

The Way to CMMI Level 2

SW Process Improvement using CMMI
with Dr. R. Kneuper, Dr. E. Wallmüller
Mar 10th, 2006

Author: Michael Paulweber
Lecturer: Hans Neuhold

**AVL List GesmbH headquarter is located
in Graz, Austria ...**



AVL
CMMI in use

- ◆ **AVL is the world's largest private and independent company developing powertrain systems with combustion engines along with instrumentation and test systems.**
- ◆ **AVL has engineering and testing know-how for the entire development process.**
- ◆ **AVL is partner to all OEMs and automotive supply industry**
- ◆ **AVL is worldwide market leader in automotive test equipment business**



**AVL
Powertrain
Engineering**



**AVL
Advanced
Simulation
Technologies**



**AVL
Instrumentation
and Test Systems**

AVL covers all customer segments in automotive area ...



AVL
CMCI in use



passenger cars

2-wheelers

racing



construction

agriculture

commercial vehicle



locomotive

marine

power plants



AVL
Powertrain
Engineering

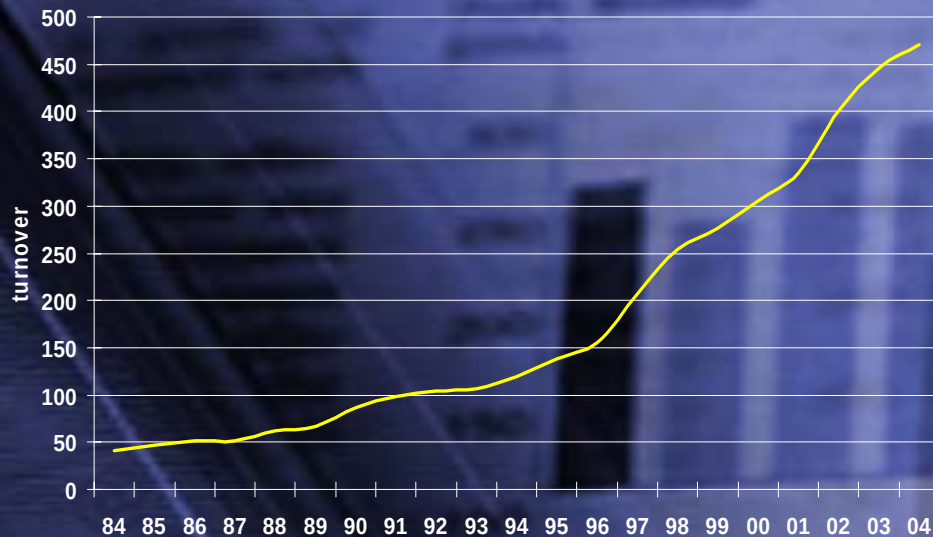


AVL
Advanced
Simulation
Technologies



AVL
Instrumentation
and Test Systems

AVL turnover grew more than 10 times during the last 20 years ...



Total growth :

1984: 40 Mio €

2005: 500 Mio €

Total increase in employees:

1984: 560

2005: 3400

Average R&D spending:

10 % of turnover

Average export quota:

96 % of turnover

Why learn about SW processes?

SW processes are not increasing costs of projects ...



AVL
CMMI in use

% of effort

100%

0%

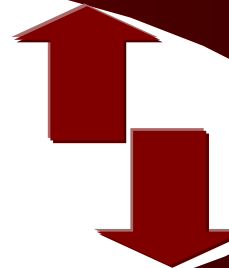
Beginning of
project

time

End of
project

Productive work

Trashing



Process work

**SOFTWARE
PROJECT
SURVIVAL GUIDE**



McConnell
of Code Complete
and Development

*How to Be
Sure Your First
Important
Project Isn't
Your Last*

Microsoft Press

Source: „SW Project Survival Guide“ by Steve McConnell

Why learn about SW processes?

SW processes are not increasing costs of projects ...



