

# Software-Engineering in Industrial Practice

## Estimation and Project Management

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Bernd Tophoven  
Darmstadt, 30.10.2015

# Bernd Tophoven

- Studies of computer science at the RWTH Aachen, major: software development
- For 22 years at Capgemini
- During this time mostly leadership and management of various IT projects
- Experience in major projects:
  - LBS Bayern: replacement of the inventory management system (40 team members)
  - Lufthansa AirPlus: credit card processing system (18 team members)
  - Commerzbank AG: clearing system for national payment transfer (47 team members)
  - Robert Bosch GmbH: driver information system (24 team members)
  - Deutsche Post AG: order management (48 team members)
  - Alldata: replacement of the overall bank application (138 team members)
  - The Federal Office of Administration (Bundesverwaltungsamt): AZR (65 team members)
- Division manager at Capgemini in Frankfurt
- Focus on project management, consulting, account management



# Approach and management determine the success or failure of software development projects

COMPUTER  
ZEITUNG

Die Wochenzeitung für die Informationsgesellschaft



- 71 percent of all projects were not successful, because they did not meet the schedule regarding time, budget and functionality. The failure rate was 66 percent in 2002. Time overrun is thereby still the project killer number 1.
- The major projects fail in most cases because of incorrect management estimations (from the Gartner group analysis of 60 failed software projects):
  - 14 projects had **unclear objectives**
  - In 8 projects were the **requirements constantly modified** without corresponding reactions
  - 8 projects failed because of **unrealistic timing**
  - In 7 projects were the costs and **effort underestimated**
  - In 6 cases wrong decisions in **supplier selection** caused the project failure
- Critical success factors of IT projects remain unchanged for many years. The Standish Group lists the top 5 success factors:
  - User involvement
  - Executive management support
  - Clear statement of requirement
  - Proper planning
  - Realistic expectations

see also

<http://www.projectsmart.co.uk/docs/chaos-report.pdf> and <http://pm-blog.com/2010/01/29/chaos-report-viel-zitiert-aber-was-steckt-dahinter/>

# Agenda

- Project success and project management
- Project initiation
- Cost estimation and project calculation
- Project planning and controlling
- Project organisation and team management
- Communication and risk management
- Project management standards and further reading

# What is a project?

- Duden 1 German spelling dictionary:  
**Plan, enterprise, design, proposal**
- DIN 6990:  
**“An undertaking that is essentially characterized by a unique set of conditions...” This uniqueness applies according to DIN 69901 to**
  - **Defined purpose**
  - **Temporal, financial, personnel restrictions**
  - **Organizational form**
  - **Differentiation from other intentions**
- A project can be defined in practice primarily by following limitations: A project is a purpose to reach **clearly defined goals** within the **predefined time** and with **limited effort**, thereby the precise approach is neither given nor known.

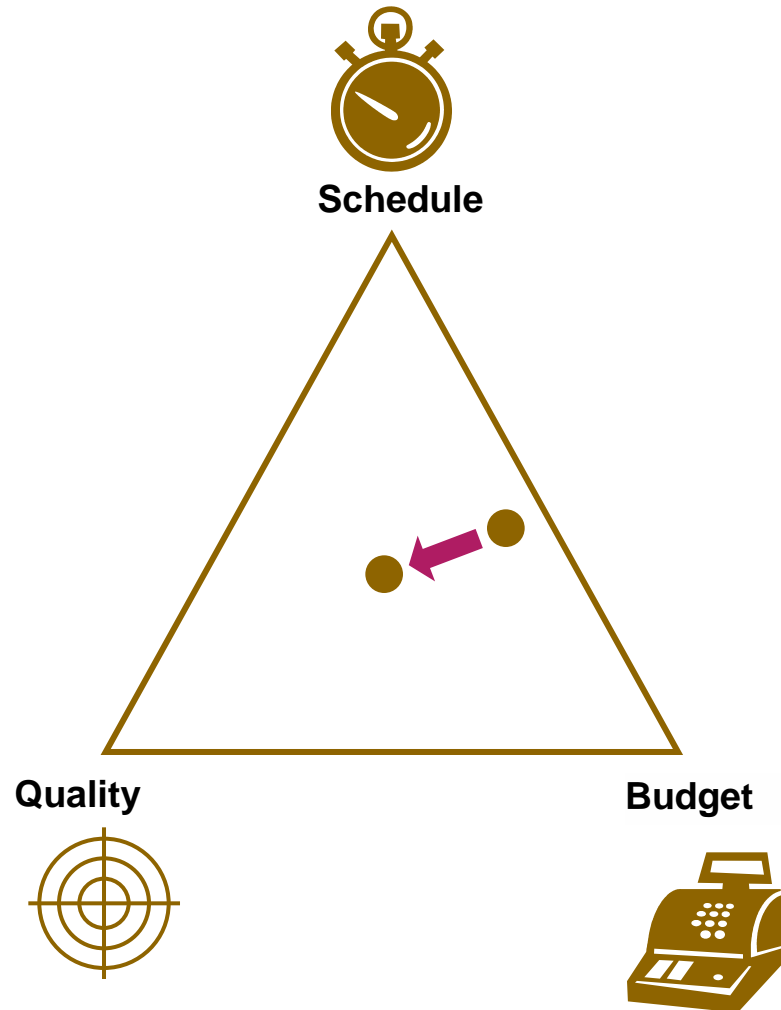
# Large IT projects can be characterised by various factors

Size	Small	Medium	Large	Mega
Project structure	<b>PL – Team</b>	<b>Overall PL – PL – Team</b>	<b>Overall PL – PM – PL – Team</b>	<b>Prog-M – Overall PL – PM – PL – Team</b>
Communication	<b>Simple (PL)</b>	<b>Complex (General PL)</b>	<b>Communic. plan (General PL, PM, PMO)</b>	<b>Communic. plan (separates TP)</b>
Planning/ Controlling	<b>1 plan by PL</b>	<b>Overview/Detail by General PL + PL</b>	<b>Multiple perspectives, PMO (dedicated function)</b>	<b>Map, dedicated function, separate sub-project</b>
PM processes	<b>Pragmatic</b>	<b>Structured</b>	<b>Formal, support by dedicated function</b>	<b>Formally complex, separate sub-project</b>
Effort (in person-years, incl. int. and ext. staff)	<b>≤ 10</b>	<b>&gt; 10 to ≤ 50</b>	<b>&gt; 50 to ≤ 500</b>	<b>&gt; 500</b>
Approximate cost (in million euro)	<b>≤ 2</b>	<b>&gt; 2 to ≤ 10</b>	<b>&gt; 10 to ≤ 100</b>	<b>&gt; 100</b>

# What is (project) management?

- Duden 5, dictionary of foreign words:  
Management is the **organization and coordination of the activities of an enterprise, that include planning, fundamental decisions , ...**
- Duden 5, dictionary of foreign words :  
Project management is the **practical, targeted implementation of a task within a specified period of time and in the given budget limit based on theoretical knowledge.**
- Project Management Institute (PMI):  
Project management is the **application of knowledge, skills, tools and techniques to project activities to meet project requirements.**

# What is a successful project management?



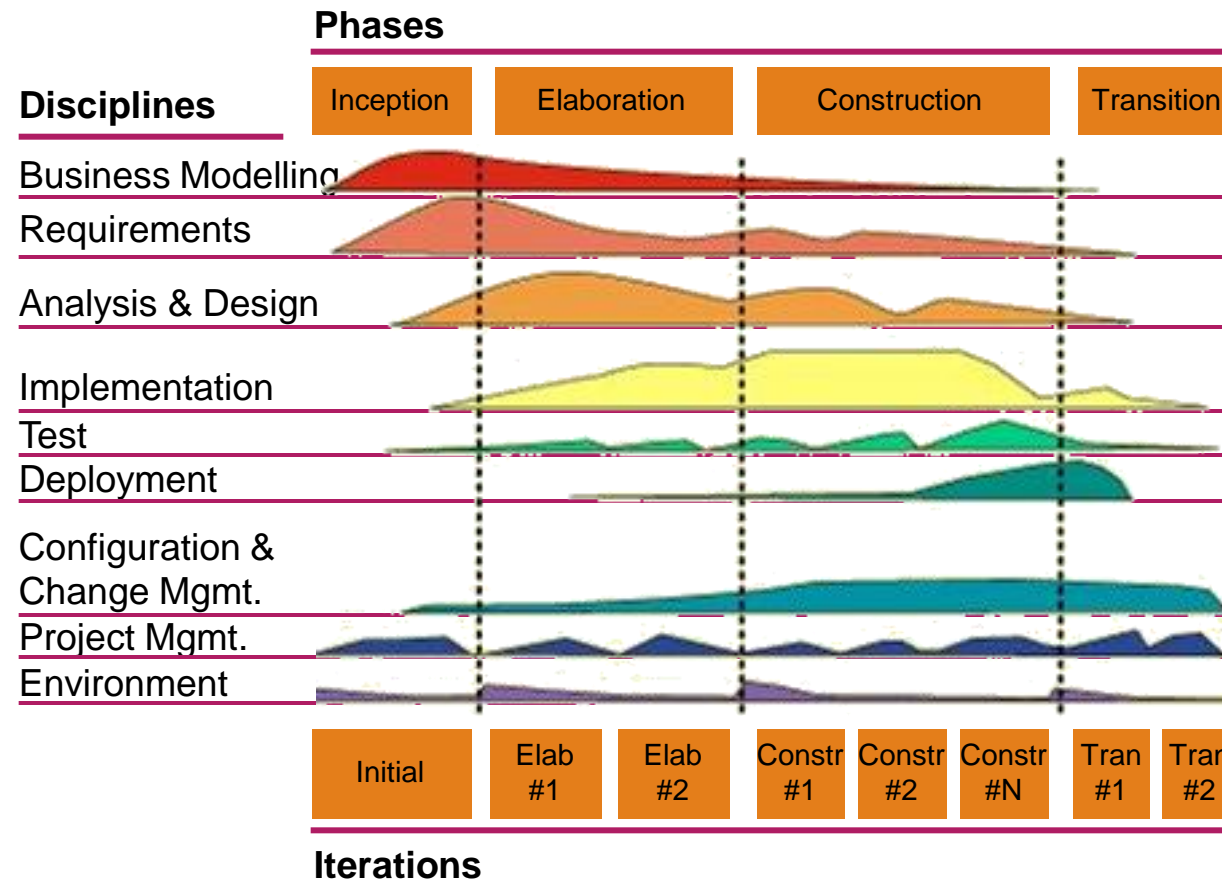
- ... when the project goals are achieved within the estimated time and budget and in desired quality
- ... and the project results are integrated into day-to-day business activities in such a way that end user expectations can be met over the long term



