

Project Management

Part 7

- 1. Introduction
- 2. People & Teams
- ▶ 3. Classical Project Management
- 4. Agile Project Management
- 5. Hybrid Project Management



Project timeline, Resource plan & Cost plan

Project Timeline (Scheduling)

- Provides the **end date** and **intermediate dates** of the project, taking into account the dependencies
- For **every activity**
 - earliest start and end date
 - latest start and end date
 - If applicable, time buffer (slack)
- **Critical path**
 - Linking all activities that do not have a time buffer
 - Determination of the final date

Comparison of scheduling methods

<i>Request</i>	<i>Schedule list</i>	<i>Bar chart (Gantt chart)</i>	<i>Networked Gantt Chart</i>	<i>Network plan</i>
Quick graphical overview of appointments	3	1	2	5
Automatic extrapolation of schedule changes to the rest of the project	5	5	1	1
Detailed project planning to minimize deadline risk	5	3	1	1
Completion dates per work package	1	2	4	5
Clear and concise presentation of the dates	2	1	3	5
Coordination of many professionals	5	3	1	3
Over 200 work packages (processes)	3	2	1	3
Only a few work packages (processes)	2	1	2	3
Many externally predetermined fixed dates	1	2	5	5
Rapid planning and maintenance without IT	1	3	5	5
Rapid planning and maintenance with IT	3	2	1	5

Schedule List

➤ Content of the delivery objects and work packages is further detailed and completely recorded in an **activity list** (operation list)

- Duration
- Order or preconditions / dependencies
- Responsible person, if applicable
- distinct identification number

ID	What	Who	Until when	Status
1	Reserve room R 001 / Foyer	Secretariat	4.7.	Done!
2	Organize floral decorations	Secretariat	28.7.	In progress
3	Decorate the room festively	Secretariat	28.7.	
4	Prepare forecourt R/S-Bau (bar tables, benches)	Secretariat	28.7.	
5	Send invitation to students	Dean / Secretariat	30.6.	
6	Organize robes and hats	Marketing	27.7.	
7	Organize a photographer	Marketing	27.7.	
8	Obtain a roll-up for the faculty	Marketing	27.7.	
9	Acquire and fix budget (Ca 5000,--) <ul style="list-style-type: none"> • Create a list of companies • Distribute Telephone Acquisition (Profs) • Send invitations to Sponsors 	JUJO / Assistant Secretary	15.6. 15.6.	
10	Organise music	JE	4.7.	
11	Select students from INF-B, WIF-B and INF-M for laudatory speech	Director of Studies	4.7.	
12	Preparing the digital registration system, evaluating registrations	IT	15.6.	
13	Create an alphabetical list of graduates for each degree program	Secretariat	27.7.	
14	Organize certificates for the graduates	Secretariat	27.7.	
15	Preparing speeches	Dean	27.7.	
16	Invite the university management	Dean	4.7.	
17	Prepare poster sponsors	Assistant	20.7.	
18	Poster sponsors, possibly hang up roll-ups	Assistant	28.7.	

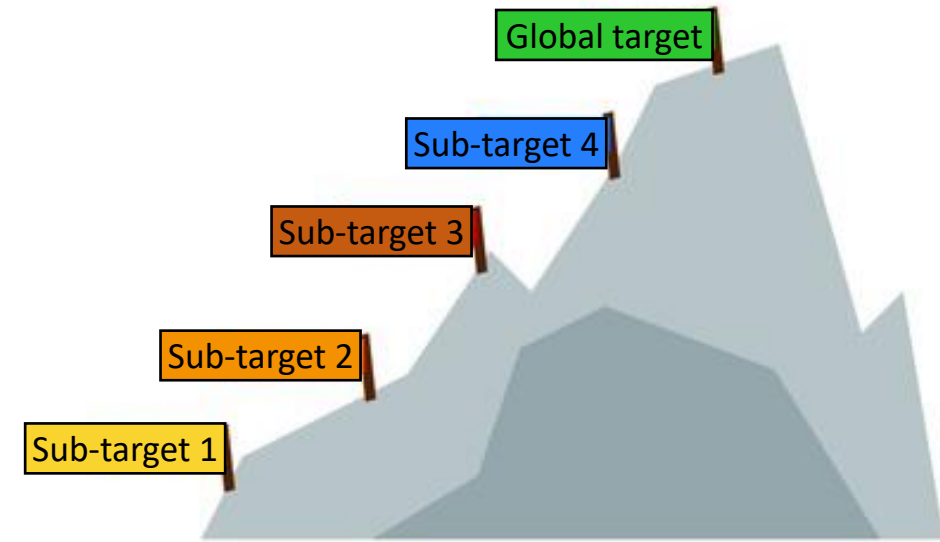
More detailed planning through schedule list

WBS Code	Element type	Designation	Responsible Person	Effort (pd)	Duration (d)	Predecessor	Start	End
<i>Unique code</i>	<i>Milestone, task or work package</i>	<i>Name of the element</i>		<i>Optional indication of the effort</i>	<i>Estimate or calculation from effort</i>	<i>Predecessor of this element</i>	<i>Will be calculated</i>	<i>Will be calculated</i>
A								
B								
C								
D								

Milestones

= Processes or events of special interest

- Externally specified milestones
- Internally determined milestones



- Milestones are usually transfers of responsibility, control points, predetermined breaking points or decision points for alternative courses of action
- Milestones are treated IT-technically with the duration of 0 time units
- Objectives of phase and milestone planning:
 - First rough structuring of the project by dividing the project into phases
 - Gain an overview of the course of the project by assigning tasks and resources to the phases
 - Initial estimation of costs

