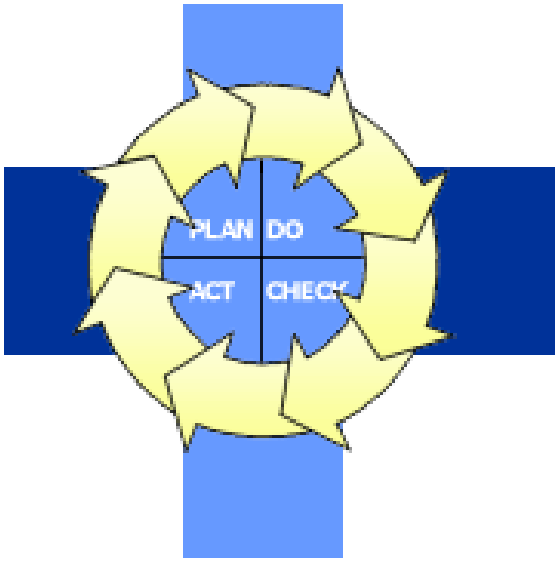
Software Process Training



Dr. Ernest Wallmüller
Wolfgang Höh

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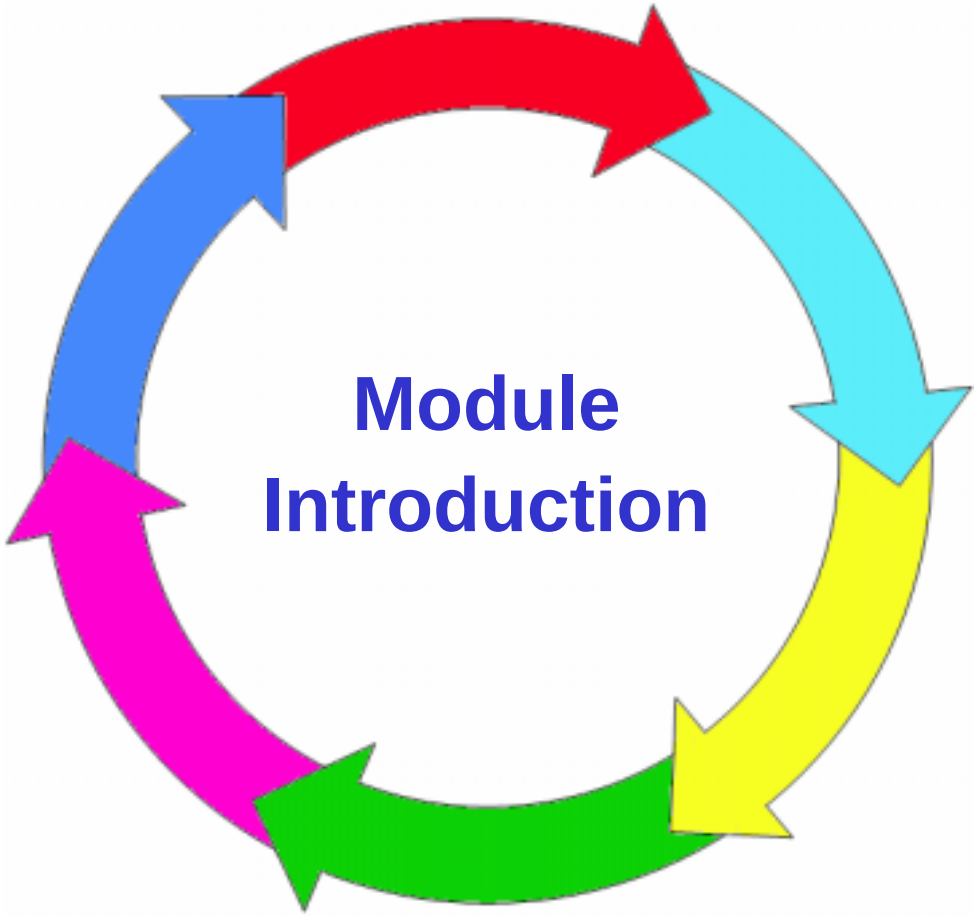

Module Introduction

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Agenda

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13:00 Opening	Paulweber
13:05 Short Introduction, agenda and overview of training	Wallmüller, Höh, All
13:30 Software processes management and CMMI at AVL	Wallmüller, All
14:15 Overview of Standard SW Process and its rules	Höh
14:45 Break	
15:00 Job Contracts	Wallmüller
Exercise - The Role Game	All
16:00 Process Improvement Organization of AVL	Wallmüller, Process Owners
16:45 Discussion and Summary	Wallmüller, All
17:00 End	

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Who we are: Ernest Wallmüller

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„Consciously shaping the change!“

Education

PhD in Information Technology of J. Kepler Universität Linz,
assistant professor, Habilitation in Business Information Management – Topic: „Prozess- und Qualitätsmanagement“;
SQS Auditor for ISO 9001:2000;
Assessor for CMMI, ISO15504, TPI and EFQM

Professional Background

assistant professor at ETH Zürich, Research and Development Projects in Software Engineering
Manager “Software Engineering and Quality Assurance” at UBS,
Senior Consultant at ATAG Ernst & Young in Switzerland, Austria, Germany and UK,
Process Coach for Bid Process, Supplier and Business Partner Process and Manager of Project Quality Office and Quality Systems at Unisys (Switzerland) AG,
CEO and Senior Management Consultant of Qualität & Informatik, Zürich

Working Area

Quality, Process, Project and Risk Management

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Who we are: Wolfgang Höh

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Education

Dipl. Phys. ETH, Zürich, lic oec HSG, St.Gallen
ISO 15504 Assessor

Professional Background

In IT-Business since 1977; 11 years managing positions with responsibilities in IT and Organization in companies of the industry and insurance sector
5 years Senior Consultant at ATAG Ernst&Young
Management Consultant of Qualität & Informatik

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Working Area
Quality, Process, Project and Risk Management

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Logistics

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Course Goal and Objectives

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Goal

Be able to effectively and efficiently perform your role as user of AVL processes, rules and job contracts.

Objectives

- **Understand the software process framework of AVL.**
- **Understand underlying principles of process management**
- **Perform as a process user and process team member through practical demonstration and exercises.**

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Block 1	Block 2
1. Half day: Introduction 2. Day: PP, PMC, RSKM 3. Day: SAM, DAR, IPM 4. Day: RD, REQM	1. Half day: Introduction 2. Day: CM, TS, PI, 3. Day: VERVAL, REVIEW, 4. Day: M&A, PPQA
Participants: GPM PL-DP RM	Participants: PL-DP SA PI SW-Dev. IVV

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Reference Materials

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- **Handbook of AVL SW Development Process Rules**
- **AVL SBU MESS Standard Software Development Process, Rev 6, 2005**
- **AVL SBU MESS Q-Day Process, Rev 4, 2004**
- **Job Contracts, 2005**

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Where do I find out more about Processes and CMMI?