AVL
CMMI in use

% of effort

100%

Trashing

**Introduction of
processes**

Productive work

Process work

0%

Beginning of
project

time

End of
project

**SOFTWARE
PROJECT
SURVIVAL GUIDE**



McConnell
Code Complete
Development

Microsoft Press

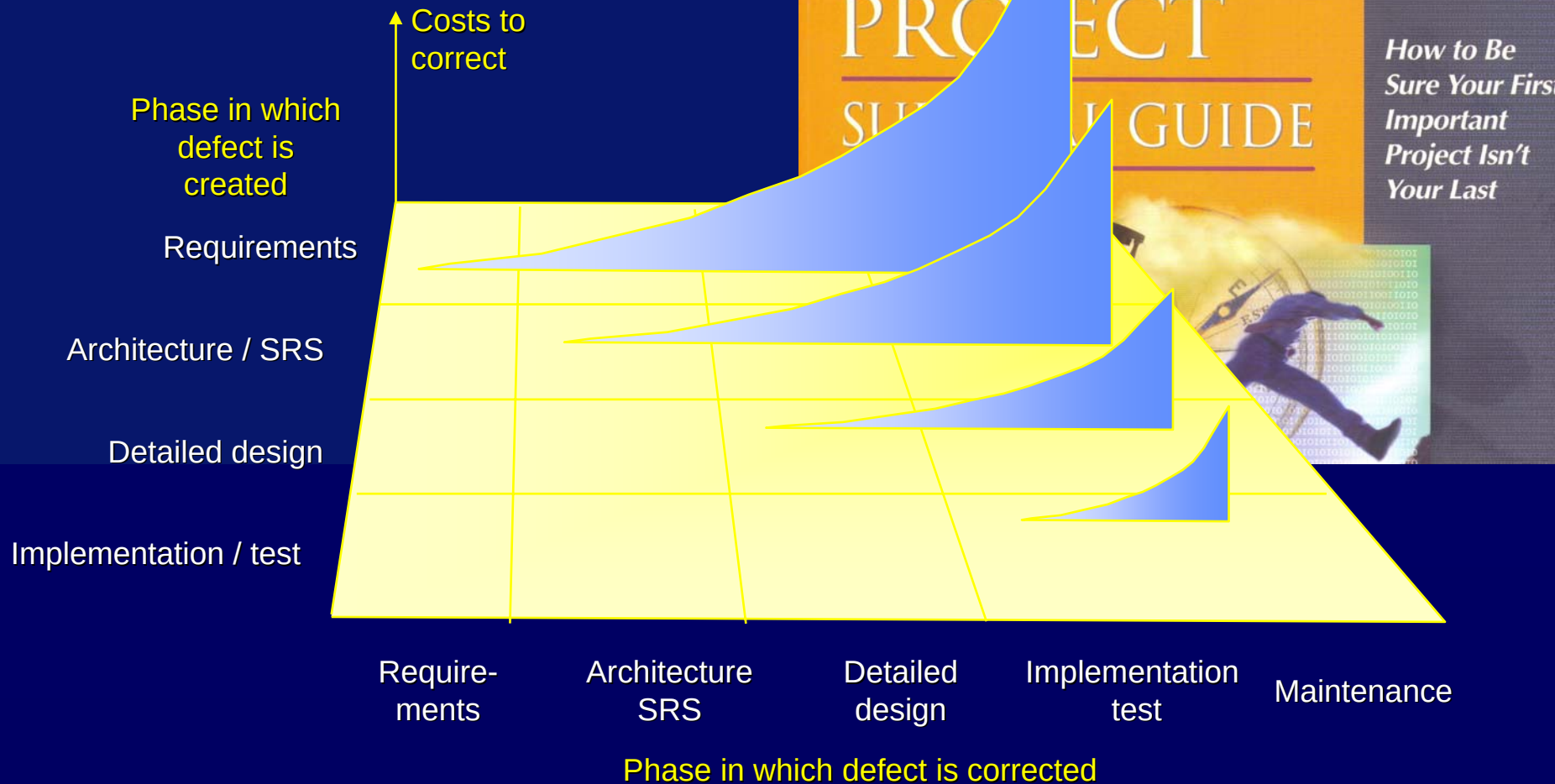
Source: „SW Project Survival Guide“ by Steve McConnell

Why learn about SW processes?

