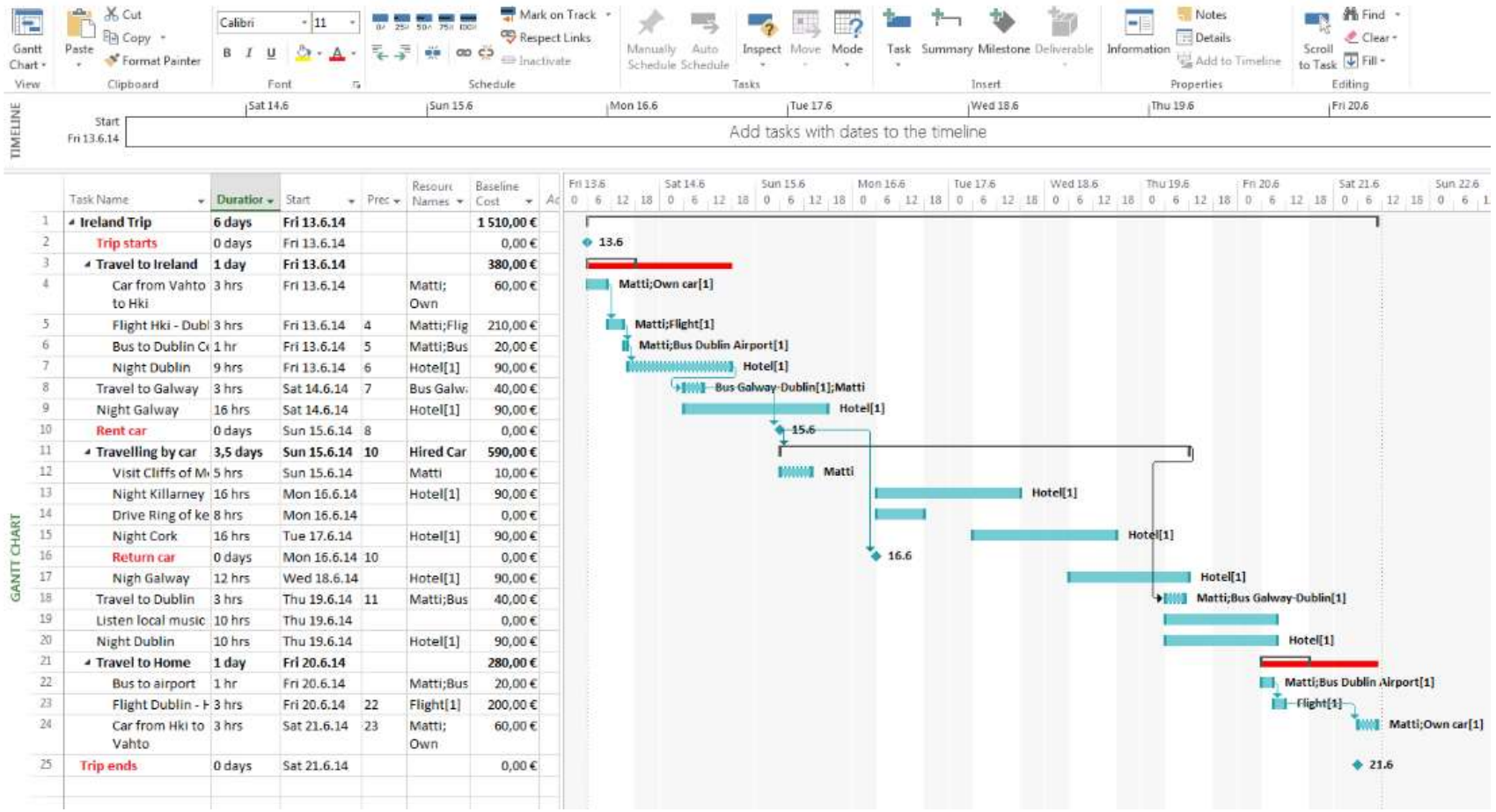




Estimations of Work Amounts of Activities

- Estimations could be based on past experiences or expert opinions “geustimates”
- For the estimates minimum and maximum amounts are defined
  - Most pessimistic (if an expert for subject does the activity)
  - Most optimistic (if a novice for subject does the activity)
- Most likely estimate is the estimate in between (not necessary arithmetic average) which is typically used for the actual scheduling