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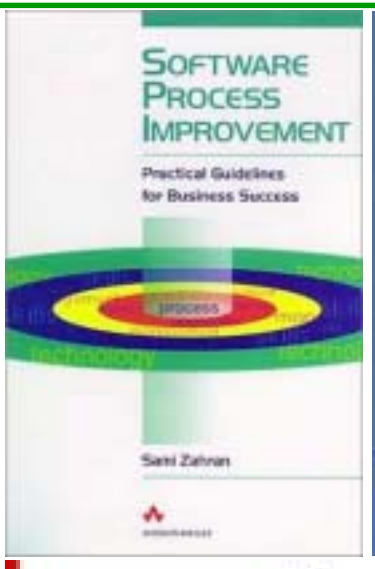
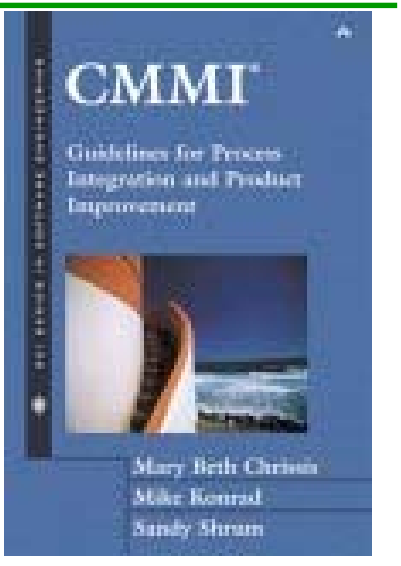
Original CMMI documentation

- **Capability Maturity Model Integration, CMMI for Software Engineering (CMMI-SW, V1.1) Continuous and Staged Representation CMU/SEI-2002-TR-001 available at http://www.sei.cmu.edu/cmmi**
- **Mary Beth Chrissis, Mike Konrad, Sandy Shrum: CMMI. Guidelines for Process Integration and Product Improvement. 663 S., SEI Series in Software Engineering, Addison-Wesley, 2003**
- **Ahern, Clouse, Turner: CMMI Distilled. A Practical Introduction to Integrated Process Improvement, 2nd ed, Addison-Wesley, 2003**
- **Sami Zahran: Software Process Improvement Addison-Wesley, 1998**
- **Steve McConnel: Software Project Survival Guide, Microsoft Press, 1998**
- **Kneuper: CMMI - Verbesserung von Software-prozessen mit Capability Maturity Model Integration. dpunkt.verlag, November 2002**
- **Wallmüller: Software-Qualitätsmanagement Hanser, 2001**
- **see also process links http://www.itq.ch/links.html**





Exercise - A short personal introductions

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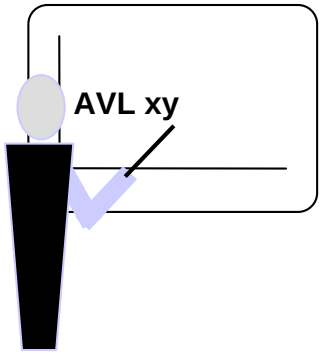

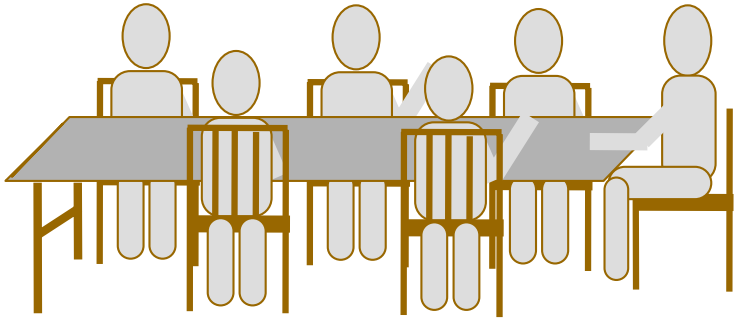

2. What do you want to get out of this course?

Please write down a card for the pin wall with your expectations

1. Introduce yourself to the audience

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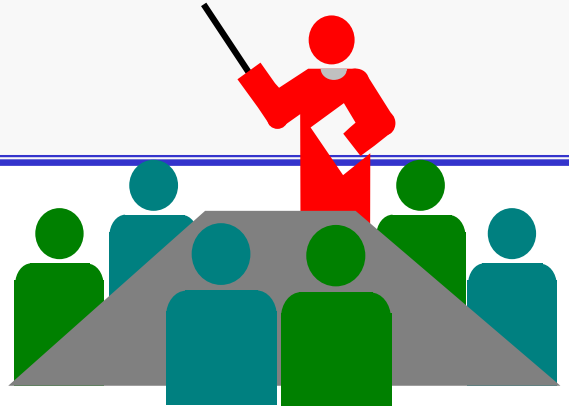
Software process management and CMMI at AVL



Objectives:

- Discover possibilities of process management
- Understanding of CMMI
- Discuss elements of a process description
- Knowing benefits of better processes

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Why Focus on *Process*?

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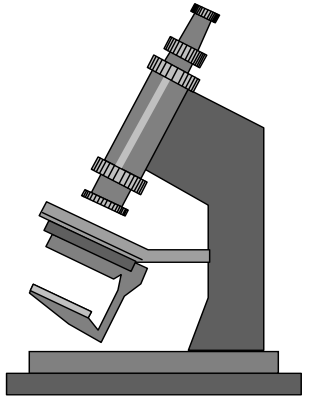
- **Focusing on products and/or technology alone misses knowledge of the *process* that may be improved to produce results "faster, better, and/or cheaper"**

- **Focusing on processes**
  - **Makes best practices standard**
  - **Helps train new people faster**
  - **Helps spread the abilities of experts**
  - **Eliminates reinventing the wheel**
  - **Emphasizes lessons learned**
  - **Consistent and predictable product quality**



"The quality of a system is governed by the quality of the process used to develop it."

Watts Humphrey, *Managing the Software Process*

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The Three Elements of Project Success

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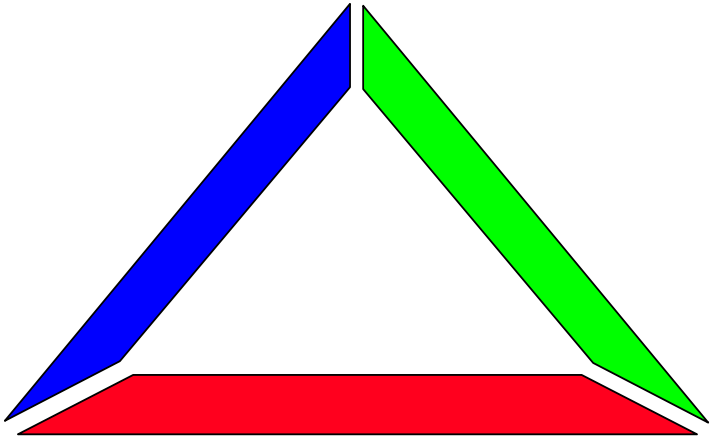
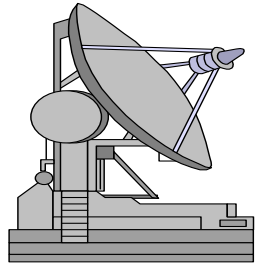
Process: a logical organization of people, technology and practices into work activities designed to transform information, materials and energy into a specified end result

People:
Skills, Training, Management





Technology:
Application domains, tools, languages, information, environments

Improved Process + Competent Workforce + Appropriate Technology
=
Reduced Risk, Higher Productivity, and Better Quality

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Exercise: What are Elements of a Process?

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Group exercise: N groups with 3 people

Time: 15‘ exercise, 15‘ presentation

Deliverable: Form filled out (➔ next foil)

Assignment:

