

Foredrag for Den Norske Dataforening, den 08.10.2003

CMM, CMMI and ISO 15504 (SPICE)

Bruk av modenhetsmodeller under programvareutvikling, er det nøkkelen til suskess?

Malte Foegen, Jürgen Richter



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Contact Persons



IT MATURITY SERVICES



Malte Foegen
 Managing Consultant
 CMMI Assessor
 ISO 15504 Working Group Member
 wibas IT Maturity Services GmbH
 Otto-Hesse-Str. 19 / T5
 64293 Darmstadt, Germany
 e-mail: mfoegen@wibas.de
 Tel: 0049 / 6151 / 50 33 49 - 26

Malte Foegen worked for IBM Germany for several years. There he participated in the development of the IBM Method for IT projects and he was project manager of the international project for the deployment of this software life-cycle model in IBM projects.

Today Malte is member of the board of directors of wibas GmbH in Germany and responsible for the software process improvement division.

He is a member of the ISO 15504 working group and frequently leads both SPICE and CMMI assessments for our customers.

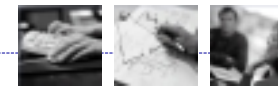


Jürgen Richter
 Senior Consultant
 CMMI Assessor
 wibas IT Maturity Services
 Rødbergveien 98 d
 0593 Oslo, Norway
 e-mail: juergen.richter@wibas.com
 Tel: 0047 / 48 21 00 20

Jürgen Richter worked for more than 14 years for IBM Germany in the division of SW quality assurance and test. He gained in-depth experience as a test manager in numerous customer projects.

As a core member of the „IBM Quality and Test Competence Center“ he played a significant role in the standardization of SW testing in IBMs customer projects.

In spring of 2003 Jürgen moved to Oslo with his Norwegian wife and since then he has been supporting customers in their CMMI software process improvement projects.



1	Quality Models
2	SW-CMM
3	ISO 15504:2004 / SPICE
4	CMMI
5	SPI in Practice
6	Summary



Quality models support the acquisition, the development and the marketing of software.



For the acquisition of external development services:

- Objectively evaluate the current and future capability of your suppliers



For software engineering:

- Objectively evaluate your own current and possible software development capabilities
- Identify and prioritize the activities in order to improve your software development
- Checklist / ,roadmap' for the execution of software process improvement activities

For marketing of your development services:

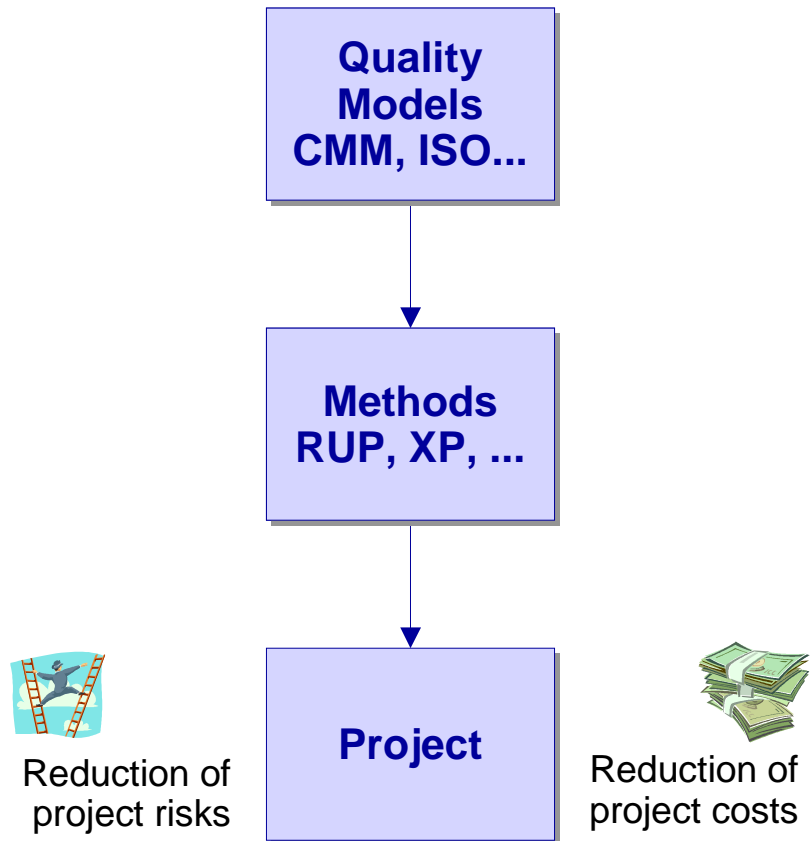
- Presentation of your capabilities
- Competitive advantage



Evaluation and Certification of the software development based on standardized and objective criteria.



Develop own ← versus → Use best practices Overview

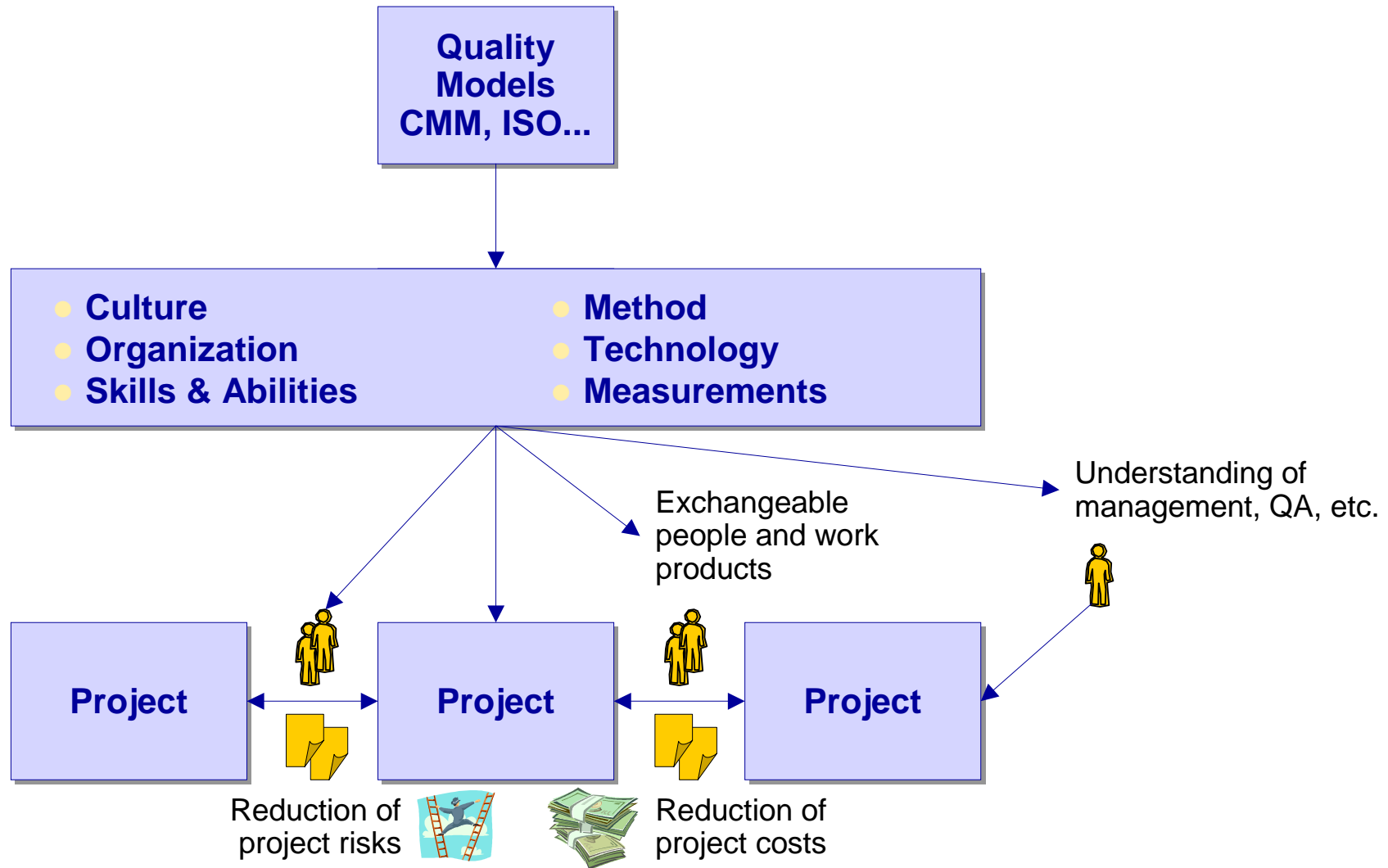


„The common cause of all troubled projects is, that these teams don't use the existing best practices.“

IBM Quality Assurance, Analysis of troubled projects

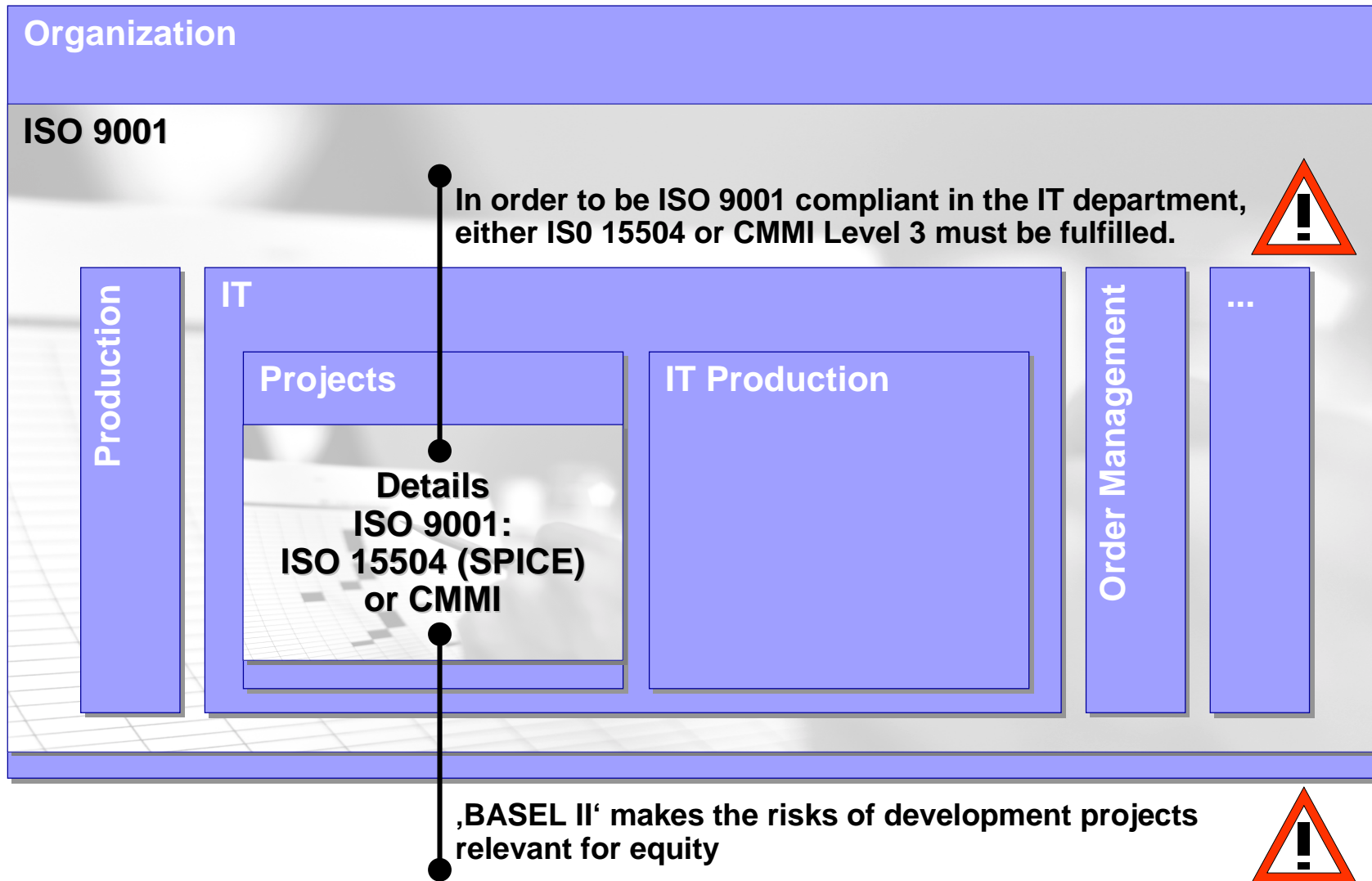


Use best practices – and change the organization





ISO 15504 and CMMI set the scope for the software development within a ISO 9001 scope