# Process models create an implementation framework for software development projects

Process models must be adapted to specific company / project needs

## Process model example

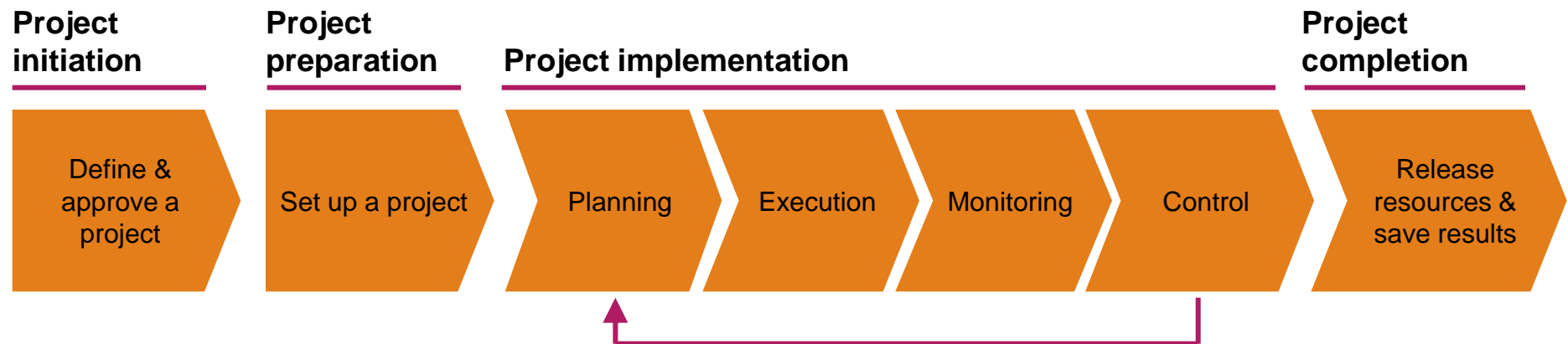


- Rational Unified Process (RUP) – see on the left side
- V-Model XT
- Extreme Programming (XP)
- Agile methods
- Feature-Driven Development (FDD)
- Spiral model
- Waterfall model
- etc.

Source: Rational Unified Process (RUP)

# Project management models create a framework for management of software projects

- The project management tasks are guided by project lifecycle
- Mostly a distinction is made between following project management phases:
  - Project initiation
  - Project preparation,
  - Project implementation
  - Project completion
- Project implementation contains iterative core processes  
Planning, execution, monitoring and control
- Project management models should be also adjusted to specific project needs!



# The PMI defines project management tasks in the form of knowledge domains and project management processes

## Project management

### 4. 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

### 7. Project Cost Management

- 7.1 Plan Cost Management
- 7.2 Estimate Costs
- 7.3 Determine Budget
- 7.4 Control Costs

### 10. Project Communications Management

- 10.1 Plan Communications Management
- 10.2 Manage Communications
- 10.3 Control Communications

### 5. 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

### 8. Project Quality Management

- 8.1 Plan Quality Management
- 8.2 Perform Quality Assurance
- 8.3 Control Quality

### 11. 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

### 6. 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

### 9. 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

### 12. Project Procurement Management

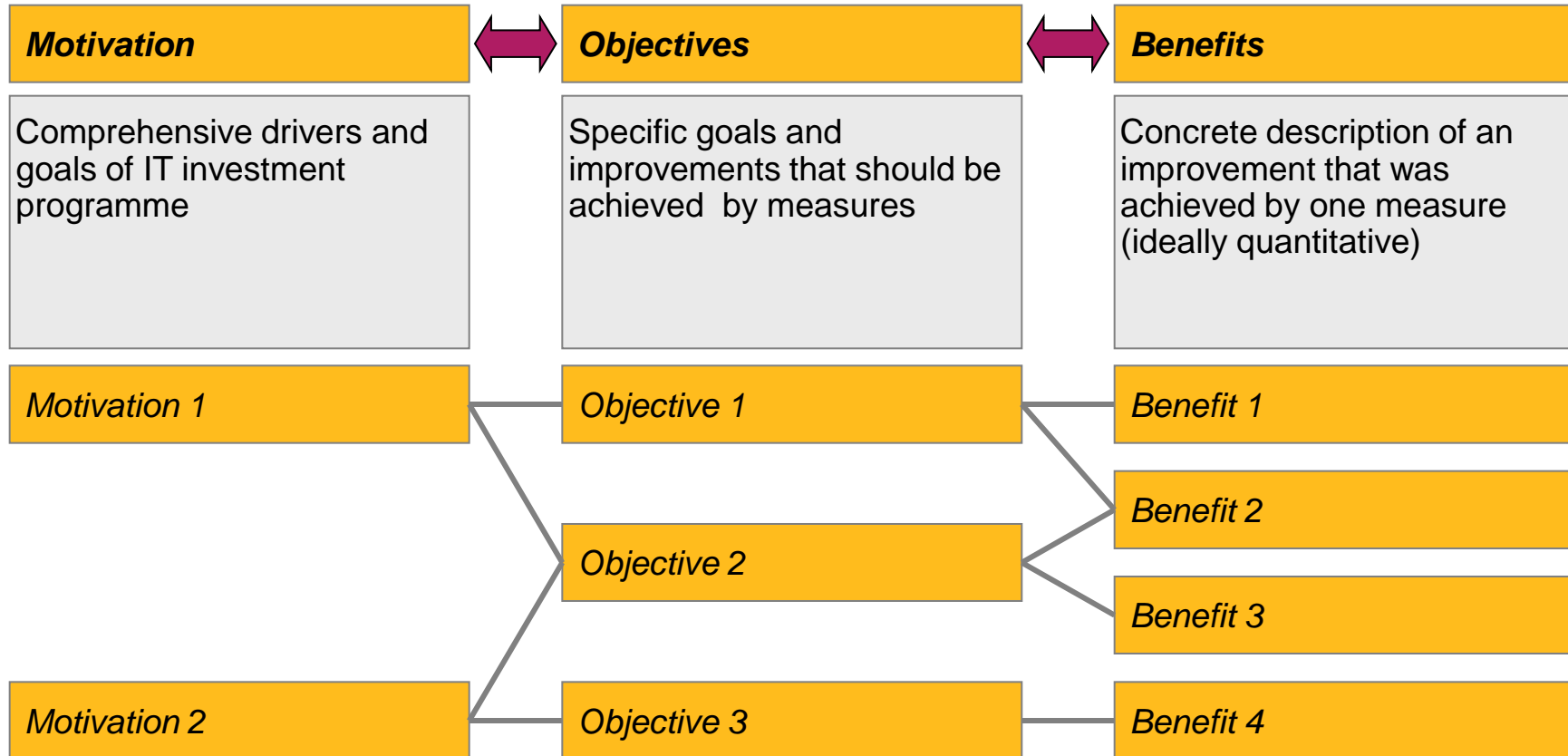
- 12.1 Plan Procurement Management
- 12.2 Conduct Procurements
- 12.3 Control Procurements
- 12.4 Close Procurements

- **Project Management Institute (PMI)** is the world's leading professional association for project management
- PMI distinguishes between 9 knowledge areas
- For each knowledge area the respective processes are described – these fundamental project manager activities are however not congruent to a simple toolbox
- Source: "PMBOK® Guide" (A Guide to the Project Management Body of Knowledge) by PMI

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# Important for orientation and control of large scale projects: exact definition of objectives and benefits



Source: Ward/Daniel: "Benefits Management", Wiley 2006

# General conditions should be specified before major project starts

## Objectives and benefits

- See previous slide
- What criteria must be fulfilled to achieve the objective?

## Deadlines

- Until when must the project objective be achieved?
- What are the influence factors (e.g. legal deadlines)?

## Budget

- What is the maximal budget to achieve the objective?

## Organisation

- Who is the principal/customer and can decide about changes of general conditions?
- Who is the agent/contractor?

## Stakeholder

- Who is affected by the project or project result?
- Who must be integrated into project?

## Personnel and resources

- Which employees and providers will be assigned to the project?
- Which resources will be needed?

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# Definitions

**surcharge for fixed price  
(„risk“)**

Surcharge to insure against risks (wrong assumptions, contractual penalties, work packages which have not been estimated, ...)

**warranty surcharge**

allowance for warranty aspects after delivery (bug fixes, etc.)

**gross effort**

**net effort (PI)**

effort for producing the actual products

**cross-sectional  
aspects (PQ)**

project and quality management, architectural consulting, meetings, ...

**other effects (PN)**

travel-time, different locations, training



# Cost estimation consists of several steps

## Action

## Result

Dividing into tasks (stock list)  
Estimate tasks individually  
Many independent estimates

Net effort

+ cross sectional aspects  
+ other effects (travel, training, ...)  
(as % of net effort, empirical values)

Gross effort

Estimation with calculated hourly rates,  
+ risk + warranty  
+ other costs (licenses, hardware, ...)

Total budget

Make plausible by

- Project plan and staffing
- Relationship of project phases
- Comparable projects