Example: Time schedule by MS Project



Possible Problems with Project Time Scheduling

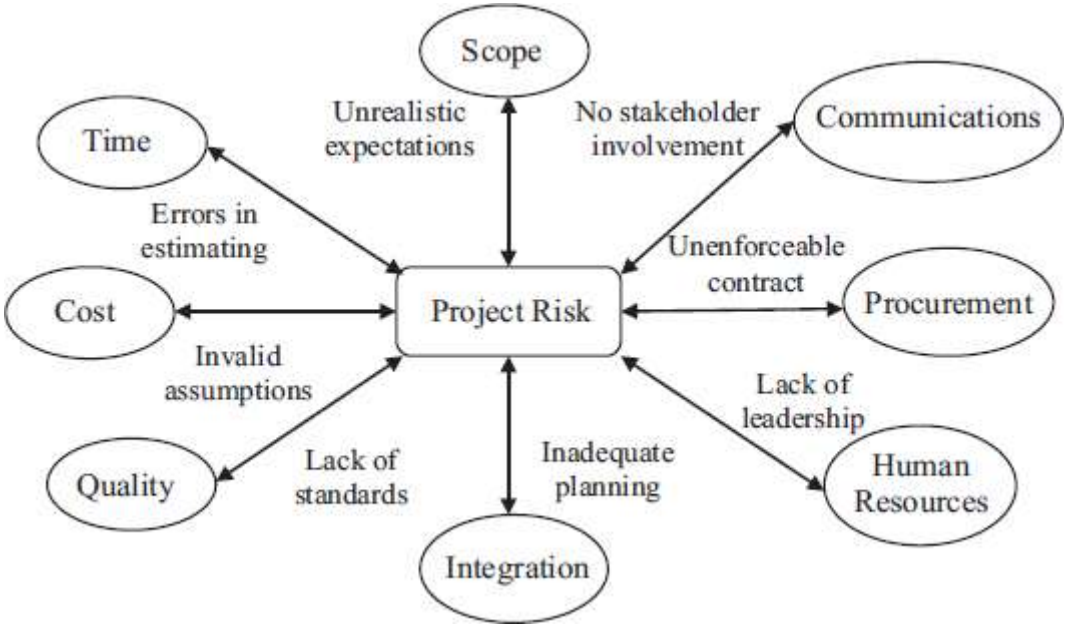
- Too optimistic estimations
- Classical ”time is running out”
- Wrong assumptions
- Wrong priorities
- Few resources allocated for critical activities
- Risk Management is not working

Risk Management

- There is need for allocation of extra resources to cover uncertainties and improve the chance of finishing on time

Causes for these risks

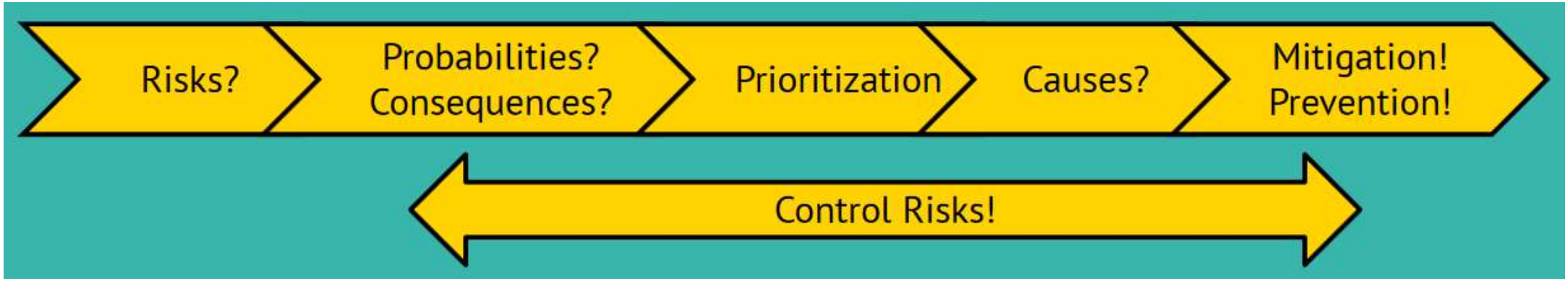
- Project scope may change
- Murphy's Law is present
- Cost estimation must anticipate interaction costs
- Normal conditions are rarely encountered