Milestone planning as the simplest form of scheduling

- For small and less complex projects, it can be used as the sole planning and controlling instrument with regard to deadlines

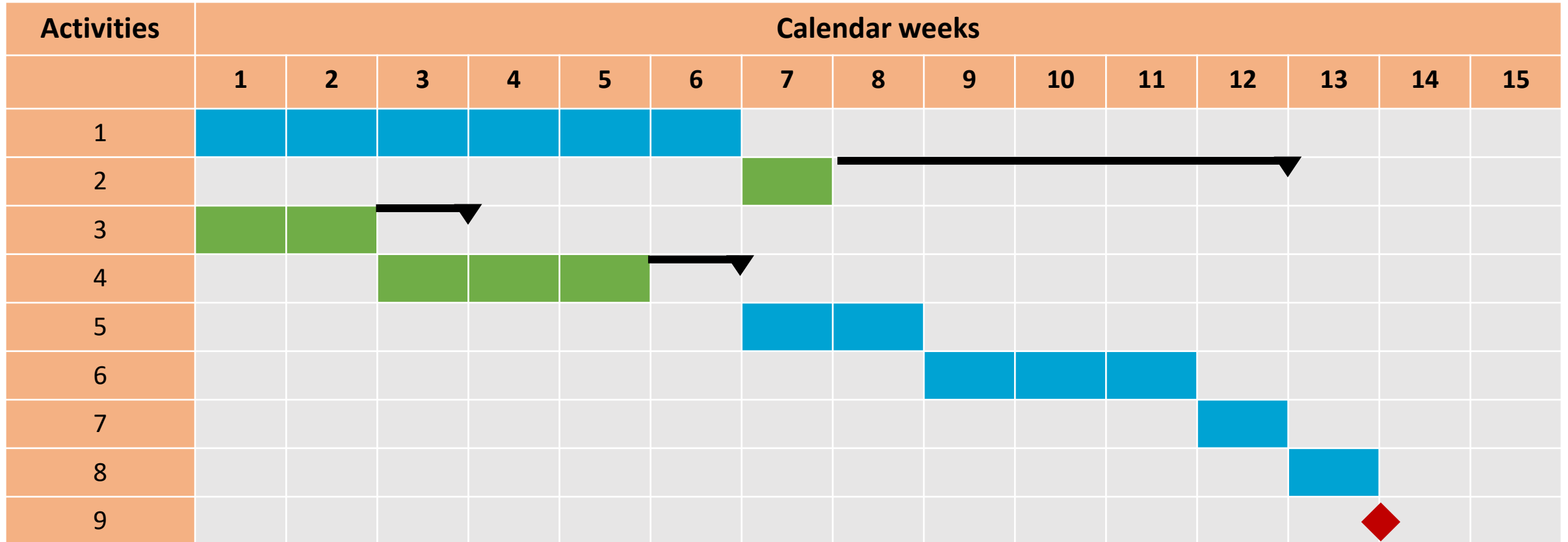
Nr	Code	Milestone name	Basis	Plan	Actual
1	MS 1	Project started	01.04.	01.04.	
2	MS 2	Permission is granted	15.05.	15.05.	
3	MS 3	Goods received	20.06.	20.06.	
4	MS 4	Partial object accepted	20.07.	20.07.	
5	MS 5	Project finished	30.08.	30.08.	

Detailed scheduling with Gantt chart shows planned total project duration

➤ Visualization of the duration of the individual work packages on a timeline

Code	Work package	Duration	Calendar weeks														
		(weeks)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.1	Project Management																
1.1.1	Project started																
1.1.2	Planning	3															
1.1.3	Controlling	15															
1.1.4.	Finishing	1															
1.1.5	Project finished																
1.2	Phase 1	7															
1.2.1	Work package 1.2.1	3															
1.2.2	Work package 1.2.2	2															
1.2.3	Work package 1.2.3	4															
1.3	Phase 2	8															
1.3.1	Work package 1.3.1	6															
1.3.2	Work package 1.3.2	4															