Costs to correct defects are exponential increasing...



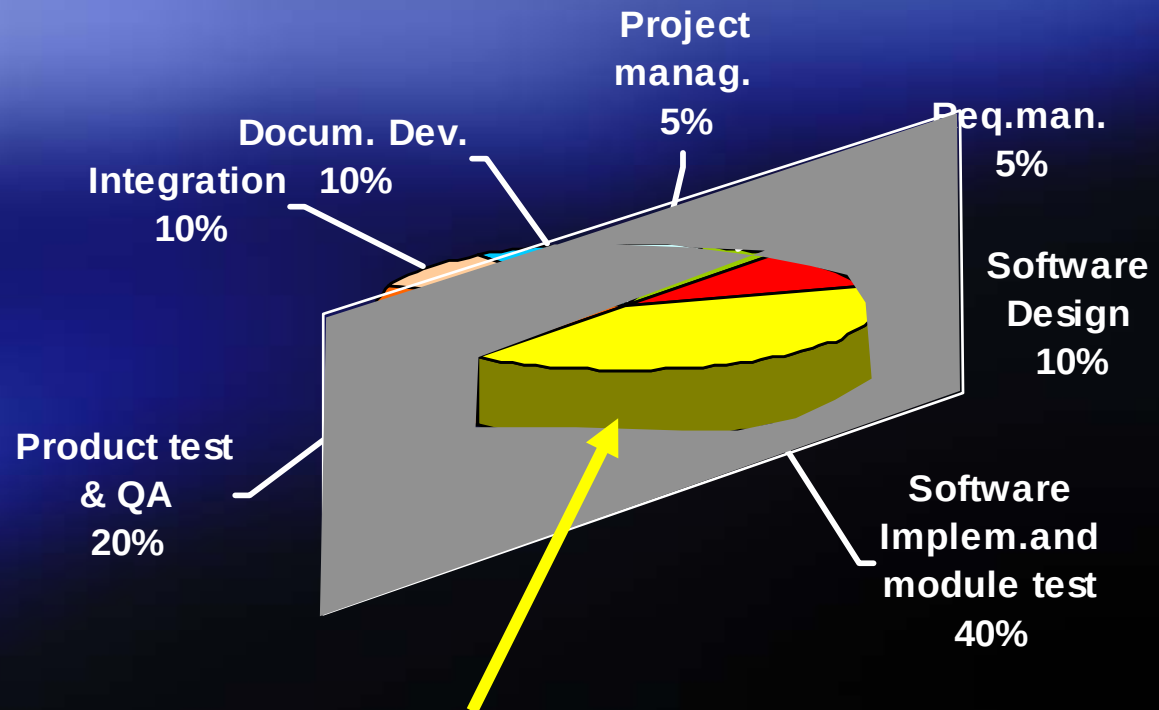
Source: „SW Project Survival Guide“ by Steve McConnell



Successful SW development requires many activities, which are described in CMMI process areas ...