Risk Management Process

Steps in Process

1. Identification of risks (what is likely to happen? What are the warning signs?)
2. Analysis of probabilities and consequences
3. Prioritization of risks
4. Find causes
5. Plan and perform actions for risk mitigation and prevention
6. Control of risks

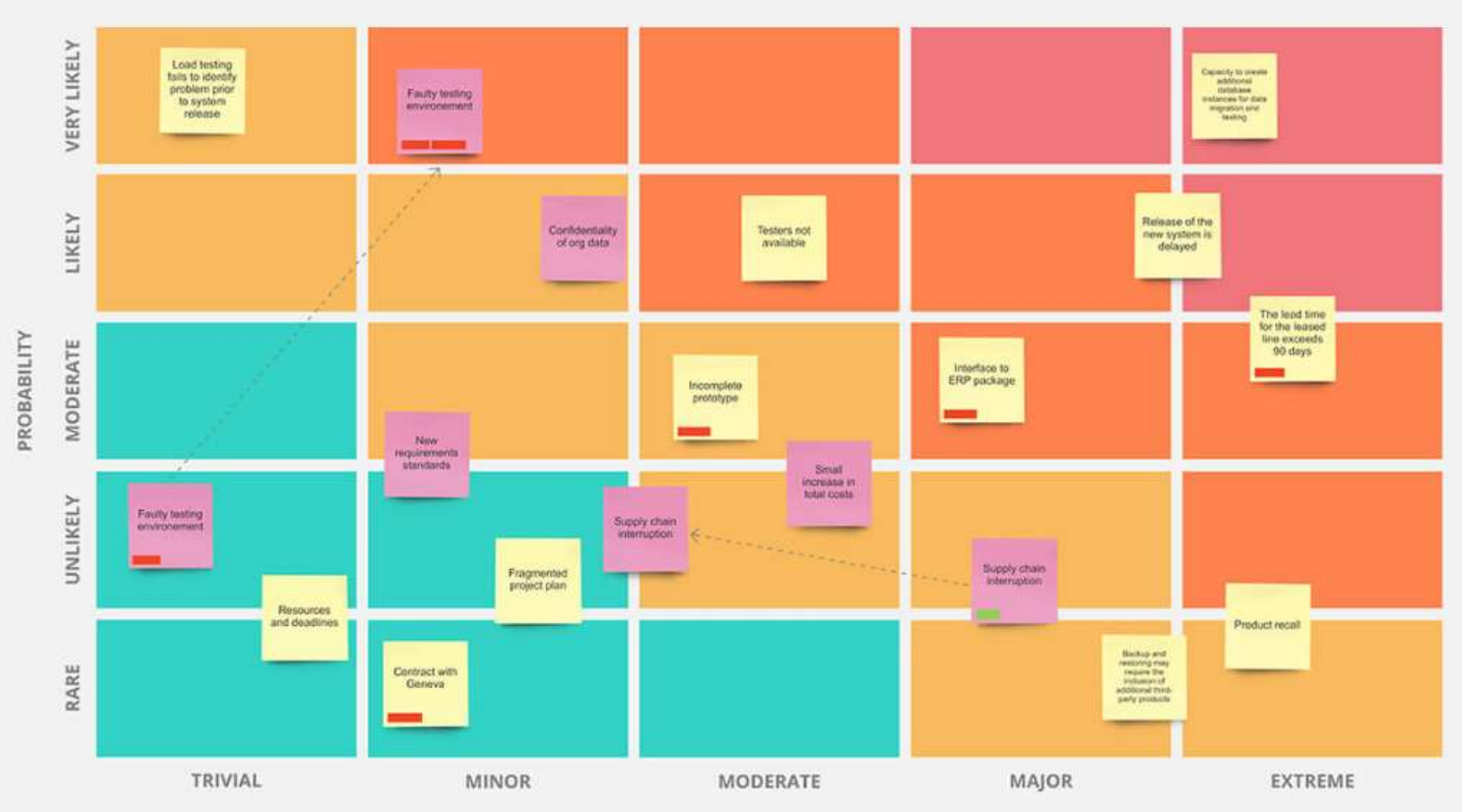


Example: Definition of Risk Values

Risk	Probability	Effect	Value	Cause	Prevention / Mitigation
Key person gets sick	2	6	**12**	Time wasted	Wash hands carefully. Increase competence of others
Person leaves project	1	5	**5**	Person changes company	Increase competence of others. Recruit
Special equipment do not work	4	10	**40**	New equipment people not used to work	Educate people for the equipment. Book support.
Ordered material do not arrive in time	8	10	**80**	Transportation time long	Order earlier. Loan
Problems with initial activity	3	5	**10**	It just takes time at the beginning	Reserve right amount of time

Value = Probability x Effect

Risk Probability vs. Impact



Requirement

“A requirement is a singular documented physical and functional need that a particular design, product or process must be able to perform.”

