IT QM Part 2 Lecture 1

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Dr. Withalm Mar 3, 2009

IT QM Bratislava

Vorlesungen am Technikum - Wien Winter 2008

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30.09.2008	**Vorlesung 1 Der weite Weg zu CMMII-Level 4**
07.10.2008	**Vorlesung 2 System Entwicklungsprozess + Planung**
14.10.2008	**Vorlesung 3 Verfahren 1 (CM, Reviews, Aufwandsabschätzung (Function Point))**
16.10.2008	**Vorlesung 4 Verfahren 2 (Wiederverwendung, Dokumentation, Case- Tools)**
13.11.2008	**Vorlesung 5 Qualität von SW 1 (Testen, Q-Bewertung, Quality in Use,)**
27.11.2008	**Vorlesung 6 Qualität von SW 2 (Quality Function Deployment, Zertifizierung von Hypermedia-Links bei InternetApplikationen, Technology Management Process)**
11.12.2008	**Vorlesung 7 Qualität einer SW-Organisation (ISO 9001, CMMI, BSC)**

CMMI: Capability Maturity Model

BSC: Balanced Scorecard

Conclusion of Part 1/1

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- Impact of Quality
  - Quality wins
  - Quality deficiencies
- Standards
  - Quality definition
- Evolution from quality control to TQM
  - Shewhart, Deming, Juran, Feigenbaum, Nolan, Crosby, Ishikawa
- Evolution of organization theory
  - i.e. Taylorism, System Dynamics, System Thinking, Quality Assurance
- Product liability
- Customer satisfaction
  - Criteria, two-dimension queries, inquiry methods

Conclusion of Part 1/2

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- Quality costs
  - Failure prevention, appraisal, failure, conformity, quality related losses, barriers
- Leadership
  - Behavior, deal with changes, kinds of influencing control, conflict resolution, syndromes to overcome when introducing changes
- Audits
- Quality awards
- Creativity techniques
  - Mind Mapping, Progressive Abstraction, Morphological Box, Method 635, Synectics, Buzzword Analysis, Bionic, De Bono
- Embedded Systems
- FMEA-Failure Mode Effect Analysis

Lectures at the Technikum- Wien Summer 2009

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- The long Way to CMMI level 4
- System Development Process
  - QS- Procedures 1 (CM, Reviews)
  - QS- Procedures 2 (Effort Estimation, Reuse, Documentation)
  - QS- Procedures 3 (Case Tools)
- Quality of SW Products
  - Test
  - Quality in Use
  - Quality Evaluation
  - Quality of Hypermedia Links
- Quality of a SW Organization
  - ISO 9000
  - CMMI
  - BSC

Lectures at the University of Bratislava/Autumn 2006

Date: 12.12.2006

- **The long Way to CMMI level 4**
  - **Overview about the most essential QM measures**
- **Quality of SW organization**
  - **ISO 9000**
  - **CMMI**
  - **BSC**

Overview

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Part 1:	The way from establishing SEM to SW quality evaluation
Part 2:	The way from requirement engineering to ISO-9000 certification
Part 3:	The way from the introduction of SW metrics to CMMI assessments
Part 4:	Benefits of CMMI / SPI

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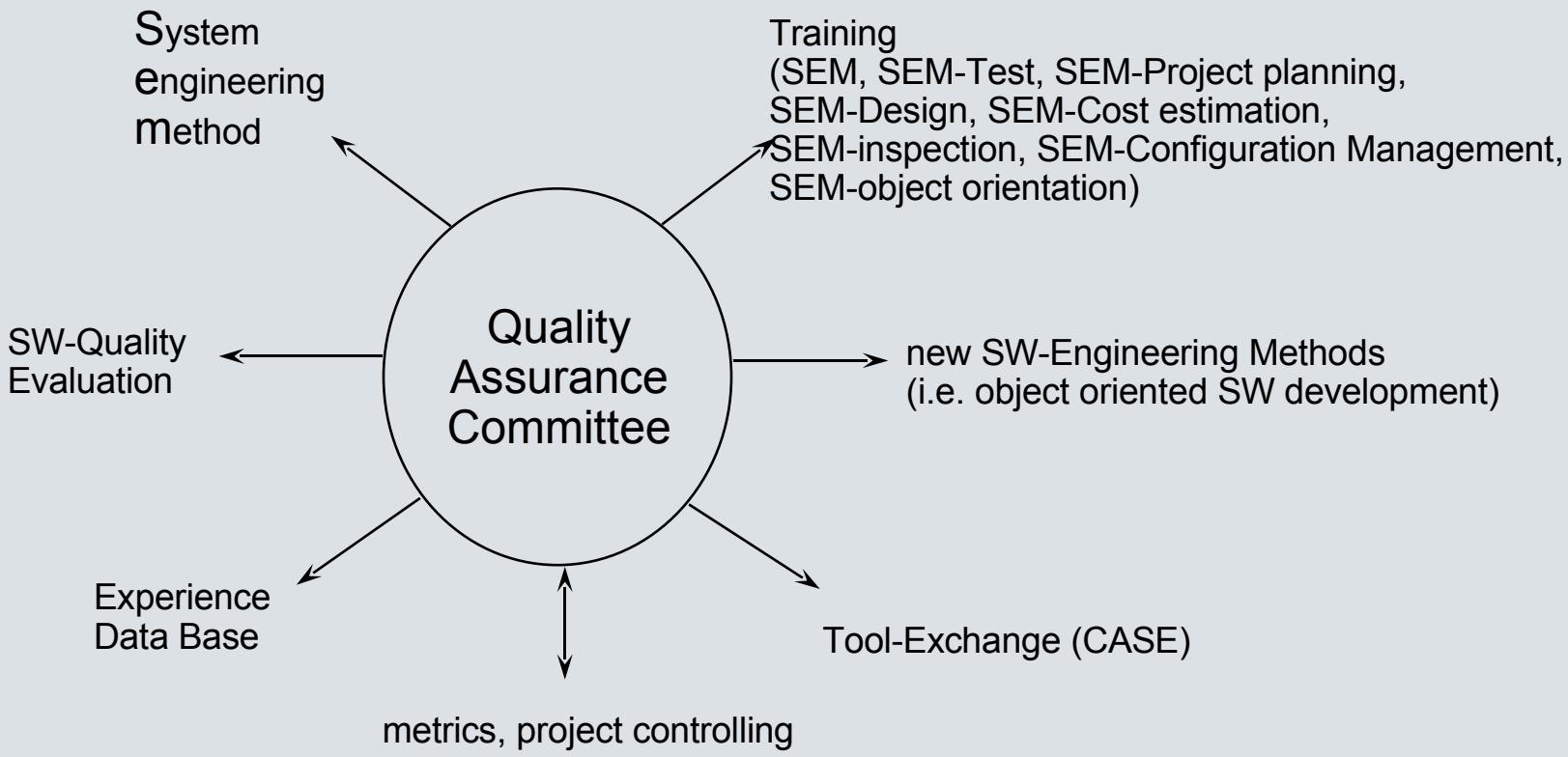
Milestones of part 1

- 20.5.83 establishing of QA-committee
- 12/83 finishing of EHB
- 6/85 finishing of EVHB
- 10/85 first SEM training
- 10/86 EDB
- 5/88 SW-quality evaluation

Tasks of QA-committee



System Engineering Method SEM/1

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- describes the performance
- sets guidelines
- offers checklists and tools
- for
  - Quality Assurance
  - Technical Product Development
  - Project Management