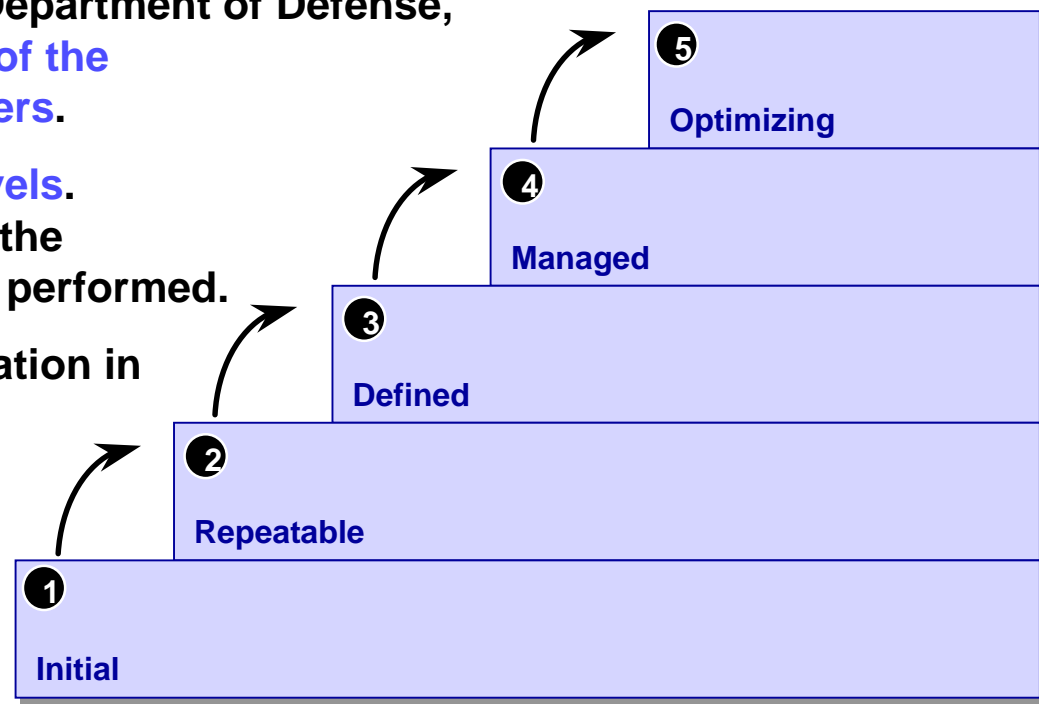


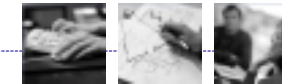
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CMM: world wide the most used quality model, available since 1986

- SW-CMM was developed by the **Software Engineering Institute (SEI)** of the Carnegie Mellon University.
- SW-CMM defines a **set of proven practices** which are typically found in **mature software organizations**. They are a Checklist for „Where are we?“ and „What should we improve?“
- SW-CMM was initiated by the Department of Defense, with the goal to **obtain control of the quality of their software suppliers**.
- SW-CMM defines **5 maturity levels**. These indicate how structured the software development is being performed.
- SW-CMM supports the organization in **improving the quality and the success of projects**.





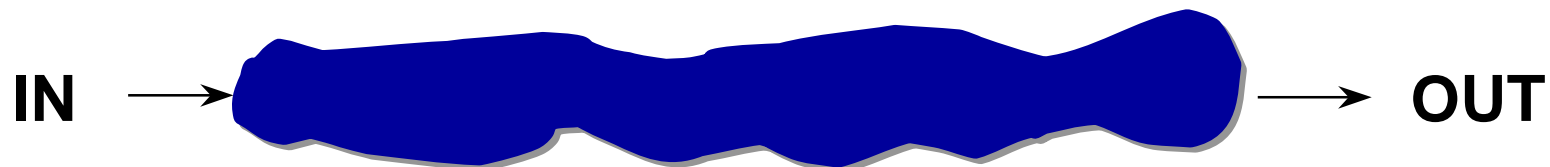
The benefit of CMM: Improvement of processes, improvement of estimations, reduction of costs.

Level	Structure of project	Benefit
5		
4		
3		
2		
1		

A project on level 1 is ad hoc and chaotic

① *Initial*

On level 1 the software process is a “black box”. The software development is **chaotic**. There are no standards for planning and controlling of projects. Success in these organizations depends on the competence, motivation and heroics of the people in the organization and not on the use of proven processes.

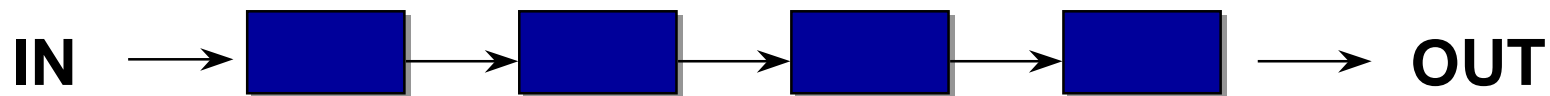


A project on level 2 is repeatable and uses milestones

② *repeatable project*

Projects in **level 2** organizations have **installed basic project management controls**, like planning, monitoring and control of time, costs, functionality and quality.

The software process consists of a series of „black boxes“ with defined milestones (checkpoints).

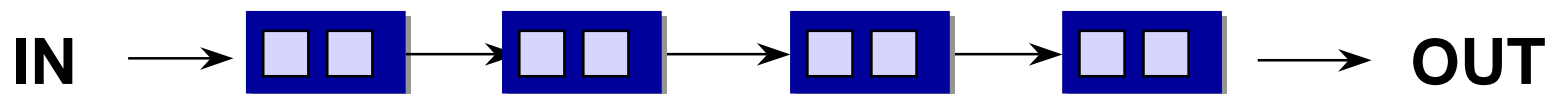


A project on level 3 is defined.

③ *Defined software process*

On level 3 a standard software process is documented and implemented across the organization.

The internal structure of the „boxes“ are now visible. Managers and team members understand their roles and responsibilities within the processes.

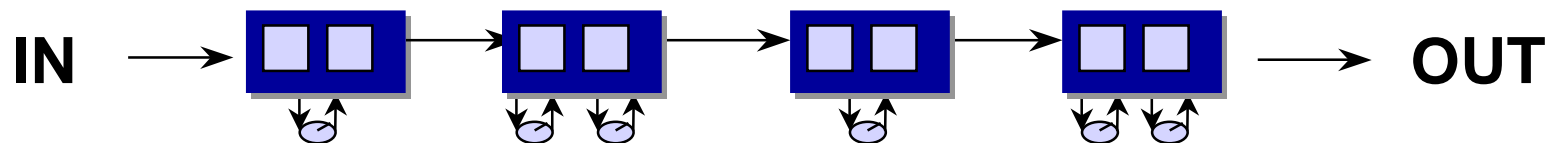


An organization on level 4 manages the software development.

④ *managed software process*

On **level 4** the organization sets **quantitative quality goals** for both software products and processes.

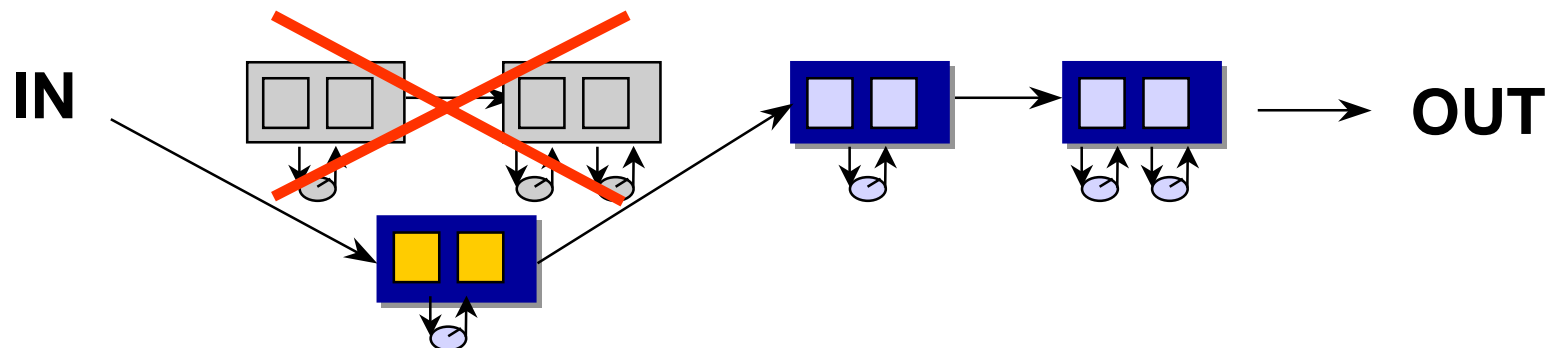
The software process is predictable because the process is measured and operates within measurable limits. With this management has an objective basis for decisions.



An organization on level 5 continuously improves its software process.

⑤ *Software process is optimized*

On level 5 an organization has the means to identify weaknesses and strengthen the process proactively. They are continuously striving to improve the range of their process capability, thereby improving the process performance of their projects.





By implementing software process improvement based on CMM, organizations have achieved a „Return on Investment“ of 1:5.