Plausible budget

Target / actual comparison

Budget forecast

# The list of work items contains all effort-relevant things and assigns them to categories

real world  
example

Aufgabenkategorie	Thema/Komponente	Aufwandsposten	Schätzung	Aufwandsrisiko	Gesamtaufwand
SP-ALLG		Initialisierung: fachliche Workshops, Themenabgrenzung, Spez-Pattern, etc.	4	1	5
SP-ALLG		Einleitung, Glossar, Überblick, Redaktion etc.	3	1	4
SP-THEMA	Stammdatendialoge	Spez Dialog: Pflege Skilehrer	1	0,5	1,5
SP-THEMA	Stammdatendialoge	Spez Dialog: Pflege Kurstypen (Art, Übungen, Preise etc.)	1	0,5	1,5
SP-THEMA	Stammdatendialoge	Spez Dialog: Pflege Stammdaten Skischule	1	0,5	1,5
SP-THEMA	Kursplanung & -abwicklung	Spez Dialog: Verfügbarkeit Skilehrer	2	0,5	2,5
SP-THEMA	Kursplanung & -abwicklung	Spez Dialog: Skikurse anlegen/pflegen	2	0,5	2,5
SP-THEMA	Kursplanung & -abwicklung	Spez Dialog: Kursbuchung	4	1	5
SP-THEMA	Kursplanung & -abwicklung	Spez Dialog: Fakturierung	2	1	3
SP-THEMA	Druckausgaben	Rechnung	1	0,5	1,5
SP-THEMA	Druckausgaben	Übersicht über alle Kurse	1	0,5	1,5
SP-THEMA	Druckausgaben	Übersicht zu einem Kurs	1	0,5	1,5
SP-NACH		Erstellen Version 1.1	2	1	3
SP-QS		Qualitätssicherung Spez	2	1	3
KON-ALLG		Vorbereitung IT-Konzept: Nutzungskonzept/EHB für Access, Pattern IT-Konzept,	5	2	7
KON-A	Stammdatendialoge	Kon Dialog: Pflege Skilehrer	0,5	0,5	1
KON-A	Stammdatendialoge	Kon Dialog: Pflege Kurstypen (Art, Übungen, Preise etc.)	0,5	0,5	1
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KON-A	Kursplanung & -abwicklung	Kon Dialog: Skikurse anlegen/pflegen	1	0,5	1,5
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KON-A	Druckausgaben	Übersicht über alle Kurse	0,5	0,5	1
KON-A	Druckausgaben	Übersicht zu einem Kurs	0,5	0,5	1
KON-QS		Qualitätssicherung IT-Konzept	1	0	1
REA-A	Stammdatendialoge	Pflege Skilehrer	1	1	2
REA-A	Stammdatendialoge	Pflege Kurstypen (Art, Übungen, Preise etc.)	3	1	4
REA-A	Stammdatendialoge	Pflege Stammdaten Skischule	1	1	2
REA-A	Kursplanung & -abwicklung	Verfügbarkeit Skilehrer (Planung)	2	0,5	2,5
REA-A	Kursplanung & -abwicklung	Skikurse anlegen/pflegen (Planung)	3	0,5	3,5
REA-A	Kursplanung & -abwicklung	Kursbuchung	7	2	9
REA-A	Kursplanung & -abwicklung	Fakturierung	4	1	5
REA-A	Druckausgaben	Rechnung in Word	4	1	5
REA-A	Druckausgaben	Übersicht über alle Kurse (Access Bericht)	1,5	0,5	2
REA-A	Druckausgaben	Übersicht zu einem Kurs (Access Bericht)	1,5	0,5	2
REA-DB		Aufbau DB	3	1	4
REA-QS		Codereviews	2		2
INT-TVO		Testfälle & Testkonzept erstellen	5	1	6

# Surcharges for cross-sectional activities are either estimated or added using a percentual increase.

cross-sectional activities		estimation	rule of thumb (in % of net effort)
project management	▶	> 6 team members: full-time project manager	10 - 20 %
architect	▶	percentage * duration	
quality management	▶	estimate individual activities	10 - 25 %
Development environment, tools	▶	depending on project type. Estimate setup and maintenance separately.	5 - 25 %
travel	▶	Number of expected travels * average travel time	
meetings, presentations	▶	Number of meetings * team members * duration	up to 15 %
training	▶	estimate individual activities	

# Different components of total effort are visible in the calculation scheme

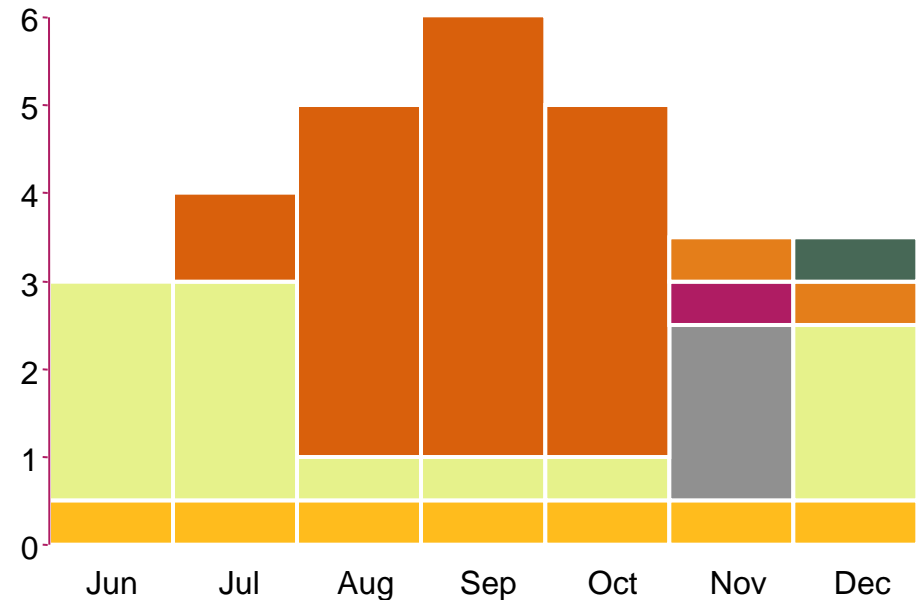
## Practical example

Task		Effort [WD]
Action 1		100
Action 2		300
Action 3		200
<b>Net effort</b>		<b>600</b>
Project management	15%	90
Quality management	15%	90
Team training	5%	30
System support	15%	90
Travel time	7%	42
Introduction support	8%	48
<b>Cross sectional tasks</b>		<b>65% 390</b>
<b>Gross effort</b>		<b>990</b>
Risk	20%	198
Warranty	10%	99
<b>Total effort</b>		<b>1.287</b>

# Effort estimation can be also made plausible by human resources

- Outline the project plan by estimated duration and team size
- Calculate the area  
here: 30 month periods (MP)
- 1 MP = 0,8 person month due to holidays, trainings, illness, non-project meetings, etc.
- The conversion from MP into person months results in:  
 $30 * 0,8 = 24 \text{ PM}$
- Does that match the effort estimation?

Number of  
team members



# Characteristics of estimation in large scale projects (1)

**The basis for the success of major IT projects is laid with effort/cost estimation and project calculation**

- A project wide common methodology for estimation ensures the comparability of different teams estimates
- Cross sectional roles and functions, planned project-wide communication, consistent and distinct documentation, targeted training and distinct knowledge management play an important role in large IT projects – that should be taken into account in project calculation
- Scope, complexity and variety of tasks are much greater in comparison to small projects
  - Consideration of sub-project structure
  - Coordination with many parties/organizational units
  - Optional themes are mandatory in major projects (a customer has invested a lot)
  - Delegation of tasks outside of the project causes maintenance effort anyway
  - Solution: reducing the required effort through the use of standards

# Characteristics of estimation in large scale projects (2)

- Formal criteria become increasingly important in major projects
  - Customer needs „certainty“ (team members can not estimate the overall project any more concerning the content)
  - Customer appoints employees who control the formal correctness („pseudo certainty“)
  - Solution: Early define obligatory formal criteria that are realistically achievable!
- Own knowledge is overestimated
  - Don't be lulled into a false sense of security in case of effort estimation
  - Verify assumed reusability explicitly
  - Identify themes for specialists and calculate the support
- Plan changes during the (long) project
  - There will be change requests during a long project lifetime
  - Solution: Calculate the cost/effort for change requests already in the estimation period

# Characteristics of estimation in large scale projects (3)

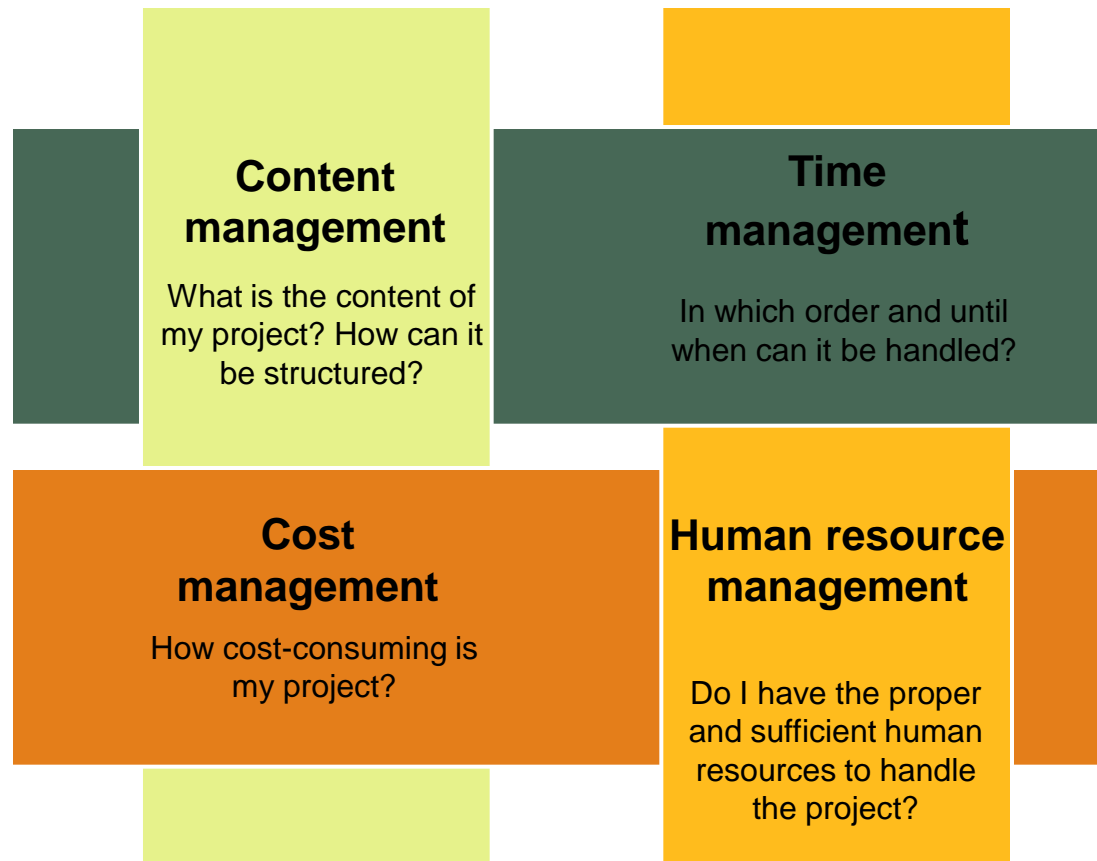
- The basis for the project (e.g. project proposal and contract, system specification) often leaves too much room for interpretation
  - Inconsistent descriptions
  - Solutions are only drafted, detailed definitions are explicitly postponed to implementation phase; problems arise with detailed work
  - Deliverables are not precisely defined
  - Excessive promises to achieve project approval
  - Processes and general conditions are not specified in detail
  - The customer can take advantage of inaccuracy
  - Solution: detailed inspection of project basis BEFORE signing the contract / project approval
  - Solution: plan cost/effort for clarification of weak spots in system specification
- Project scope is often too large for an implementation in one step („big bang“)
  - Big bang solution is complex
  - Risks of big bang approach are too high and will not be paid by the customer
  - Solution: consider delivering different increments in calculation since the very beginning
  - This requires concurrent operations and many test phases / launches
  - Increments are not making things cheaper, but the project is more controllable



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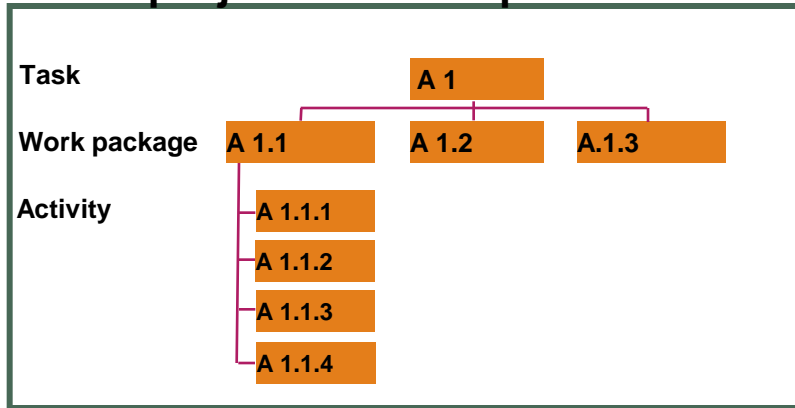
# Project planning and controlling play a key role in project management



- Different knowledge fields of the project management are according to PMI an expression of 4 central questions that should be regularly answered during project planning
- The more precisely these questions can be answered, the more realistic is a plan
- Mostly it is impossible to answer these questions independently of one another.
- That's why project planning & controlling consider aspects of different knowledge fields.