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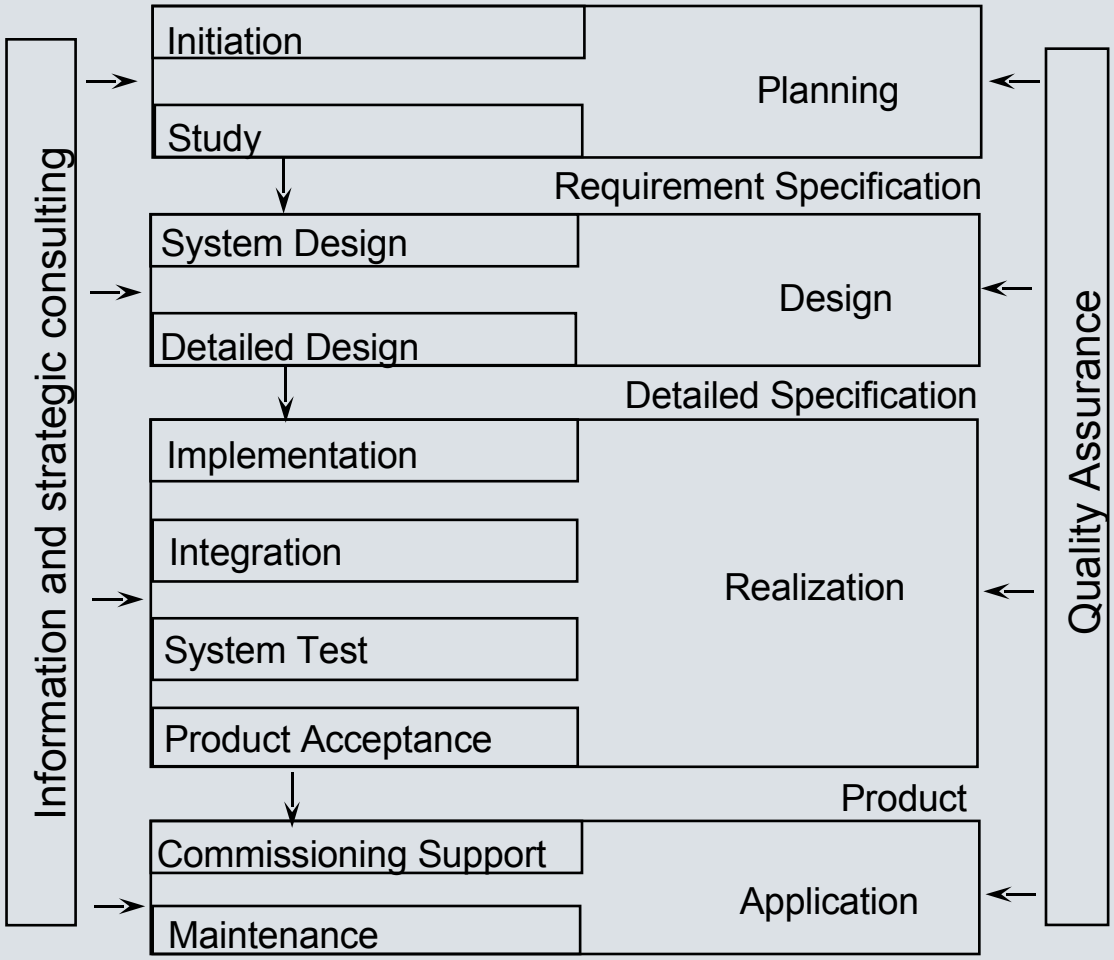
System Engineering Method SEM/2



System Engineering Method SEM/3

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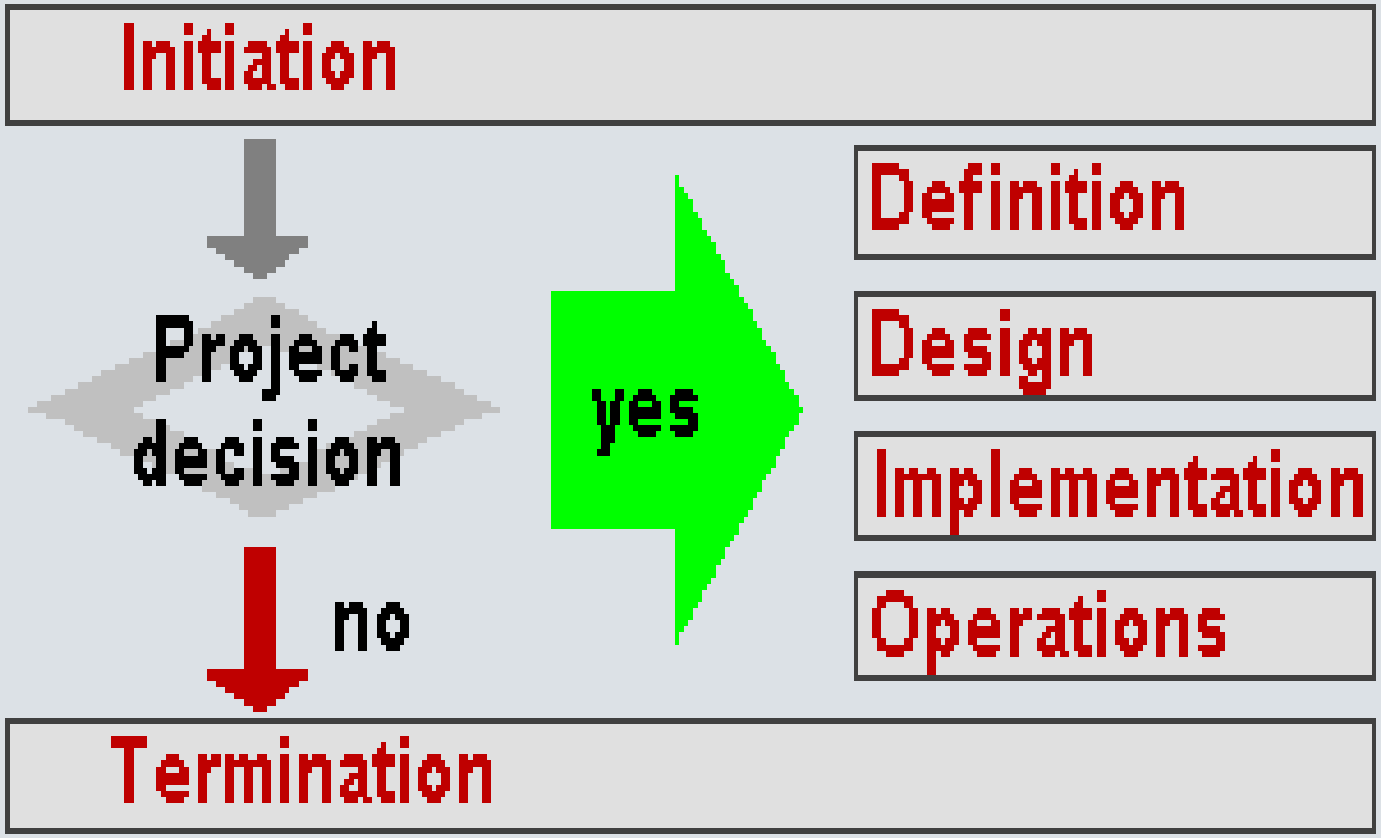

System Engineering Method SEM/4

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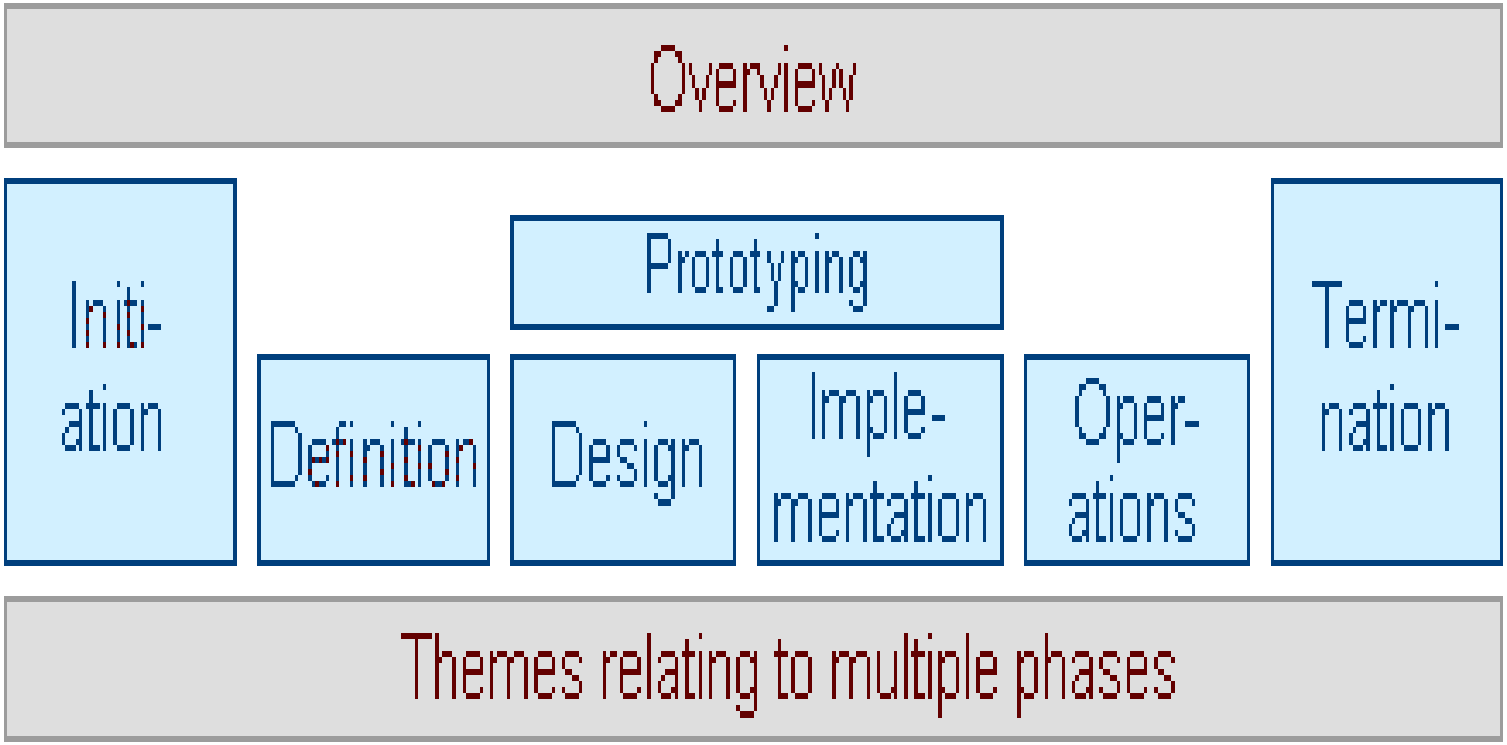

SEM-Seminars

- SEM (System-Engineering-Method)
- SEM-CM
- SEM-Test
- SEM-Design
- SEM-Project planning
- SEM-Expenditure estimation
- SEM-Inspection
- CM-SW (Configuration Management)
- CM-UNIX (Configuration Management under UNIX)
- OO-MAN (Object oriented technologies for Manager)
- OO-SW (Object oriented SW-development)
- OO-Design
- OO-Booch (Object oriented design by Booch)
- OMT (Object oriented models with OMT by Rumbough)
- UML (Unified Modeling Language)

Configuration Management (CM)

back up

which components
belong to the XYZ system ?

which components
are already finished ?

since which version
the error is got rid off?

where can I find an actual
version of the modul ?

what makes the difference
between the version for
Kuwait and Costa Rica ?