- **Fill in and discuss what are the key elements of a process?**

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Elements of a Process 1

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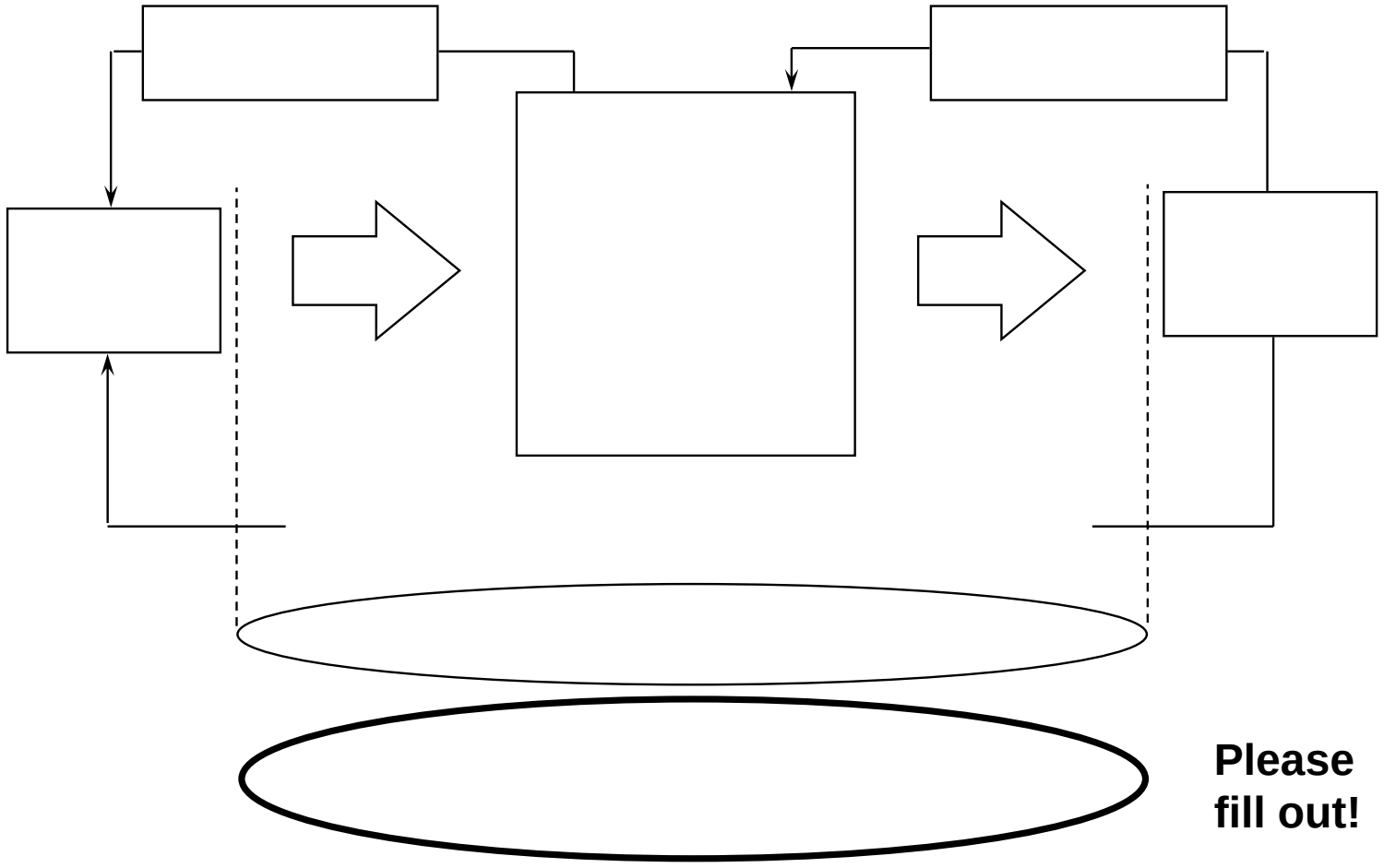

Please fill out!

Elements of a Process 2

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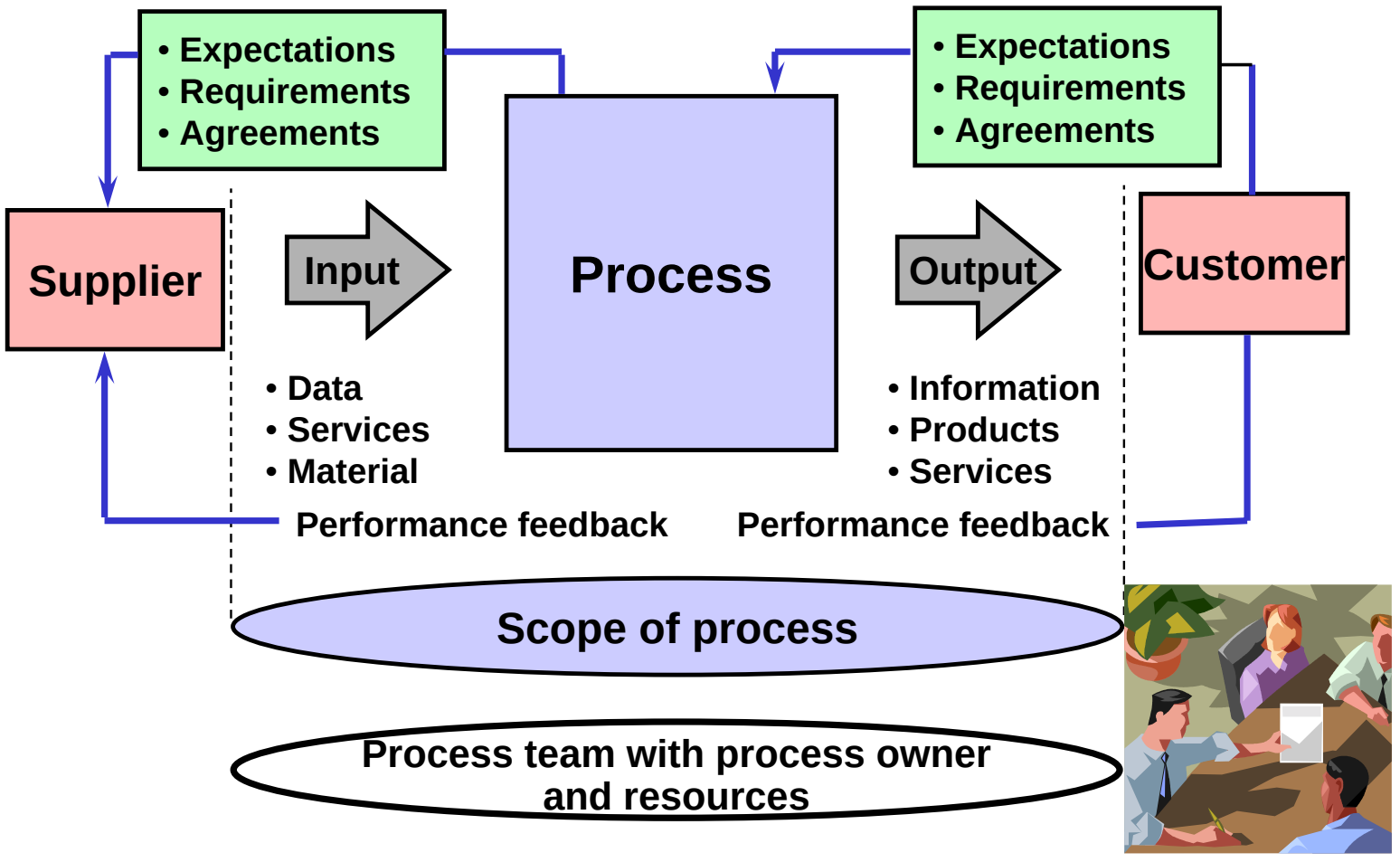

Process in Operational Context

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Operational Framework

Policies
The "laws" or "regulations" that govern or constrain operations

Standards
The "operational definitions" or "acceptance criteria" for final and interim products

Constraints on processes

Processes
Describe "what happens" within the organization to build products that conform to the standards in accordance with the policies of the organization

Processes implemented by

Methods and Procedures
Describes "how-to", or gives step-by-step instructions that implement the process

Methods and procedures are supported by

Training
Knowledge/skills required to use a method or procedure

Tools and Means
Tools for the implementation of methods and procedures such as templates

demo intranet

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How to Institutionalize a Process?

