Success Factors in IT Project Management

Talk – 12.02.2020

Uwe Gühl

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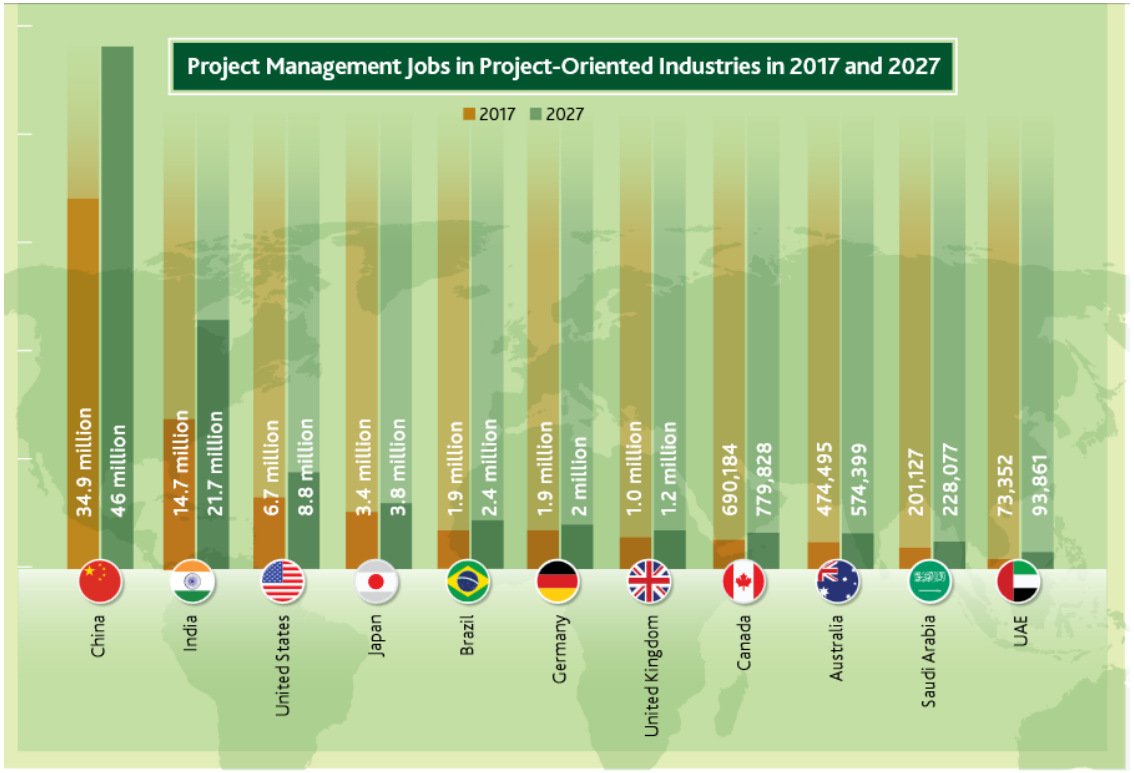
Importance

- Project management get's more and more important in business live
  - Project activities in daily working live of an engineer increased from 9% to 16% [ES09]
  - The demand for project management specialists keeps growing [Bat19]
  - Data by PMI predicts exponential growth for the next decade for the need of project management professionals [PMI 17a]

Importance



By 2027, employers will need **87.7 million** individuals working in project management oriented roles

Source: [PMI17a]

Importance

- Challenges
  - growing complexity of projects,
  - availability and use of resources.
- Future project management
  - application of agile methods in addition to classic PM methods,
  - artificial intelligence,
  - digitalization,
  - permanent change,
  - cost pressure,
  - globalization.
- Potentials
  - virtual teams,
  - intercultural teams.

Source: [Bat19]

Definitions

- Different organizations care about project management and project management methods, like, e.g.,
  - International Project Management Association [IPMA20], who defined the IPMA Competence Baseline (ICB), basis for certification programs
  - Project Management Institute [PMI20] who defined the A Guide to the Project Management Body of Knowledge (PMBOK Guide) [PMI17]
  - UK Government and Axelos concerning PRINCE2 [axe20]
- Different organization use different definitions

Definitions

- What is a project?
  There is no distinct definition, proposals:
  A project is a
  - unique, transient endeavour undertaken to achieve planned objectives [apm20]
  - temporary endeavor undertaken to create a unique product, service, or result [Wik20] [Pmi04]
  - temporary organization that is created for the purpose of delivering one or more business products according to an agreed business case [axe20]

Definitions

- What is a project?
  Characteristics of a project are thus:
  - defined goal
  - there is a start and an end
  - temporary
  - handles something completely new
  - unique
  - complex
  - trans-sectoral
  - limited resources are available

Definitions

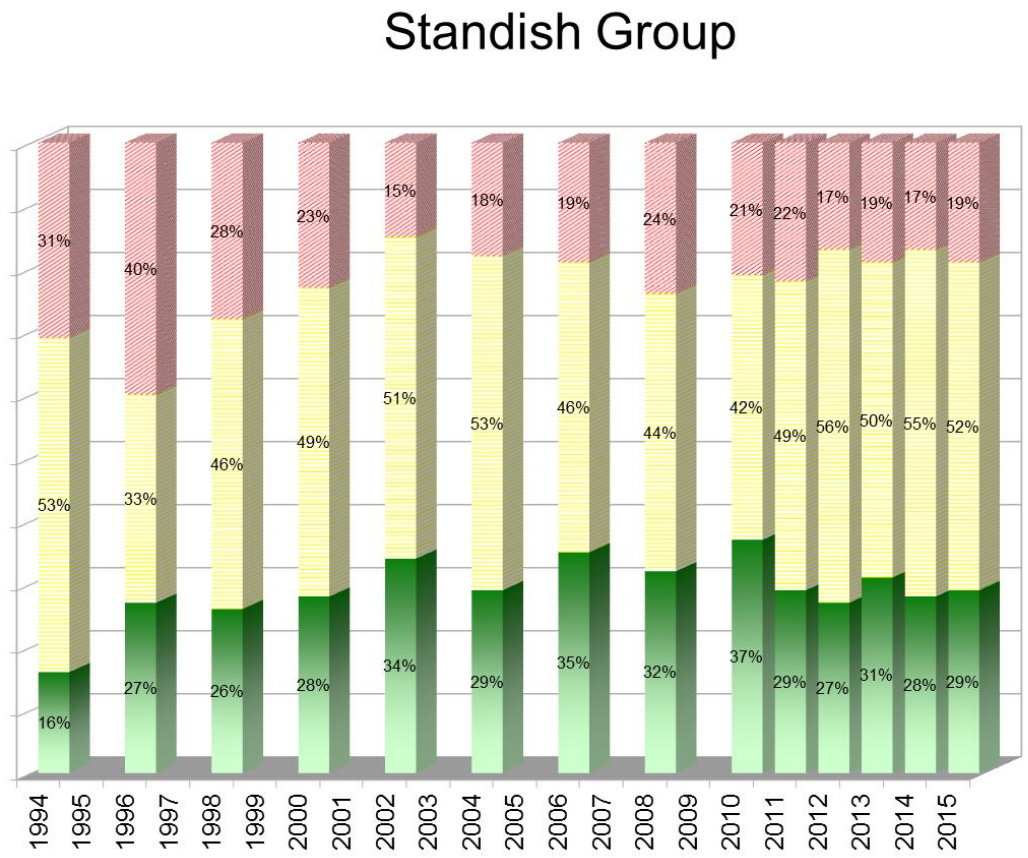
- What is project management?
  - The application of processes, methods, knowledge, skills and experience to achieve the project objectives [apm20]
  - The complete set of tasks, techniques, tools applied during project execution [Wik20], [DIN09]
  - The planning, delegating, monitoring and control of all aspects of the project, and the motivation of those involved, to achieve the project objectives within the expected performance targets for time, cost, quality, scope, benefits and risk [axe20]

Definitions

- What is project management?
  - *‘At its most fundamental, project management is about people getting things done,’*

    Dr. Martin Barnes, APM President 2003-2012

Successful Projects



Results of IT-Projects [Wik20a], [HW15]

The project is cancelled at some point during the development cycle.

Cost or time overruns or didn't fully meet the user's needs

Project is completed on-time and on-budget, with all features and functions **as initially** specified.