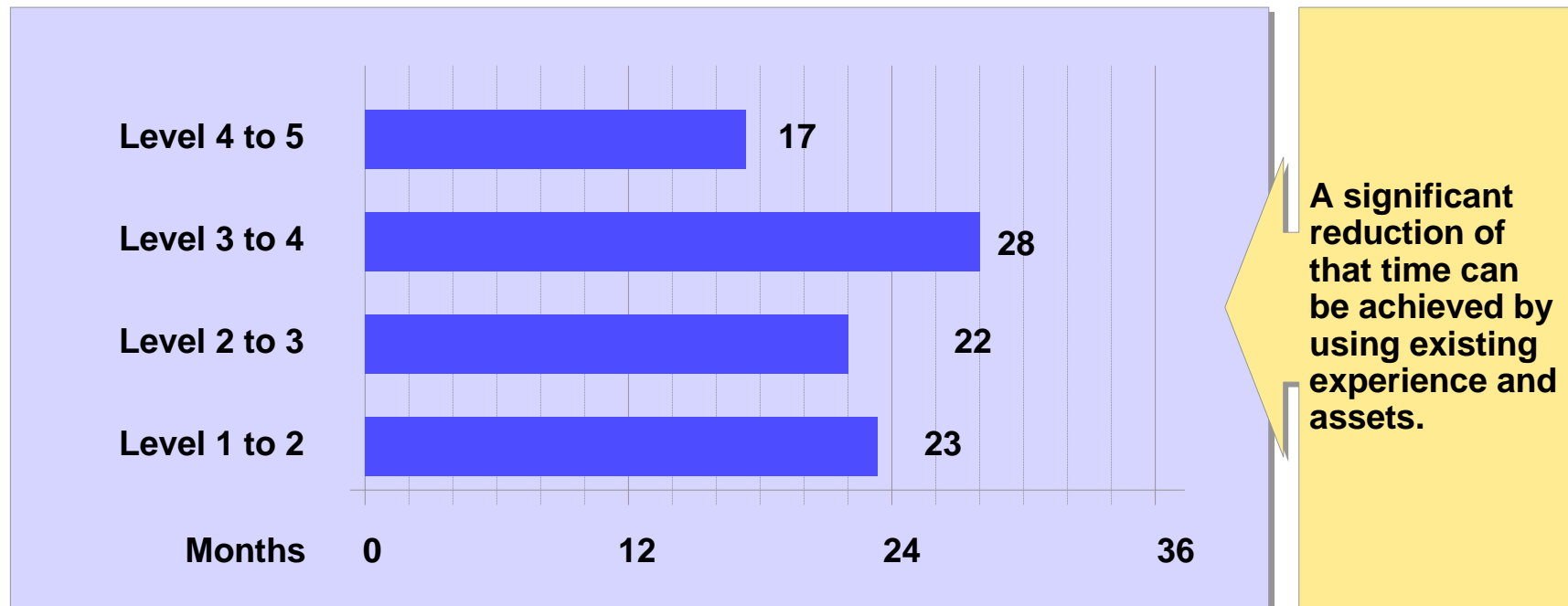
Benefit

Productivity growth (per year)	35 %
Increase of early defect detection (per year)	22 %
Reduction of time-to-market of a product (per year)	19 %
Reduction of field defects (per year)	39 %
Return on Investment	5.0

From: "Benefits of CMM-Based Software Process Improvement", Software Engineering Institute
Average of 13 organizations, using SW-CMM



The transition from one level to the next takes on average about 2 years.



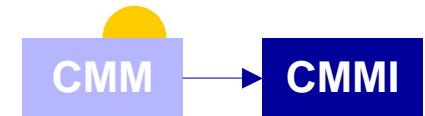
Average time used to reach the next maturity level in organizations, that have started their software process improvement in 1992 or later.

From: Software Engineering Institute, Process Maturity Profile of the SW Community, August 2002



CMM Integration – CMMI – was released as the new CMM version.

SW-CMM development will not be continued.



SW-CMM „Sun setting“

- „SEI will not develop and release any enhancements to the SW-CMM model or to any SW-CMM training.“
- „The new assessment model SCAMPISM V1.1 was released by the SEI to replace CBA IPI and SCESM as standard for assessments or evaluations. The SEI will not release any enhancements to CBA IPI and SCE methods.“
- „Data of SEI-authorized assessments, based on the SW-CMM, will still be accepted.“



From the SEI website <http://www.sei.cmu.edu/cmmi/adoption/sunset.html>



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ISO 15504 / SPICE: the international standard for process reference models and assessments

- In **June of 1993** a project with a mandate by the Joint Technical Committee JTC1 of ISO and IEC was started.
- The first **draft** of the standard was published in **1998** as a technical report.
- The **final publication** of the standard is expected in **2004**. The standard **differs significantly from the first draft** (technical report).
Information given will refer to the new standard 15504:2004.
- ISO 15504:2004 contains the **methodology and structure to perform assessments of system development processes**.
- ISO 15504:2004 **contains an assessment model: SPICE** (Software Process Improvement and Capability Determination).
- ISO 15504:2004 is **linked to ISO 9000:2000**.

ISO 15504
:2004

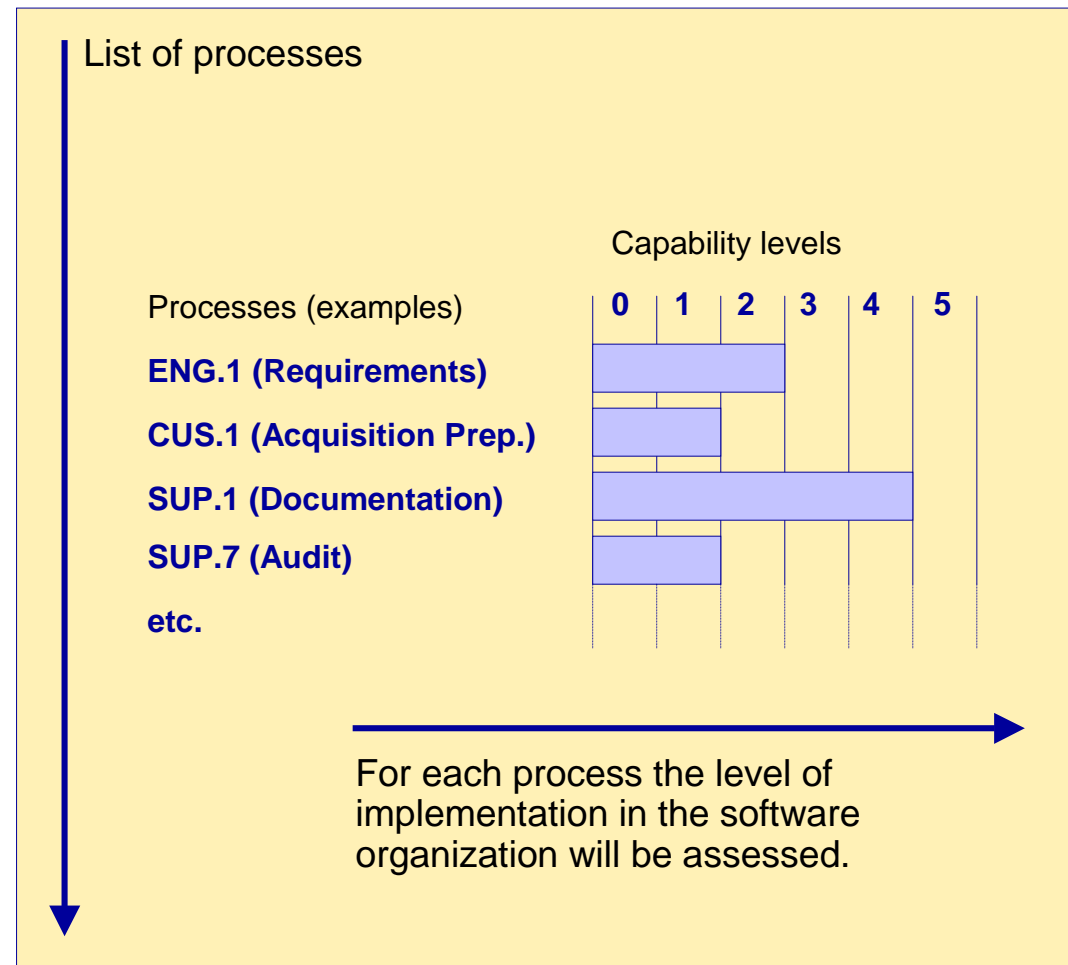
SPICE



The main innovations of ISO 15504 in comparison to CMM: Capability level of single processes and not maturity levels of the whole organization.

The elements:

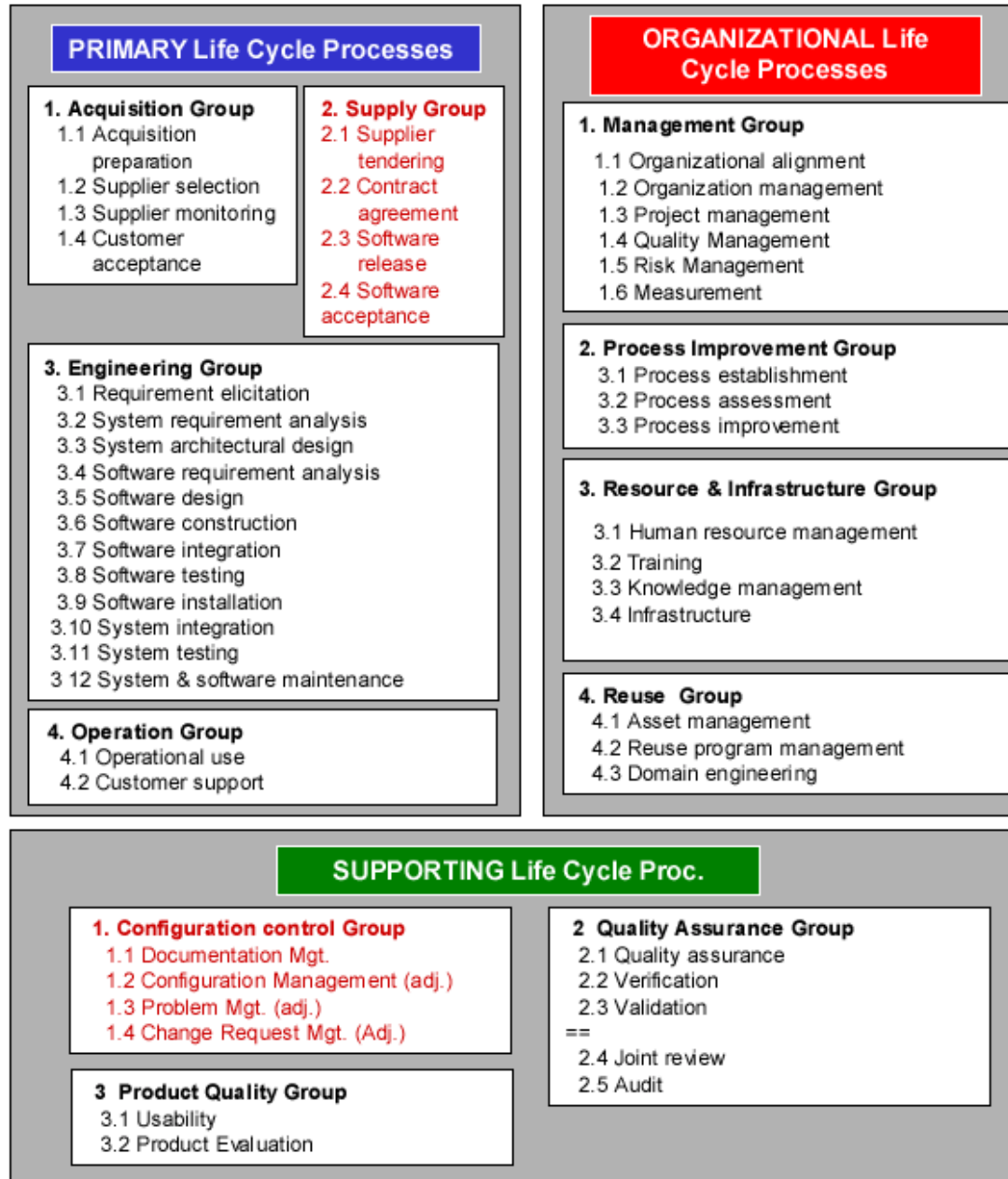
- A set of processes (e.g. ISO/IEC 12207 for software development)
- An evaluation of the capability level of each process, independent of other processes.