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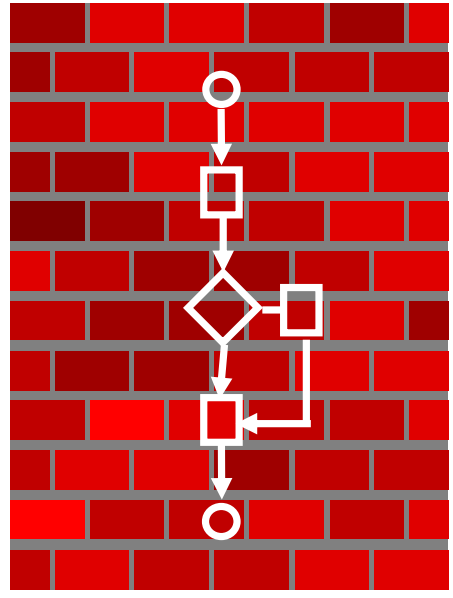
- Document it
- Develop a written policy requiring its use
- Get visible management support at all levels
- Get visible practitioner support
- Make sufficient resources available to support its use
- Schedule it into all applicable projects or activities
- Support it with required training
- Measure it in some way
- Verify that it is followed, via reviews and audits
- Automate your process whenever possible (workflow)
- Continuously improve your process



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Process Management = SPI

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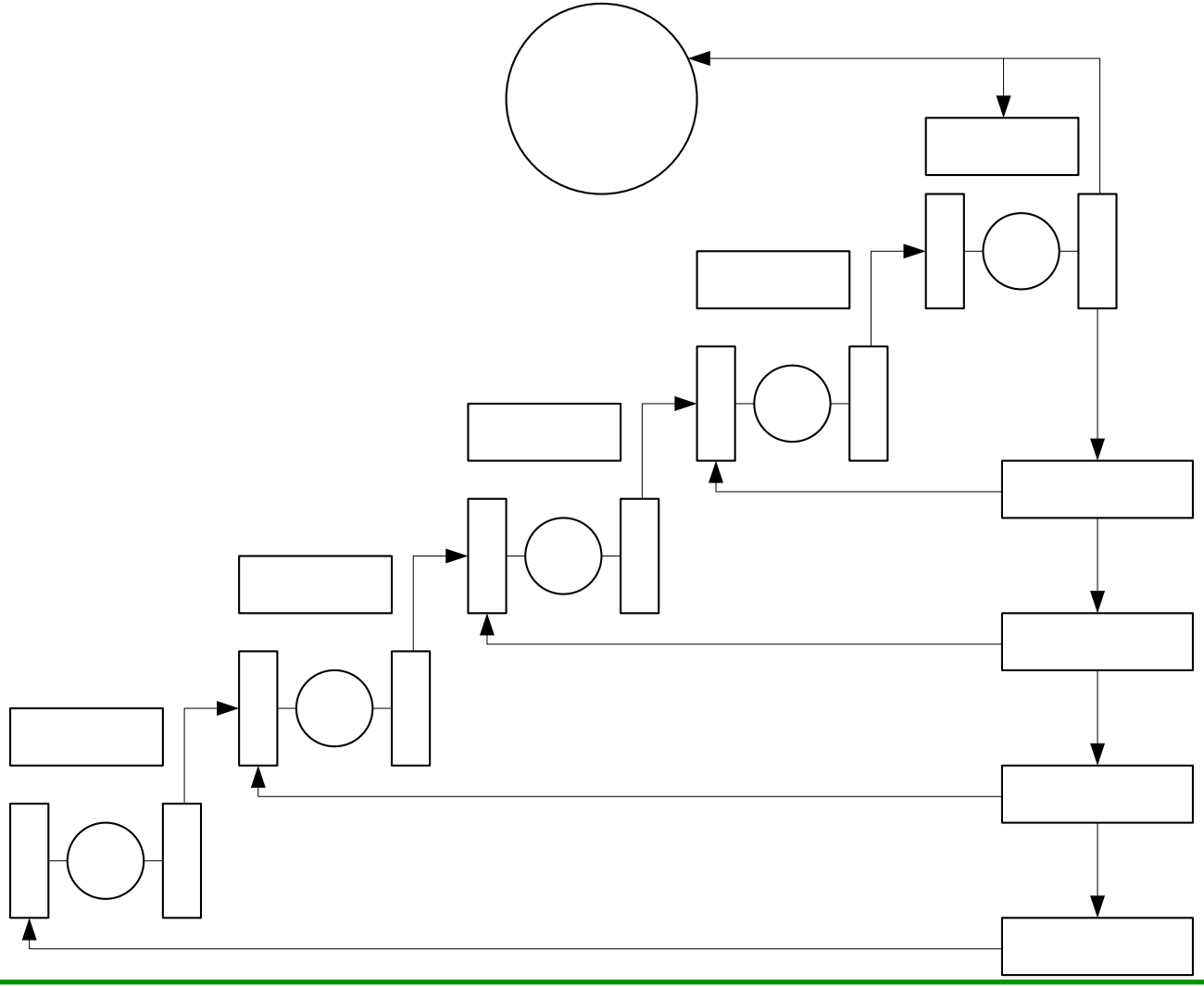

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Basic Elements in a Process

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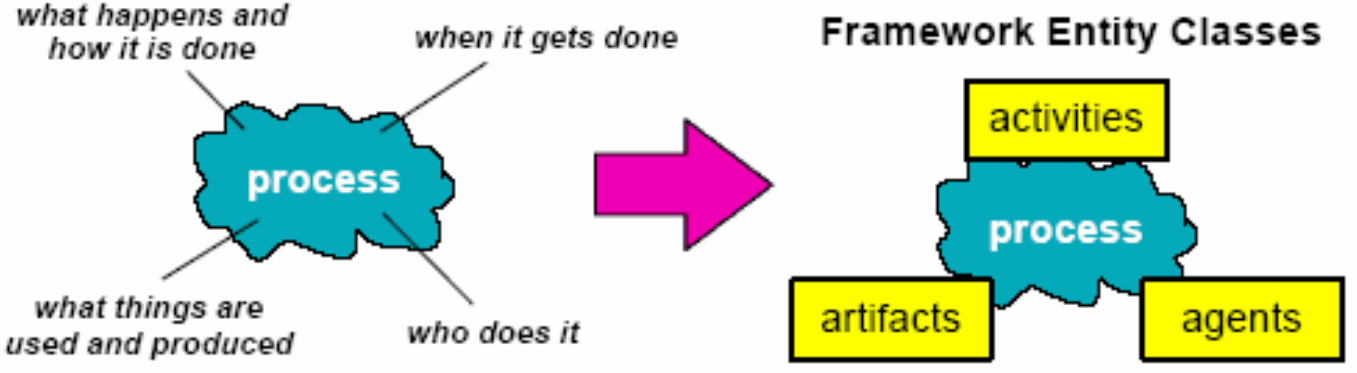
The conceptual framework for software processes includes three principal entity classes.

activities	what happens and how
artifacts	what things are used and produced
agents	who does it



AVL: work products job contracts

A Defined Process (Rule) has ...

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- Policy
- Purpose
- Inputs
- Entry Criteria
- Activities/Practices
- Tasks
- Work Products
- Job Contracts (Roles)
- Measures
- Outputs
- Exit Criteria

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Demonstration

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- **Time: 15 Minutes**
- **Please take the process description of software process Rule 4 (REQM) and have a look on it.**
- **Questions:**
  - **what is helpful for you as a project leader (PL-DP)?**
  - **what is helpful for you as a requirements expert (RM)?**
  - **what is helpful for you as a product manager (GPM)?**
  - **what is helpful for you as a work package leader (WPL)?**

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How to Tailor a Process 1

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- Processes *should* be tailored for a project - no two projects are the same
- SEPG's guidance on tailoring:
  - What CAN'T be tailored: the intent or objectives
  - What CAN be tailored: number of phases/activities, roles, responsibilities, document formats, formality/frequency of reports or reviews

    (see Tailoring - Process Rule 23 TAILOR)
- Tailoring considerations:
  - Life cycle activity: prototyping, maintenance
  - Software characteristics: COTS, reuse, embedded firmware
  - Your policies, languages, hardware reserve, culture
  - Acquisition strategy: contract type, contractor involvement
  - Life cycle strategy: waterfall, evolutionary, spiral, etc.
- Use Best Practices, Tailoring Guidelines, and Professional Judgment