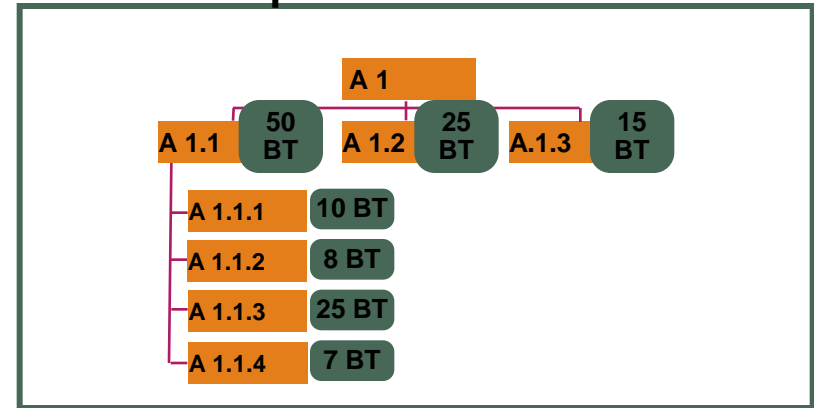
# The project plan includes multiple (sub-) plans and is created in several steps

## Basis: project structure plan PSP



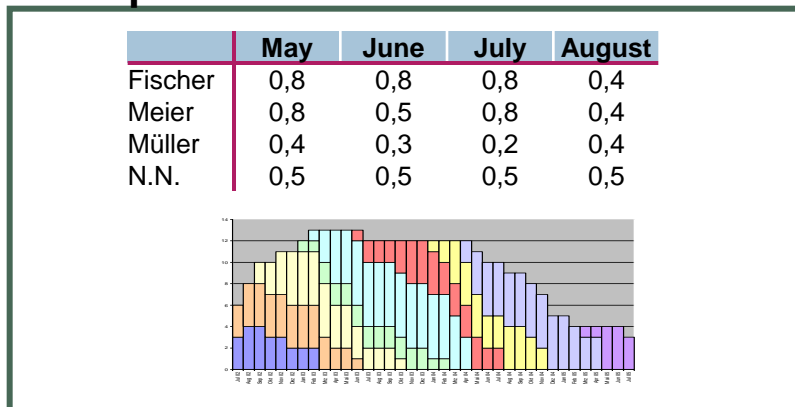
Estimate

## Cost / effort plan



Identify dependencies  
Parallelization capability,  
milestones, ext. supplies etc.

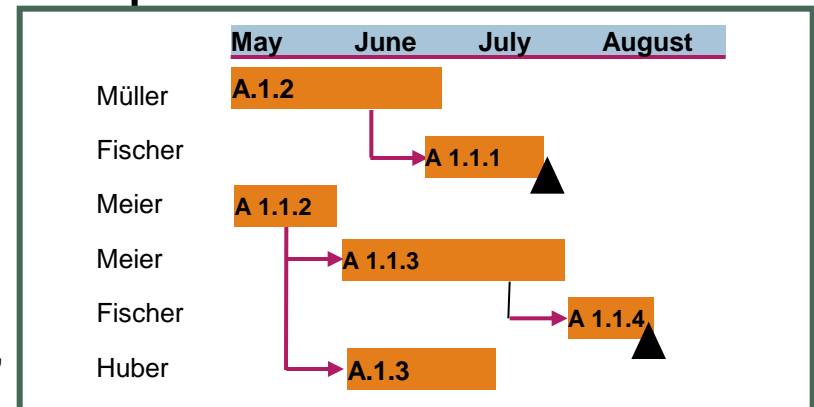
## Team plan



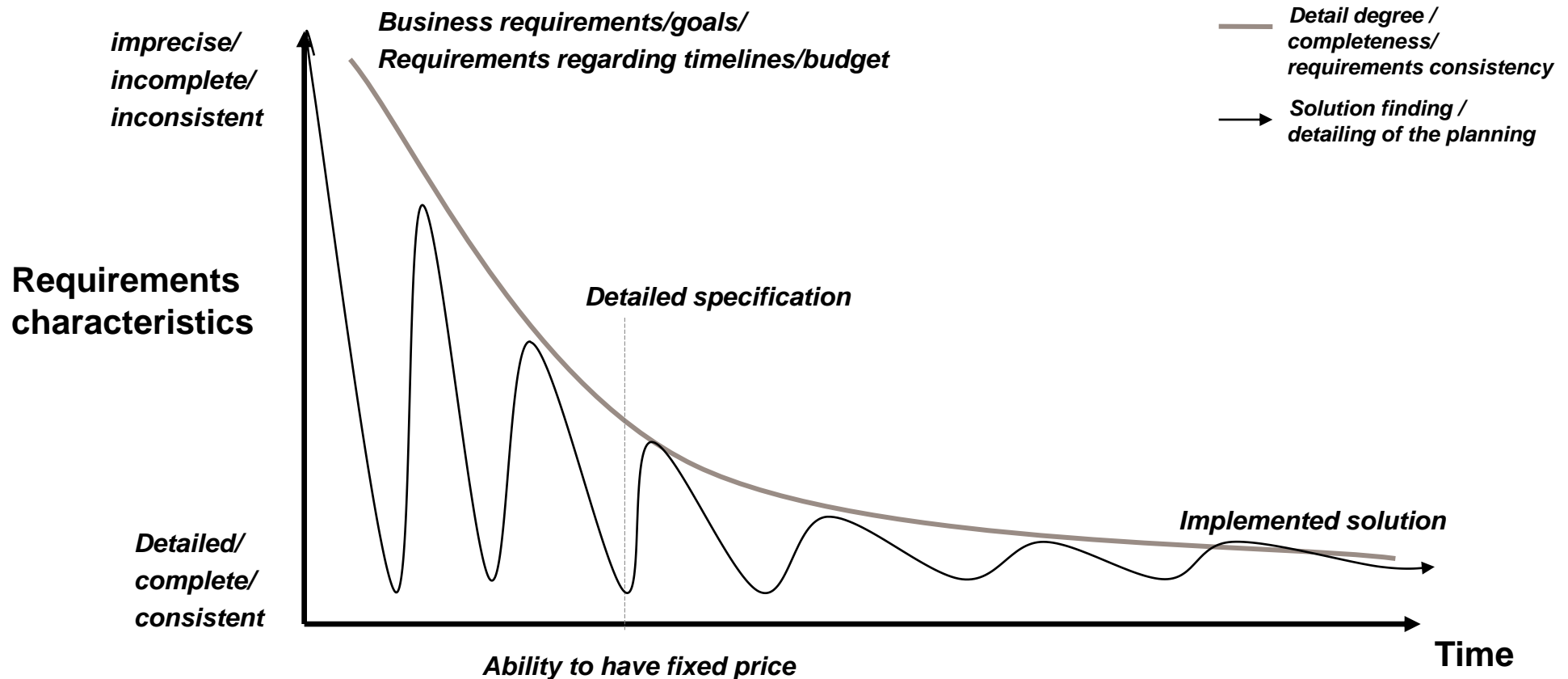
Assign names

Correlation  
number of  
team members,  
time plan

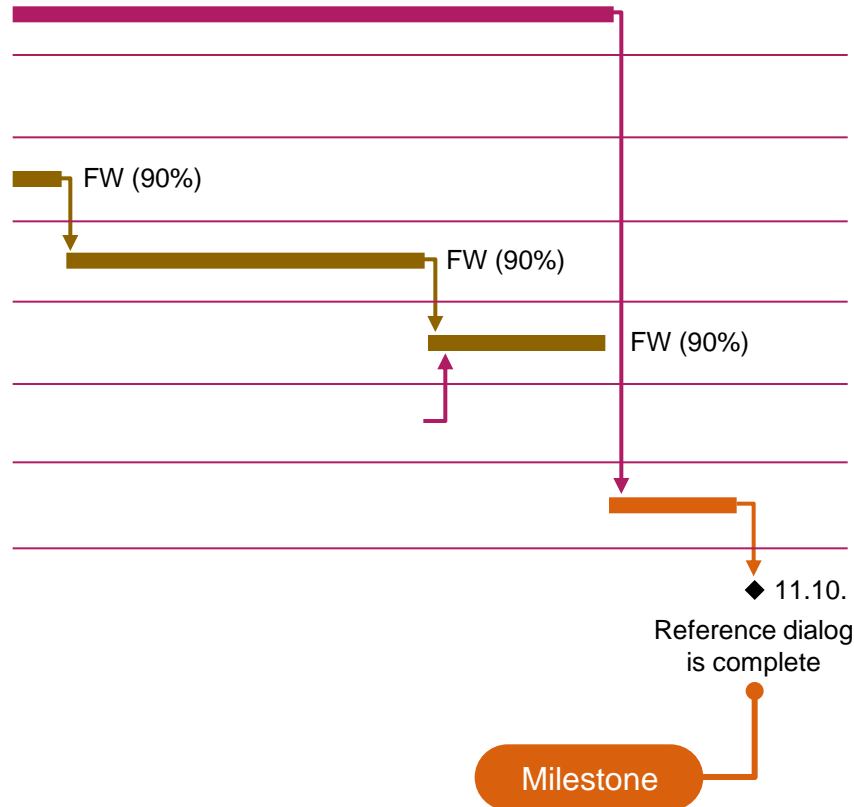
## Time plan



# Major projects start with high planning uncertainty due to vague requirements; further detailing of the solution / plan over time