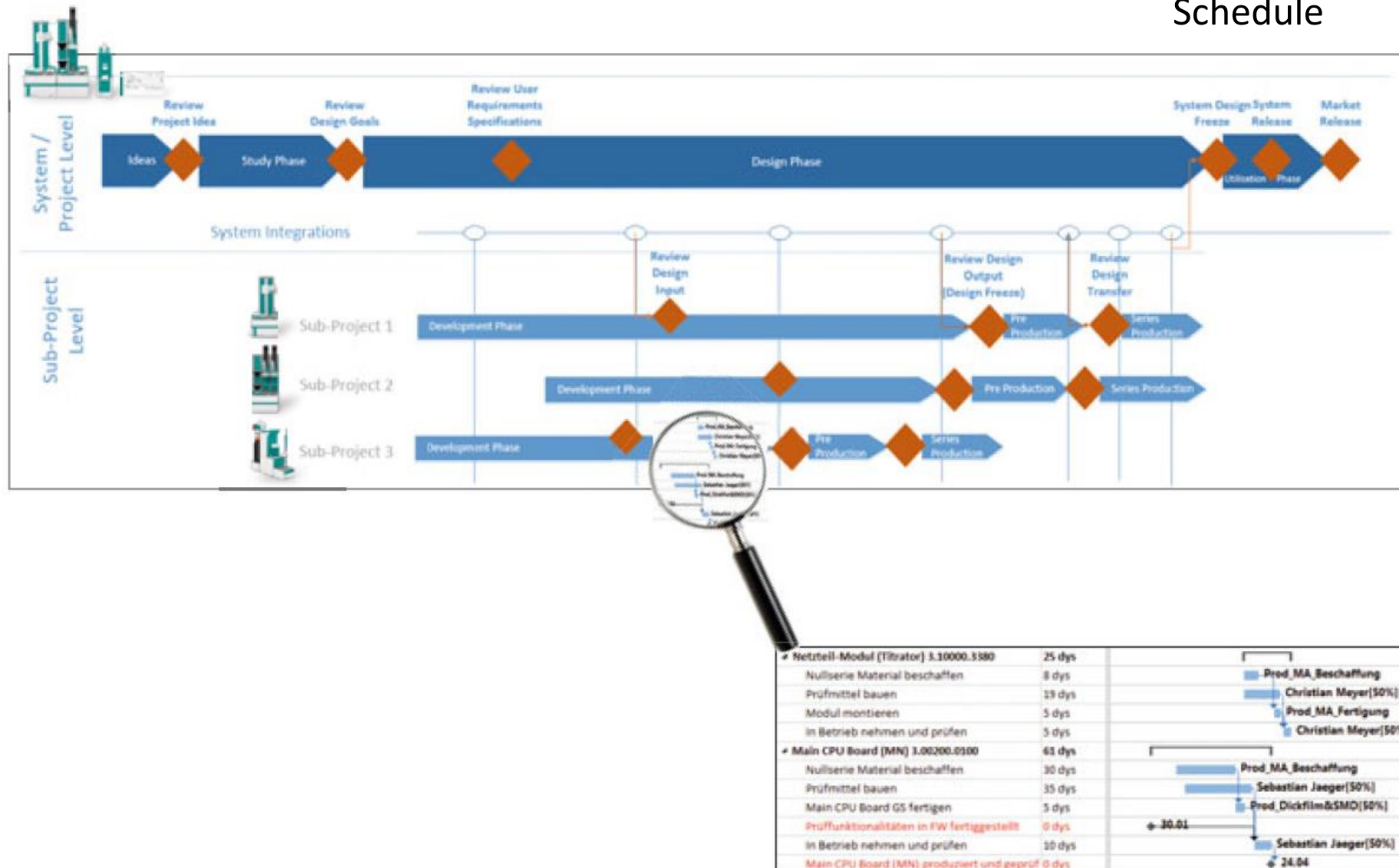
Example: Bar chart (Gantt chart) with slack