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How to Tailor a Process 2

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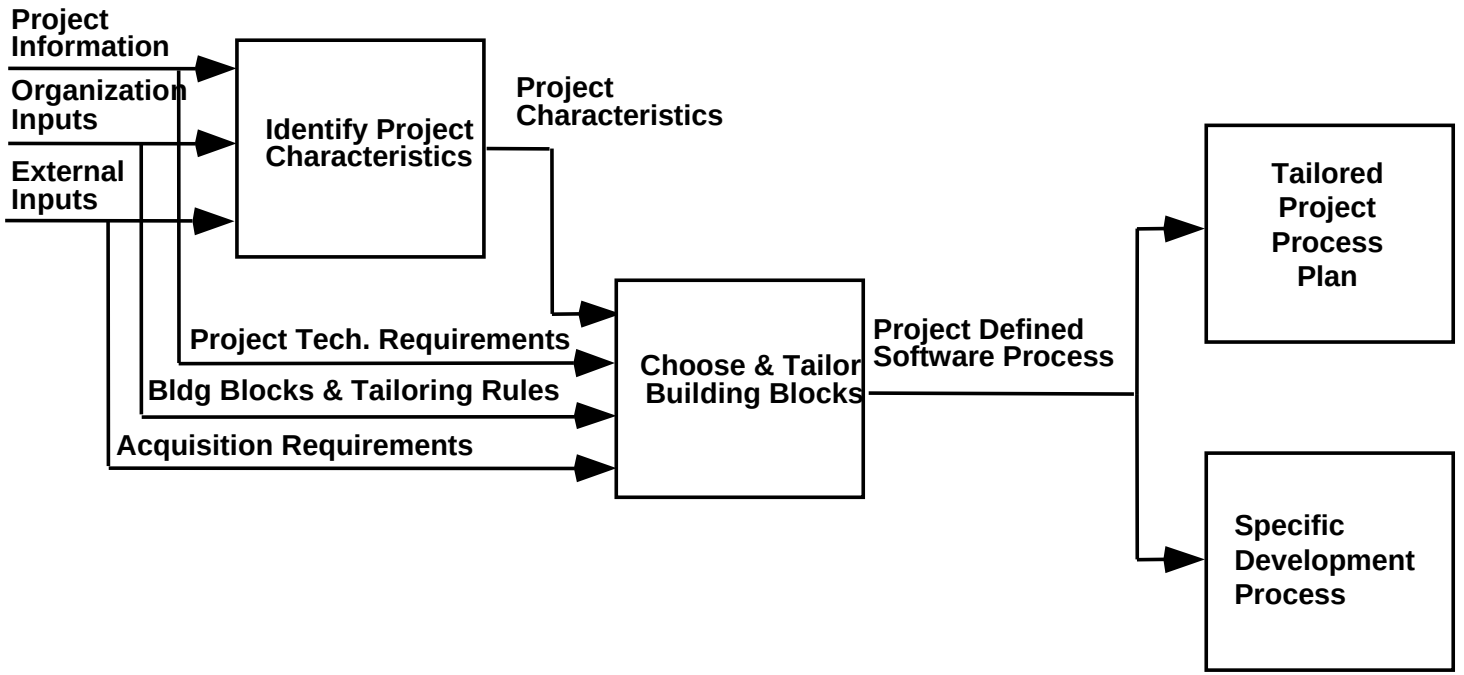
- **Purpose of tailoring**
  - **reduce project risk to an acceptable level**
  - **make most cost-effective use of engineering resources**



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CMMI SW Staged Representation

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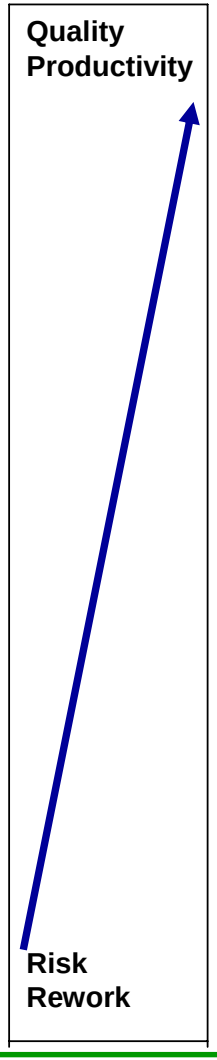
Level	Focus	Process Areas
5 Optimizing	*Continuous Process Improvement*	Organizational Innovation and Deployment Causal Analysis and Resolution
4 Quantitatively Managed	*Quantitative Management*	Organizational Process Performance Quantitative Project Management
3 Defined	*Process Standardization*	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Decision Analysis and Resolution
2 Managed	*Basic Project Management*	Requirements Management Project Planning Project Monitoring and Control Supplier Selection and Monitoring Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Initial		



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The Maturity Levels

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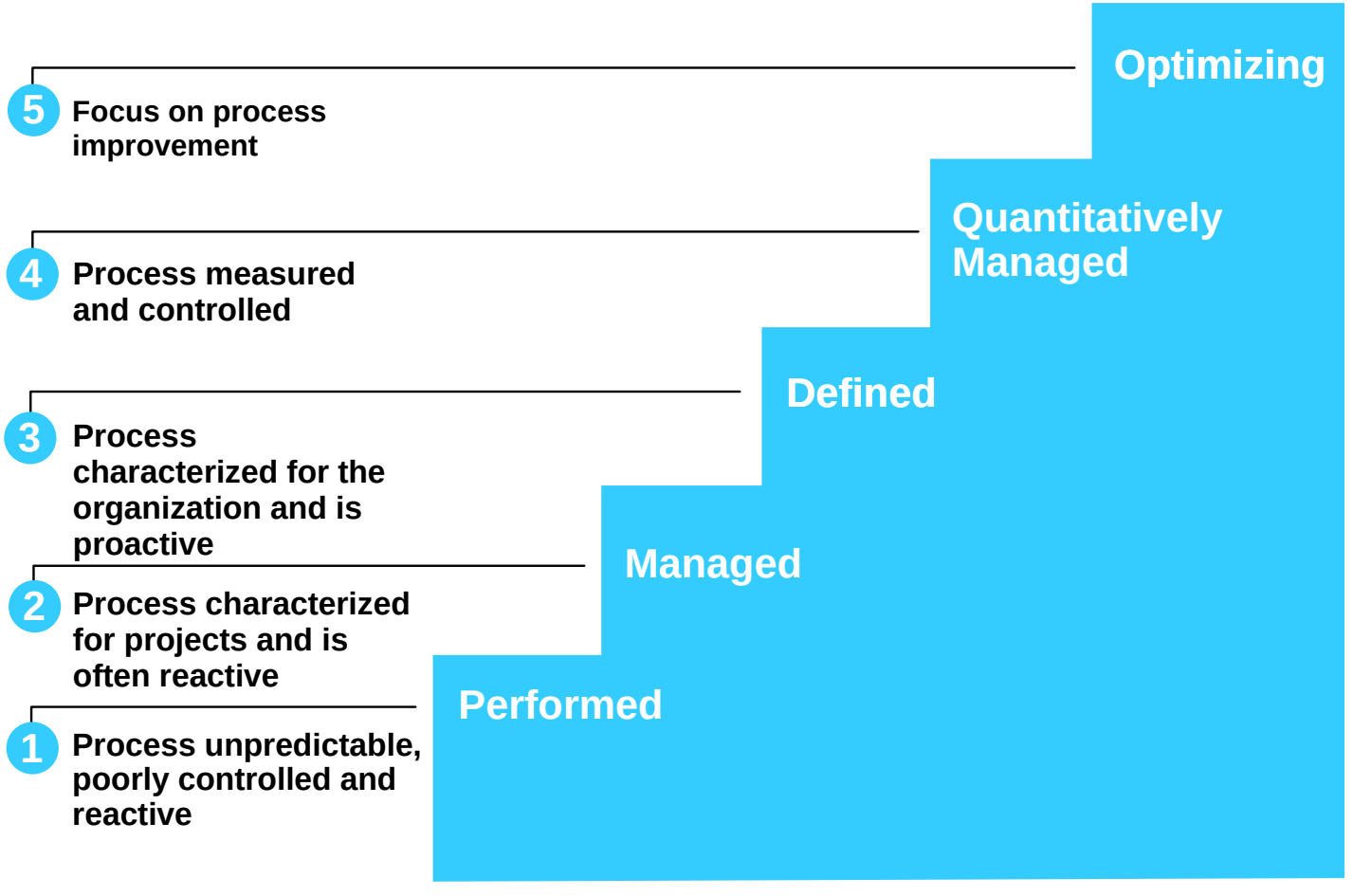