This error was already still
get rid off !

Verification versus Validation

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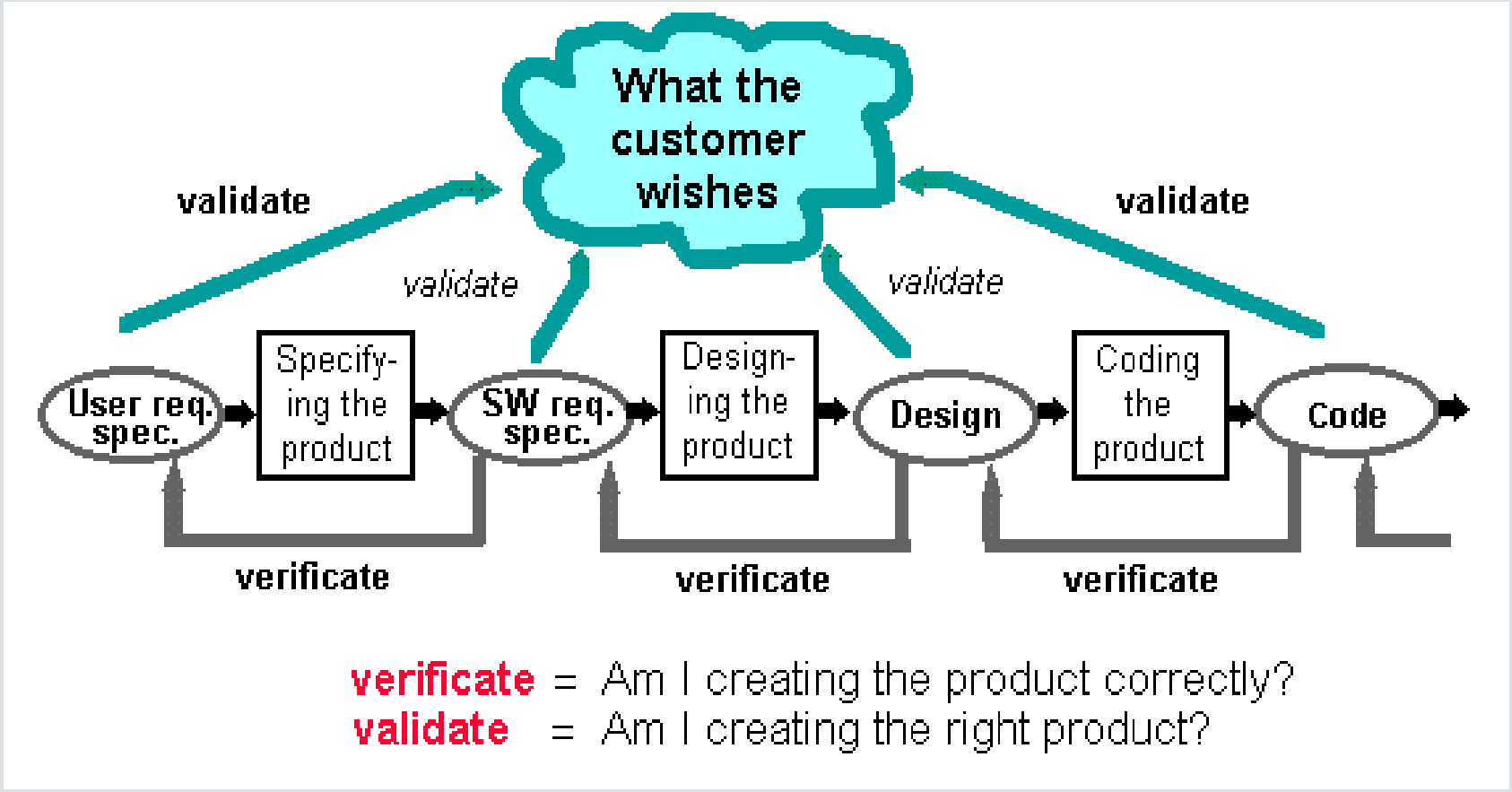

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Reviews

Comment technique

- many participants possible
- smaller date problems
- and fewer co-ordination expenditure
- average error detection rate a

special method:

Development Document Control (DDC)

Session technique

- higher error detection rate enabled by dialogue
  - synergy effect
- promotes know-how exchange and communication

special method:

Intensive inspection

Test

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- Testing of all requirements
  - business oriented, functional, non functional
- V-model
  - Against which document (architecture design ←→ integration test)
- Test level
  - Stand alone, integration, system, acceptance, and regression
- Test type
  - Black box, white box (code coverage: instruction, branch, path)
- End of test criteria
  - Code coverage, Functions, Performance, State based,…

General process model

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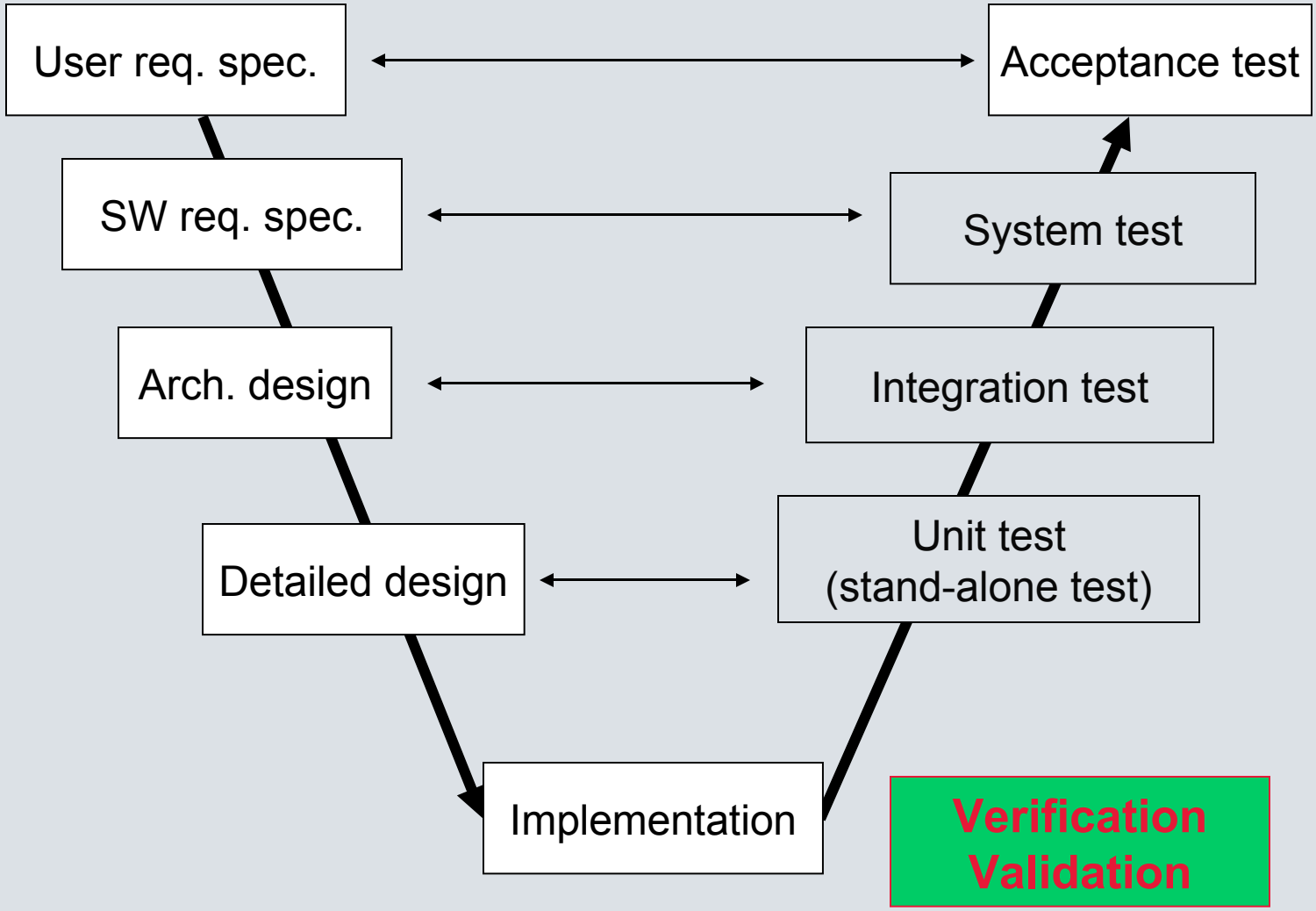