New definition of success factors since 2011: On time, on budget with a **satisfactory result** [HW15]

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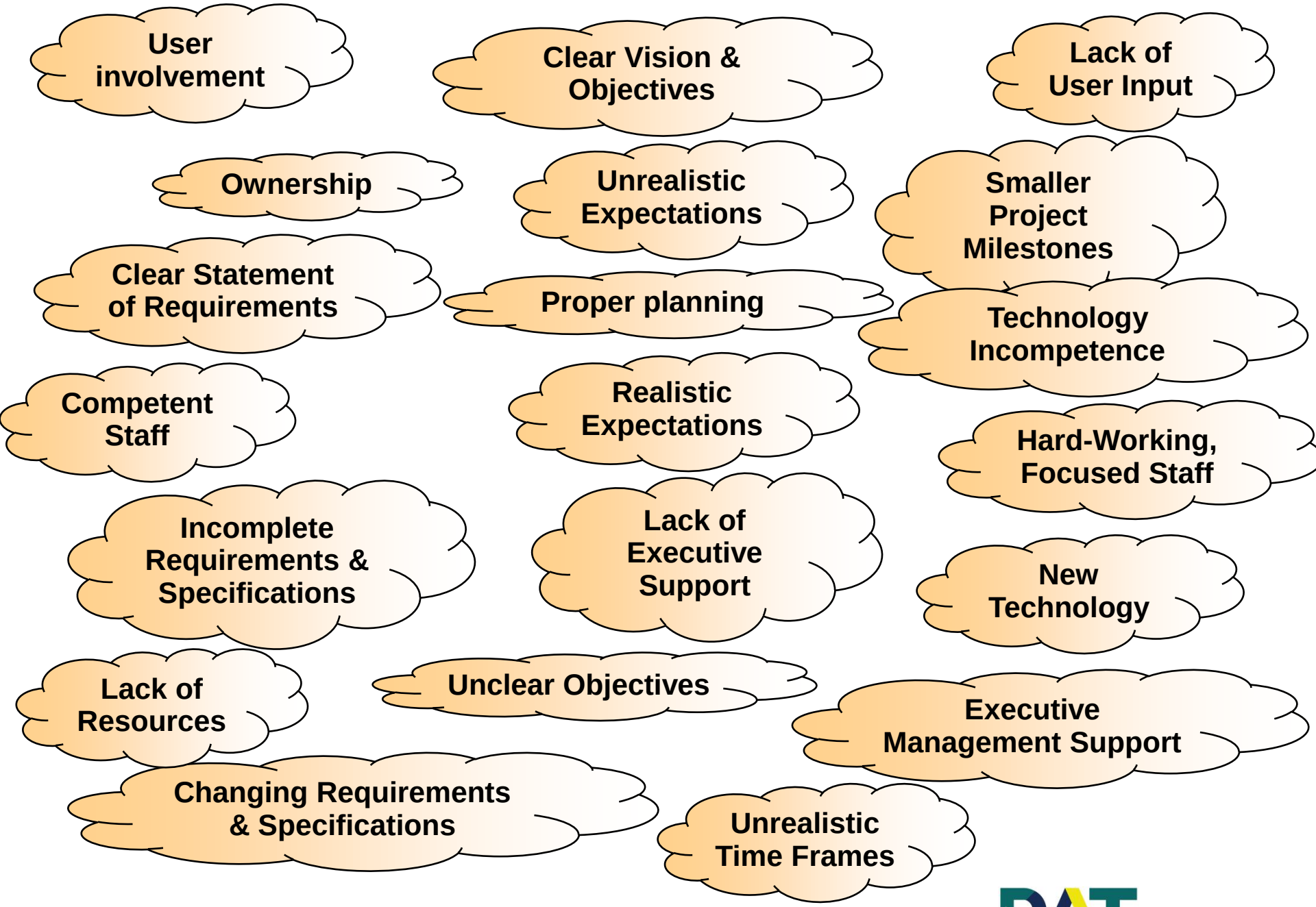
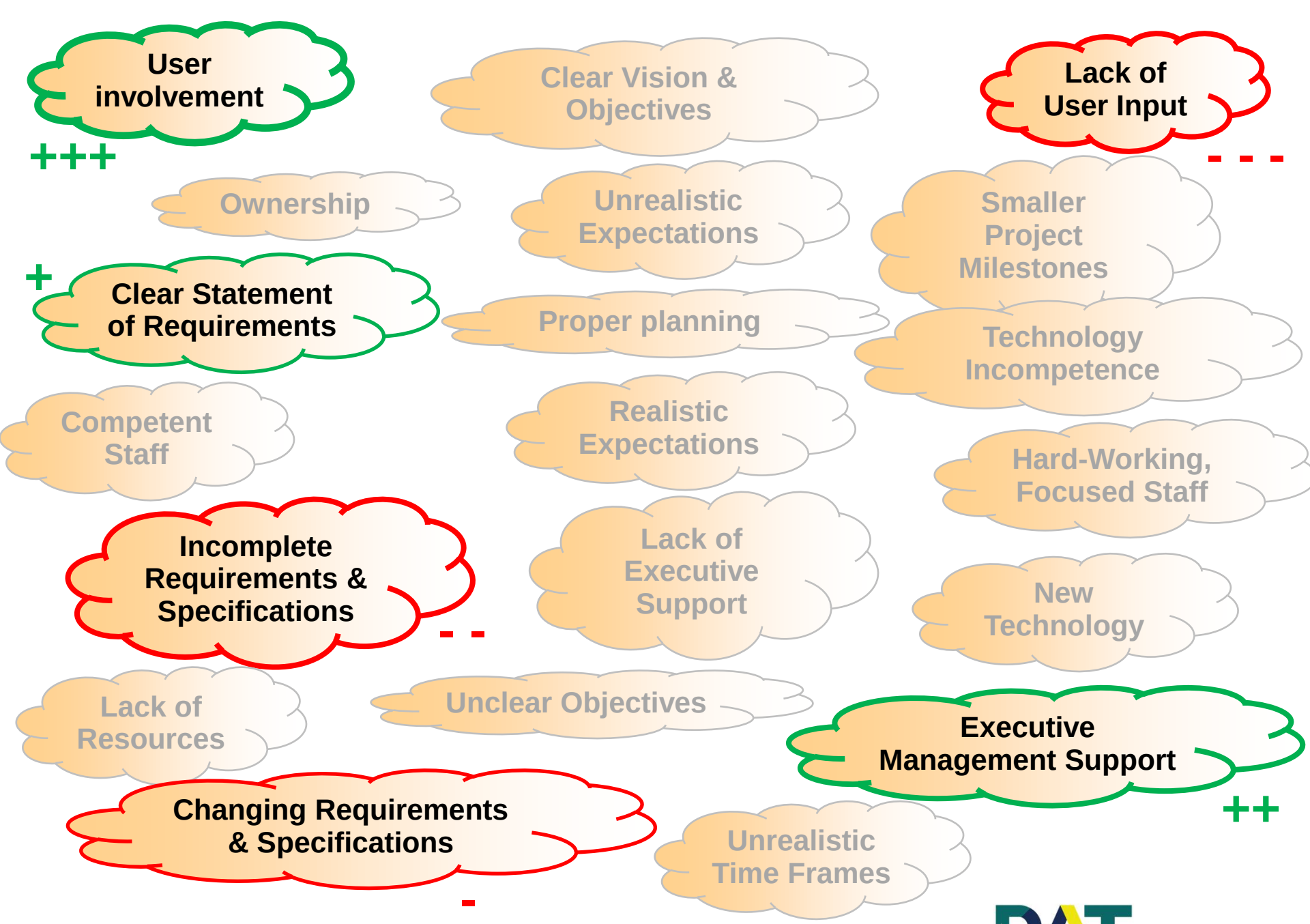

User involvement
Clear Vision & Objectives
Lack of User Input
Ownership
Unrealistic Expectations
Smaller Project Milestones
Clear Statement of Requirements
Proper planning
Technology Incompetence
Competent Staff
Realistic Expectations
Hard-Working, Focused Staff
Incomplete Requirements & Specifications
Lack of Executive Support
New Technology
Lack of Resources
Unclear Objectives
Executive Management Support
Changing Requirements & Specifications
Unrealistic Time Frames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Lack of Executive Support
New Technology
Lack of Resources
Unclear Objectives
Executive Management Support
++
Changing Requirements & Specifications
-
Unrealistic Time Frames

Successful Projects

Project Success Factors [SG14]	% of Responses
1. User Involvement	15.9 %
2. Executive Management Support	13.9 %
3. Clear Statement of Requirements	13.0 %
4. Proper Planning	9.6 %
5. Realistic Expectations	8.2 %
6. Smaller Project Milestones	7.7 %
7. Competent Staff	7.2 %
8. Ownership	5.3 %
9. Clear Vision & Objectives	2.9 %
10. Hard-Working, Focused Staff	2.4 %
Other	13.9 %

Successful Projects

Project Challenged Factors [SG14]	% of Responses
1. Lack of User Input	12.8 %
2. Incomplete Requirements & Specifications	12.3 %
3. Changing Requirements & Specifications	11.8 %
4. Lack of Executive Support	7.5 %
5. Technology Incompetence	7.0 %
6. Lack of Resources	6.4 %
7. Unrealistic Expectations	5.9 %
8. Unclear Objectives	5.3 %
9. Unrealistic Time Frames	4.3 %
10. New Technology	3.7 %
Other	23.0 %

Process Models

- Different process models and standards have been deployed – on international level
  - Project Management Body of Knowledge (PMBOK-Guide) [PMI17]
    Standard of the US American Project Management Institute (PMI) [PMI20]
  - PRINCE2
    Originally PRINCE (acronym for **PR**ojects **IN** **C**ontrolled **E**nvironments) was a standard by the British government for IT project management.
    The further development to PRINCE2 is de facto standard for project management in Great Britain, but used in other countries as well [axe20].