“It is a statement that identifies a necessary attribute, capability, characteristic, or quality of a system for it to have value and utility to a customer, organization, internal user, or other stakeholder.”

Requirements Engineering

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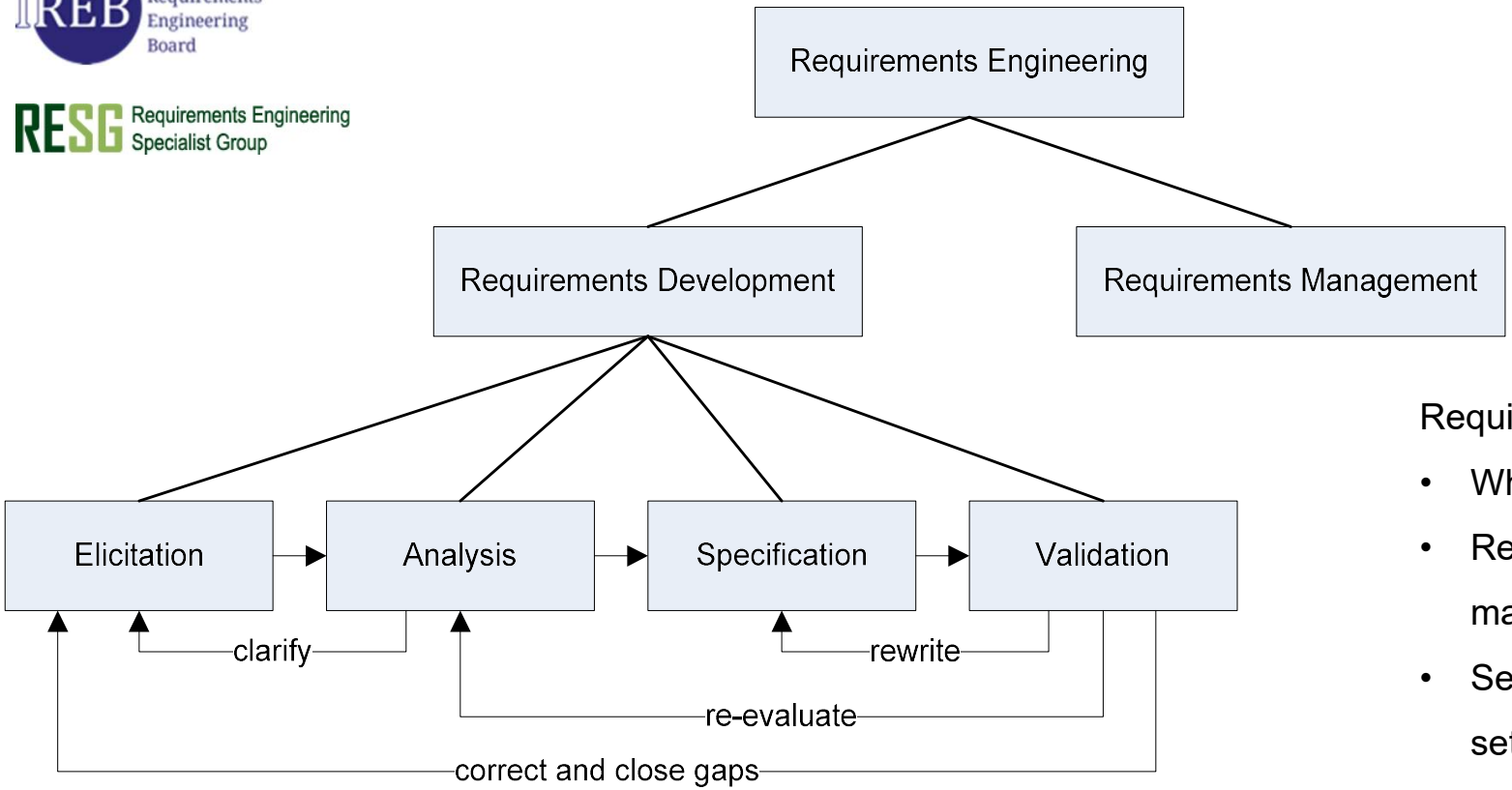
IREB International Requirements Engineering Board