PROWEB (PROject controlling via WEB)

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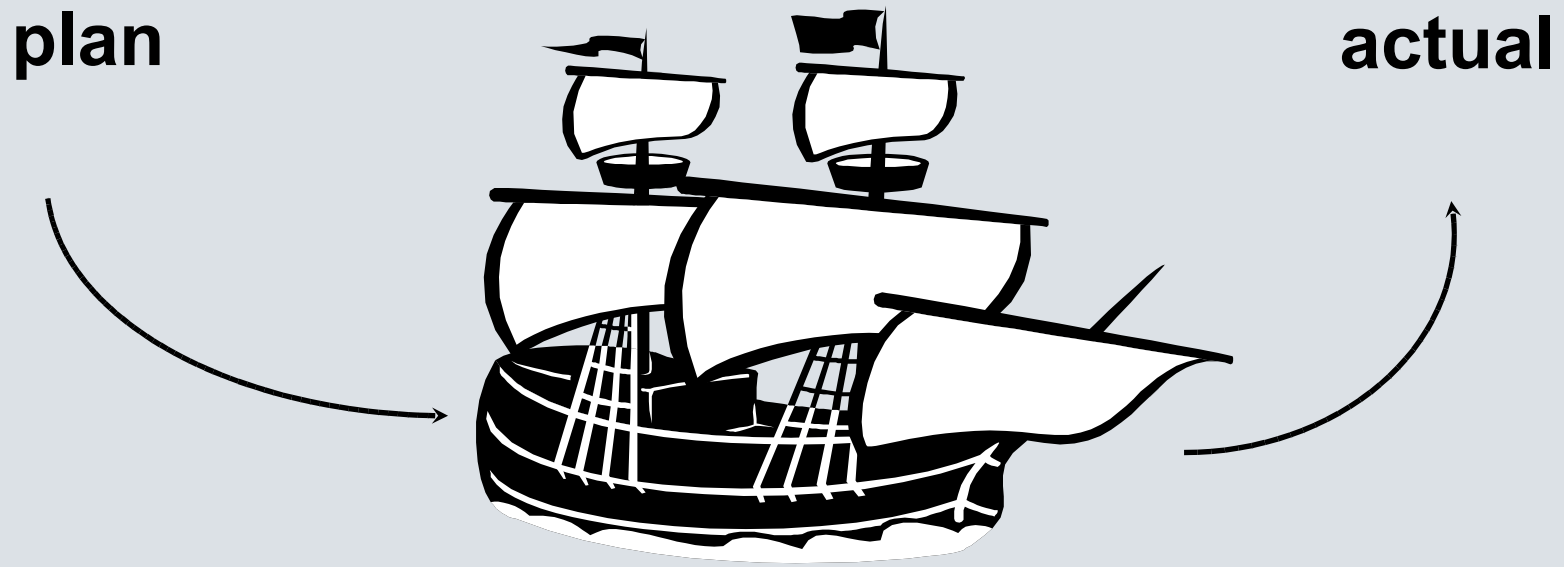
- **Tool to systematically collect and evaluate technical and commercial data of all PSE projects**



Experience Data Base PROWEB

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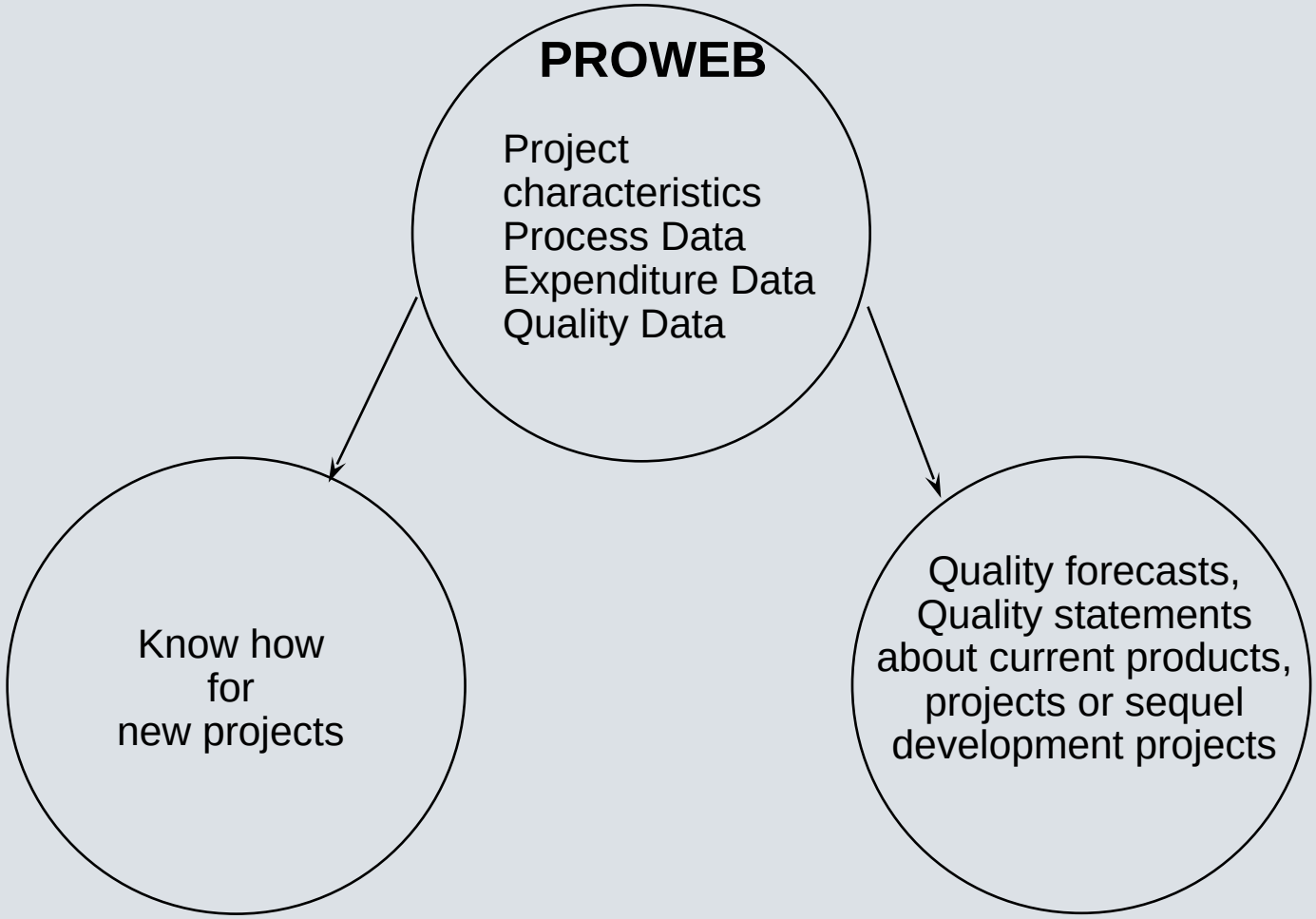

Function-Point-Method

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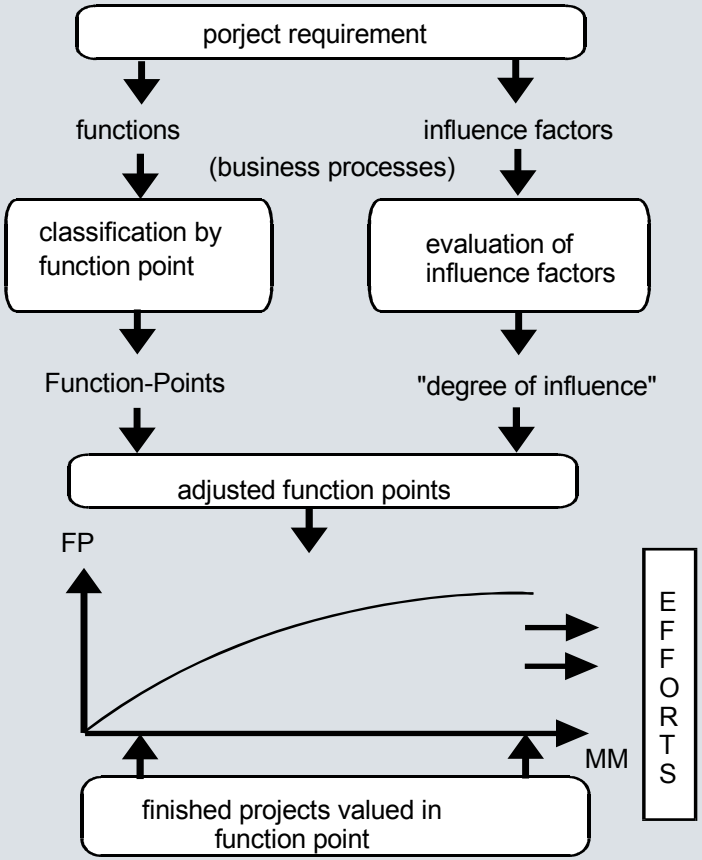
Keep in mind: Primarily a measure of volume of a SW-system.
Statistically/indirectly a measure of expenditures



SEM-Software Quality Evaluation

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- Definition of the requirements in the requirement specification
- Forecast about the expected quality during development
- Objective criteria for product acceptance

Overview

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Part 3:	The way from the introduction of SW metrics to CMMI assessments
Part 4:	Benefits of CMMI / SPI

Milestones of part 2

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- 1989 requirement engineering
- 1990 User-groups/Tool-exchange
- 6/92 OO-SEM
- 6/92 internal audits
- 10/92 New QM-organization
- 1-3/93 obligate Q-training for all PSE employees
- 10/93 ISO-9001 certification audit

Requirements Engineering

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- Business oriented requirements
- Functional requirements
  - Explicit
  - Implicit
- Non functional requirements

User Groups (actually Support Centres called)

- Aims:
  - Exchange of experience
  - Support
- Information Subjekts:
  - C++
  - Neural Networks
  - UNIX
  - Windows
  - Special Case Tools
  - OMT/UML
  - Java
  - Middle Ware (CORBA, WEB Services, SOA,..)
- Monthly meetings of the User Group.
- Participants are experienced developers of the whole PSE.