Process Models

- Different process models and standards have been deployed – on international / national level
  - IPMA Competence Baseline (ICB) [IPMA20]
    - The ICB is a common framework to ensure that consistent and harmonized standards are used
    - National cultural differences are addressed in National Competence Baselines by adding specific competence elements and content to the ICB

Process Models

- Different process models and standards have been deployed – on company level.
  Examples
  - ITPM at BMW Group [Pri06]
  - Houston at Daimler AG [Gor10]
  - Project Management Excellence at Siemens AG [Sie11]

Process Models

- Different process models and standards have been deployed – for different domains. Example for IT
  - Waterfall model
  - V-Model
  - Rational Unified Process
  - Scrum

Process Models

- Why process models and standards?
  - To ensure in an organization continuous project management quality in using same procedures and similar documentation methods
  - To be considered: Projects are different concerning topic, size, objectives, and scope
  - Tailoring should help to adapt the process model on project specific needs

Process Models

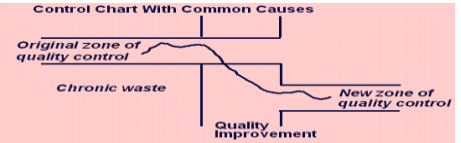
- CMMI (Capability Maturity Model Integration)
  - Process model to improve processes in organizations
  - Framework of best practices
  - Successor of CMM
  - Developed by experts from industry, government, and the Software Engineering Institute (SEI) at Carnegie Mellon University (CMU), USA
  - CMMI models provide guidance for developing or improving processes that meet the business goals of an organization.
  - Defines five “Maturity Levels”

Process Models

CMMI maturity levels

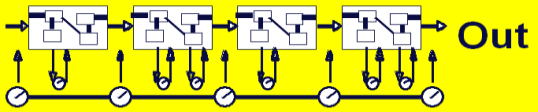
5 Focus on process improvement

"Optimizing"



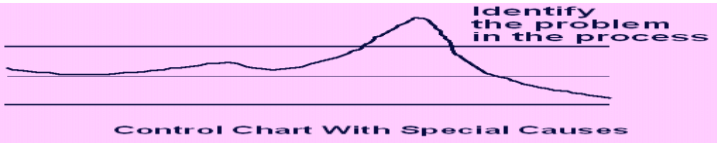
4 Processes measured and controlled

"Quantitatively Managed"



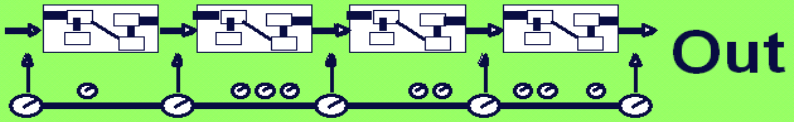
3 Processes characterized, fairly well understood

"Defined"



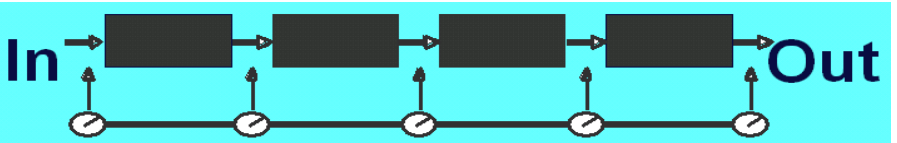
2 Projects can repeat previously mastered tasks

"Managed"



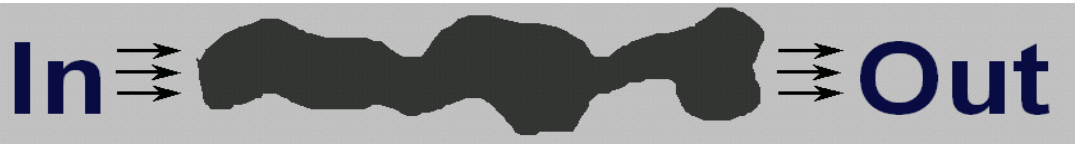
1 Processes unpredictable and poorly controlled

"Performed"



0 Processes dependent on "Heroes"

"Incomplete"



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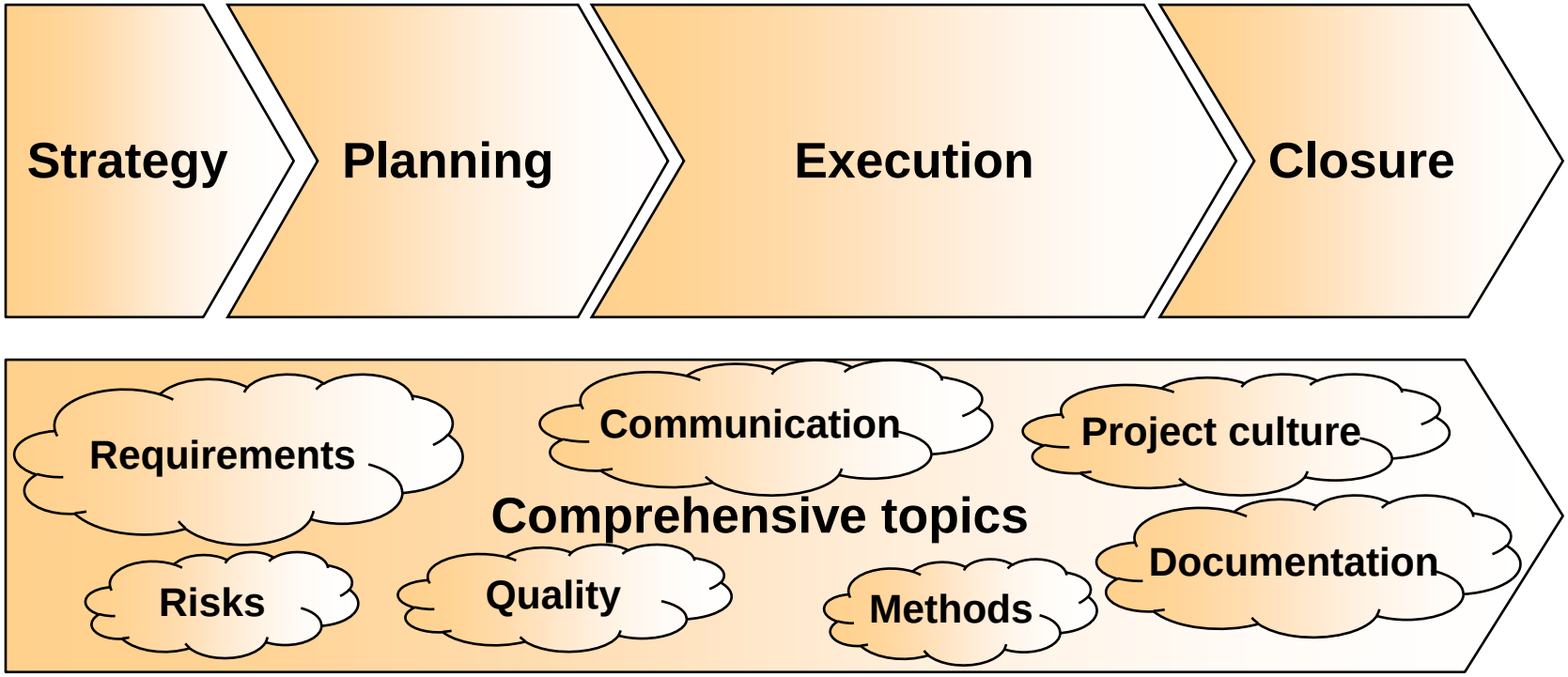
Process Models