RESG Requirements Engineering Specialist Group



Requirement Engineering

- Whole project/product lifecycle
- Requirements definition, management, documentation, etc.
- Set of systematic and logical set of methods
- Particularly in software, systems projects

Requirements Features

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- Correctness
- Unambiguousness
  - Every stakeholder understanding it the same way
- Completeness
  - All the necessary req's, nothing less, nothing more
- Consistency
- Rankings for importance
- Verifiability
  - Are we building the product right?
- Validation
  - Are we building the right product
- Traceability

SMARTTT criterias

- **Specific**: be specific and precise
- **Measurable**: establish a measurable indicator of progress
- **Assignable**: is agreed by and can be associated with a stakeholder
- **Realistic**: can be realistically achieved within constraints
- **Time-related**: using a specific timeframe
- **Traceable**: full traceability to needs, stakeholder and test
- **Testable**: define test criteria to confirm achievement

Why Do Projects Fail?

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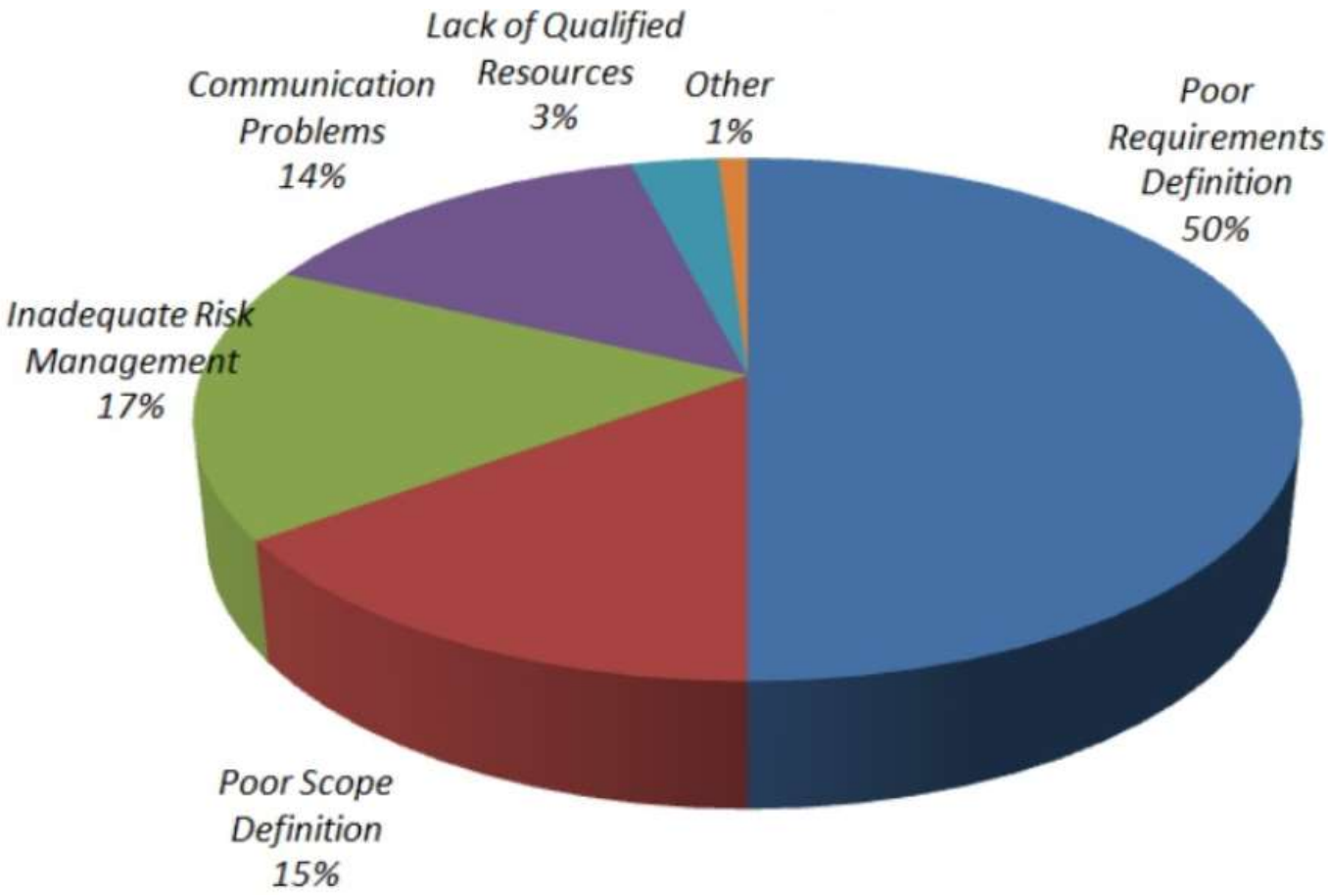