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CMMI Staged Representation

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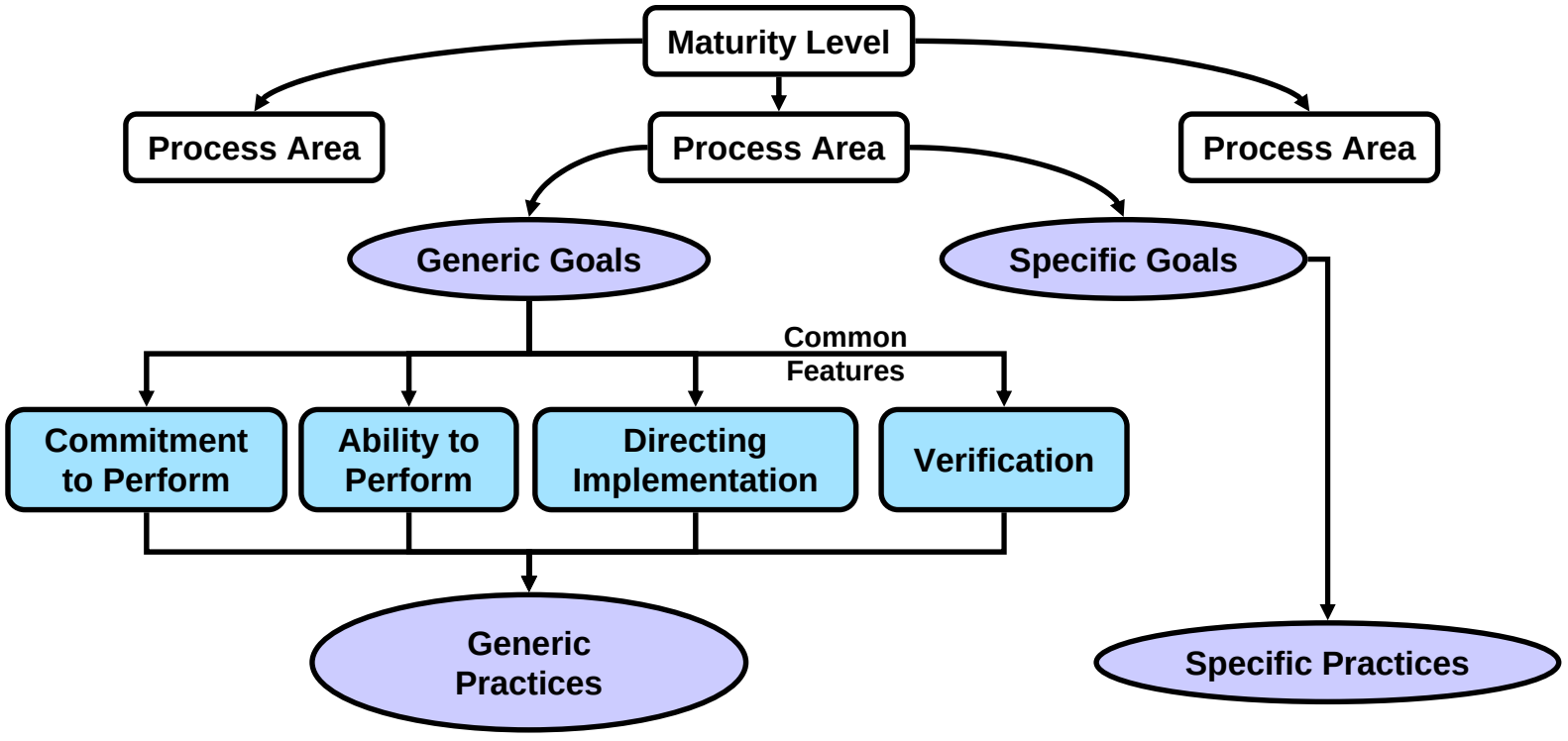

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Improving a Process Area

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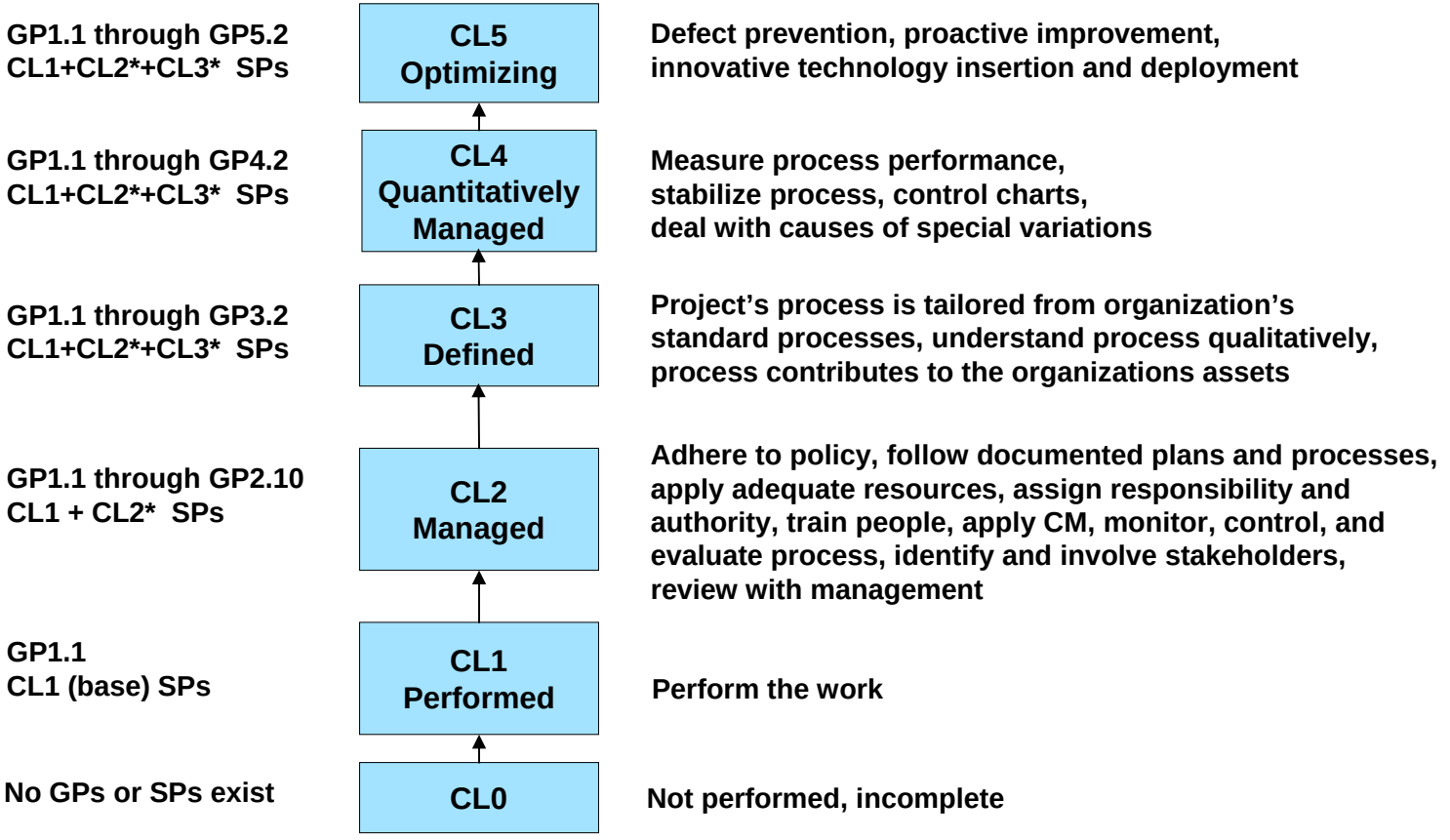

* Advanced practices exist only in the Engineering PAs.