- Evaluation
  - Process models are tools
  - The maturity level of an organization and the usage of defined project management processes
    - ➢ does not guarantee successful projects, but
    - ➢ increases the probability to execute a project successfully

Structuring Projects



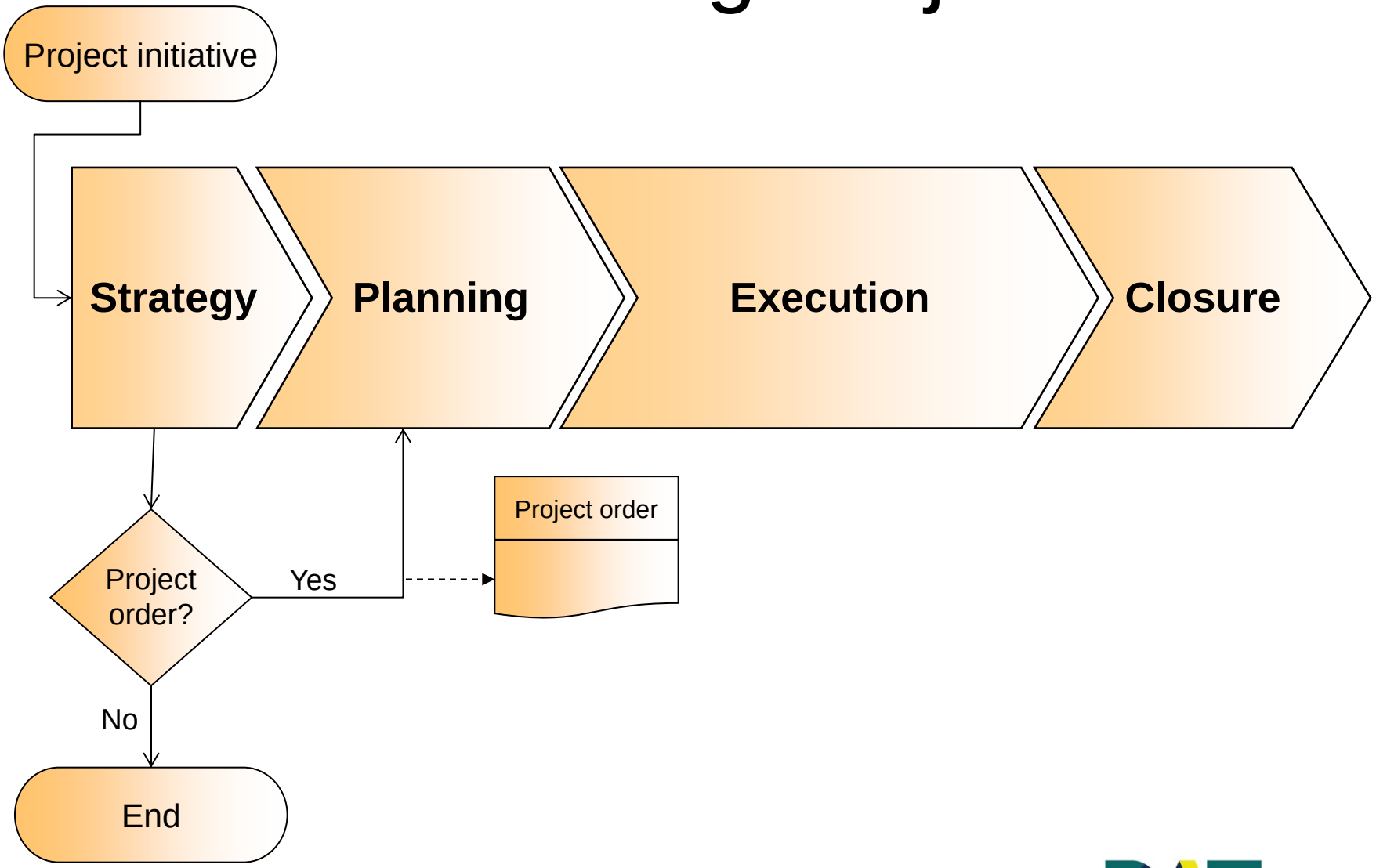
Structuring Projects

- Comprehensive topics
  - Projects consist of comprehensive topics like requirements, project culture, communication, documentation, quality, and risk management
  - Additionally there are methods
  - These topics are important during different or all project phases

Structuring Projects

- Project phases
  - A project phase is a “chronological sequence of a project, separated against other phases” because of matter of facts.“ [DIN09]
  - There is no unique differentiation concerning project phases, but most sources define at least three phases
    - Planning
    - Execution
    - Closure
  - Additionally a phase “Strategy” could be defined. After a project order the project is in operation.
  - Project phases are typically separated by milestones

Structuring Projects



Summary

- Project management importance increases – world wide
- A project is distinguished by an aim with restrictions
  - temporal,
  - financial,
  - and personnel
- *“project management is about people getting things done”*
- Successful projects involved user, got executive management support, and had clear requirements
- Project management process models to support projects
- Projects have
  - project phases
  - comprehensive topics like communication and requirements – important over the complete project lifecycle

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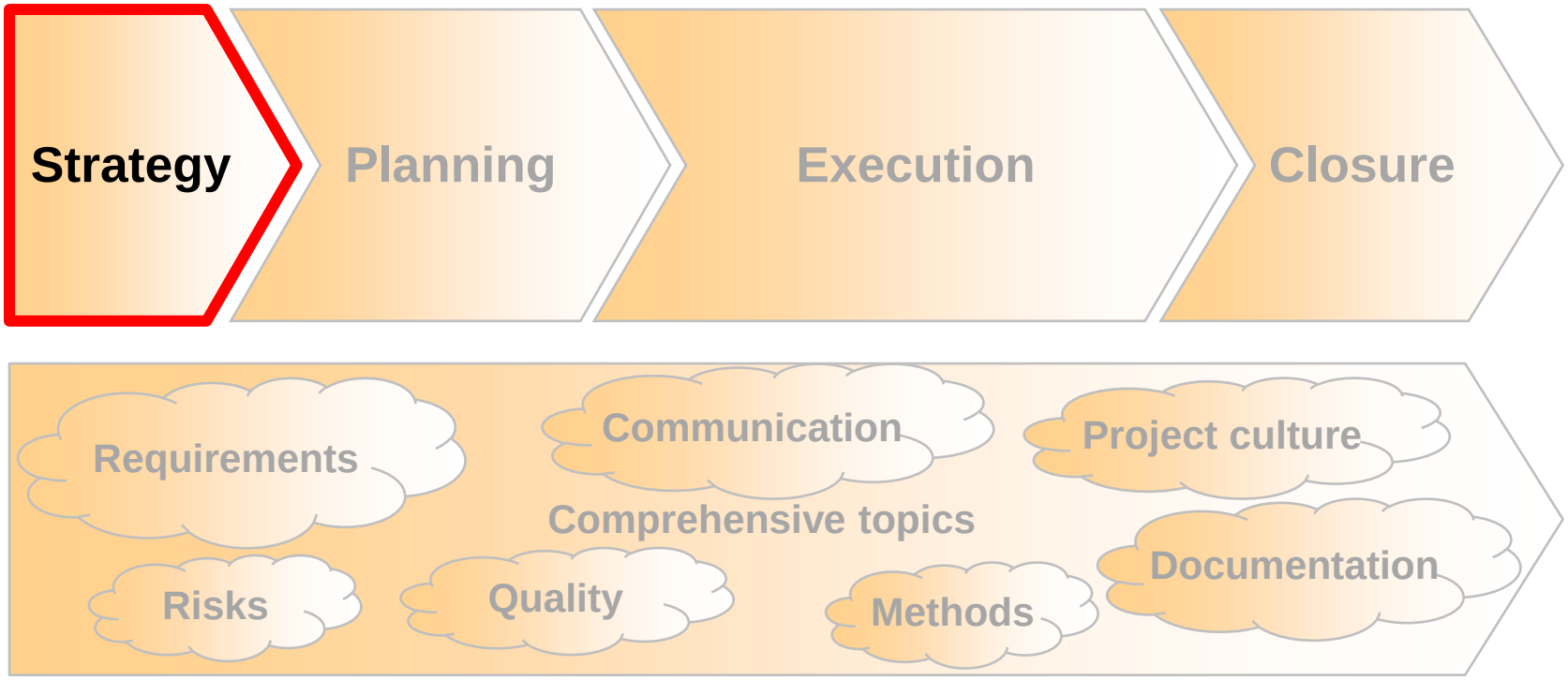
Strategy Phase



Strategy Phase

- Project stage: Strategy Phase
  Synonyms: Conception stage, initial stage

- Goal of the strategy phase is to achieve a project order
- Resulting documents:
  - Project order
  - (Initial) specification documents