ESI International survey of 2000 business professionals, 2005

Requirement Prioritizing

- Not all requirements are equally important
- Need to analyze dependencies, priorities
- E.g. expressions:
    - Essential (must haves)
    - Desirable (should haves)
    - Optional (could haves)
- or:
    - Essential (safety, legal, key customer req. etc.) * * * *
    - High (stakeholder) value * * *
    - Medium value * *
    - Low value (“Nice to have”) *

Have a good planning!

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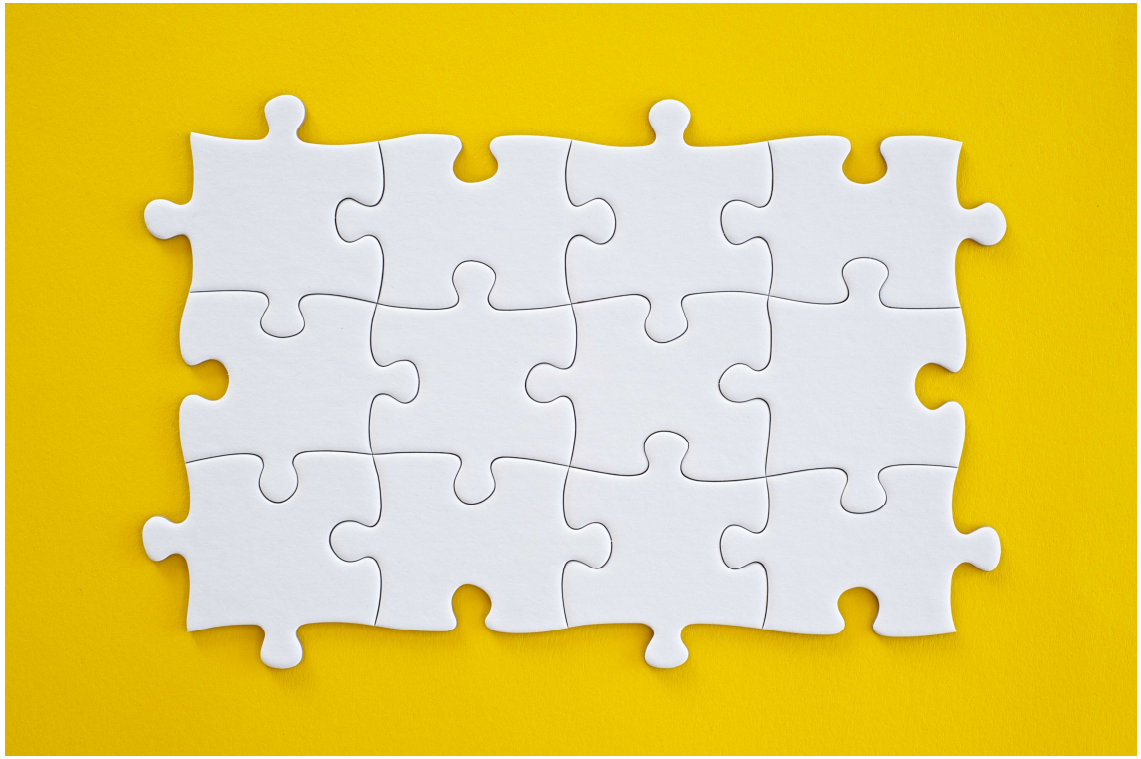

*"In preparing for battle, I have always found that plans are useless, but **planning is indispensable**."*

General Dwight D. Eisenhower

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