- ◆ Project management
- ◆ Requirement management
- ◆ Software Design
- ◆ Software Implementation (C++, C#, ...) and module test
- ◆ Integration
- ◆ Product test & Quality assurance
- ◆ Documentation development



Only 50 % „classical,, SW development activities

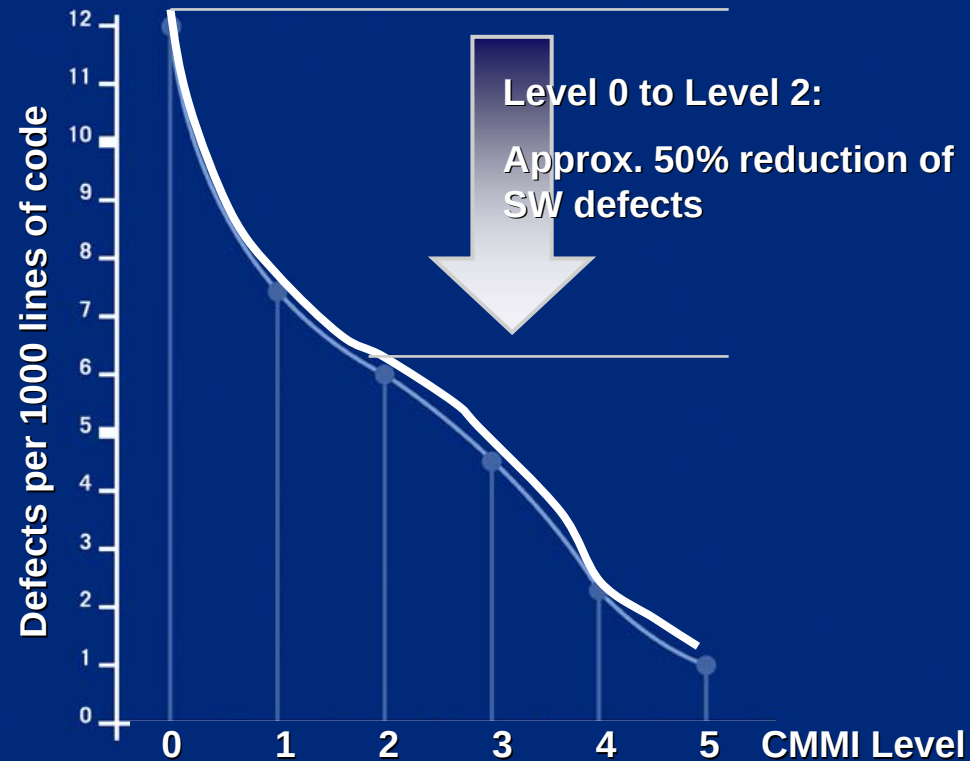


- ◆ Highly **creative engineers** needed in SW industry, therefore **enforce workflow** whenever possible
- ◆ **SW development tools** help to introduce common workflow
 - ◆ Daily build via configuration management system → necessary to guarantee maintainability
 - ◆ Requirement data base → avoid requirement creeping
 - ◆ Defect tracking system → identify problem zones and maturity of SW product
 - ◆ Test data base → knowledge about degree of test coverage
- ◆ Successful **introduction** of tools **cost** approximately as **much as the tool** itself

CMMI – Capability Maturity Model Integrated®: The Standard for Professional SW Development



AVL's steps to excellence in SW development



Source: SEI - SW Engineering Institute
Carnegie Mellon University

Our Goal: CMMI Level 3



- ◆ Excellent quality in all AVL MES SW products
- ◆ Predictable product development costs
- ◆ Development milestones met
- ◆ Platform for information between MES development centers
- ◆ Continuous improvement monitored by objective metrics
- ◆ Substantially improved productivity

Roadmap to reach CMMI level 3 in MES ...