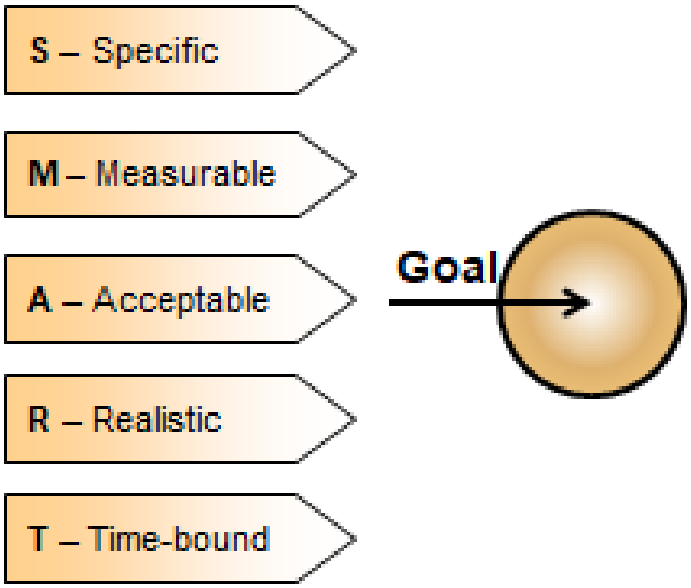
Project Goals

- Project goal
  Synonyms: Project charter, Project objective, Project aim
- DIN 69901 defines the project goal as "measurable result under defined constraints of a project“ [DIN09]
- The complete goal descriptions could be covered by the questions:
  - What?
  - When?
  - How much?
  - Where?
- Goals are desires!
- Non-goals differentiate the project and describe what the project renounces, means what should not be achieved.
- A strategy describes the path to the goal

Project Goals

SMART method to create goals

- **S**pecific
  The goal is described clearly, precisely, and consistently.
- **M**easurable
  The goal is verifiable.
- **A**cceptable
  The goal is exigent; it is challenging and positively worded.
- **R**ealistic
  The goal can be reached with given resources in given time; conditions are clarified.
- **T**ime-bound
  The goal should be reached by a specific date.



Project Order

- Project order
  Synonyms: Project assignment, project brief, project contract, project definition, project scope
- DIN 69905 defines „project order“ as „Agreement about deliveries and services of the parties to a contract.”
- Typically we talk about a mandatory contract document, where a signing contracting body (customer) instructs a contractor (supplier) to perform the agreed services and commits to pay a corresponding commission

Project Order

- Clarify everything and write it down
  - The project order should be confirmed in written form
  - The project order is the formal start of a project From this time on the project life cycle could be traced

- Hint
  During this stage you should try to find high ranked sponsors and to inform them regularly

Project Order

- Typical content:
  - People involved, especially principal and contractor
  - Goals
  - Assignment of tasks
  - Expected project results
  - Critical success factors
  - Costs and benefits
  - Time schedule and milestones
  - Organization
  - Signature

Project Order

- Example

Project order

Project name	2nd edition *"Projektmanagement für die Praxis"*	**Project No.**	SV_Bö_2.Aufl
Principal	Mr. xyz, Springer Vieweg, Wiesbaden		
Project manager	Daud Alam, Uwe Gühl		
Version/Date	*1.0/31.10.2019*	**Status**	*In progress*

Steering committee	./.		
Project team	Daud Alam, Uwe Gühl		
Project start	01.06.2019	**Project end**	30.04.2020
Objectives	*Extension and revision of "Projektmanagement für die Praxis"*		
Non-goals	The English edition will not be updated		
Project scope	1. Additional chapter: Agility 2. Additional section: Change management 3. All templates available electronically 4. Revision and more exercises with solutions		
Milestones	Regular communication every 2 months with discussion of status and proceeding.		
Contract value	1.000 Euro		

Summary

- A project order is the fundament of a project
  - Who is the principal, who is the contractor?
  - Project contract with agreement on project goals: Measurability, non-goals, constraints to be considered
- Project goals to
  - be able to control the project
  - measure the project output

Contents

Requirement: Clap around

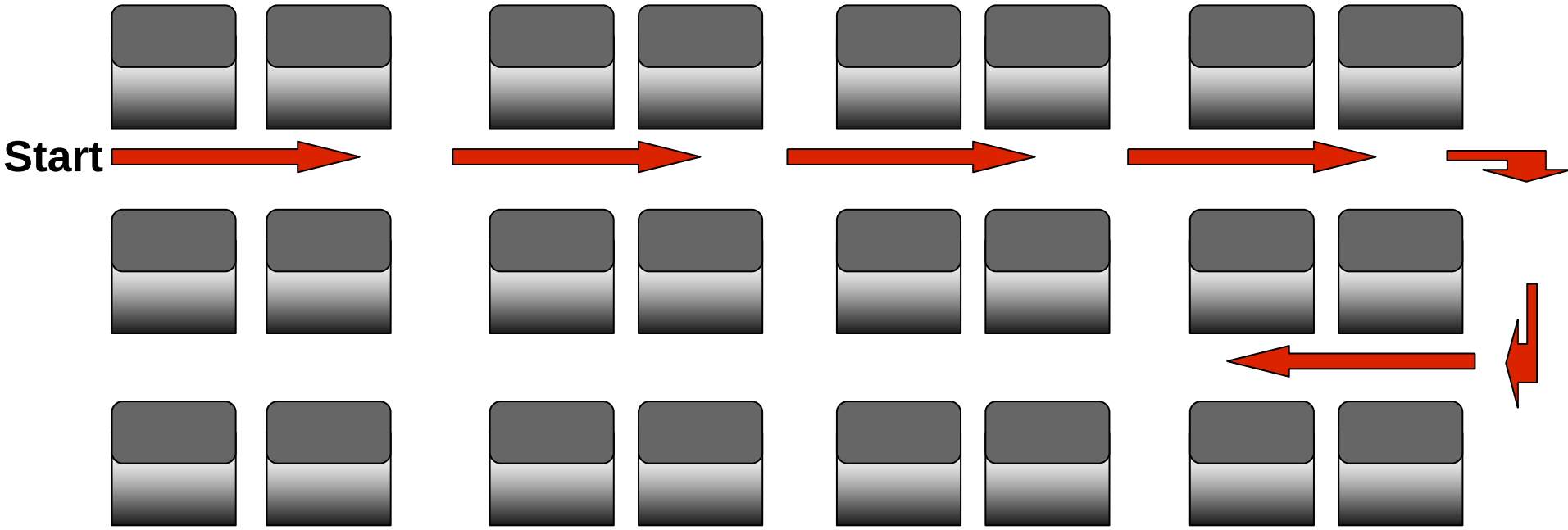
- The student at the right back (in direction to the board) claps first – finally the clap should arrive in the first line
- “Sender”: Student sends a clap to his neighbor
- “Receiver”: Student receives a clap from his neighbor
- Both “sender” and “receiver” clap at the same time together.
- After receiving, student passes clap to next neighbor
- At the end of a line student claps to person in front

Requirement: Clap around

- Begin “passing the clap” by asking one person to turn at their waist and clap together with the person on their left.
- The person receiving the clap “takes it” by clapping simultaneously with the person on their right, then continues the action by “giving the clap” to the person on their left.