█ Critical path
 → slack

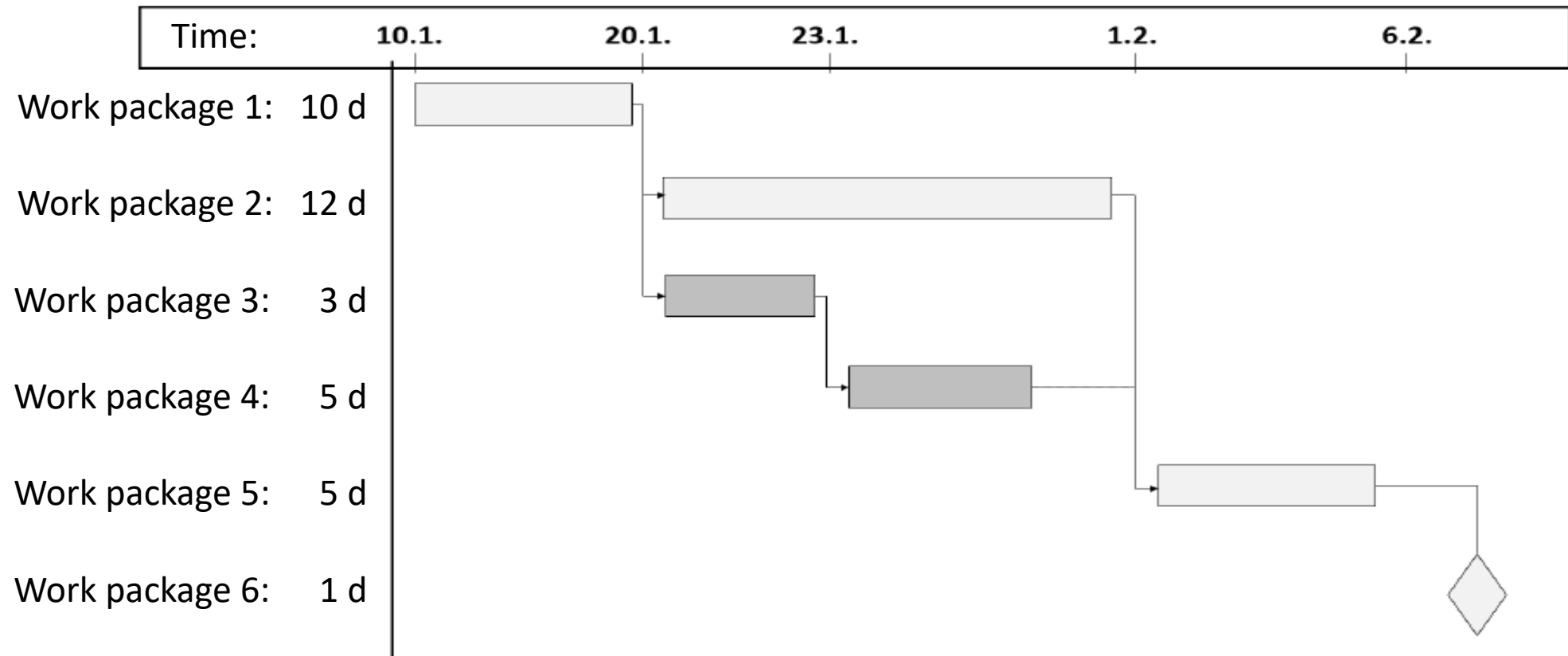
Example: Two levels of detail

Schedule

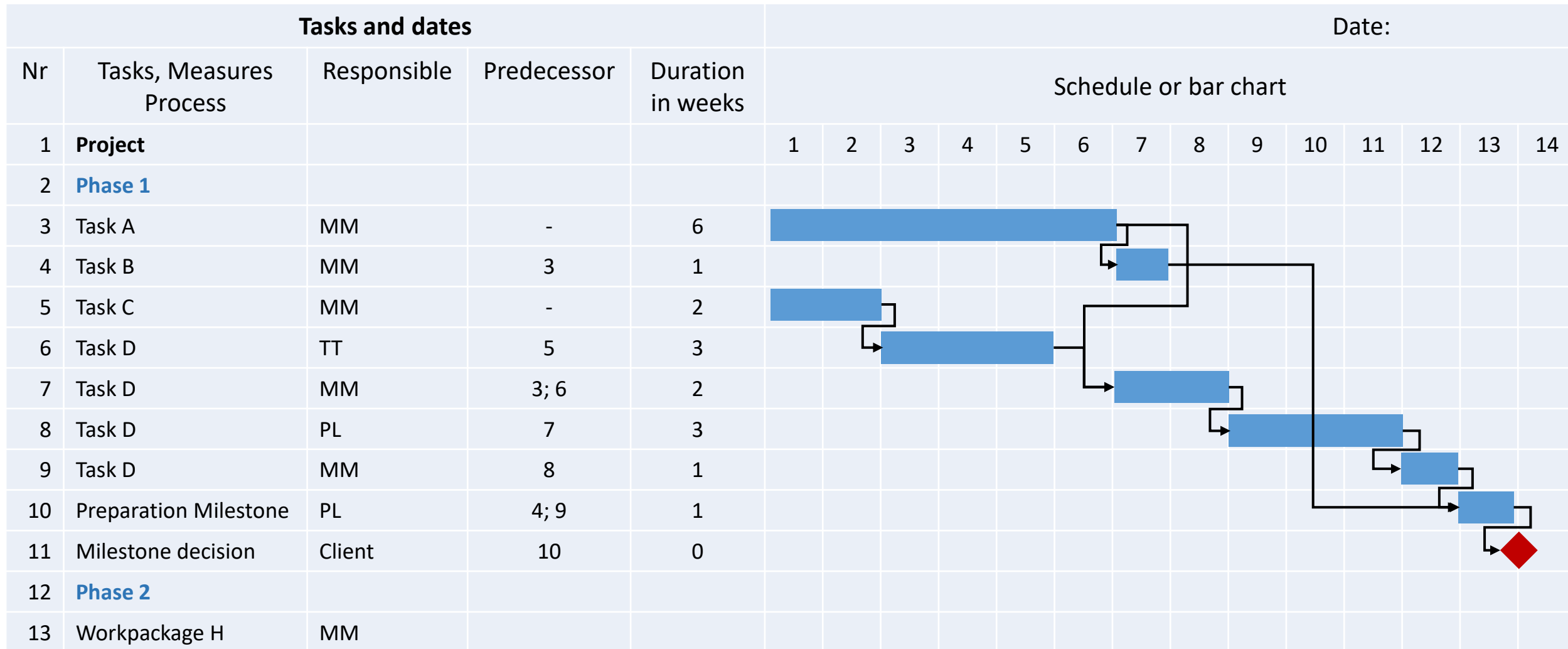


Further planning depth through networked bar chart (networked Gantt chart)