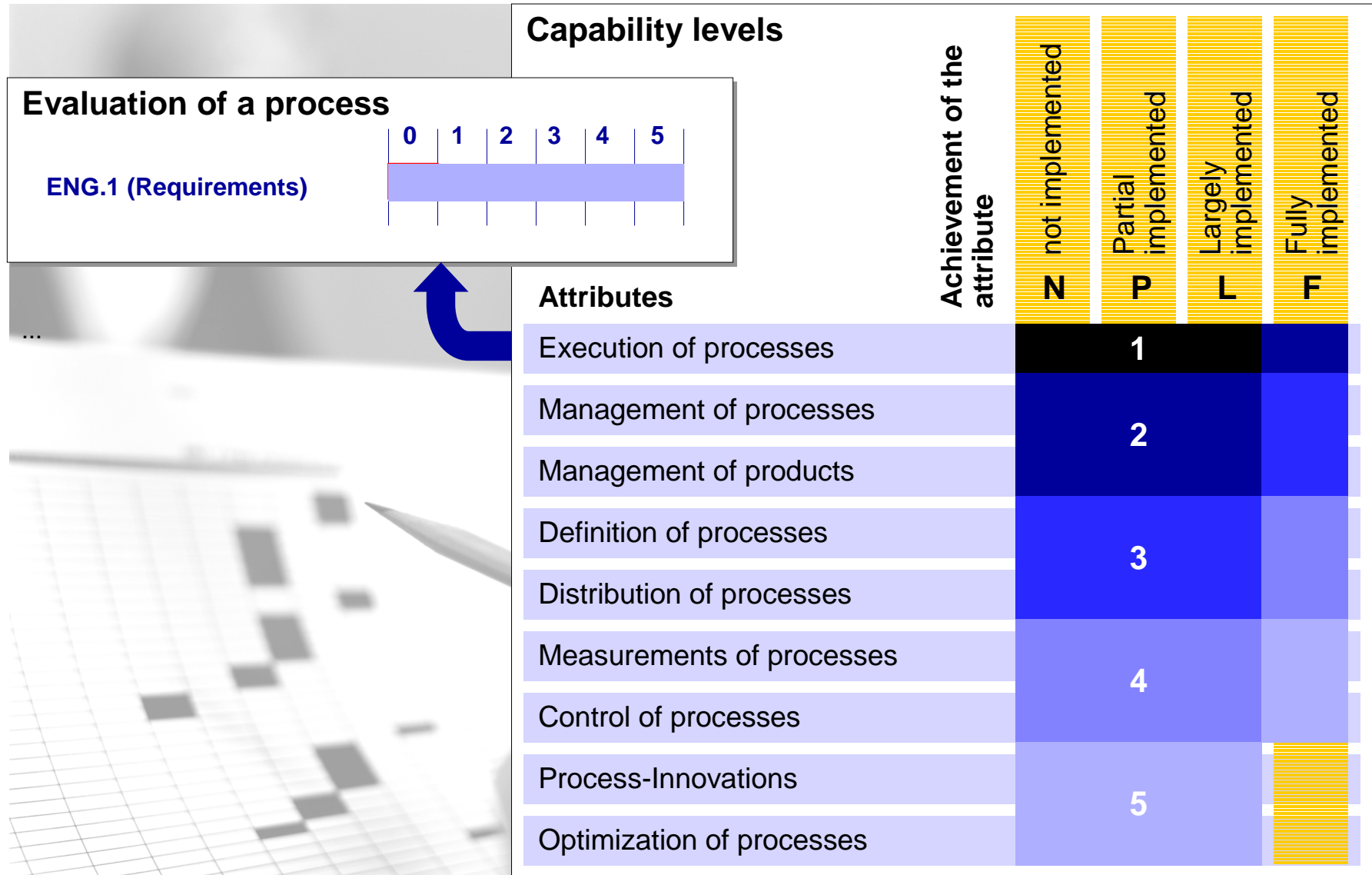
The processes of SPICE (ISO 15504 Part 5)

(in reference to ISO 12207 AMD 1)



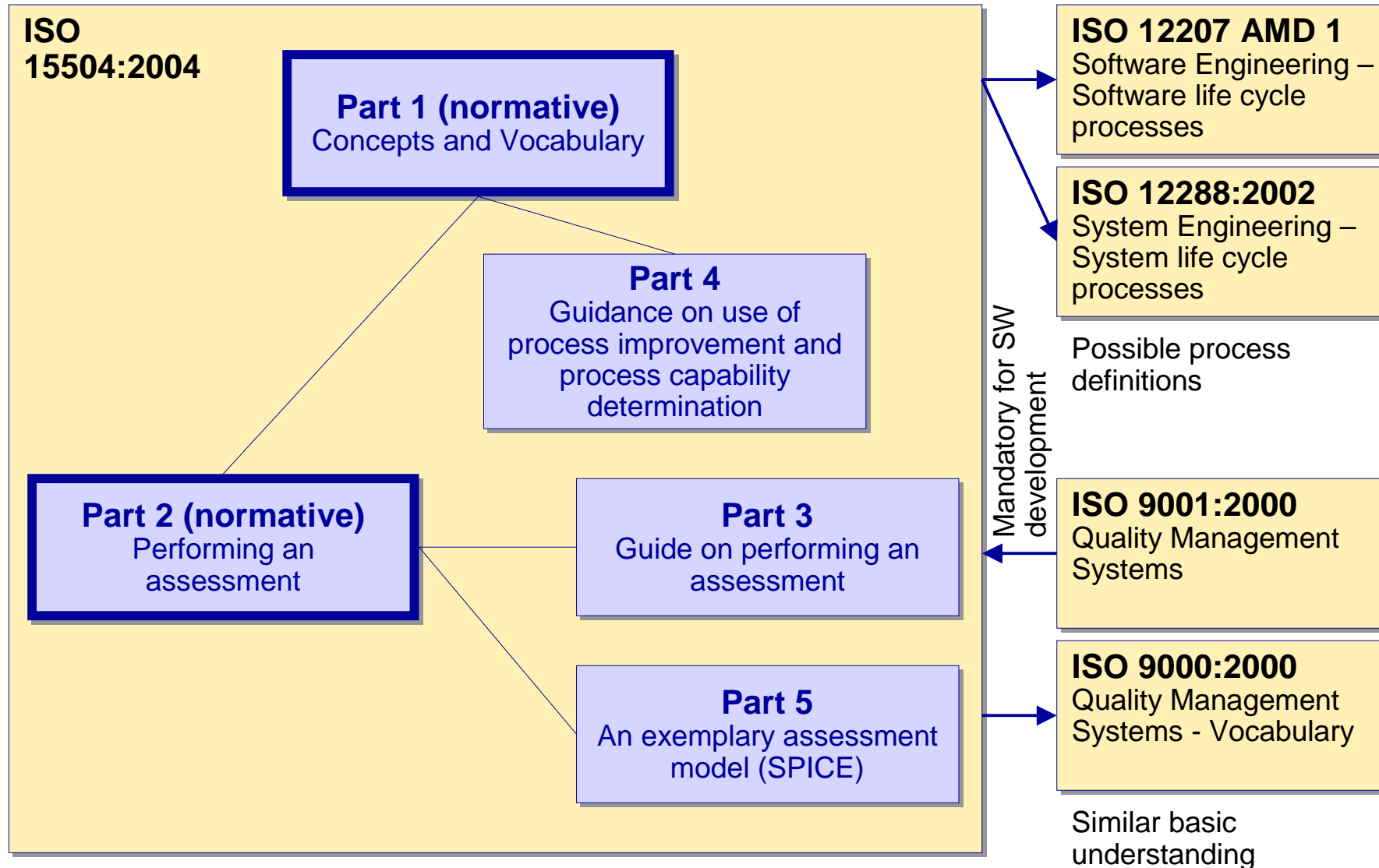


The evaluation of the capability level of a process based on the of compliancy to 9 attributes.



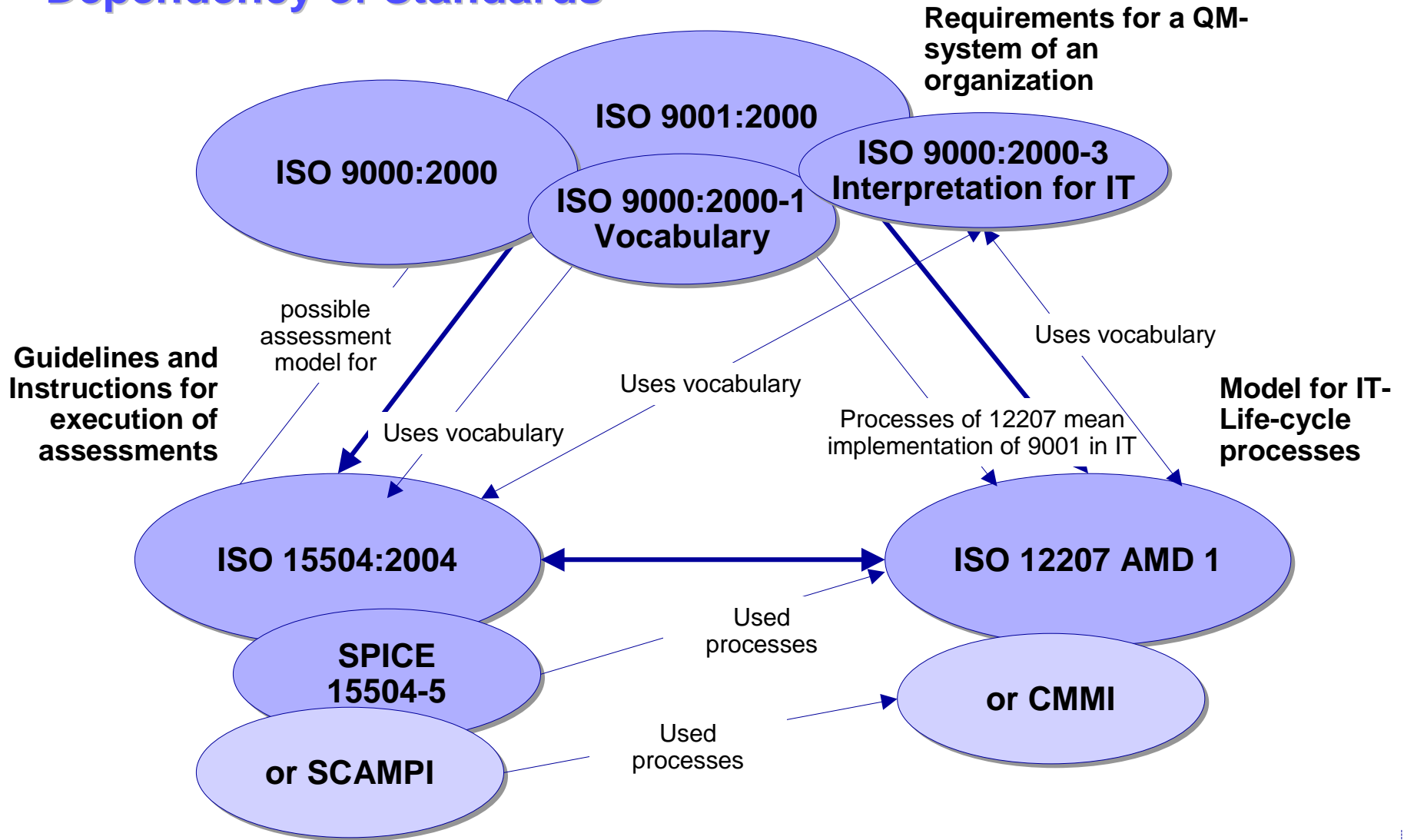


The parts of ISO 15504 – and referenced Standards





Dependency of Standards

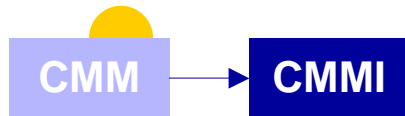




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CMM Integration (CMMI) is the new version of SW-CMM.