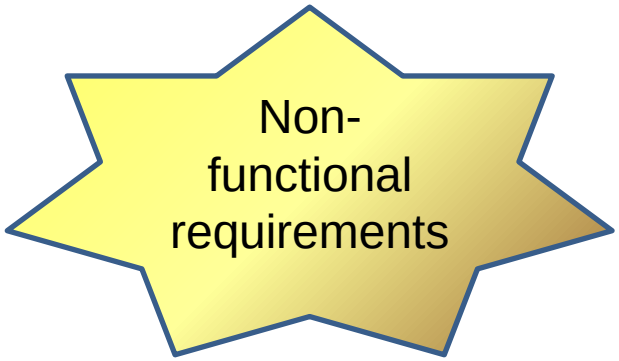
Source: [CTC12]

Requirement: Clap around



Requirement: Clap around

- Hints
  - Clapping passes all the way around with no talking.
  - Clap right on cue – not too early, not too late.
  - Make and maintain clear eye contact if together



Requirement: Clap around

- Challenges
  - Difficult to work only with written requirements
  - What is clear for the customer is not always clear for the developers
  - Issue: Language
- Helping
  - Direct communication, face to face or per phone
  - Pictures, drawings
  - From abstract to concrete requirements

Identification of Requirements

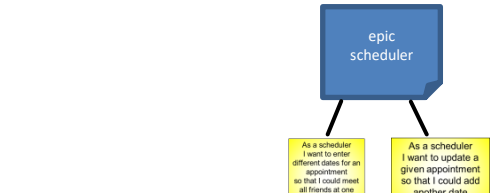
- A goal of Requirements Engineering is to get a complete, consistent, modifiable, and traceable software requirement specification [Wie99].
- How to get “complete” requirements?
  Find the “right people”, e. g., in using
  - stakeholder analysis
    - Principal
    - End users
  - environment analysis

Identification of Requirements

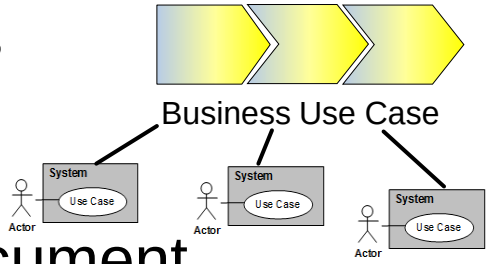
- With the “right people”
  - Interviews
  - Paper Prototyping
  - Desktop Tests
  - Workshops
- More sources to identify requirements:
  - User manuals, system administration guideline, system documentation of older / comparable systems
  - Information from 1st level support
  - Open defects of older / comparable systems
  - Entries in forums
  - Market analysis

Documentation of Requirements

- Diverse possibilities to document requirements
  - epics/User stories



  - Business use cases/Use cases



  - Requirements specification document
  - Business process master list
  - Business blueprint
  - Requirements list

Tool support possible

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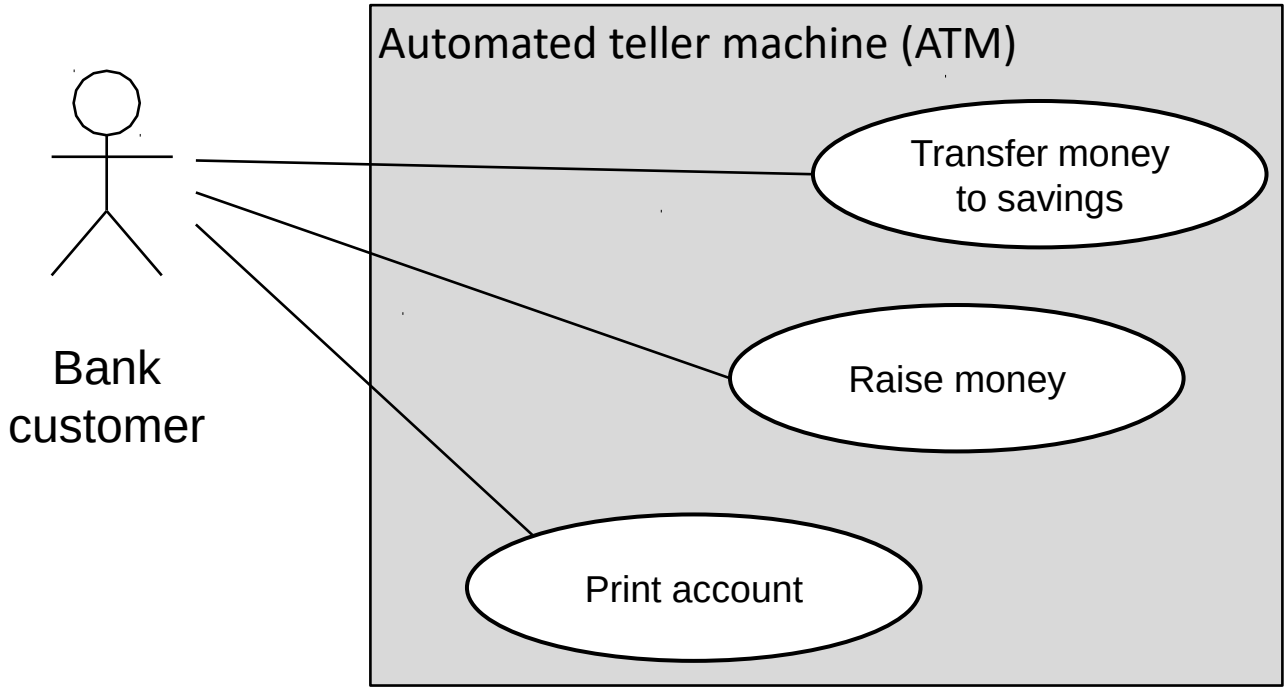
Use case

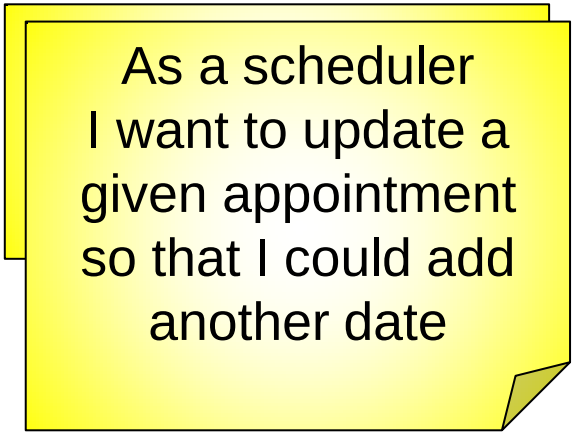
- Use case: list of actions or event steps typically defining the interactions between a role (actor) and a system to achieve a goal. [Wik20b]



User Story

User Story

- Short, simple description of a feature told from the perspective of the person who desires the new capability, usually a user or customer of the system.
  Proposed template:
  As a <type of user>,
  I want <some goal>
  so that <some reason>
- User Story is something like a promise to talk.



Example of a User Story

User Story

INVEST model [Wak03] to write user stories well

- **I** ndependent – no overlap, no dependencies
- **N** egotiable – captures the essence, not details
- **V** aluable – specified value for the customer
- **E** stimable – to help in planning and prioritization
- **S** mall – should be conducted in a sprint
- **T** estable – more effective, if tests were written before implementation

Tests are typically based on acceptance criteria

Requirements List

- A result of a workshop with stakeholders could be a collection of requirements, acceptance criteria, tasks to be executed etc.
- Requirements list to trace requirements

				Acceptance criteria		Actions
Id	Quality characteristic	Prioritiz	Requirements	Id	Criteria	Task
1	**Functionality**	o Prio 2				
1.2	Accuracy E.g. the needed precision of results	o Prio 2	Currency must be presented by two decimal places			
		o Prio 2				
		o Prio 2				
		o Prio 2				
4	**Efficiency**	++ Prio 1				
4.1	Time Behaviour Response time, processing time, throughput	++ Prio 1				
5	**Maintainability**	o Prio 2				
5.4	Testability: Effort needed to test a system change.	o Prio 2				
6	**Portability**	-- Prio 3				
6.3	Adaptability: Ability of the system to change to new specifications or to move to another operating environment	-- Prio 3				

Requirements List

- Example

Requirements list

Project name	2nd edition *"Projektmanagement für die Praxis"*	**Project No.**	SV_Bö_2.Aufl
Responsible	Daud Alam, Uwe Gühl		
Version / Date	*1.0/31.10.2019*		

No.	Requirement	Stakeholder	Com-plexity	Priority	Status	Comments
1	Additional chapter: Agility	Xyz	High	High	Planned	
2	Additional section: Change management	Xyz	Medium	Medium	In progress	
3	All templates available electronically	Xyz	Low	Medium	Done	

Writing requirements

- Good requirements are
  - correct: They have to say the right things.
  - consistent: They can’t contradict each other.
  - unambiguous: Each must have one interpretation.
  - complete: They cover all the important stuff.
  - relevant: Each must meet a customer need.
  - testable: There must be a way to tell if they are satisfied.
  - traceable: There must be a way to determine their origin.

Writing requirements

- KISS – Keep it simple and smart
  - Keep sentences and paragraphs short.
  - Use the active voice.
  - Use proper grammar, spelling, and punctuation.
  - Use terms consistently and define them in a glossary or data dictionary.

Quality measure: Glossary to speak “the same language”.
There should be only one common glossary.
There should be one responsible.

Writing requirements

- Prioritization of requirements
  - High priority: **Must** – to be realized in the next iteration, e.g. product release.
  - Medium priority: **Should** – necessary.
  - Low priority: **Could** – Nice to have if there is enough time.
- Excerpt (out of agile software development):
  In iteration planning requirements are selected out of a product backlog to be realized – following prioritization by customer.