- Representation of dependencies between work packages and time buffers



Example: Networked Gantt Chart



Example illustration of a Gantt chart with project management software

Fine concept completed

Gears / Brakes

Select gearshift / brake system

Quality Assurance

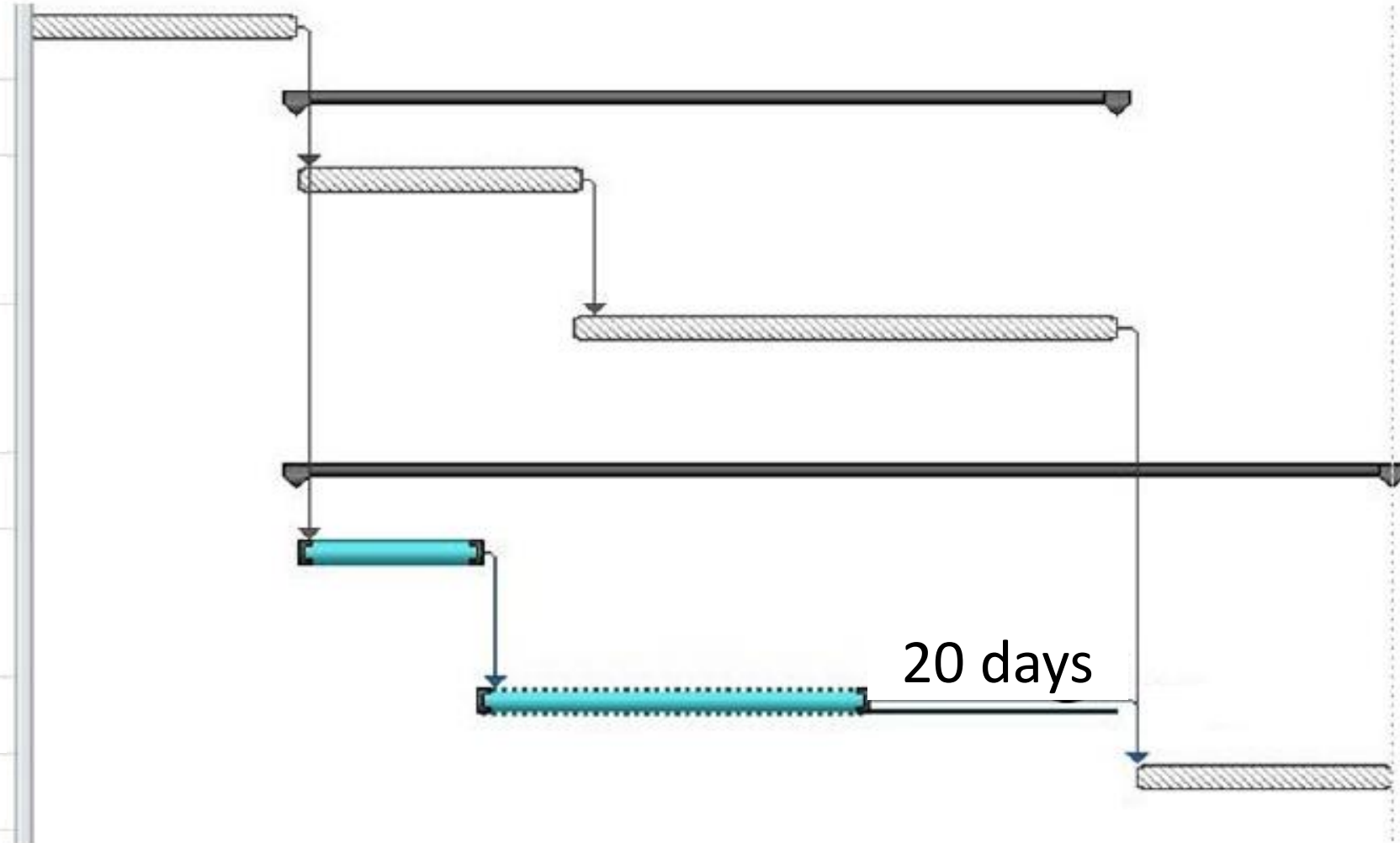
Gearshift / Brakes

Lighting

Create a construction plan

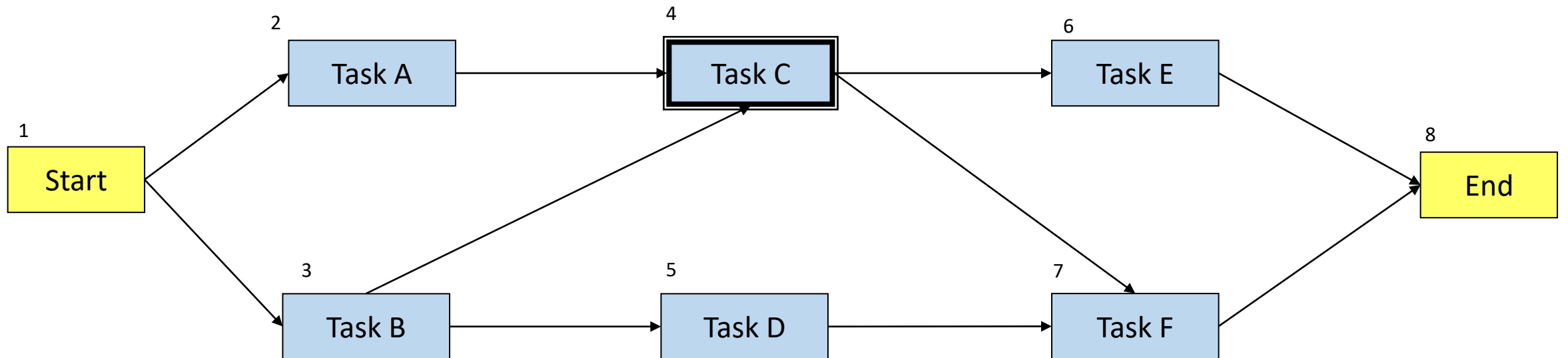
Testing lighting

Final acceptance



Network planning technique

- Presentation of the logical relationships
- Developing a timeline
- Finding the critical points
- Ongoing control and deadline monitoring



Time constraints can only be met if resources are available

- Resources

Resources (**personnel**, **materials**, **aids**) necessary for the implementation of the project

- Resource Plan

- Overview of the need and supply of resources
- Information about resource utilisation