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Tool-Exchange

- Aims:
  - Exchange of experience
  - Support
- Information Sources:
  - Development Departments
  - Suggestion Scheme
  - Purchase Department
- Monthly meetings of the Tool Exchange.
- Tool Data Base provides the name of a person with experience and knowledge about tools existing in the PSE.

New QM-Organization

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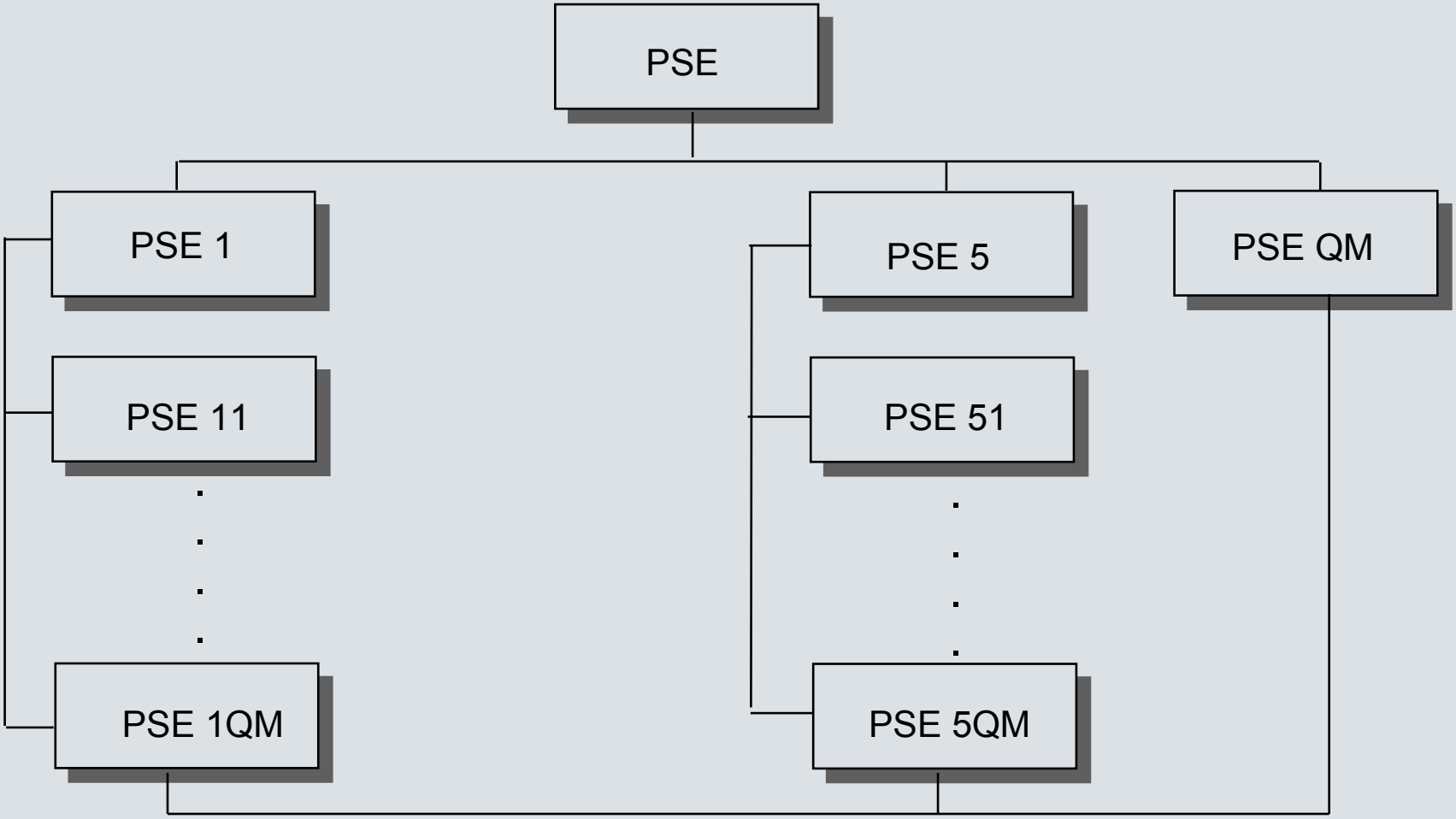

ISO-9001 The way to the certificate / 1

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previous measures:

- revision of SEM regarding norm conformity
- internal audits (current since may 92)
- coordination with parent firm (in Germany)
- lecture series about ISO 9000 ff in all departments
- auditor training
- audit procedure manual
- audit check list

ISO-9001 Certification - history in general

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back up

- after 2 nd world war QA was set up by Deming & Juran in Japan
- in USA, Europe still classical quality validation
- by HW development QA did not get acceptance till present times
- so-called QA in software in the beginning was only
- restricted to tests and error count
- in USA above all military (DoD) starts with QA, which is also checked with audits (AQAP)
- Siemens starts in 1980 with QA system (CSA) to get through audits

quality validation
sample audits on the finished product

quality assurance
current checks during the development process

ISO-9001 Certification - history SW in general

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back up

- begin of 1980 quality label for SW (pure quality validation)
- discussion about certification since the middle eighties
- in Germany "Made in Germany" syndrome delays certification
- cooperation since 1990 with standards institute on ISO 9000 ff
- since 1992 pressure upon Siemens regarding certification

ISO-9001 Certification - connection SW-engineering - QA

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- SW engineering has 3 dimensions:
  - organization - method - technology

- organization means:
  - application of a method (e.g. SEM, SEPP,....)
  - verification of this application
  - organization of QA
  - record of primary data (metrics)

- method means e.g.:
  - functional development method
  - object oriented development method

- technology means:
  - with which tools the method is set up
    - informatics institutes of universities were originally mostly interested
    - in the beginning SW-engineers were only interested in technology

ISO-9001 Benefits & Drawbacks of certification/1

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- **Benefits**
  - quality assurance => quality system
  - procedures for project environment
  - major efforts for certification
  - regular internal audits
- **Drawbacks**
  - ISO 9001 - seduces to formalism
  - motivation

Peopleware

ISO-9001 Benefits & Drawbacks of certification/2

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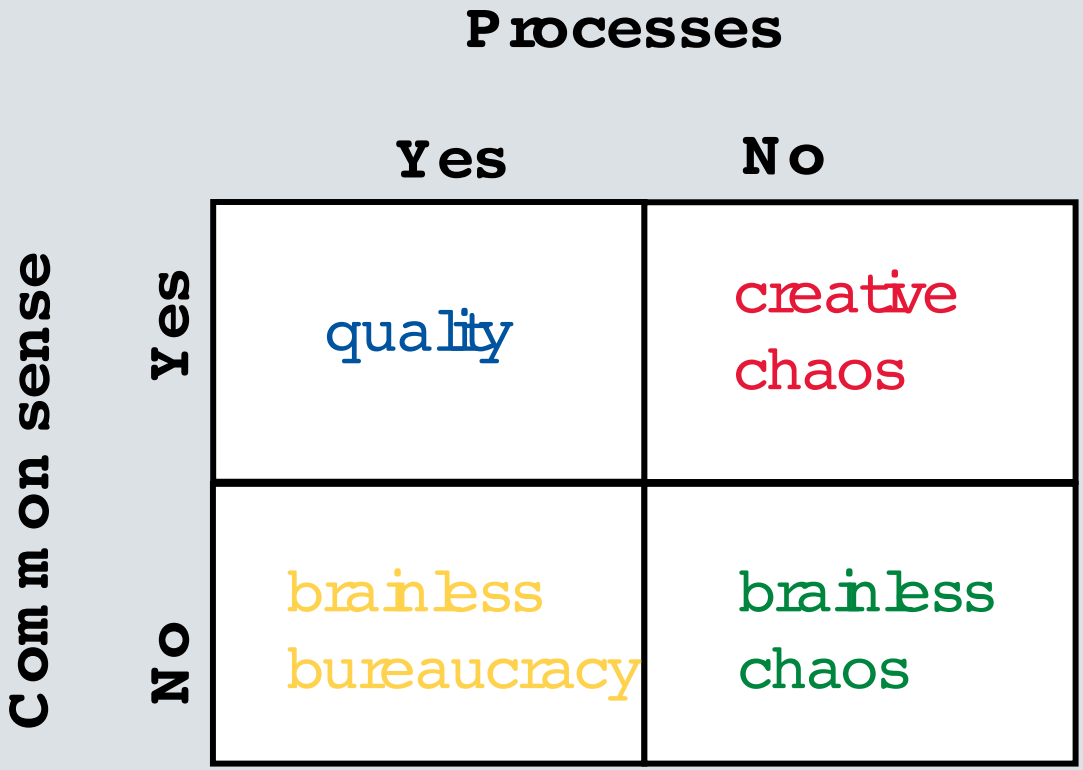