2004

2005

2006

2007

Level 3 for
SBU-MES

CMMI Level 2 for BU-E,
MI, MO, AVL-NA

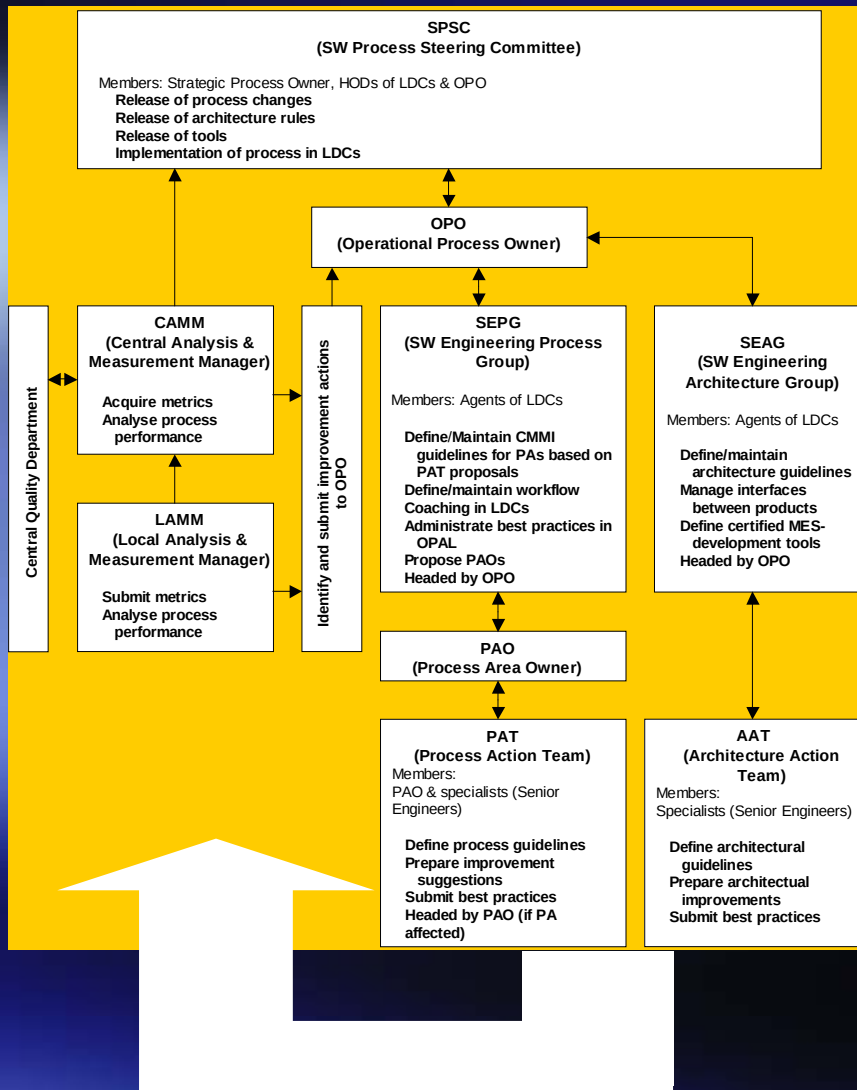
CMMI Level 2 for PE

Work on Level
3 in Graz

AVL's SW processes adapted

- 2006: Official CMMI Level 2 at all centers (MI, MO, BU-E, AVL-NA)
- 2006: Internal CMMI Level 3 for some centers in Graz (MI, MO, PE)
- 2007: Official CMMI level 3 for SBU-MES

SW process improvement organization helps to increase development quality ...



SPO ... Strategic Process Owner is sponsor in upper management (CEO)

SPSC... SW Process Steering Committee releases changes and monitors implementation (head of development from major development centers)