# Milestones define important results to specified deadlines and give the opportunity to synchronise sub projects



- Milestones are important intermediate results of a project. Milestones consists of
  - deadline
  - defined result
  - quality goals & acceptance criteria
- Milestones can be intern or extern
- Each milestone provides an answer to important question like: Do we have the technology under control? Do we know what we must implement? Is the customer satisfied?
- Milestones contribute to progress monitoring and team motivation

# Plans of different granularity can be valid for a major project

## **Rough plan**

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- Granularity: stages/phases/sub projects
- Focus: overall project
- Time horizon: total duration
- Mapping sub projects/resource groups
- Availability incl. vacation is equally distributed
- A milestone ca. every 2 months
- Target group: management
- Visualisation is important

**The further into the future, the rougher**

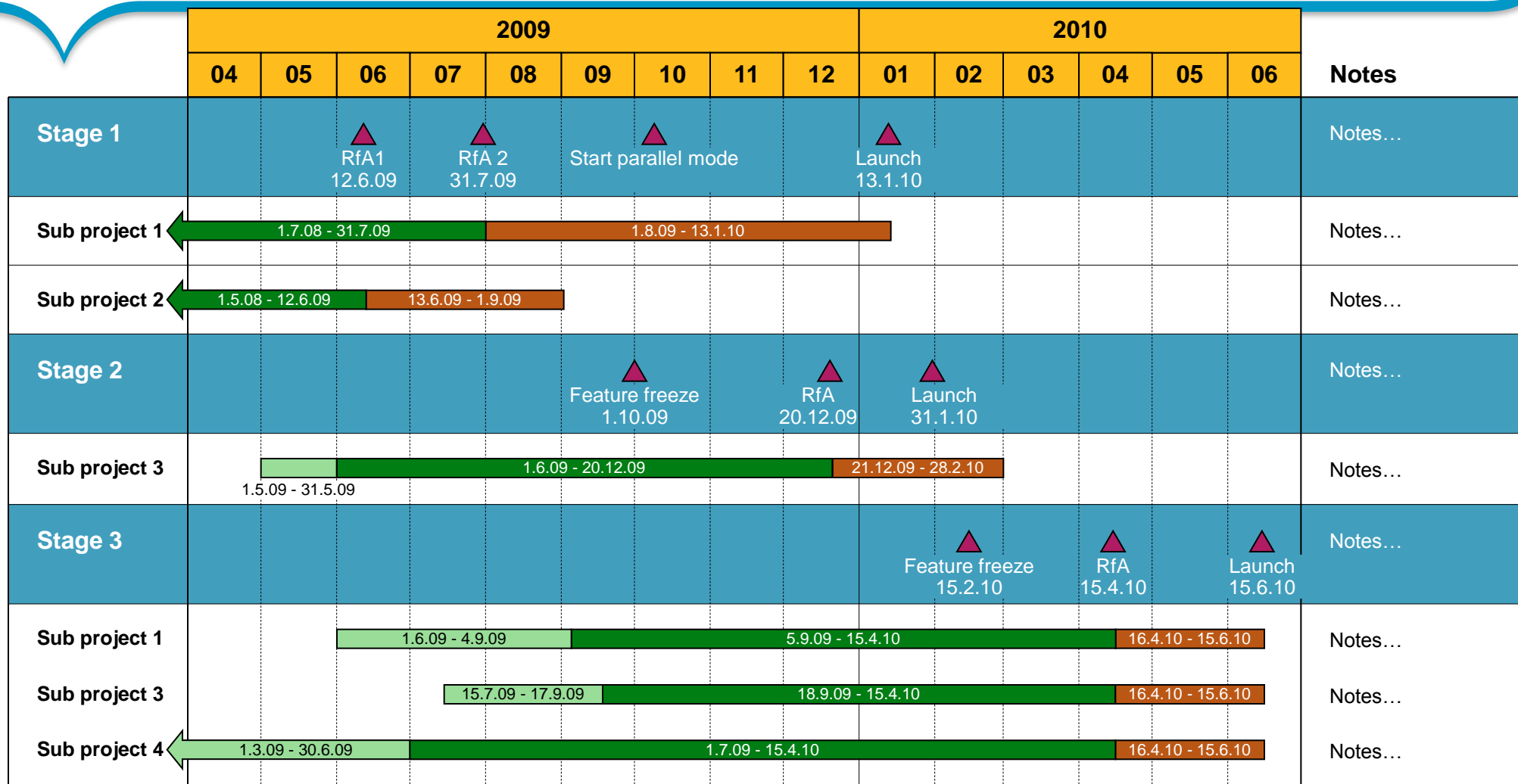
## **Detailed plan**

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- Granularity: task/work package
- Focus: sub project
- Time horizon: 2-3 months
- Mapping individuals (name, knowhow is known)
- Availability incl. vacation, training, etc. individually
- Target group: team
- Operability as working instrument is important

**Each team member knows what he does  
in the next 1-2 months**

Planning views are created at the main project layer, and provide an overview of different aspects of the overall project



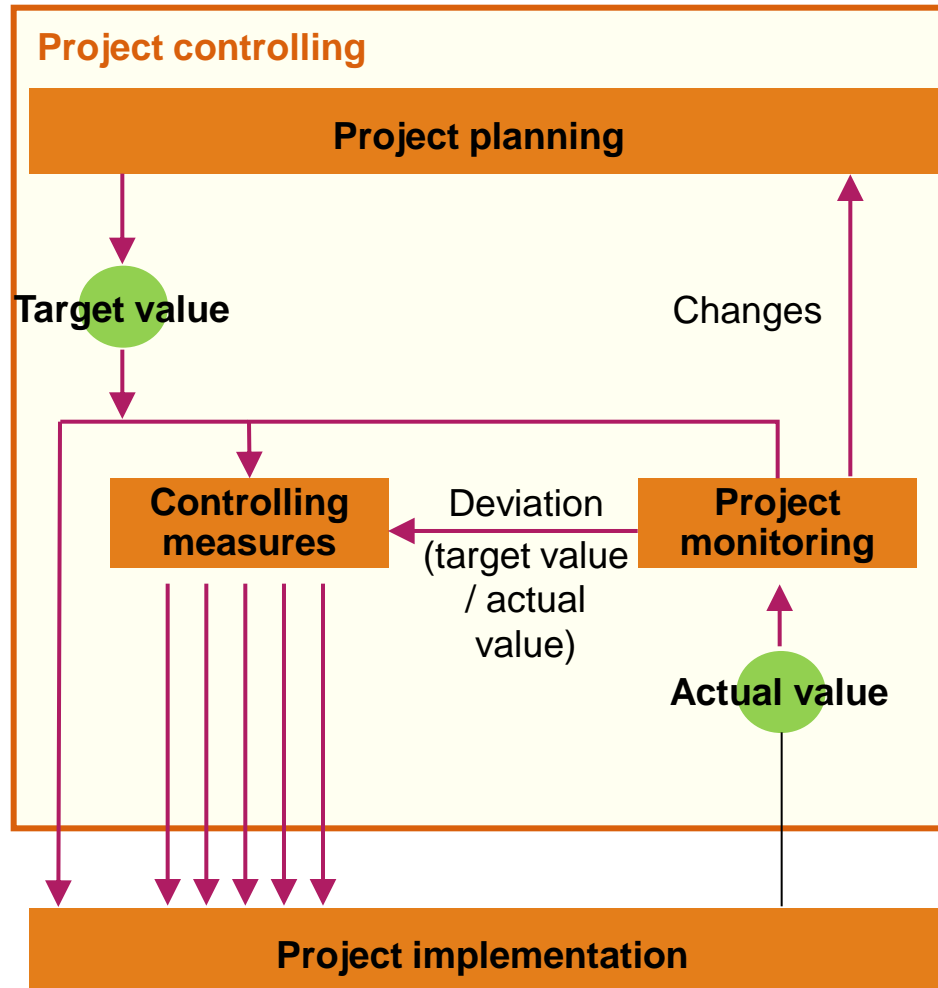
Specification

Realisation

Acceptance and launch

Survey/ preliminary work

# Project controlling checks regularly, whether the planning is still valid, and intervenes when corrections are necessary



- Project planning develops requirements for project implementation by general conditions (e.g. deadline, budget/effort, achievement of objectives): “target value”
- Project monitoring reports the “actual value” to project controlling
- Project monitoring makes the target/actual comparison, performs foresighted observations and identifies deviations
- Project controlling develops measures and initiates them, in order to correct the deviations in project implementation and to return the project into corridor that is preset by general conditions



# Target/actual effort comparison is made by regular remaining effort estimation

Task	Numbers from effort estimation / offer estimation		Aggregated values from timekeeping		estimated remaining effort
	Plan = target	Actual effort	Remaining effort	Extrapolation actual + remaining	Deviation target ./ extrapolation
Activity 1	100	35	45	80	20
Activity 2	300	120	250	370	-70
Activity 3	200	0	200	200	0
<b>Net sum</b>	<b>600</b>	<b>155</b>	<b>495</b>	<b>650</b>	<b>-50</b>
Project leading	90	25	70	95	-5
Quality management	90	15	75	90	0
Team training	30	40	10	50	-20
System support	90	50	70	120	-30
Travelling time	42	10	30	40	2
Introduction support	48	0	48	48	0
<b>Cross sum</b>	<b>390</b>	<b>140</b>	<b>303</b>	<b>443</b>	<b>-53</b>
<b>Gross sum</b>	<b>990</b>	<b>295</b>	<b>798</b>	<b>1093</b>	<b>-103</b>
Risk buffer	198		120	120	78
<b>Total sum</b>	<b>1.188</b>	<b>295</b>	<b>918</b>	<b>1.213</b>	<b>-25</b>

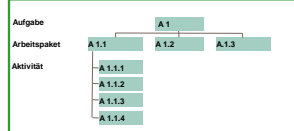
Also re-evaluate the risks

Remaining effort estimation from 3.11.2009

# Central tools for project controlling are project plan and monthly evaluations

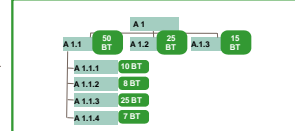
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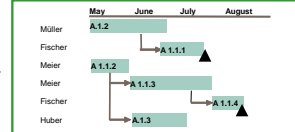
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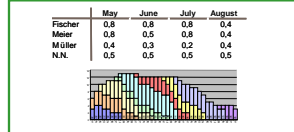
Time plan