Quelle: Technologies; SEI

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Milestones part 3

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- 4/93 establishing of metric working group
- 6/93 establishing of project controlling working group
- 9/93 CMMI-training in Vienna
- 10-11/93 1st CMMI-assessment
- 1-2/94 2nd CMMI-assessment
- 3-4/94 3rd CMMI-assessment

SW-Metrics for PSE/1
Adherence of accomplishment :

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$$\frac{\text{Number of produced (i.e. inspected, updated, stored) phase results according to the current milestone-date}}{\text{number of planned phase results according to the current milestone-date}}$$

SW-Metrics for PSE/2
Adherence of expenditure:

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$$\frac{\text{real expenditure}}{\text{planned expenditure}}$$

SW-Metrics for PSE/3
defect detection rate:

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$$\frac{\text{Number of detected defects of a review}}{\text{number of reviewed pages of a document x 100 for documents}}$$

$$\frac{\text{Number of detected defects of a code review/test}}{\text{number of reviewed brutto lines of code x 1000 for code}}$$

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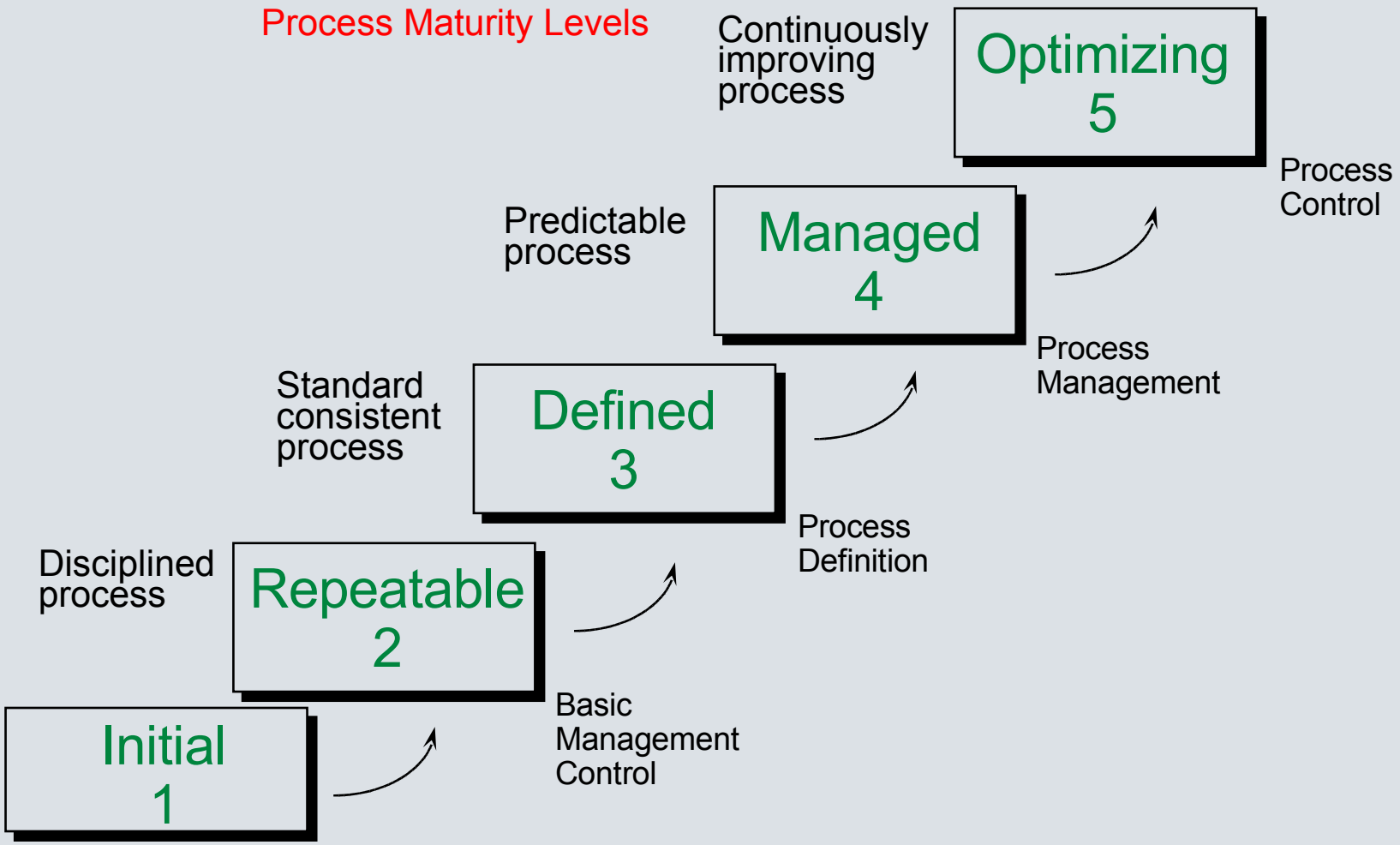
defect rate:

$$\frac{\text{Number of detected defects of a test phase or after acceptance}}{\text{size x 1000}}$$

CMMI Capability Maturity Model Integrated/1



CMMI Capability Maturity Model Integrated/2
Comparison of the fact finding procedures

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	Internal Audit	Process Assessment
Team	Audit team (2-3 persons) • lead auditor • auditor • observer / auditor trainee (occ.)	Assessment team (8 persons) • 1 Consultant (ISPI) • 3 ZFE • 4 PSE
Interviews	one interview partner at a time two hours	1 Site / 3 Projects group Interviews (3-6 persons, up to 1day) individual interviews (up to 2 hours)
Over all Duration	about one week per audit	about one month
Examined Units	One audit for each Department (20) and a large project	Three Assessments for different development processes

CMMI Capability Maturity Model Integrated/3
Activities Flow: Joint Siemens-ISPI Assessment

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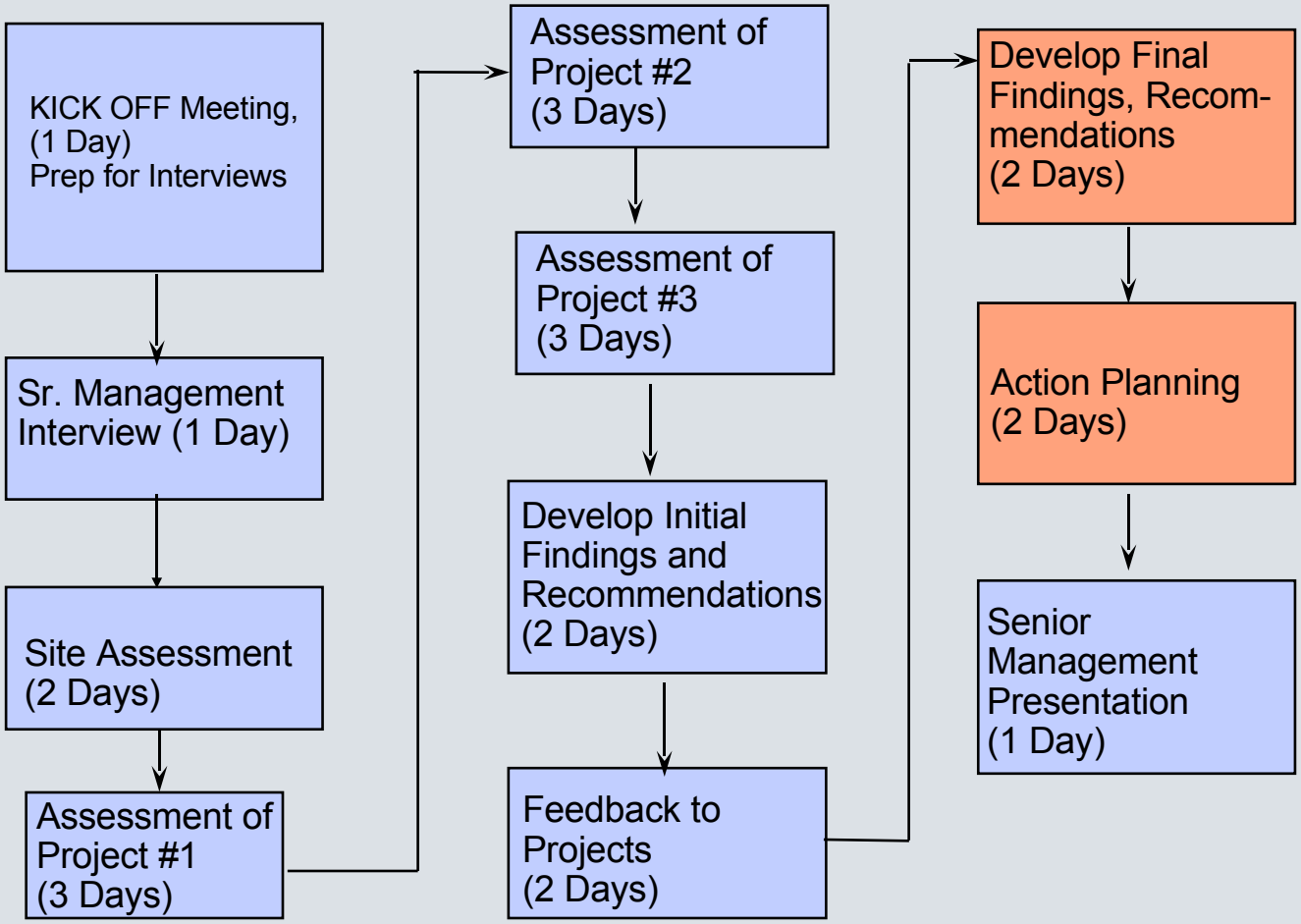