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REQM - Capability Levels 1 & 2

Requirements Management

Specific practices (CL1 - "base")

SP1.1-1: Obtain an Understanding of Requirements
SP1.3-1: Manage Requirements Changes
SP1.5-1: Identify Inconsistencies Between Project Work and Requirements

Generic practices (CL1)

GP1.1: Perform Base Practices

Specific practices (CL2 - "advanced")

SP1.2-2: Obtain Commitment to Requirements
SP1.4-2: Maintain Bidirectional Traceability of Requirements

Generic practices (CL2)

GP2.1: Establish an Organizational Policy
GP2.2: Plan the Process
GP2.3: Provide Resources
GP2.4: Assign Responsibility
GP2.5: Train People
GP2.6: Manage Configurations
GP2.7: Identify and Involve Relevant Stakeholders
GP2.8: Monitor and Control the Process
GP2.9: Objectively Evaluate Adherence
GP2.10: Review Status with Higher Level Management

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The Business Case for SPI

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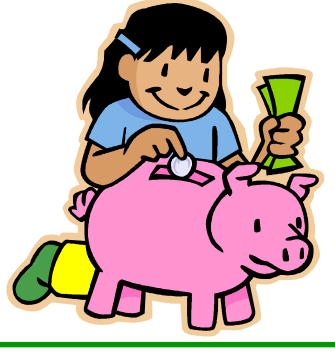
A report by DoD Data & Analysis Center for Software (DACS) found:

- **Application of SPI to "Example organization with example projects":**

Development costs	Reduced 73%
Rework costs	Reduced 96%
Average schedule length	Reduced 37%
Post-release defects	Reduced 80%
Weighted risk likelihood	Reduced 92%
Return on Investment	21:1

- ***A Business Case for SPI Revised - Measuring ROI from Software Engineering and Management*. DACS, September 1999**



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- **Processes and rules are important to do excellent work**
- **A process description and rules help you to find out what to do in a project**
- **By tailoring you find the fastest and cost effective way for your project work**
- **CMMI is a mean to improve processes and rules**
- **CMMI offers you practices that you perform in form of activities and tasks**

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Module

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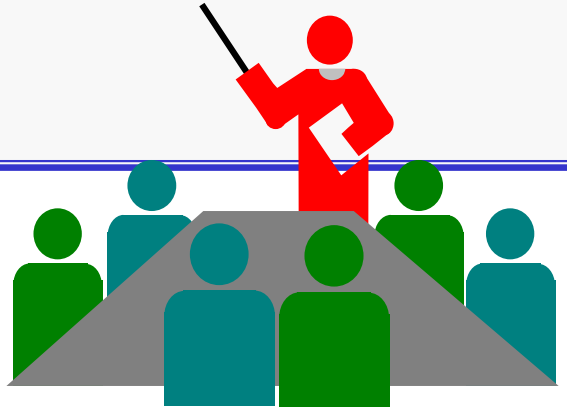
Overview of Standard SW Process and Rules



Objectives:

- **Getting an overview**
- **Knowing elements of the standard software process**
- **Understanding the rules and job contracts**

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History of SW Development Process

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- **May 1997:**
  Start of Business Reengineering
- **Nov 1997:**
  Software Development Process design
- **Jan 1998 - May 1998:**
  Training of all SW Engineers world wide
- **Feb 1999:**
  First Project completed
- **July 1999:**
  Additional Tool Support National Suite
- **Feb 2000:**
  More Projects completed
- **Mar 2005:**
  5th improvement completed - Rules are CMMI based!

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Abbreviations

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- **PL-CP** Project Manager of Customer Project
- **PL-OF** Project Manager for Order Fulfillment
- **PL-DP** Project Manager for Development Project
- **TSS** Technical Sales Support Engineer
- **SE** Sales Engineers
- **LDC** Leading Development Center
- **CDC** Contributing Development Center
- **STL** Skill Team Leader
- **GPM** Group Product Manager
- **HOD** Head of Development in Development Center
- **MD** Managing Director in Development Center
- **SW-DCT** Software Development Coordination Team

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PROCESS MODEL MES 1

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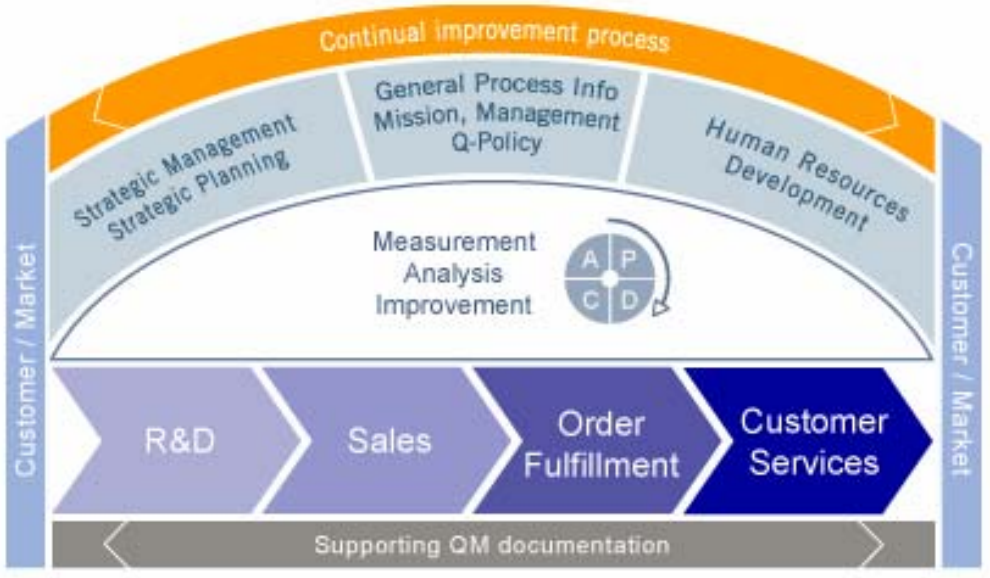

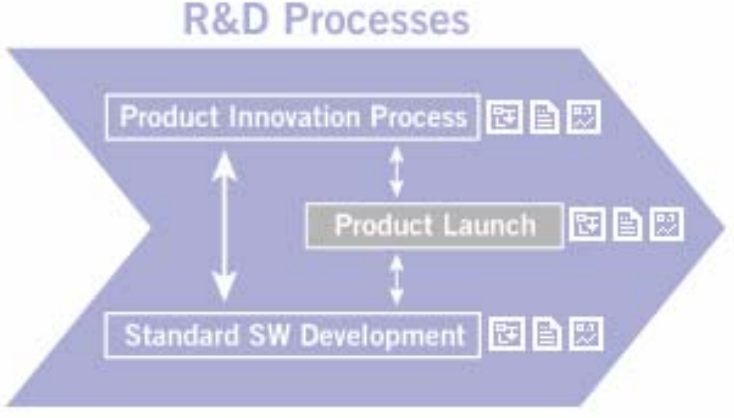

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PROCESS MODEL MES 2

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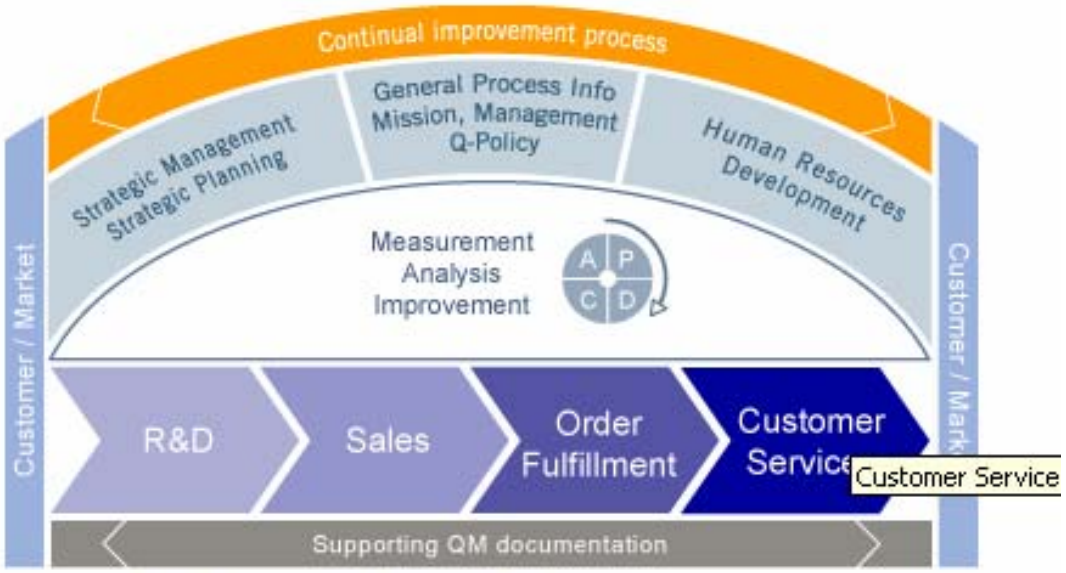