Assign names

Correlation number of team members, time plan

Team plan



Remaining effort

## Person days report

Aufgaben	PSPS Task	Start Aufwand Task	Ende Aufwand Task	ESTIMATED - 1 MONTH PD		ACTUAL - 1 MONTH PD		ANWANDER Gesamtaufwand		Differenz high	
				Estimate	Max	Actual	Max	Estimate	Max	Estimate	Max
Projektstart	PM-001	01.05.2015	05.05.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-002	06.05.2015	10.05.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-003	11.05.2015	15.05.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-004	16.05.2015	20.05.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-005	21.05.2015	25.05.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-006	26.05.2015	30.05.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-007	31.05.2015	04.06.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-008	05.06.2015	09.06.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-009	10.06.2015	14.06.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-010	15.06.2015	19.06.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-011	20.06.2015	24.06.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-012	25.06.2015	29.06.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-013	30.06.2015	04.07.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-014	05.07.2015	09.07.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-015	10.07.2015	14.07.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-016	15.07.2015	19.07.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-017	20.07.2015	24.07.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-018	25.07.2015	29.07.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-019	30.07.2015	03.08.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-020	04.08.2015	08.08.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-021	09.08.2015	13.08.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-022	14.08.2015	18.08.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-023	19.08.2015	23.08.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-024	24.08.2015	28.08.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-025	29.08.2015	02.09.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-026	03.09.2015	07.09.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-027	08.09.2015	12.09.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-028	13.09.2015	17.09.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-029	18.09.2015	22.09.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-030	23.09.2015	27.09.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-031	28.09.2015	01.10.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-032	02.10.2015	06.10.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-033	07.10.2015	11.10.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-034	12.10.2015	16.10.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-035	17.10.2015	21.10.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-036	22.10.2015	26.10.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-037	27.10.2015	31.10.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-038	31.10.2015	04.11.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-039	05.11.2015	09.11.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-040	10.11.2015	14.11.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-041	15.11.2015	19.11.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-042	20.11.2015	24.11.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-043	25.11.2015	29.11.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-044	30.11.2015	03.12.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-045	04.12.2015	08.12.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-046	09.12.2015	13.12.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-047	14.12.2015	18.12.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-048	19.12.2015	23.12.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektcharakteristika	PM-049	24.12.2015	28.12.2015	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
Projektorganisation	PM-050	29.12.2015	01.01.2016	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0

Actual numbers  
PD

Effort report („timesheet“)

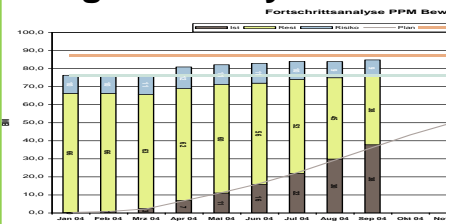
## List of milestones

Milestone	Bedeutung/Milestone	Interim	Termin	Folgebegründung	Status
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit

## Delivery list

Milestone	Bedeutung/Milestone	Interim	Termin	Folgebegründung	Status
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit
Revisionsplanung fertig	Revisionsplanung fertig, Daten aus System in die Datenbank	Interim	11.10.2015	Revisionsplanung fertig, Daten aus System in die Datenbank	in Arbeit

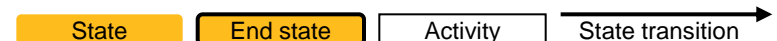
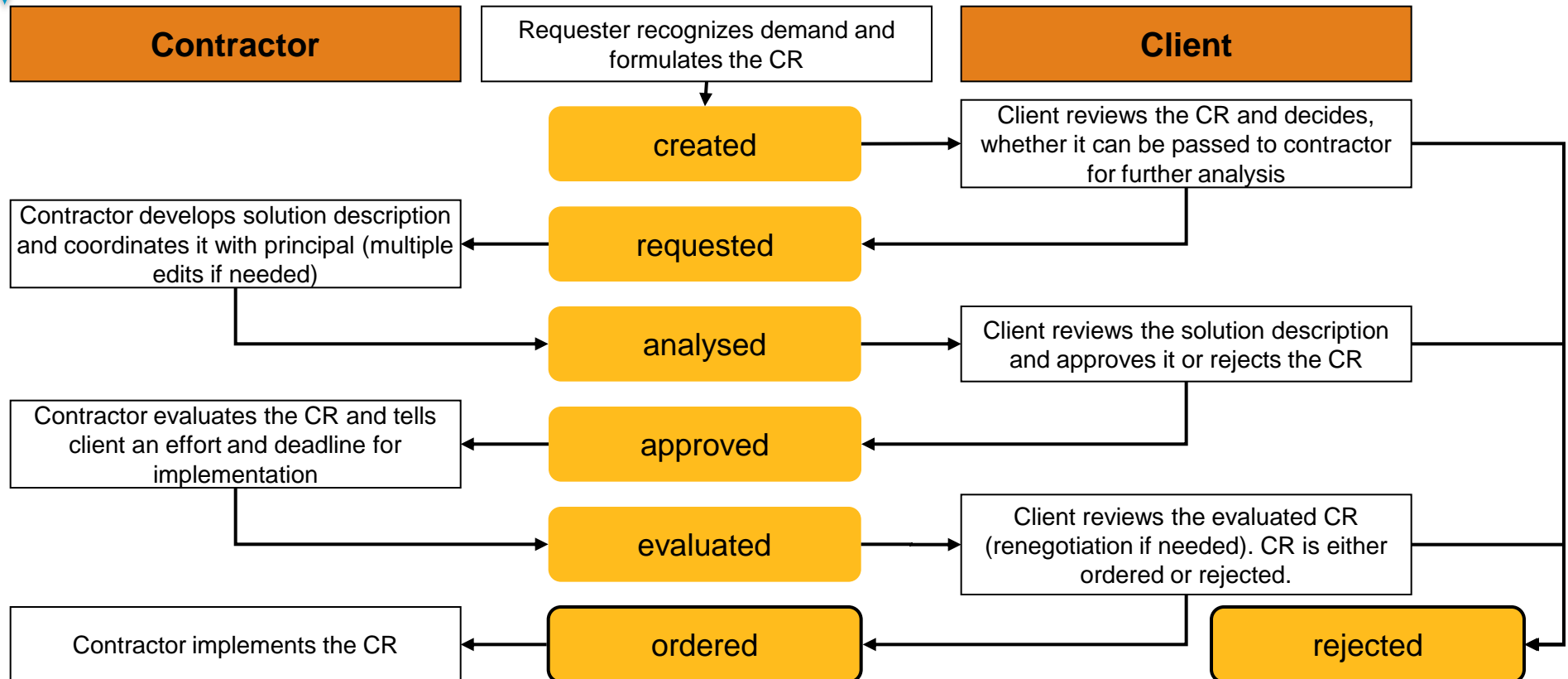
## Progress analysis



# Management of change requests (CR) is also an important component of project controlling

- It must be clear, against what the changes in scope of services should be made; e.g. relating to specification, business concept, functional specification etc.
- Changed or additional requirements are always CRs; errors/bugs are not CRs
- CRs are always formulated in written form and describe content and effort; the estimation is made according to the same calculation scheme as project calculation
- Administrate all CRs with their state (requested -> accepted) in one change management tool.
- The procedure for handling of the CRs must be established formally

# There are established methods of handling CRs in project practise



# Answering the following questions has proven its worth during estimation of CRs

1. What exactly is the problem?
2. What exactly is the suggested solution?
3. Who wants it and who should pay for it?
4. Were all the affected people involved in the discussion?
5. What costs and benefits will arise?
6. How oft does it happen?
7. **What happens if we don't do that?**

**Goal:**     **Functional scope to be implemented should be as large as necessary,  
but as small as possible!**

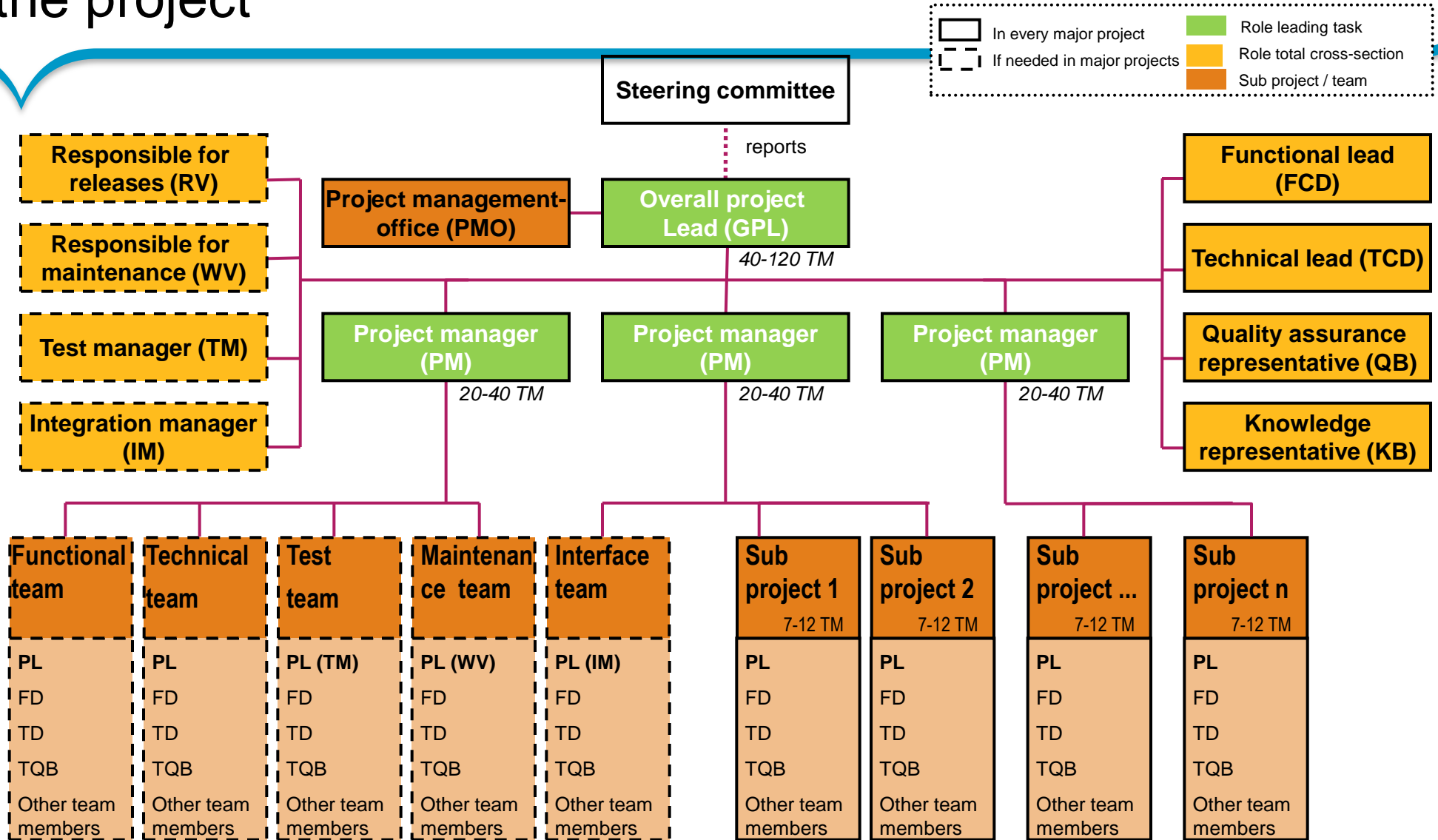
# A sustainable and consequent project planning and controlling is essential for the success of large projects