CMMI Capability Maturity Model Integrated/4 Site-Assessment

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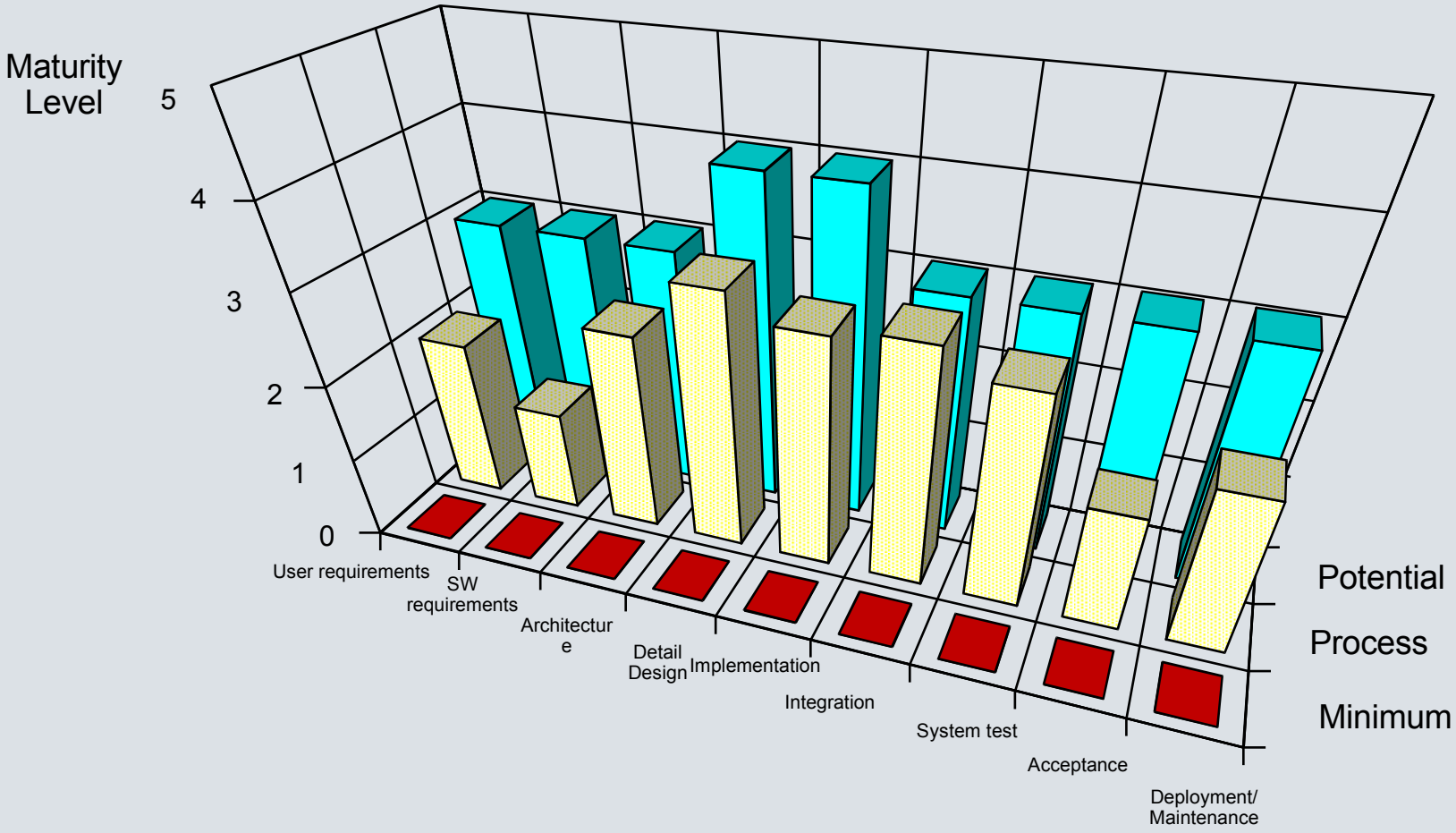

CMMI Capability Maturity Model Integrated/5
Development process Overview Site (I)

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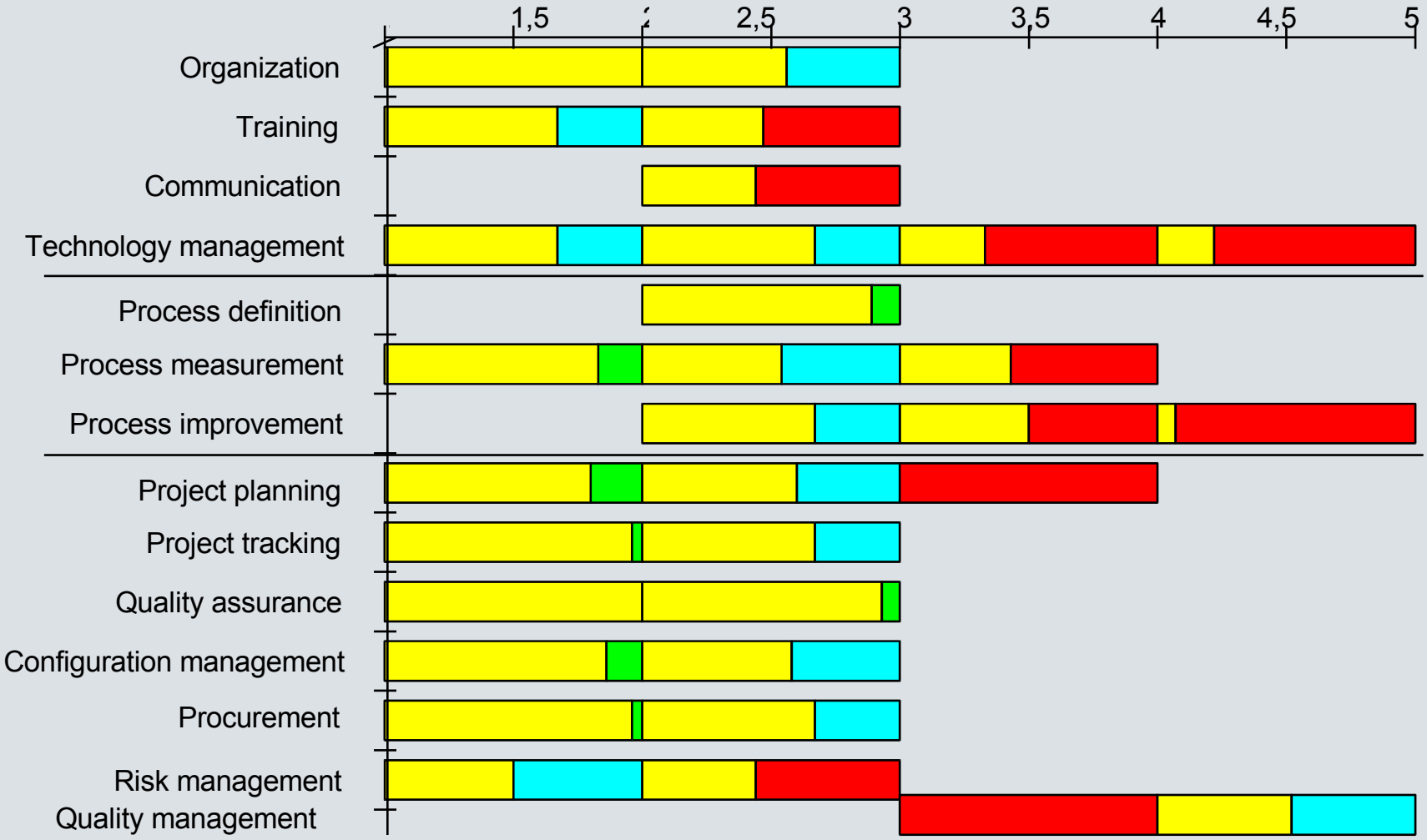