- The different CMM Models such as „System CMM“ and Software CMM were integrated
- In addition to the staged model (5 maturity levels) CMMI now also defines a continuous model (as in ISO 15504 (SPICE)), where single processes can be evaluated.
- CMMI contains more detailed guidelines for implementing the process areas. CMMI contains therefore more information, but not necessarily more requirements than SW-CMM.
- In CMMI the process areas of the 5 maturity levels were rearranged.
- CMMI fulfills ISO 15504.



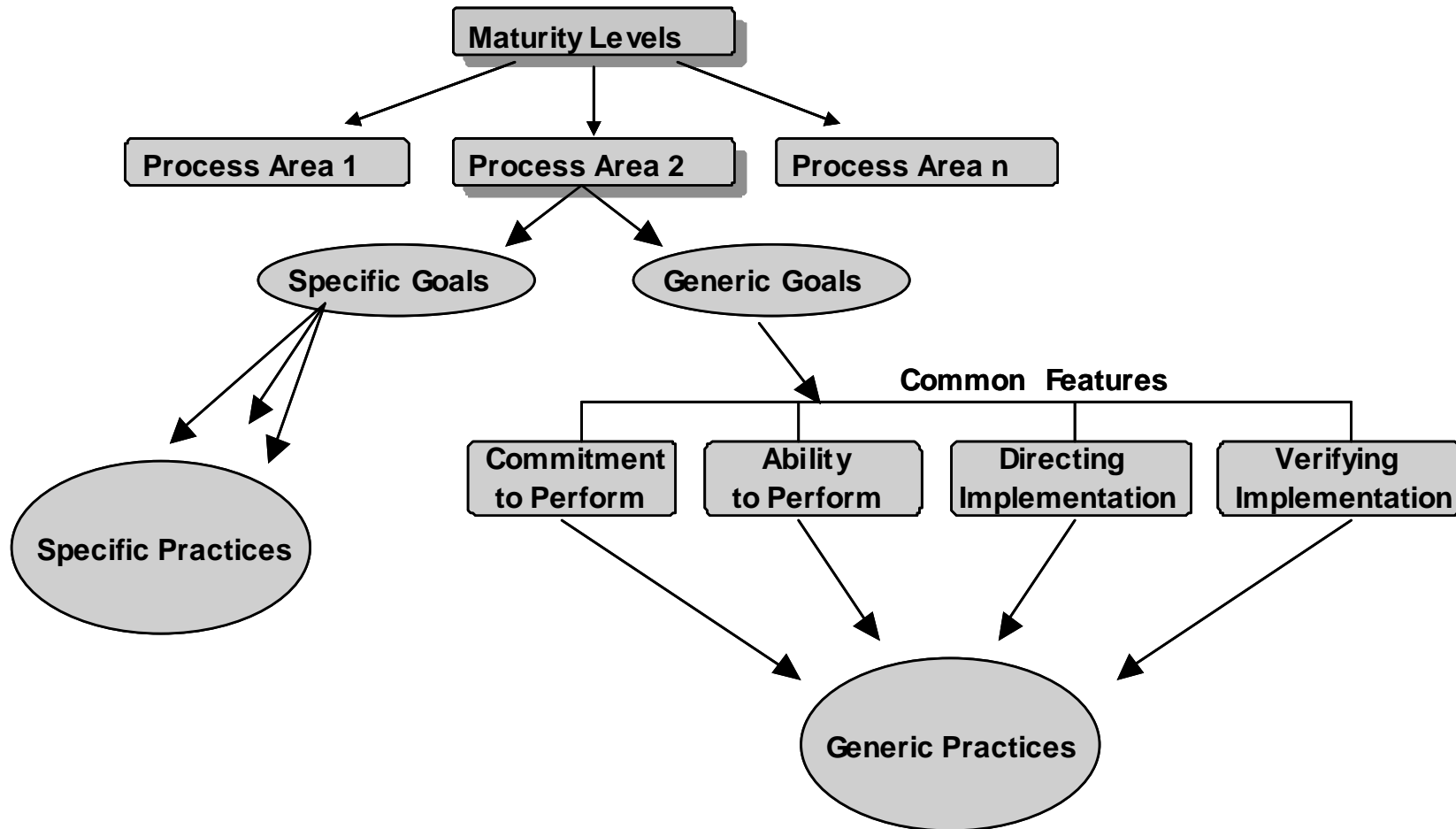


With CMMI the evaluation of the maturity level of an organization is based on the evaluation of the capability levels of single processes

Process Area	0	1	2	3	4	5	← Process Capability
Requirements Management ENG Measurement and Analysis SUP Project Monitoring and Control MAN Project Planning MAN Process and Product Quality Assurance SUP Supplier Agreement Management MAN Configuration Management SUP	2 ←						
Decision Analysis and Resolution SUP Product Integration ENG Requirements Development ENG Technical Solutions ENG Validation ENG Verification ENG Organization Process Definition PRO Organization Process Focus PRO Integrated Project Management MAN Risk Management MAN Integrated Supplier Management MAN Organizational Training PRO Integrated Teaming MAN Organizational Environment for Integration SUP							
Organizational Process Performance PRO Quantitative Project Management MAN	4						
Organizational Innovation and Deployment PRO Causal Analysis Resolution SUP							5



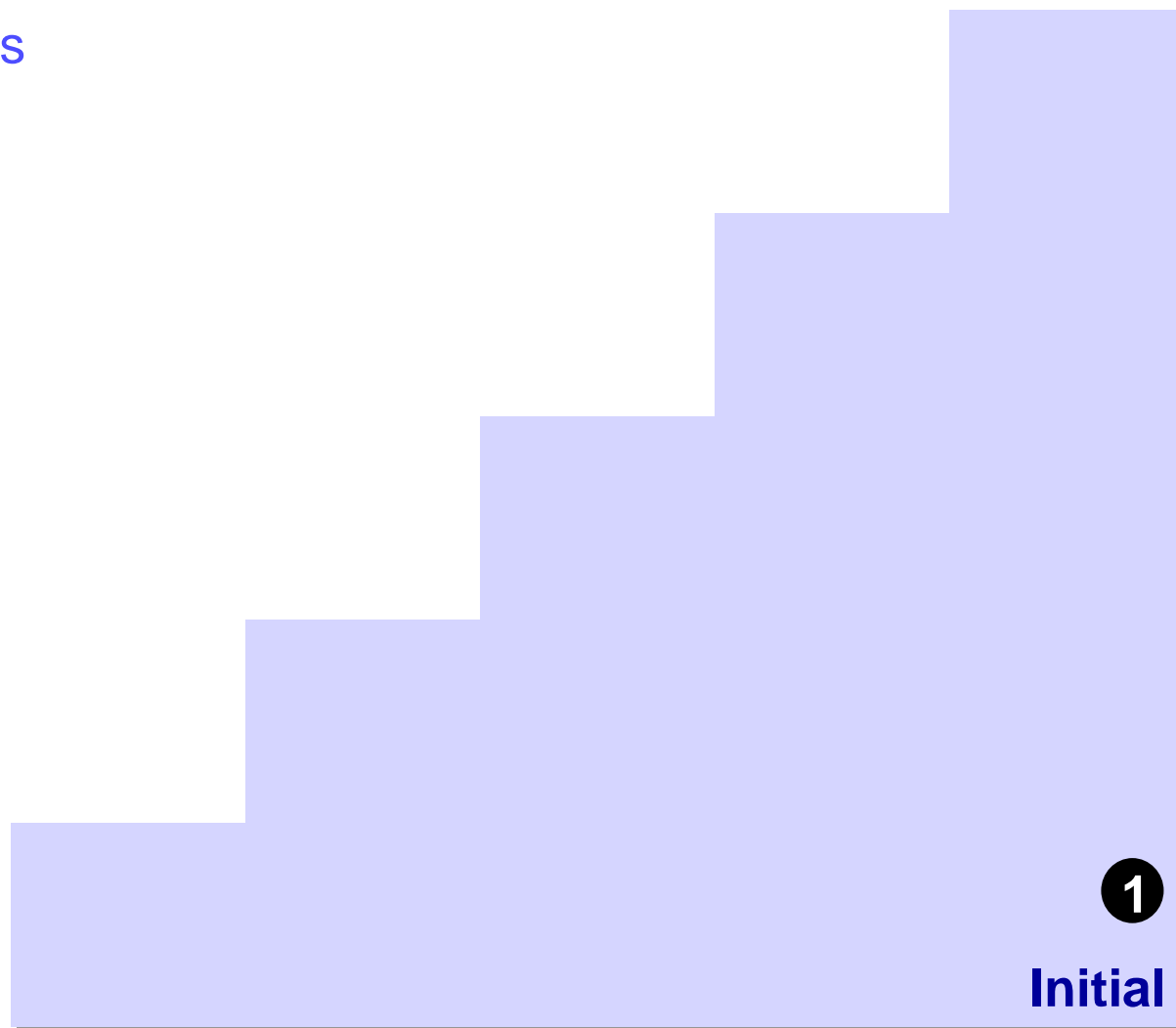
CMMI Process Model Components (staged representation)





A project on level 1 („Initial“) has no defined processes

- 1 No Process Areas on level *Initial*





A project on level 2 („Managed“) has the basic project management processes in place

2 The Process Areas of level *Managed*

Project Planning MAN

Project Monitoring and Control MAN

Supplier Agreement Management MAN

Requirements Management ENG

Configuration Management SUP

Measurement and Analysis SUP

Process and Product Quality Assurance SUP

2

Managed



An organization on level 3 („Defined“) has defined processes and all projects are using them

3

The Process Areas of level *Defined*

Organization Process Definition PRO
Organization Process FOCUS PRO
Organizational Training PRO

Integrated Project Management MAN
Risk Management MAN
Decision Analysis and Resolution SUP

Product Integration ENG
Requirements Development ENG
Technical Solutions ENG
Validation ENG
Verification ENG

Integrated Supplier Management MAN
Integrated Teaming MAN
Organizational Environment for Integration SUP

3**Defined**



An organization on level 4 („Quantitatively Managed“) has quantitative measurements in place and projects are controlled based on the analyzed data.