- A project wide common methodology to project planning and controlling ensures that every person has the same view on the project sequence
- Regular, at least monthly estimates of remaining effort are necessary to determine the project status – a project with 200 team members that is only 1 day going in the wrong direction has used up 1 working year!
- A clear defined, consistent and consequent change request management from the beginning ensures that only that is being done what was agreed upon – any deviation from the agreement is primarily a modification/change
- A consequent project controlling is essential – that means the readiness to check the course of the project and steering intervene if necessary; and thereby to be proactive and not merely react

# Agenda

- Project success and project management
- Project initiation
- Cost estimation and project calculation
- Project planning and controlling
- Project organisation and team management
- Communication and risk management
- Project management standards and further reading

# Project organisation depends on size, type and content of the project



Abbreviations: project lead (PL), technical designer (TD), functional designer (FD), TP quality assurance representative (TQB), team members (TM)



# Project organisation and defined roles should be suitable to customer organisation

- The customer/client is often positioned in a formal way
- The focus is on investment protection and management of the contractor/project
- Unimportant tasks become thereby often central topics
- Agreement to reduction of these tasks has often only limited success
  
- Recommendation: Invest in organisation and project roles, to counteract effectively the customer organisational requirements
- Recommendation: Establish trust at all levels
- Recommendation: Consider that common project roles (QB, CD, etc.) have a limited amount of time
- Recommendation: Let customer employees shine!

# There are empirical values for defining of proper project organisational structure

- The general principle is: "divide et impera"
- Tasks must be clearly assigned within the project organisation; the responsibilities must be clearly defined
- There must be a team for major cross-sectional tasks
- Experienced persons must be appointed for large individual tasks or outstanding roles (e.g. for the functional lead role)
- Starting from ca. 7 team members 1 fulltime project lead should be involved
- For sub project teams calculate up to 15 team members incl. sub project lead
- The project is an independent organisational unit within the company organisation
- The concrete organisational structure depends on project needs and can be changed during the project
- The project team needs separate rooms or separate building with its own infrastructure, like workstations, project server, telephones, meeting rooms, video conference rooms and computer centre

# Project work is team work – that is the reason for many facets of project management



# Probably the most important issue is to build powerful teams



- That means ...
  - to find the right person for certain task
  - to find the right mix of persons for one team
  - to make clear the expectations of all stakeholders
  - to create a suitable working environment
  - to give free space to act
  - to be fair
  - to motivate the employee

# Team building includes teamwork with employees from the customer side.

- Team members from the customer...
  - know their business and technical environment usually much better
  - are essential for the project success
  - think often over the borders of project context
  - are often directly affected by the new IT system
  - are sometimes not very motivated
- What to do:
  - Learn from each other
  - Support mutual appreciation and help
  - Set up mixed teams



# In large IT projects any team building questions must be considered, prepared and answered consequently

- Project team members leave their origin organisational unit and switch – maybe for long time – to the project organisational unit. The implications of the switch are:
  - change of supervisor
  - target agreements and job description
  - perspectives after project work
- The orientation of the individual employee within the project organisation must be managed – for example
  - highlighting the individual freedom to act in spite of many standards
  - explicit team-building activities
  - consideration of different cultures
  - communication of overall aim and single contribution of an employee

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# A significant success factor in large projects is a good communication management

A communication concept gives answers to following questions

<i>Who</i>	<b>Clarify responsibility</b>
communicates	
<i>What / Why</i>	<b>Message</b>
<i>When</i>	<b>Appointment</b>
<i>With what</i>	<b>Medium</b>
<i>To whom</i>	<b>Stakeholder</b>

Who communicates with whom?  
Who coordinates this communication?

Which mindset and/or know-how need the stakeholder to fulfil expectations?

Which mindset and/or know-how have the stakeholder actually?

Which message or information must be transferred when?

Which media is used for communication?

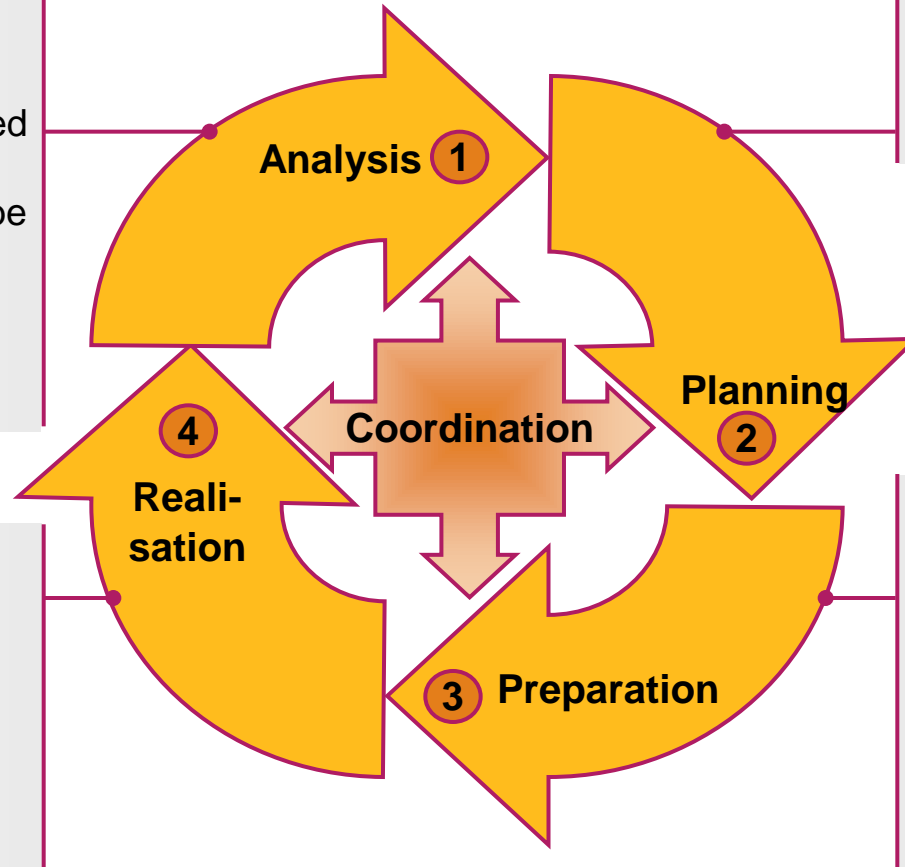
Which internal and external stakeholders must be involved in the communication?



# The communication needs a coordinated process.

Which target groups?  
What behavior should be motivated?  
Which mindset is to be achieved?  
What information is needed and when?  
What message needs to be conveyed?  
Which appointment?  
Conditions  
Feedback

Responsibility  
Medium  
Form  
Time / Dates  
Resources  
Budget



Text  
Pictures  
Banner  
Web Pages  
Flyer  
Presentation documents  
Training materials  
...

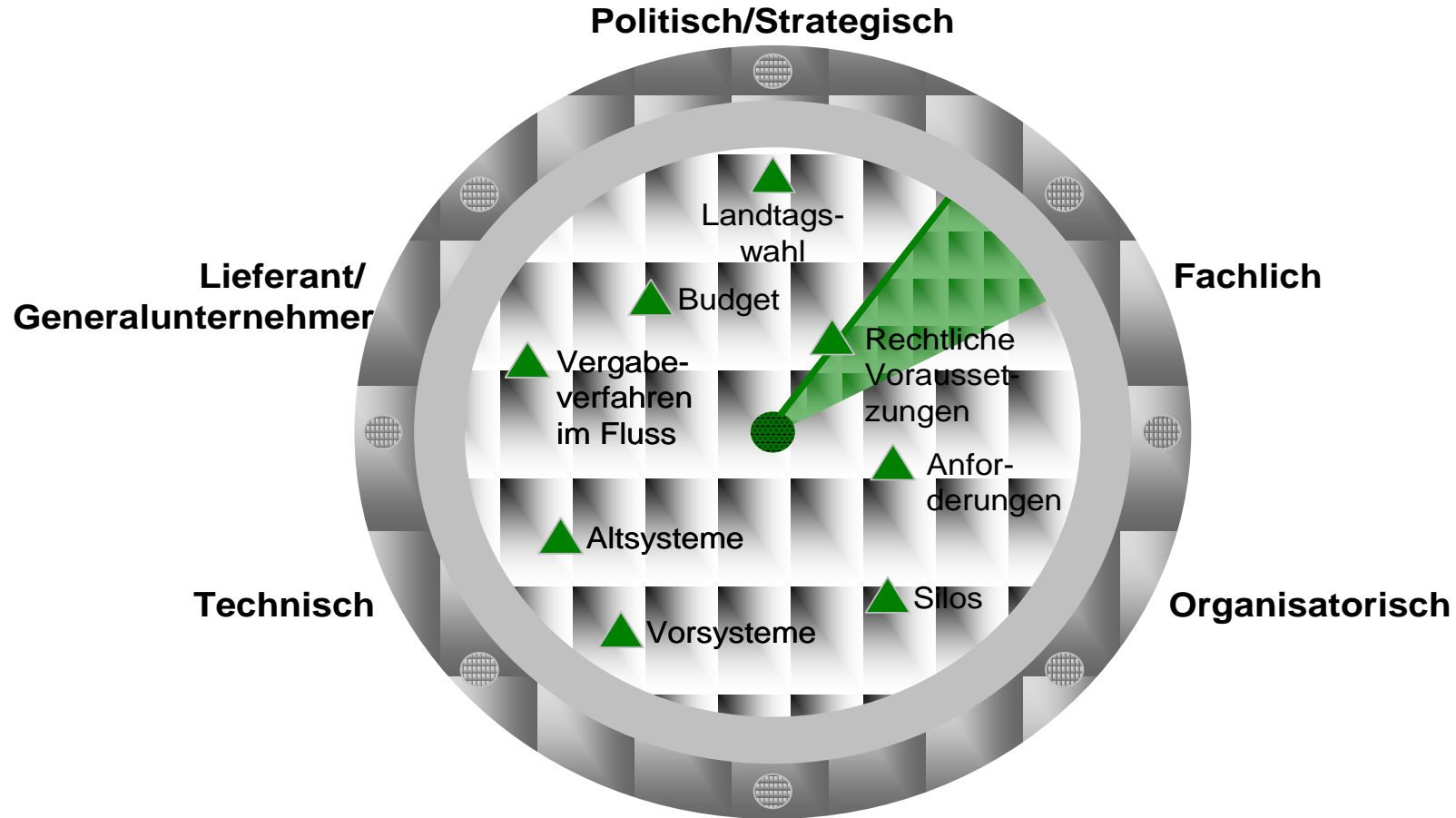
Shipment  
Address  
PR  
Campaign  
Promotion  
Tel. or Videoconference  
...