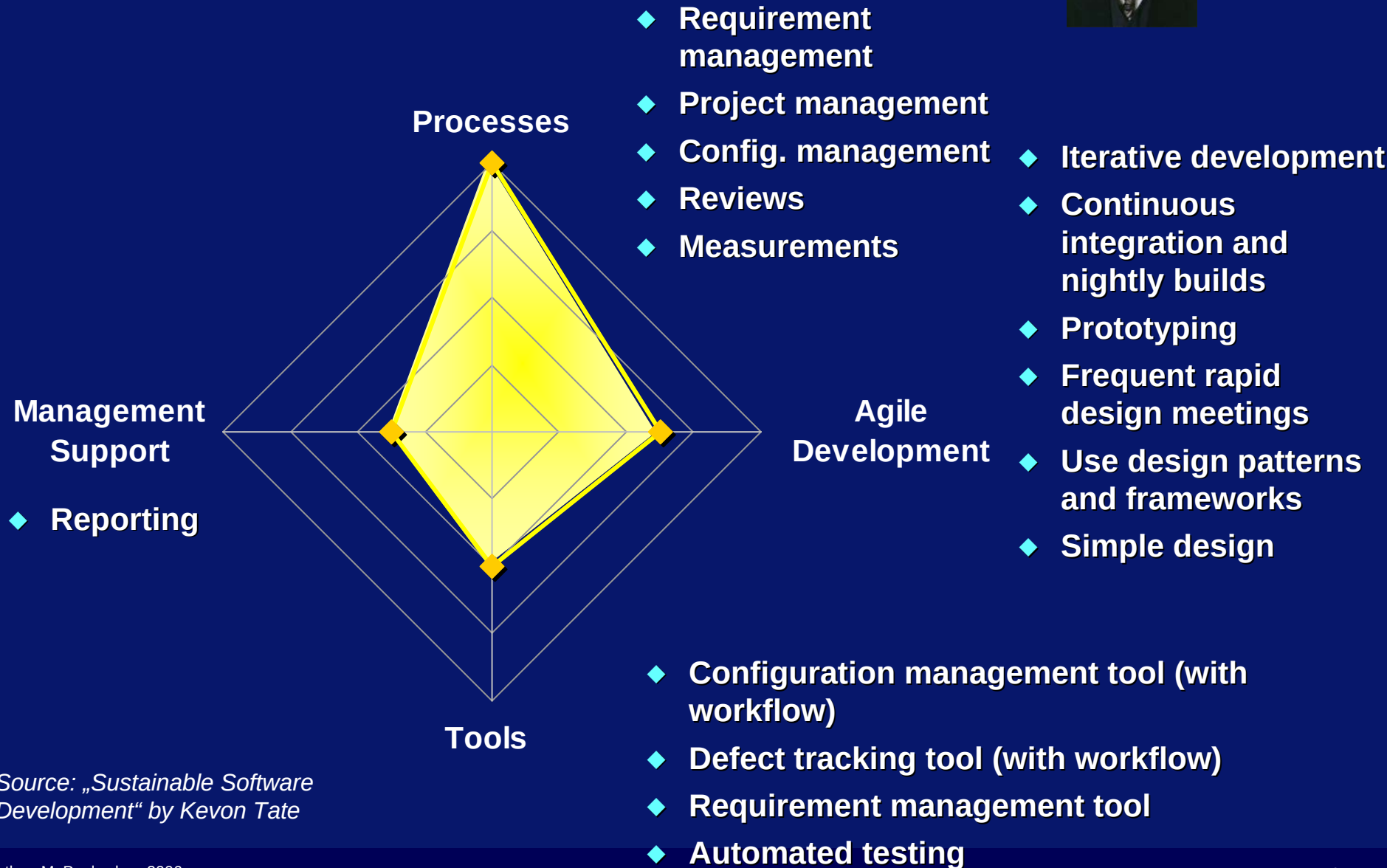
OPO... Operational Process Owner coordinates activities

SEPG... SW Engineering Process Group coaches and disseminates (representatives of development teams world wide)

SEAG.. SW Engineering Architecture Group defines interfaces (main architects of various development teams world wide)

C/LAMM Central/Local Analysis & Measurement Manager (provides feedback to management)

Several aspects are crucial for successful SW development ...