CMMI Capability Maturity Model Integrated/6
Life Cycle Functions: Implementation and Module Test

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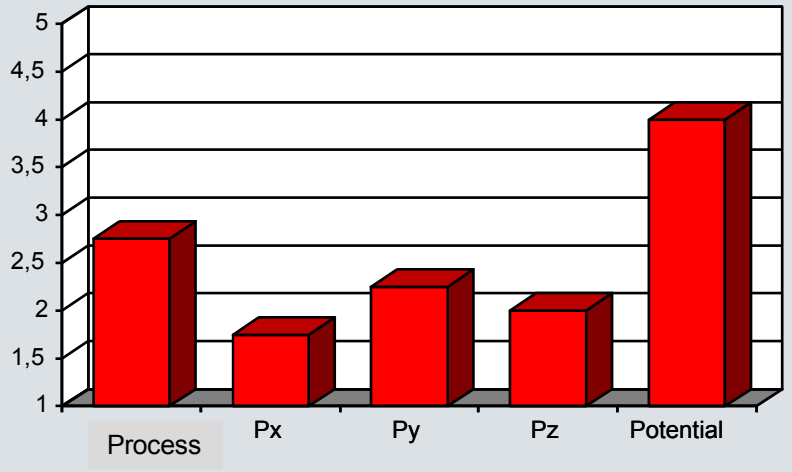
- Main Assessment Criterion according to the CMMI :
  - Programming Guidelines (Taking into consideration Quality, Complexity, and Readability)
  - Reuse of design or code
  - Development from reusable components
  - Application of code generators
  - Test methods and end criterion



- Test criteria and Methods for the test case design (e.g., Boundary testing, Cause-Consequences Graph, ...) was not used in the project

  Translation problems exist in the reuse of software concerning process definitions. Hint:: Reuse must be applied in the earlier phases.

  Introduce Test end-criterion, methods, and standards for Module Testing on the Project

  Perform statistical analysis of the errors found during Module Testing, based on simple procedures such as checklists

  Force the application of methods and tools to the analysis of code and test quality (e.g. Test coverage measurement, static and dynamic code analysis)

  Use code generators in case corresponding tools are applied in the earlier phases

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Benefits of CMMI/1
In Quality/1

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- exploring of Weaknesses

  - some of these were already known or supposed

    * now recommendation were accepted by management

    * could be executed

Benefits of CMMI/2
In Quality/2

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- coming from site assessment

  - SEM was totally reworked (including the first phases especially proposals)
  - broad support by management for introduction of
    * project controlling
    * metrics
    * reviews

Benefits of CMMI/3
In Quality/3

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- coming from project assessments

  - short - term measures

    * CM

    * Test data

Benefits of CMMI/4 for management

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- management becomes conscious

  - importance of process improvement

  - supporting all recommended measures

    * especially funding of user groups and workshops

Benefits of CMMI/7 for Customer

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- Summer 1993 we made interviews with customers
- Spring 1997 interviews with the same customers
- Autumn 2005 3rd interviews with customers
  - High Correlation between CMMI level and satisfaction of customers
- Improvements above all

  - less serious errors

  - adherence of accomplishment

  - adherence of expenditure

Benefits of CMMI/5 for motivation of employees

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- motivation of employees
  - in group interviews
    * discussing of their problems
      + a lot were easy to repair
      + elimination of unnecessary procedural steps
        + making it the same for years
- Questionnaire on Intranet(1997 and 2005)
  - High Correlation between CMMI level and satisfaction of employees
    - Dates are met
    - No overtime necessary

Benefits of CMMI/6
In Quantity

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- reviews

  - finding of errors in early phases was improved by 100 %

    * saving more than 10’ in one year

- finding of errors in proposals

  - saving more than 8’ in one year

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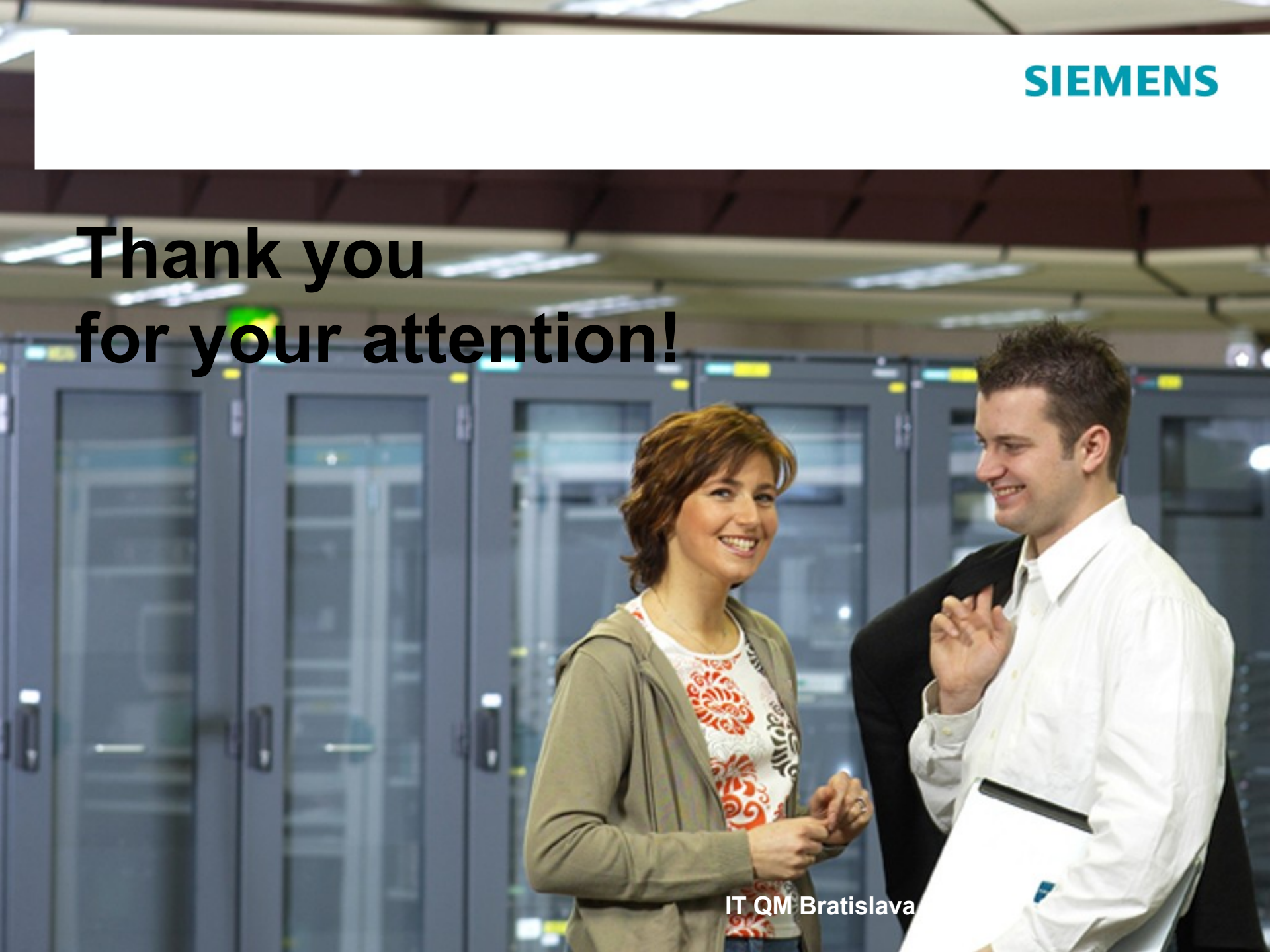
Thank you for your attention!



Farbpalette mit Farbcodes

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Primäre Flächenfarbe:

R 255 G 255 B 255

Sekundäre Flächenfarben:

R 215 G 225 B 225	R 170 G 190 B 195	R 130 G 160 B 165
R 220 G 225 B 230	R 185 G 195 B 205	R 145 G 155 B 165

Akzentfarben:

R 255 G 210 B 078	R 245 G 128 B 039	R 229 G 025 B 055	R 000 G 133 B 062	R 000 G 084 B 159	R 000 G 000 B 000
R 255 G 221 B 122	R 248 G 160 B 093	R 236 G 083 B 105	R 064 G 164 B 110	R 064 G 127 B 183	R 064 G 064 B 064
R 255 G 232 B 166	R 250 G 191 B 147	R 242 G 140 B 155	R 127 G 194 B 158	R 127 G 169 B 207	R 127 G 127 B 127
R 255 G 244 B 211	R 252 G 223 B 201	R 248 G 197 B 205	R 191 G 224 B 207	R 191 G 212 B 231	R 191 G 191 B 191
R 255 G 250 B 237	R 254 G 242 B 233	R 252 G 232 B 235	R 229 G 243 B 235	R 229 G 238 B 245	R 229 G 229 B 229