Writing requirements

- Add to defined requirements acceptance criteria
  - Use concrete examples.
  - Define test cases to be passed.
- Excerpt (out of agile software development) “Definition of done” is an agreement to decide, when a realization of a requirement could be accepted by the customer, for example
  - presentation successful,
  - automated test cases passed.

Writing requirements

- Use the “right” granularity
  - A helpful granularity guideline is to write individually testable requirements.
  - If you can think of a small number of related tests to verify correct implementation of a requirement, it is probably written at the right level of detail.
  - Watch out for
    - multiple requirements that have been aggregated into a single statement.
    - "and" / "or" in a requirement

    ⇨ Several requirements might have been combined.

Changing requirements

- Possible reasons:
  - Topics have been
    - forgotten,
    - expressed wrongly.
  - Stakeholder does not like delivered solution.
  - Market changed.

Changing requirements

- How to deal with changes?
  - Introducing change management with a “change control board” (CCB).
  - Prioritization
    Focus on the most important requirements and on the requirements to be implemented next.
  - Enforce communication
    Requirements Engineer ⇔ Developer ⇔ Tester
  - Regular milestones, short development cycles
    Regular feedback concerning implementation of requirements (⇨ agile software development)

Want to learn more?

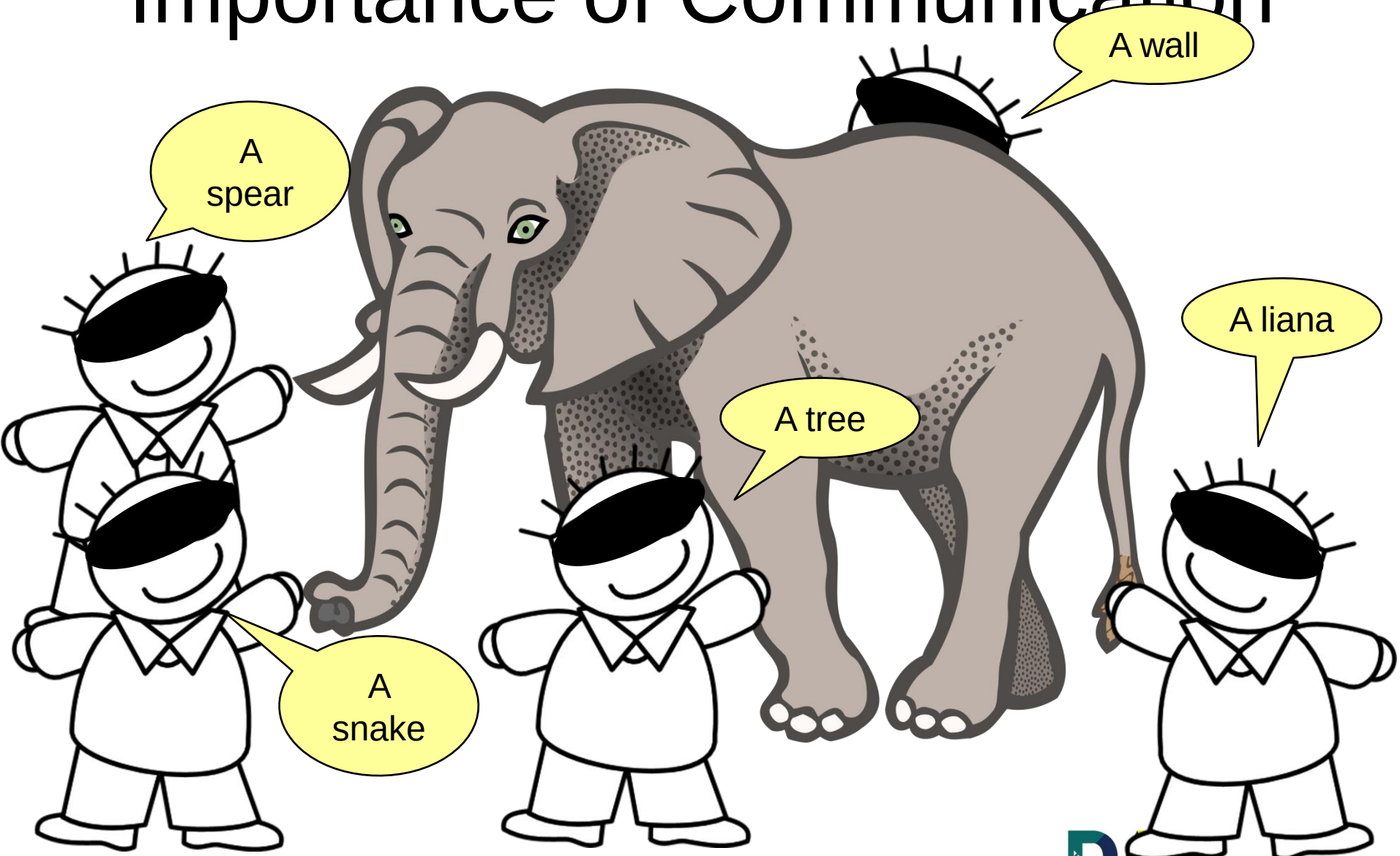
- Professional organizations, e.g.,
  - International Requirements Engineering Board, [IREB20]
    → offer a certification program to get
    "Certified Professional for Requirements Engineering".
- Books on Requirements Engineering
  - [PR15] Klaus Pohl, Chris Rupp: Requirements Engineering Fundamentals, 2nd edition, Rocky Nook Inc., 2015
  - [Wie05] Karl E. Wiegers: More About Software Requirements: Thorny Issues and Practical Advice, Microsoft Press, 2005
  - [Ale09] Ian Alexander: Discovering Requirements – How to Specify Products and Services, Wiley, 2009

Summary

- Requirements are a critical success factor for projects
- Identification of requirements with stakeholders
- Documentation of requirements
  - Specification
  - Use cases/user stories
  - Requirements list
- Guideline for good requirements
  - KISS
  - INVEST
  - Prioritization
  - Acceptance criteria
- Changing of requirements requires
  - change management or
  - agile software development

Contents

Importance of Communication



Importance of Communication

- Communication is a (if not the) key to project success

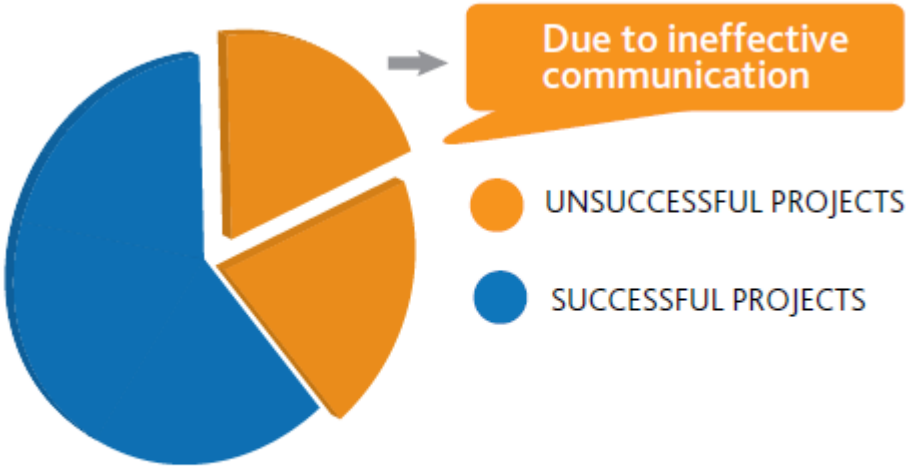


Figure 4. One out of five projects is unsuccessful due to ineffective communications.