Work packages or phases	Effort	Roles (Competence requirements)				
WBS-Code	In pd	PL	PTM 1	PTM 2	PEE 1 (HR)	PEE 2 (SW developer)
1.1	5	3	1	1	-	-
1.2	10	-	1	-	7	2
1.3	40	-	-	2	3	35
Total expense	55	3	1	3	10	37
Gross availability		-	3	2	-	-
Planned absence		-	3	2	-	-
Net availability for the project		10	17	1	30	25
Over/under coverage		+7	+15	-2	+20	-12

HR = Human Resource
SW = Software

WBS = work breakdown structure
pd = person days

PTM = project team member
PEE = project employee

Resource Plan

- Initial situation: Schedule
- Determine **resource requirements** per activity / task
- Reconciliation with capacity
- Determination of requirements per bottleneck resource

$$Duration = \frac{\text{process effort}}{\text{Number of resources} * \text{Availability}} + \text{Waiting time} + \text{risk buffer}$$

- Determination and presentation of the resource requirement profile
- Availability analysis:
Determination of over coverages and under coverages.
Consideration of several projects running in parallel or that resources are only partially available to the project

Resource plan

- Initial situation:
Schedule
- Determine **resource requirements** per activity/operation
- Comparison with capacity

Schedule

- Task 1: Specify software
- Task 2: Develop software
- Task 3: Test software
- Task 4: Create documentation



Resource plan (required resources in hours [h] or quantity [#])

- Task 1: Requirements Engineer [h]
30 30
- Task 2: Software Developer [h]
120 120 120 120 120
- Task 3: Software Developer [h]
Tester [h]
Prototype testsystem [#]
30 30
60 60
1 1
- Task 4: Requirements Engineer [h]
Technical editor [h]
30
60

Demand (Total)	Requirements Engineer [h]	30	30							30
	Software Developer [h]			120	120	120	150	150		
	Tester [h]						60	60		
	Technical editor [h]									60
	Prototype test system [#]						1	1		

Adjustment with capacity

- Capacity: Requirements Engineer [h]
- Software Developer [h]
- Tester [h]
- Technical editor [h]
- Prototype test system [#]

30	30	30	30	30	30	30	30
120	120	120	120	120	120	120	120
				50	50	50	50
				60	60	60	60
						1	1

cw 4 cw 5 cw 6 cw 7 cw 8 cw 9 cw 10 cw 11

time

 Overload: Lack of resources

Types of resources

Single-use

- Input materials
- Energy
- Financial resources
- Short-term project-relevant data