4 The Process Areas
of level *Quantitatively Managed*

Organizational Process Performance PRO

Quantitative Project Management MAN

4
**Quantitatively
Managed**



An organization on level 5 („Optimizing“) has established processes to improve its defined processes („Continuous Improvement“)

5 The Process Areas
on level *Optimizing*

Organizational Innovation and Deployment PRO

Causal Analysis Resolution SUP

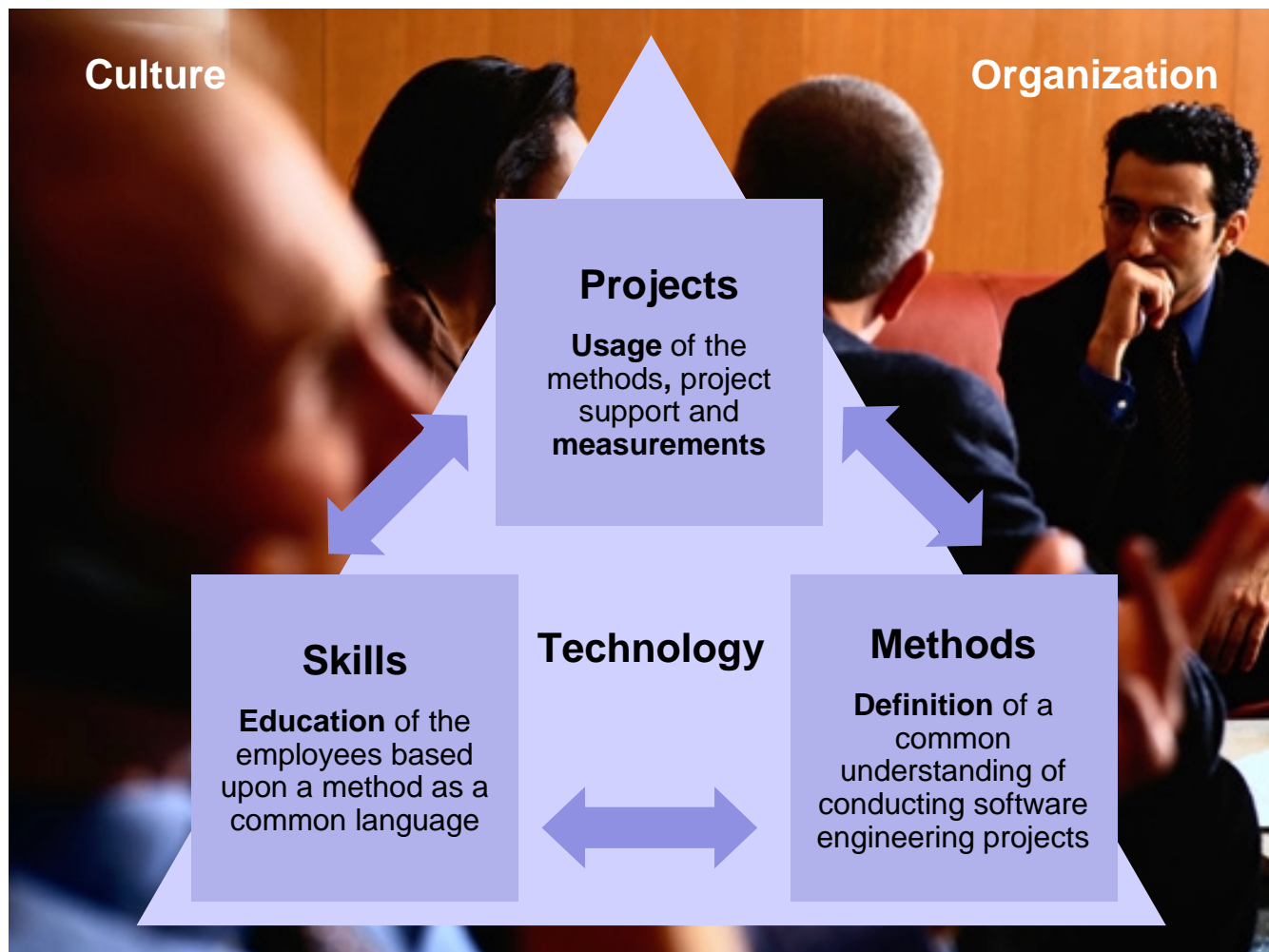
5
**Opti-
mizing**



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Software process improvement (SPI) addresses method, skills, projects, culture, organization and technology





Software process improvement is organizational change – and a project

Organizational Change

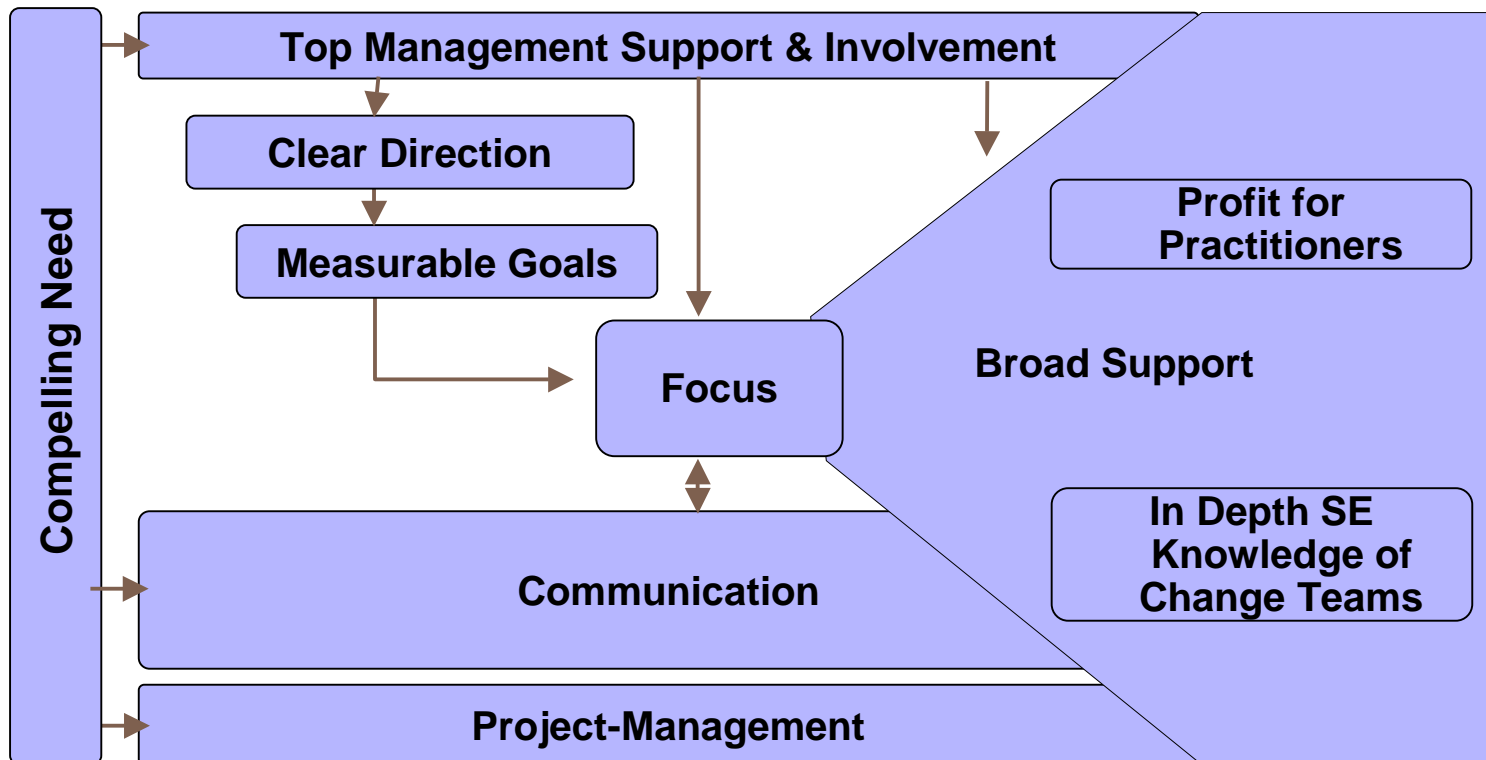
- is the **realization of new processes or technologies** in order to adapt an **organization to new business requirements** or to open up **new possibilities**

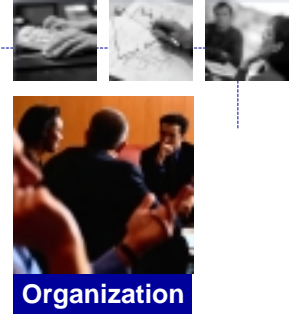
Project

- is a **temporary endeavor** undertaken to create a **unique product** or service
(Definition of „project“ by the Project Management Institute)

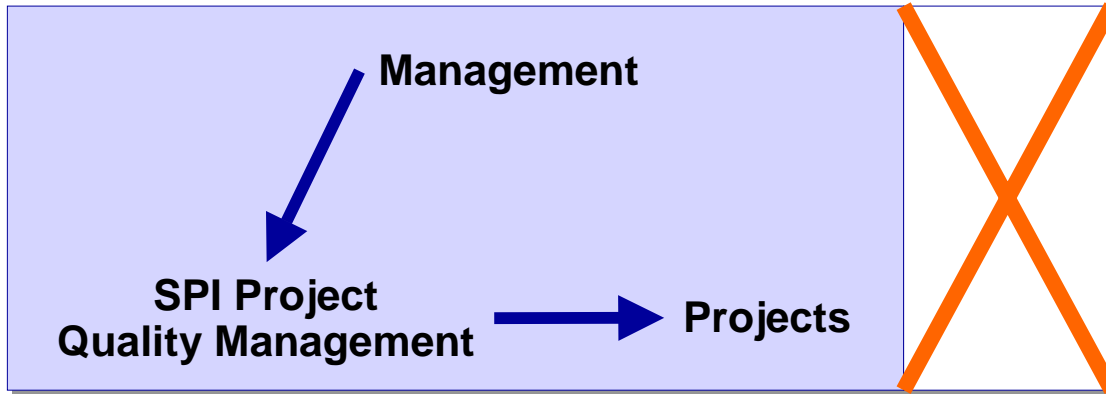


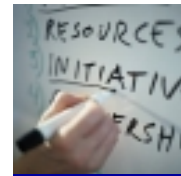
Key success factors for a software process improvement project