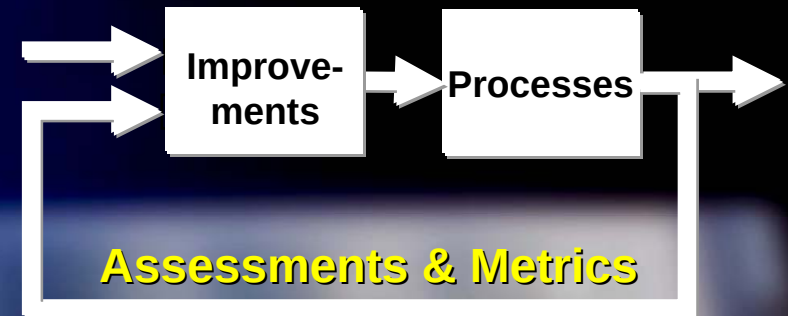
Several aspects are crucial for successful SW development:
Requirement development & management is critical
for success of projects ...



AVL
CMMI in use

**AVL strives for excellence in
SW development**

**Continuous SW process
improvements help to reach
the goal**



A „**closed control loop**“ is a precondition
for continuous improvements



- ◆ **Monthly PIP status reviews**
 - ◆ Project status report
 - ◆ Milestone trend analysis
 - ◆ Cost trend analysis
 - ◆ Requirement tracking list
 - ◆ Bug trend analysis
- ◆ **Weekly change control boards**
 - ◆ Bug trend analysis
- ◆ **Senior management summary reports**

Tools are required to know the status of product development, CMMI provides help ...



◆ Monthly PIP status r

◆ Status report

◆ Cost t

◆ Requi

◆ Bug t

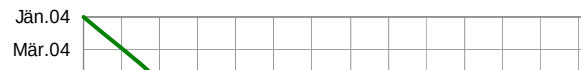
◆ Weekly c

◆ Bug t

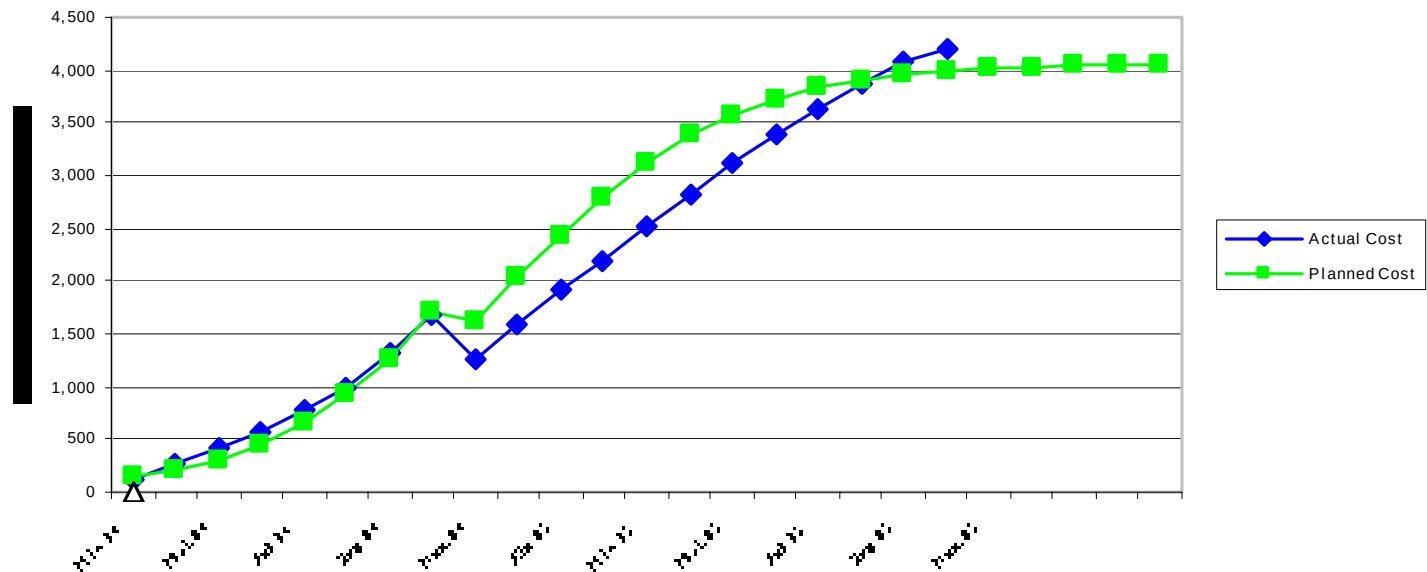
◆ Senior m summary

AVL	Development Project Summary Report	
Project-Leader:	Project-Name: PUMA Open 12.2	Document changed: 19.12.2009 09:51
Errechner: C:\d\kub	Reporting Period: C:\VSO\2005	File path to project summary report: c:\vso\dac