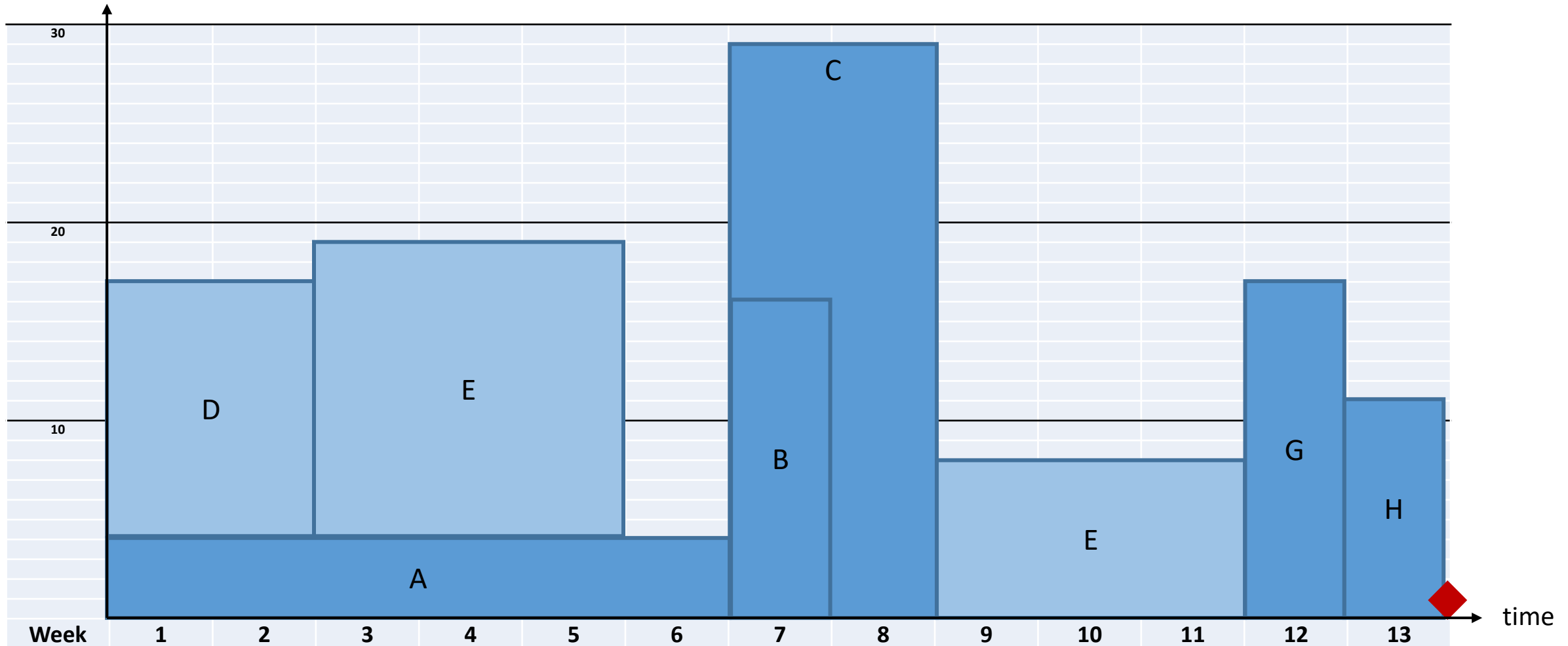
Repeatable

- Business premises
- People
- Equipment
- Knowledge independent of persons

Resource allocation plan

➤ Identification of resource requirements with a suitable time scale

Number of persons



Resource requirements and availability are compared in capacity planning

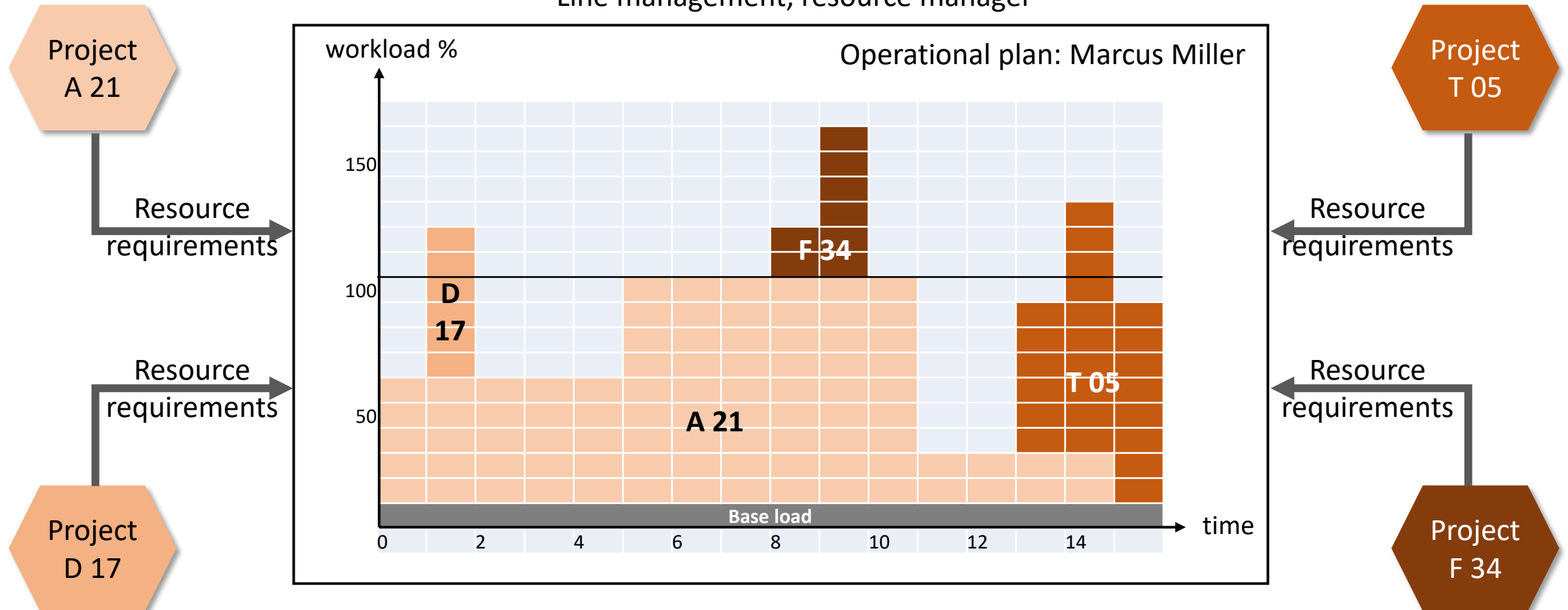
Bar chart project 4711										
Work package (WP)	Resource requirement including distribution per work package	Weeks								
		1	2	3	4	5	6	7	8	9
WP a	4 pd (50% / 50%)	2	2							
WP b	20 pd (equally distributed)			4	4	4	4	4		
WP c	15 pd (10 pd in cw4, 5 pd in cw 6)				10	0	5			
WP d	10 pd (4 pd in cw5 & cw6, 2 pd in cw7)					4	4	2		
WP e	6 pd (equally distributed)							2	2	2
Requirement (pd)		2	2	4	14	8	13	8	2	2
Availability (pd)		4	4	4	4	4	4	4	4	4
Result (pd)		2	2	0	-10	-4	-9	-4	2	2

undercoverage in resources

Resource coordination in multi-project management

- Resource requirements of all projects and resulting **resource utilisation**

Line management, resource manager



Cost plan

- Recording of all resources used in the project that cause a cost or direct cash expenditure

Nr	Task	Duration (days)	FTE	Effort (days)	Day rate (€/day)	External costs (€)	Internal costs (€)
3	Task A	30	0.50	15	1,200		18,000
4	Task B	5	1.40	7	1,500		10,500
5	Task D	10	1.00	10	1,200		12,000
6	Task E	15	1.40	21	1,500		31,500
	Investment					95,000	
7	Task C	10	1.50	15	1,200		18,000
8	Task F	15	0.80	12	1,833	22,000	
9	Task G	5	1.60	8	1,500		12,000
10	Preparation milestone	5	1.00	5	1,800		9,000
11	Milestone decision	0					
					Subtotal	117,000	111,000
					Total project costs		228,000

FTE

=

Full time equivalent

FTE = Full time equivalent

Schedule

- Task 1: Specify software
- Task 2: Develop software
- Task 3: Test software
- Task 4: Create documentation