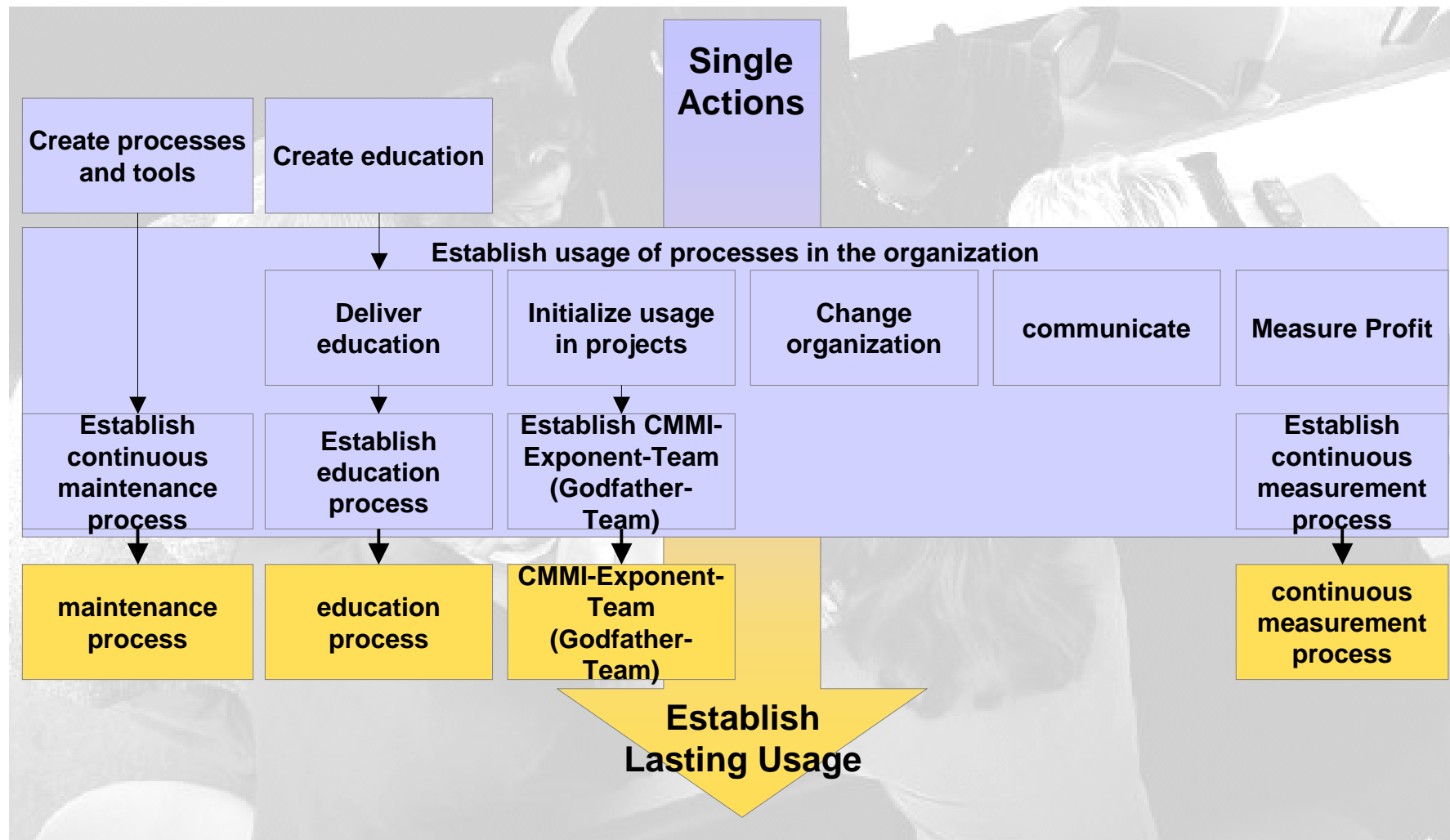
**SPI cannot be mandated by a SPI project.
Rather management must require SPI from the
organization, which in turn turns to the SPI
project for support**



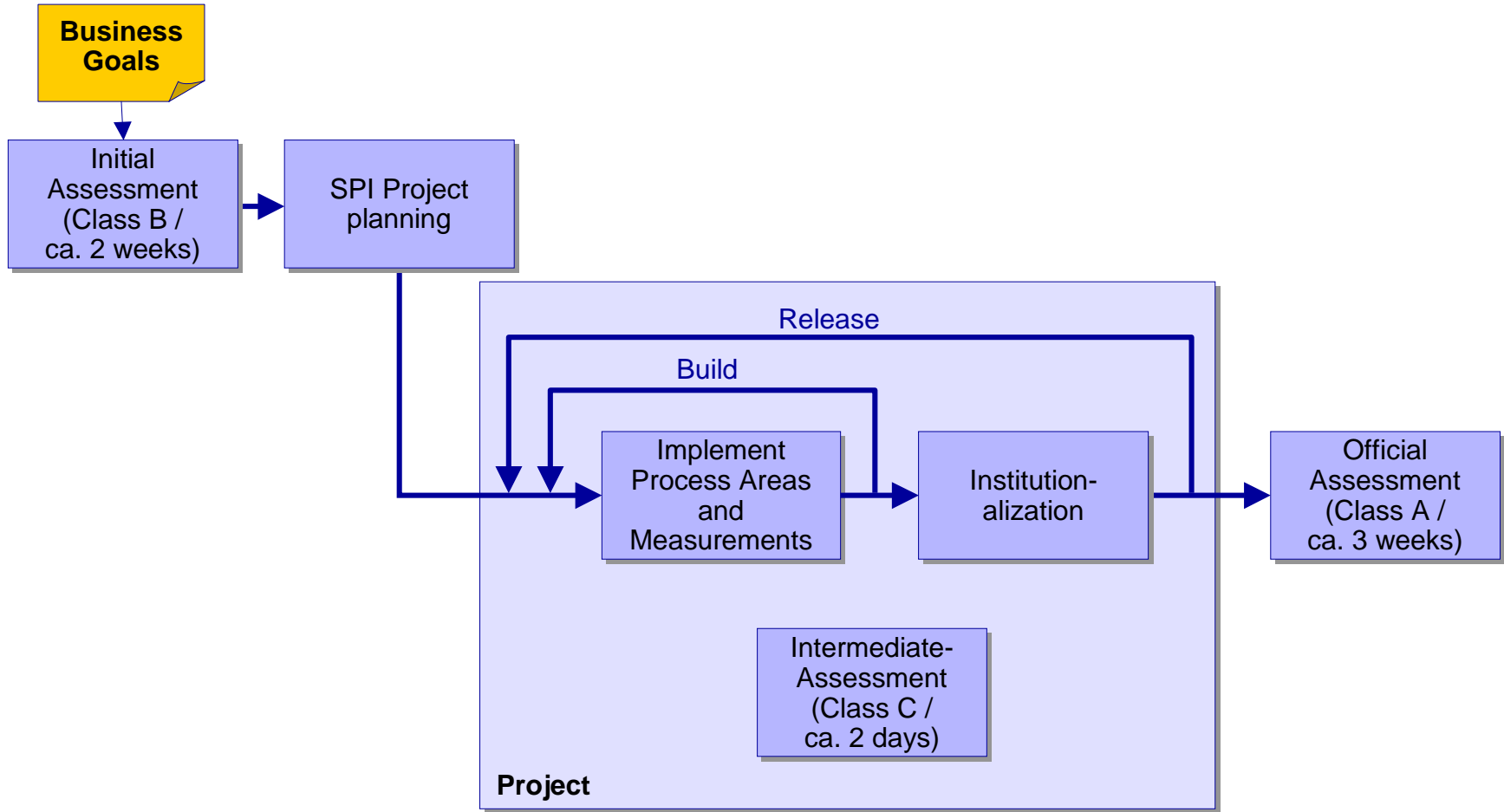


SPI Project

Typical actions of a CMMI software process improvement project

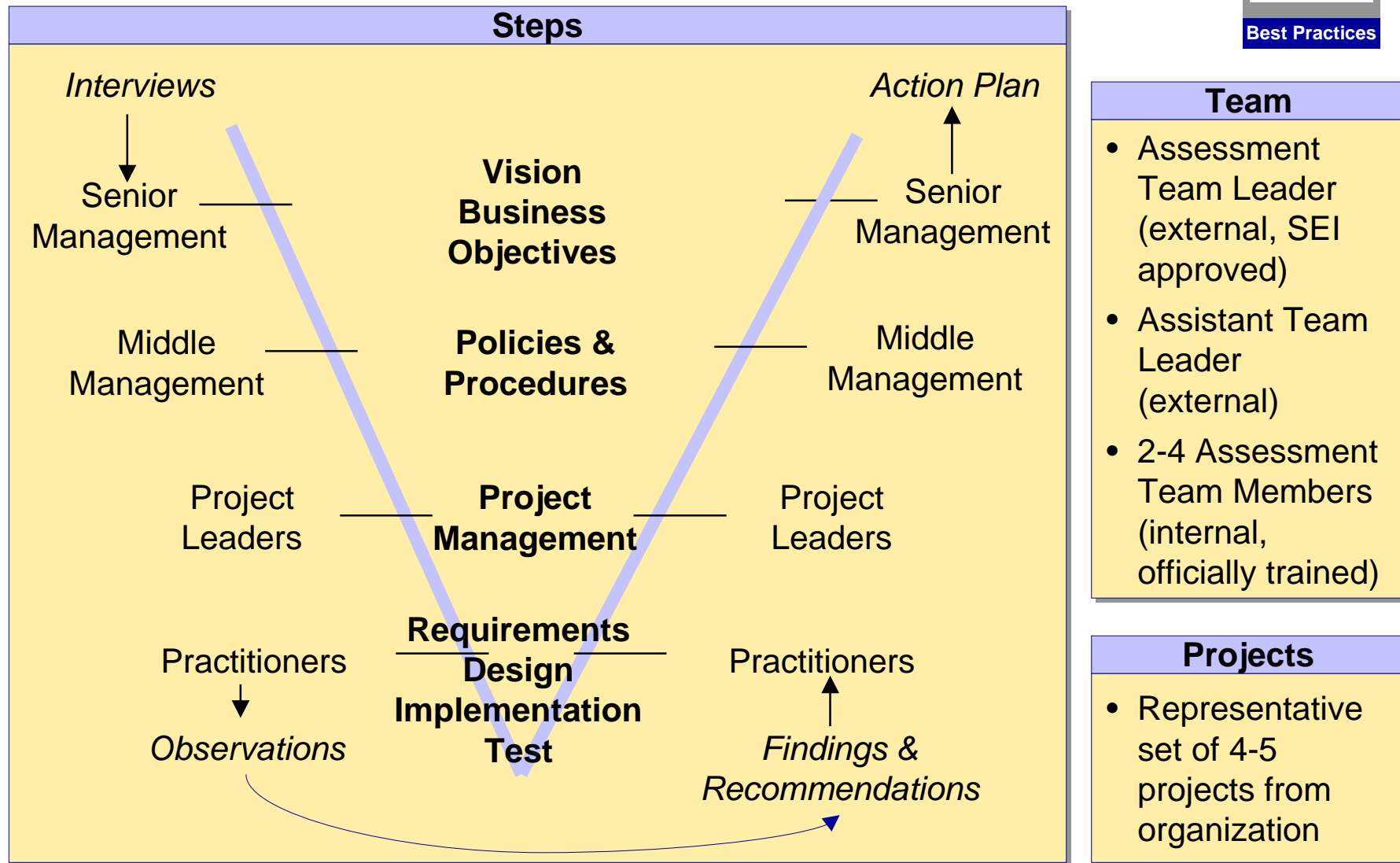


Iterative method is the key for success. The iterations base on prioritized process areas and the sequence of chosen projects.