Magic V2.0



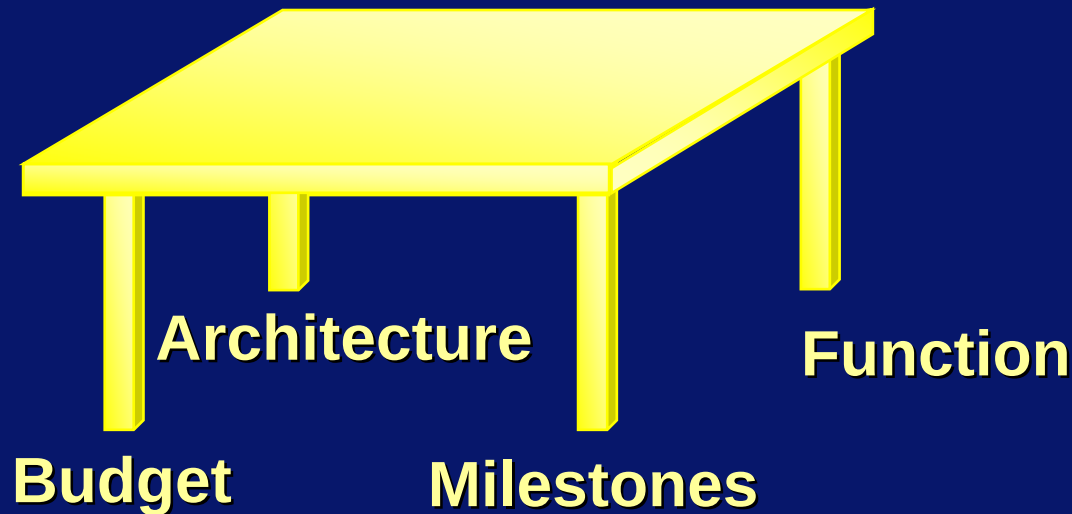
Cost Trend PUM A Racing V1.4





- ◆ **Status reviews required to keep projects on track**
- ◆ **Standardized status reports save time at preparation and even more at reviews**
- ◆ **Status reports without reviews are useless**
- ◆ **Status reviews serve for quick adjustment of project course (→ all relevant stakeholder must participate)**

A stable table has four legs ...



- ◆ Strong processes help to keep budget, milestones and functions in balance
- ◆ Architecture and sustainability are safeguarded by concepts from agile development



- ◆ **CMMI helps** to introduce **all basic** practices
- ◆ CMMI helps to improve quality of estimations significantly (no activities are forgotten)
 - adherence to milestones
- ◆ **CMMI doesn't help** to develop **longterm extensible** SW
 - Concepts from „agile SW development“ can help („Sustainable SW development“)



- ◆ **Systematische Vorgangsweise kombiniert mit erforderlichen Kontrollmechanismen (Regelkreisen).**
- ◆ **CMMI unterstützt mit Know How in allen Prozessbereichen.**
- ◆ **RD & REQM ist ein typischer kritischer Erfolgsfaktor.**
- ◆ **Risikomanagement zeigt sich als wichtiges Instrument zum frühzeitigen Erkennen von möglichen Problemen.**
- ◆ **Laufende Produkt- und Prozessverbesserung ist ein weiterer kritischer Erfolgsfaktor.**
- ◆ **Kennzahlen überwachen und motivieren.**