Source: [PMI13]

Importance of Communication

- Tom DeMarco: “The business we're in is more sociological than technological, more dependent on workers' abilities to communicate with each other than their abilities to communicate with machines.” [ML87]

Improving Communication

Basic rules:

- Respect and acceptance
- Active listening
- Asking open questions
- Justified compliments
- Understanding the perspective of other people
- Talking clear, specific, goal-oriented
- Being a role model

Improving Communication

Communication hierarchy:

- Best is face to face communication
  Not only words are important, but body language, facial expressions, gestures and voice as well [MF67]
  Go to the desk of the person, if something has to be discussed
- Second is communication by phone / chat – bidirectional information
- Third is communication by text only like email
  - Beware of email communication.
    It is very easy to misunderstand what is said, even if emoticons (smileys) are used.
  - Use email to confirm topics, to summarize results discussed, to send information to be shared like minutes

Improving Communication

Tools and methods

- Regular meetings
  - Simple approach, for every participant:
    - What did I achieve?
    - Next steps
    - Current issues
  - Minutes
- Task list
- Project glossary
- Communication plan

Minutes

Project name	<Name of project>	Project No.	<Number of project>
Location	<Location of meeting>	Date	<dd.mm.yyyy>
Minute taker	<Name of minute taker>	Version	<n.m.p>
Topic	<Topic of meeting>		

Attendees	<Att1 Name, department, mail, phone> <Att2 Name, department, mail, phone>

No.	Task	Category	Respon-sible	Start date	Due date	Prio-rity	Status	Results	Comments
1	Task No. 1	Admin	Joe	15.03.	22.03.	high	in progress		
2	Task No. 2	Admin	Lee	15.03.	15.03.	mediu	done	Plan	
3	Task No. 3	Work	Jim	15.03.	29.03.	low	open		in discussion

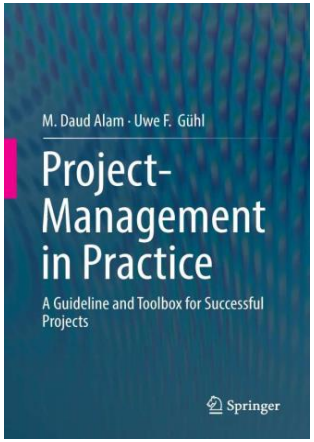
Kind of communication	Who	Purpose	Frequency
<Principal meetings>	<Principal>	<Update, critical issues, approval requests>	<Biweekly, on request>
<Project board meetings>	<Project board>	<Status, approval requests>	<Every 2 months>

Summary

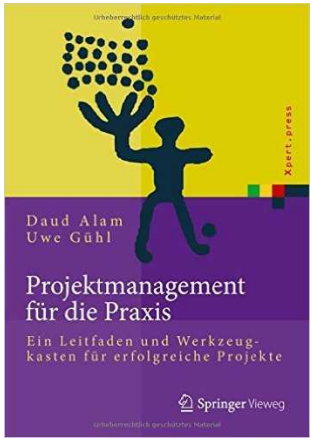
- Many projects fails because of communication issues
- Basic communication rules should be followed, most important: Respect and acceptance
- Several tools and methods could be used to improve the communication like
  - regular meetings and
  - a task list

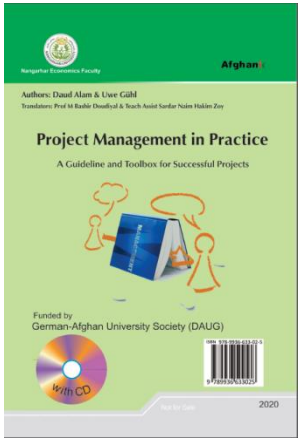
Sources

- Daud Alam, Uwe Gühl: „Project-Management in Practice – A Guideline and Toolbox for Successful Projects”, Springer-Verlag Berlin Heidelberg, 2016, ISBN 978-3-662-52943-0



Also available in
German and Pashto (afghan language)





Sources

- [Ale09] Ian Alexander: Discovering Requirements – How to Specify Products and Services, Wiley, 2009
- [apm20] association for project management (apm): Glossary, URL: https://www.apm.org.uk/body-of-knowledge/glossary/, 2020
- [axe20] AXELOS Limited: PRINCE2® 2017 Glossary of Terms English, URL: https://www.axelos.com/glossaries-of-terms, 2020
- [Bat19] Natascha Batic: “PM 2020”: How pma members see the future in project management”, URL: https://www.ipma.world/pm-2020-how-pma-members-see-the-future-in-project-management/, 18.12.2019
- [com12] computereconomics: Project Managers Grow in Importance, URL: http://www.computereconomics.com/article.cfm?id=1719, March 2012
- [CTC12] Chicago Teachers' Center at Northeastern Illinois University: Every Art, every child: Pass the clap, URL: http://everyarteverychild.org/artmaking/theater/passtheclap.html, 2012
- [DIN09] DIN Deutsches Institut für Normung e. V.: DIN 69901-5:2009-01, Projektmanagement – Projektmanagementsysteme - Teil 5: Begriffe. URL: https://www.beuth.de/en/standard/din-69901-5/113428752, 2009
- [ES09] Eigner, Martin, and Ralph Stelzer: Ein Leitfaden für Product Development und Life Cycle Management, Springer Berlin-Heidelberg, 2009
- [Hir14] Kay-Eric Hirschbiegel: Die Trends im Projektmanagement - ein Überblick, tecchannel, IT im Mittelstand, URL: http://www.tecchannel.de/software/erp/2064194/trends_im_projektmanagement/, 2014
- [Gor10] Gorriz, M.: IT-Prozesse erfolgreich standardisieren, URL: https://www.automotiveit.eu/wp-content/uploads/2010/03/DaimlerAutomotiveDay2010_-Dr-Michael-Gorriz_VERSAND.pdf, 2010

Sources

- [HW15] Shane Hastie, Stéphane Wojewoda: Standish Group 2015 Chaos Report - Q&A with Jennifer Lynch on Oct 04, 2015, URL: http://www.infoq.com/articles/standish-chaos-2015, 2015
- [IPMA20] International Project Management Association (IPMA), Homepage, URL: http://www.ipma.world/, 2020
- [IREB14] International Requirements Engineering Board, URL: http://www.ireb.org/, 2020
- [Jal02] Pankaj Jalote: Software Project Management in Practice, Addison-Wesley, 2002
- [MF67] Mehrabian, Albert, Susan R Ferris: Inference of attitude from nonverbal communication in two channels. The Journal of Counselling Psychology 31(3):248–252, 1967.
- [ML87] Tom De Marco with Timothy Lister: Peopleware: Productive Projects and Teams, Dorset House, 1987
- [PMI04] Project Management Institute: *A Guide to the Project Management Body of Knowledge: PMBOK Guide*. 3rd Edition. Newtown Square, Pennsylvania, Project Management Institute, p. 5, 2004
- [PMI13] PMI: The high cost of low performance: The essential role of communication, URL: https://www.pmi.org/~/media/PDF/Business-Solutions/The-High-Cost-Low-Performance-The-Essential-Role-of-Communications.ashx, May 2013
- [PMI17] Project Management Institute. *A Guide to the Project Management Body of Knowledge: PMBOK® Guide*. Sixth Edition. Newtown Square, Pennsylvania, Project Management Institute, 2017
- [PMI17a] Project Management Institute: Project Management, Job Growth and Talent Gap, 2017 – 2027, URL: https://www.pmi.org/-/media/pmi/documents/public/pdf/learning/job-growth-report.pdf, 2017
- [PMI20] Project Management Institute: Homepage, URL: http://www.pmi.org/, 2020

Sources

- [PR15] Klaus Pohl, Chris Rupp: Requirements Engineering Fundamentals, 2nd edition, Rocky Nook Inc., 2015
- [Pri06] Priemuth, T.: Überblick und Grundlagen IT- Qualitätsmanagement der BMW Group, URL http://bis.informatik.unileipzig.de/de/Lehre/0506/SS/SQMmore/files?get=vortragpriemuthbmwgroup.pdf, 2006
- [Sch15] Schollerer, Michael: "Erfolgreiches Projektmanagement auf Basis des Vorgehensmodells ITPM der BMW", LMU München, URL: http://www.pst.ifi.lmu.de/Lehre/wise-14-15/jur-pm/itpm-ausarb, 2015
- [Sie11] Siemens AG, Corporate Technology Office Project-Management: Project Management Excellence, URL: http://www.energy.siemens.com/hq/pool/hq/power-generation/power-plants/power-plant-project-management-excellence.pdf, 2011
- [SG14] The Standish Group: Report Chaos, URL: https://www.projectsmart.co.uk/white-papers/chaos-report.pdf, 2014
- [TPO20] Technology Program Office @ Berkeley, University of California: PM Glossary, URL: https://technology.berkeley.edu/tpo/glossary, 2020
- [Wak03] Bill Wake: INVEST in Good Stories, and SMART Tasks, URL: http://xp123.com/articles/invest-in-good-stories-and-smart-tasks, 2003
- [Wie05] Karl E. Wiegers: More About Software Requirements: Thorny Issues and Practical Advice, Microsoft Press, 2005
- [Wie99] Karl E. Wiegers: Writing Quality Requirements, http://processimpact.com/articles/qualreqs.html, 1999
- [Wik20] Wikipedia: Glossary of project management, URL: https://en.wikipedia.org/wiki/Glossary_of_project_management, 2020
- [Wik20a] Wikipedia: Chaos-Studie, URL: https://de.wikipedia.org/wiki/Chaos-Studie, 2020
- [Wik20b] Wikipedia: Use Case, URL: https://en.wikipedia.org/wiki/Use_case, 2020