# Status reports for highest management must present the significant information clearly.

Status	Is	Forecast	Main risks	To be decide
Content/Quality	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	New legal requirements after the election endanger the planned launch date of the stage 2. Schedule for solution 2b unsustainable.	Approval for revising the framework due to the requirement xy.
Time	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
Costs	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
Achieved significant results and activities (last month)				
Overall project	Subproject stage 2		Subproject stage 3	
Specification stage 3 accepted System test sage 2a completed RfA stage 2a succeed Acceptance test Stufe 2a in progress System test stage 2b delayed (reason for yellow time light )	Prio1/2 bugs in stage 2a during the system test are completely resolved. Support during the acceptance for stage 2a Bugs in used open source component (reason for red content light) Evaluation of solution alternative to open source done.		Acceptance specification with 5 Prio1 Notes Training done within time limit Acceptance given.	
Significant planned results and activities (next 3 months)				
Overall project	Subproject stage 2		Subproject stage 3	
Conceptual design for stage 3 until Dec 2009 Build realisation team stage 3 Acceptance of stage 2 until end of Nov 2009 Going live stage 2 by end Dec 2009 Schedule for stage 2b solution must prove valid (reason for yellow time forecast)	Replacement open source component (due to standard interface planned to end Oct 2009) with built-in standard software components RfA stage 2b mid November 2009 Support during the acceptance for stage 2a Preparation for Going live		Architecture Workshop stage 3 Conceptual design stage 3 with an existing team Team planning for the start of realisation phase stage 3	











Example from the practice

# Risk management identifies risks regularly in all dimensions that impact on the achievement of the project objective



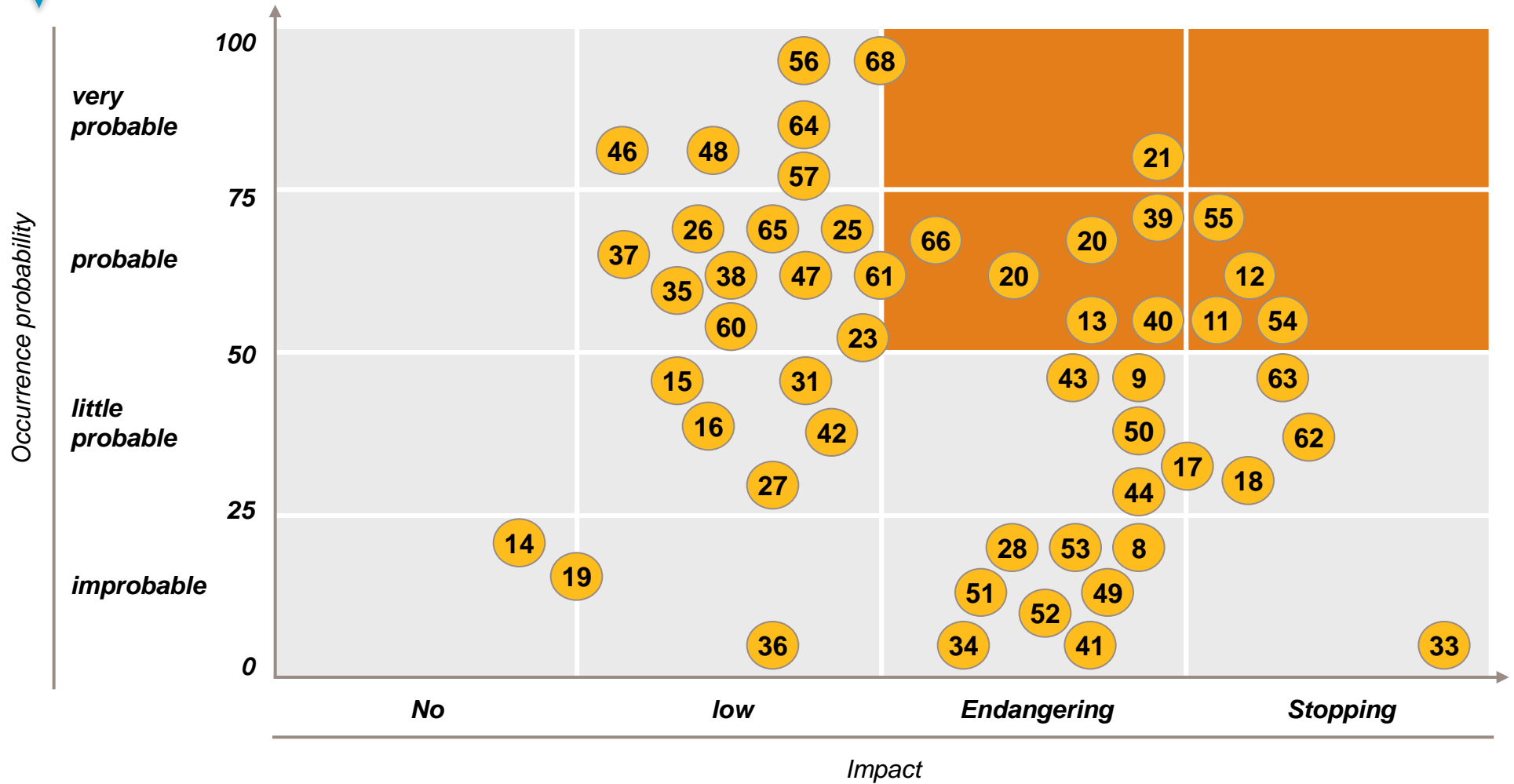
Example from public sector

# The risk list is the central instrument for the treatment of identified risks

Risk number	Risk	First assessment		Explanation	Actions for the reduction	
		Occurrence probability	Impact		Damage potential	Occurrence probability
9	The benefit of the project is covered by more important projects			Is given by the general and special situation. The following points have in doubt greater attention by management:...	Driving decisions, driving project "on sight"	Constantly contact to management, keep project visibel
15	Supplies of other projects delayed			xxx (finished), Frontend – Backend	Keep open date, no announcement befor Test ✓	Early effects communicate and escalate immediately.
21	Organizational culture prevents quick decisions?!!			...	No eGov solutions	...
50	No defined acceptance criteria, no defined acceptance process			...	...	...
55	Project sponsor has no vital interest in the success of the project			xxx	...	...

Extract from risk list

# A clear presentation of the risks supports the communication



Risk matrix

# The pressure to succeed increases disproportionately for large scale IT projects.

- The larger the project, the greater the financial and organizational use of the client / customer.
- The damage done by a project failure is much higher for large projects.
- Career of the customer / client individual employees is linked to project success.
- Large projects always mean a high investment, too. Single employees, departments, organizational units and even whole companies depend on the project success.
- The customer does almost everything to minimize the risk.

# People matter, results count



# Agenda

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# There are standards for project management - and a multitude of recommendable publications



260,000 members in 150 nations of the world. Leading organization on PM. Sets industry standards, researches, teaches, publishes  
[www.pmi.org](http://www.pmi.org)

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Research and Development Institute of the U.S. Department of Defense. Particularly relevant for CMMI certification  
[www.sei.cmu.edu](http://www.sei.cmu.edu)

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International Project Management Association: 40 national PM organizations (in Germany: GPM German Association for Project Management), under international umbrella  
[www.gpm-ipma.de](http://www.gpm-ipma.de)

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PRProjects IN Controlled Environments: Ultimate standard in UK, very strong in public sector (UK, DK, PL,...)  
[www.ogc.gov.uk](http://www.ogc.gov.uk)

# There are standards for project management - and a multitude of recommendable publications

- [MARCO1999] Tom DeMarco, Timothy Lister: Peopleware: Productive Projects and Teams, Addison-Wesley Professional; 3 edition (June 28, 2013)
- [DRÖSCHEL1999] Wolfgang Dröschel, Manuela Wiemers: Formales Projektmanagement für den öffentlichen Bereich in Das V-Modell 97, Oldenbourg 1999 aktualisiert im V-Modell XT Rel. 1.01 (<http://www.kbst.bund.de/V-Modell/-,293/V-Modell-XT.htm>)
- [BROOKES2003] Frederik P. Brookes: The Mythical Man-Month: Essays on Software Engineering, Addison-Wesley Professional; Anniversary edition (August 12, 1995)
- [PMBOK2004] A Guide to the Project Management Body of Knowledge, Project Management Institute 2004
- [MARCO1998] Tom de Marco: The Deadline: A Novel About Project Management, Dorset House (July 1997)

# Research and science live on the exchange of ideas, the clear arrangements are thereby useful

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## **If you have any questions, please contact:**

Capgemini | Offenbach

Dr. Martin Girschick

Berliner Straße 76, 63065 Offenbach, Germany

Telephone +49 69 82901-376

Email: [martin.girschick@capgemini.com](mailto:martin.girschick@capgemini.com)

## People matter, results count.

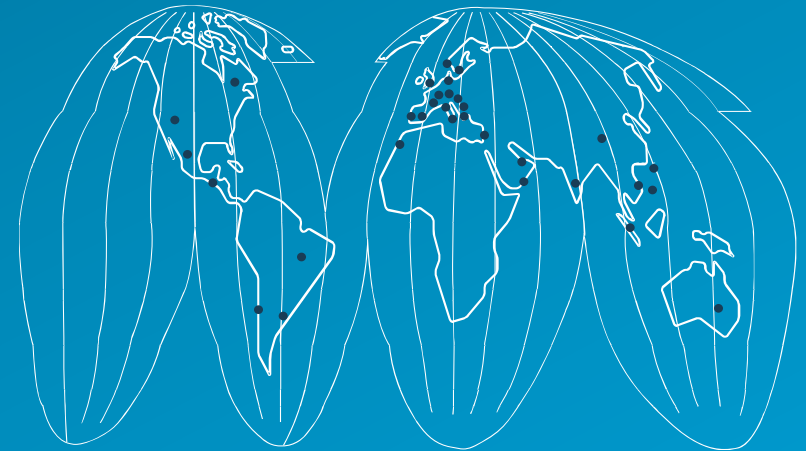


### About Capgemini

With more than 120,000 people in 40 countries, Capgemini is one of the world's foremost providers of consulting, technology and outsourcing services. The Group reported 2011 global revenues of EUR 9.7 billion.

Together with its clients, Capgemini creates and delivers business and technology solutions that fit their needs and drive the results they want. A deeply multicultural organization, Capgemini has developed its own way of working, the Collaborative Business Experience™, and draws on Rightshore®, its worldwide delivery model.

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