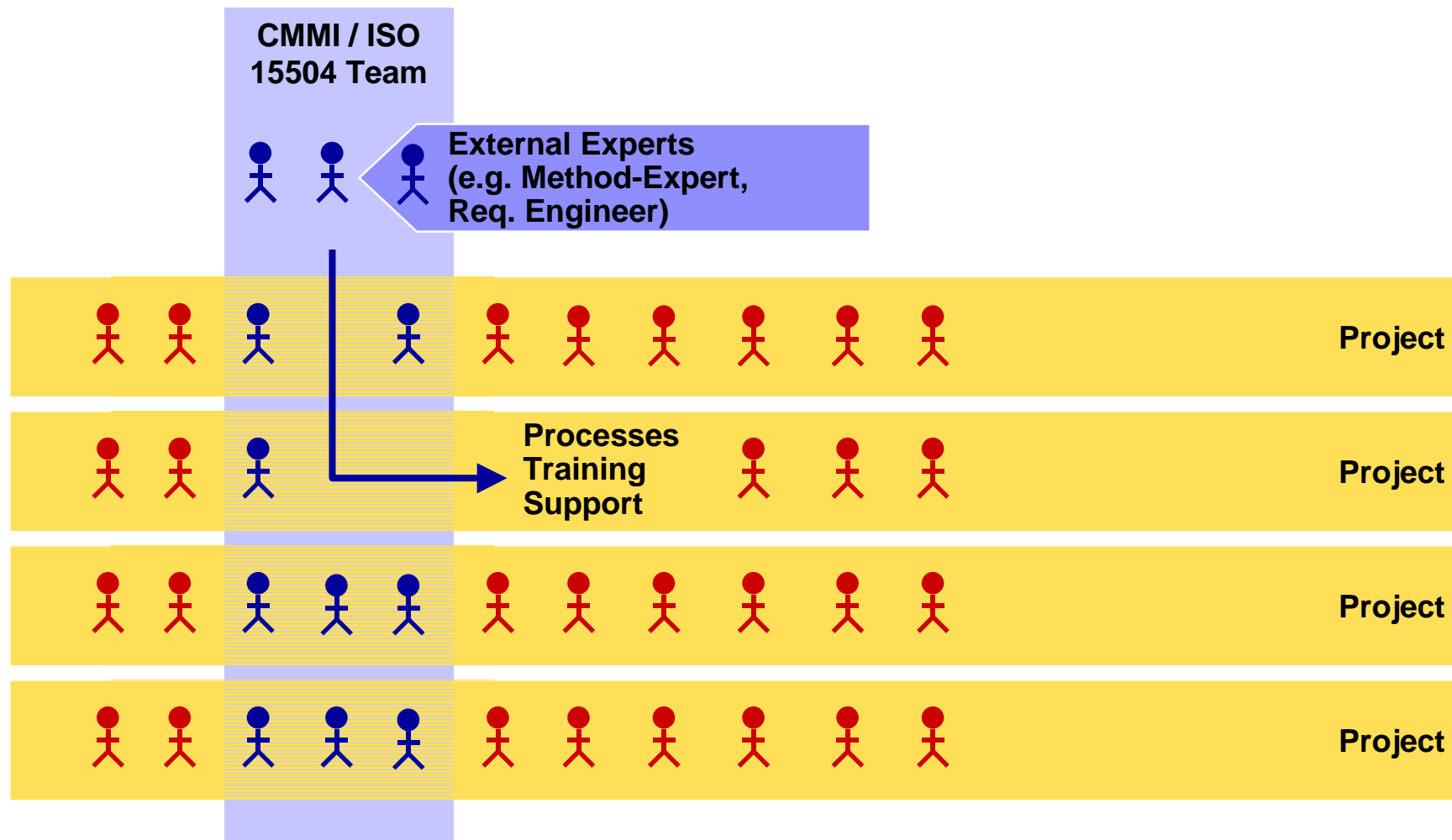


The steps and the team of an assessment



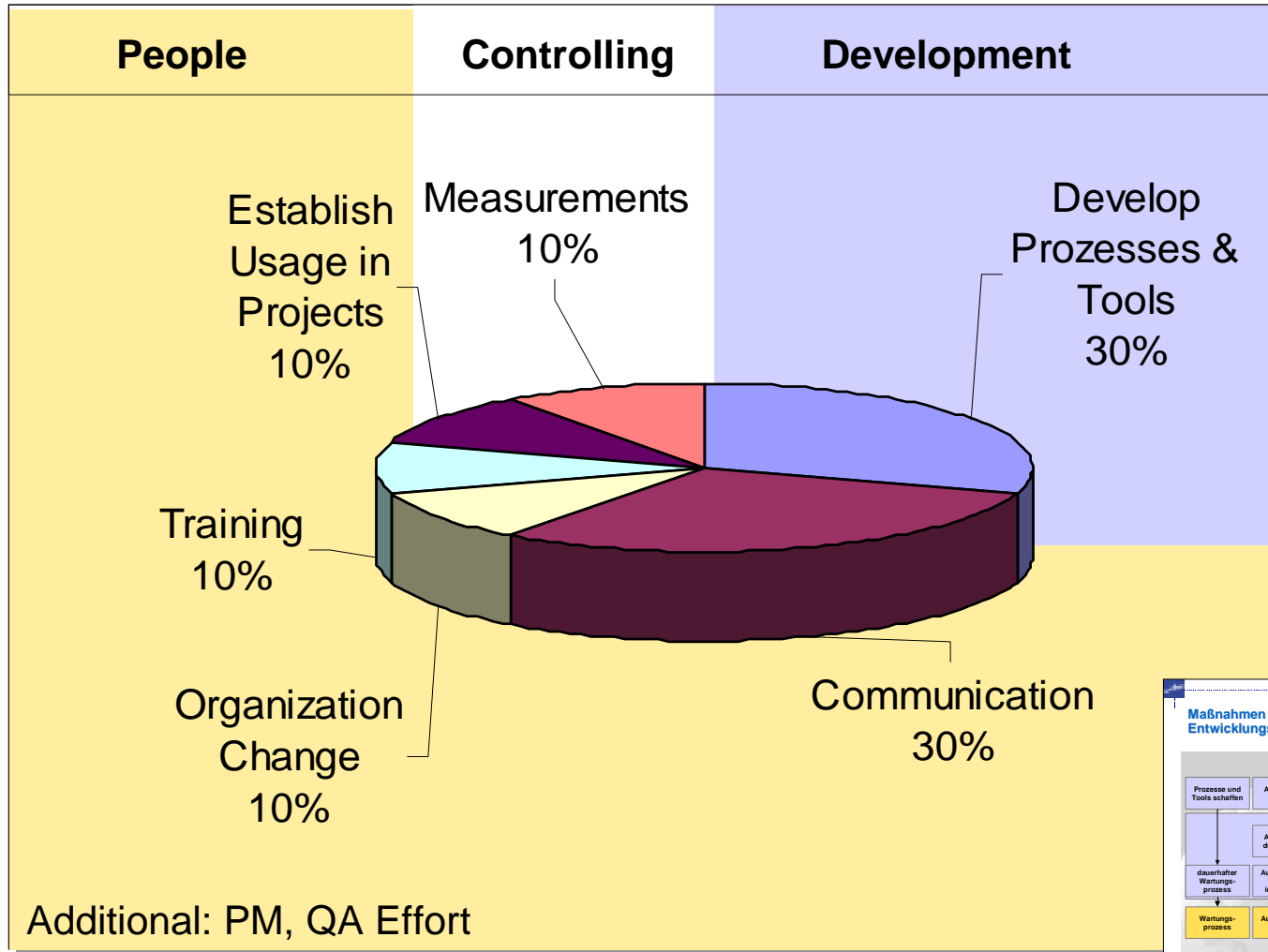


A competence team must be responsible for the usage and maintenance of the processes. Team members of the projects are part of the competence team.

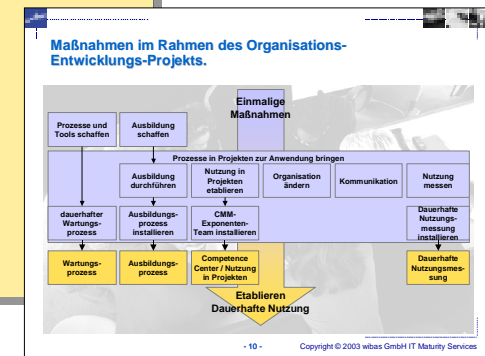




Distribution of effort



Total SPI Effort:
3% - 6% of organization size





Example-Scenario: e-business company with consultants, designers and developers *problem*

Problem:

Most of the projects are troubled. Lack of communication and lack of understanding among the different roles in the projects.

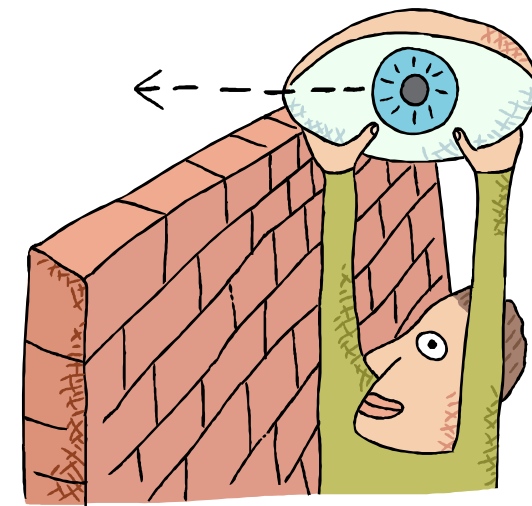
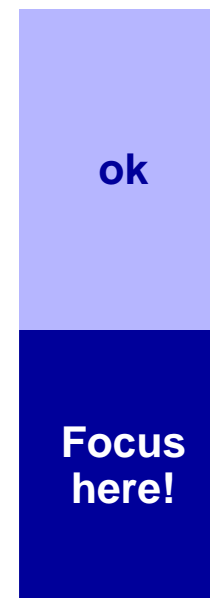
1. step: Identification of weaknesses with an assessment, to be able to define specific improvement activities

Obvious process strengths:

- Each *individual* engineering discipline
- Project management
- Customer supplier management

Identified process weaknesses:

- No common understanding / no common process
- Human resource management





Example-Scenario: e-business company with consultants, designers and developers *solution*

2. step: Activities to improve the processes

- Development of a common understanding of the project
- Reorganization of the teams (by projects rather than by disciplines)



Direct benefit:

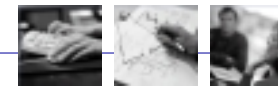
- No more troubled projects
- Turn around of the company

Further benefit:

- Higher motivation
- Higher corporate identification of the employees

Sustained strengths:

- Outstanding individual performance (several design awards)
- Good customer supplier management



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Summary and Recommendations

SPI

- Software process improvement helps to reduce costs and risks in IT projects - and CMMI/ISO 15504 help you to do this successfully by proven best practices
- Software process improvement is organizational change – and a project.
- The transition of an organization from one CMMI maturity level to the next takes on average approx. 2 years. Total SPI Effort: 3% - 6% of organization size (per year).
- Iterative method is the key for success.
- The whole organization has to take part in process improvement - the SPI project just supports this. The close interaction between software development projects and the SPI project is necessary.

SW-CMM vs. CMMI

- If you start now: use CMMI instead of SW-CMM. SW-CMM is being shut down.

ISO 15504 vs. CMMI

- CMM(I) is used more often than ISO 15504
- ISO 15504 is not a standard yet - but will be 2004
- CMMI integrates software and system engineering - ISO 15504 does not
- CMMI gives more guidance and best practices for implementation



More Information

CMMI

- Go to the official SEI website:
www.sei.cmu.edu/cmmi



ISO 15504

- www.isospice.com - but currently the new version is not yet available
- ISO 15504 TR 1998 is available from www.iso.org

More information needed:

- We offer an individually tailored Info Day for CMM(I), ISO 15504:2004 and SPI
- We deliver In-house training - official SEI classes and individually tailored classes
- We conduct assessments
- We support SPI projects
- www.wibas.com



Abbreviations

CBA-IPI	CMM-Based Appraisal for Internal Process Improvement
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
SCAMPI	Standard CMMI Assessment Method for Process Improvement
SCE	Software Capability Evaluations
SEI	Software Engineering Institute
SPI	System/Software Process Improvement
SPICE	Software Process Improvement and Capability Determination

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IT Maturity Services



IT MATURITY SERVICES

Otto-Hesse-Str. 19 B ` 64293 Darmstadt ` Germany ` Phone +49 / 6151 / 50 33 49 - 0 ` Fax +49 / 6151 / 50 33 49 - 33
www.wibas.com