Resource plan (required resources in hours [h] or quantity [#])

Task 1: Requirements Engineer [h]	30	30						
Task 2: Software Developer [h]			120	120	120	120	120	
Task 3: Software Developer [h]						30	30	
Tester [h]						60	60	
Prototype testsystem [#]						1	1	
Task 4: Requirements Engineer [h]								30
Technical editor [h]								60

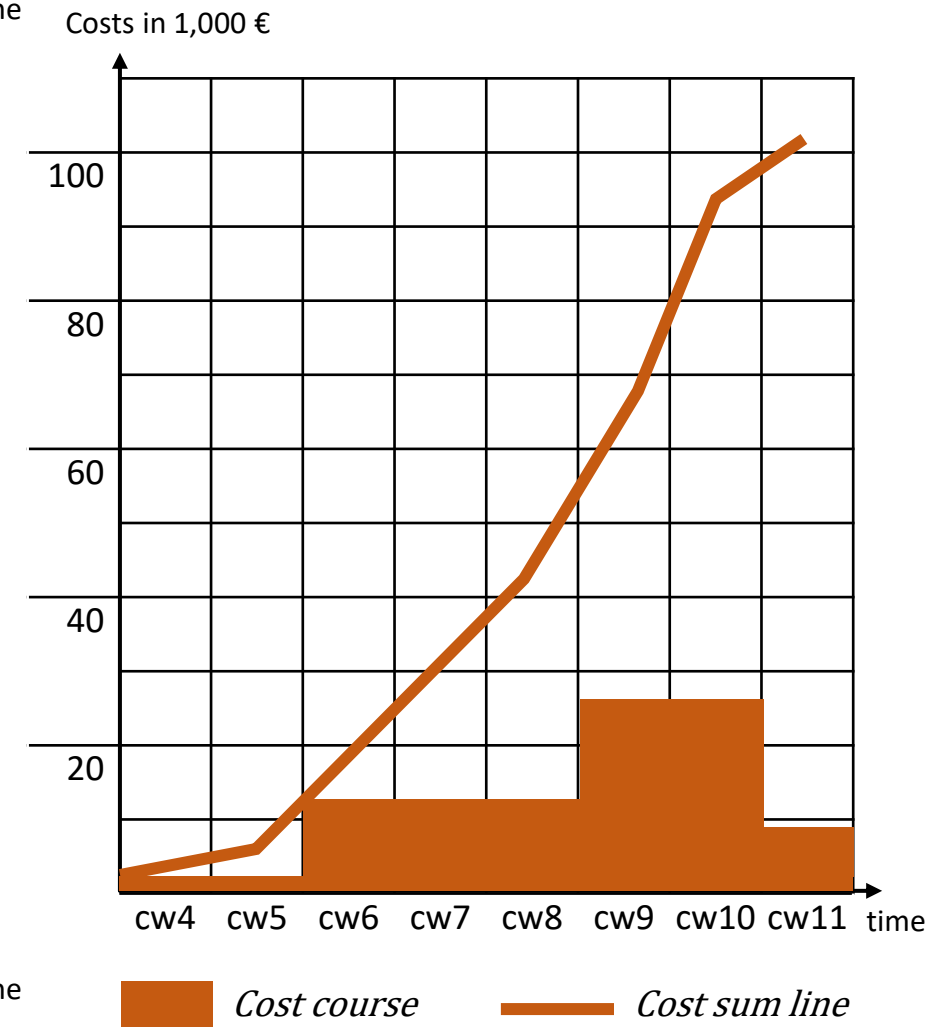
Demand (Total)	Requirements Engineer [h]	30	30						30
	Software Developer [h]			120	120	120	150	150	
	Tester [h]						60	60	
	Technical editor [h]								60
	Prototype test system [#]						1	1	

Cost calculation

Resource type	Cost rate								
Requirements Engineer	100 €/h	3	3						3
Software Developer	100 €/h			12	12	12	15	15	
Tester	100 €/h						6	6	
Technical editor	100 €/h								6
Prototype test system	5,000 €/w						5	5	
Costs per time unit [1,000 € per week]		3	3	12	12	12	26	26	9
Total costs [1,000 €]		3	6	18	30	42	68	94	103

time

Cost representation



Cost plan and budget plan

1. Review the activity or work package structure of the project
2. Determination and evaluation of the cost types used in the project
3. Assignment of cost types to (groups of) work packages
4. Summary of all costs
5. Representation according to
 - Work package or task
 - Cost type
 - Time schedule

Optimisation of the resulting project plan

- Goal:
 - Project to end at the earliest possible date
 - Resources should be used as sensibly as possible
 - Costs should be as low as possible
- Procedure:
 - Iteratively revise the first draft of the plan
 - Create multiple scheduling alternatives ⇨ Choose the optimal solution
- Attention:
 - Time lost at the beginning of a project is the same as at the end (delays the completion of the project)

Focus on plan optimisation

- **Deadlines:**

Focus on the critical path

- Time reduction of critical processes shortens deadline
- **Attention:** non-critical processes can become critical!

- **Resources:**

Optimal use of resources - Resource utilization

- **Costs:**

Replace expensive resources with cheaper ones, thereby reducing costs (possibly resulting in a later project deadline) or reducing the scope of the project (coordination with the client required!).

Summary of project planning

- Procedure plan for project implementation is created
 - Targeted use of resources
 - Critical factors in the course of the project are known
- Basis for project monitoring and control