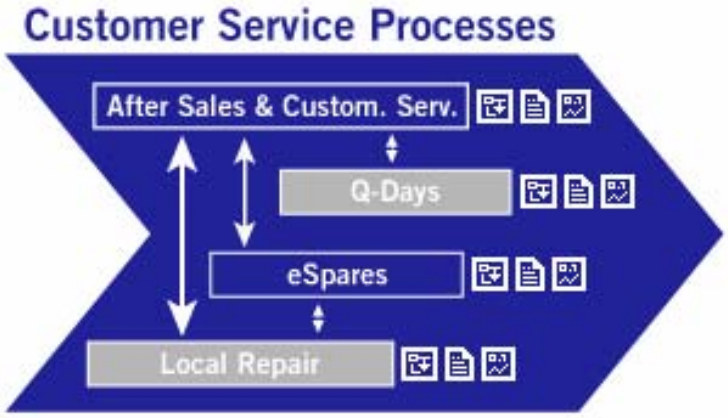

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Standard Software Development Process

Change History

Rev.	Date	
1	12/13 November 1998	Initial definition
2	01 August 2000	(MOT Tryout added)
3	14 October 2000	HOD Meeting
4	22 November 2001	Iterative Process introduced
5	18 October 2003	Documentation Process adapted
6	16 March 2005	Adaptation to CMMI Rules

Exercise: Please take the printout of AVL SBU MES Standard Software Development Process and have a look on it.

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Standard Software Development Process

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Process Overview

Phase of the Process	**Phase A:** Create URS & Set-up Project Organisation	**Phase B:** Creation of SRS	**Phase C:** Design	**Phase D:** Implementation / Module Testing and Integration	**Phase E:** System Testing	**Phase F:** Pilot Customer Commissioning
Preconditions of Phase	PIP-Review 2 Approved rough URS	PIP-Review 3 Signed Development Contract	PIP-Review 4	Software Design Approval	α-Version	β-Version
Objectives of Phase	Development Contract between GPM and PL-DP & Start of Development	Approval of the SRS by GPM	Approval of the Software Design by GPM	α-Version and User Documentation	β-Version	Final Version of Standard Software
Necessary **Tasks** to achieve the Objectives	• PIP-Review 2 • Feasibility Assessment • URS • Project Structure and Master Schedule • Agreement on Resources • PIP-Review 3 • Development contract	• Distribution of work to CDC and LDC • Release orders for Phase B • Creation of URS for components • Creation of SRS (Rapid prototyping) • Identification of re-usable software • Start creation User Documentation • Approval of SRS (PIP-Review 4)	• Adjustment of project structure • Release orders for Phase C • Draft the architectural design • Completion of the Software Design LDC and CDCs • Prepare Test Plan • Design Review (internal) • Software Design Approval by GPM	• Adjustment of project structure • Release orders for Phase D • Implementation and Module Test • Adaptation of SW-Production System • System Integration • Completion of User Documentation	• Release orders for Phase E • Software Test • Bug Fixing • Translation of SW • Translation of Documentation • PIP-Review 5	• Software Installation at a pilot customer • Customer acceptance • PIP-Review 6

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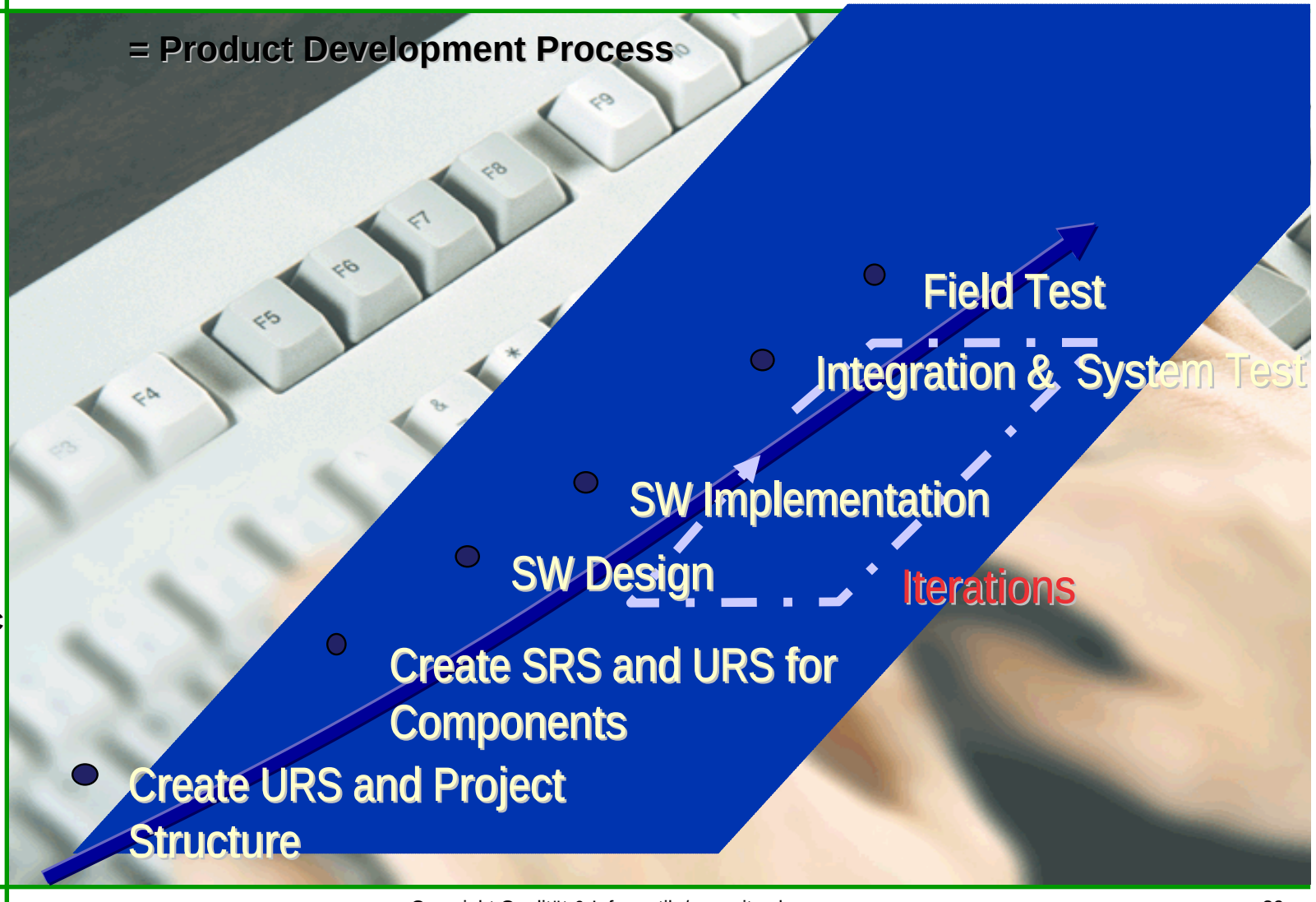

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Iterations, Builds and Versions 1

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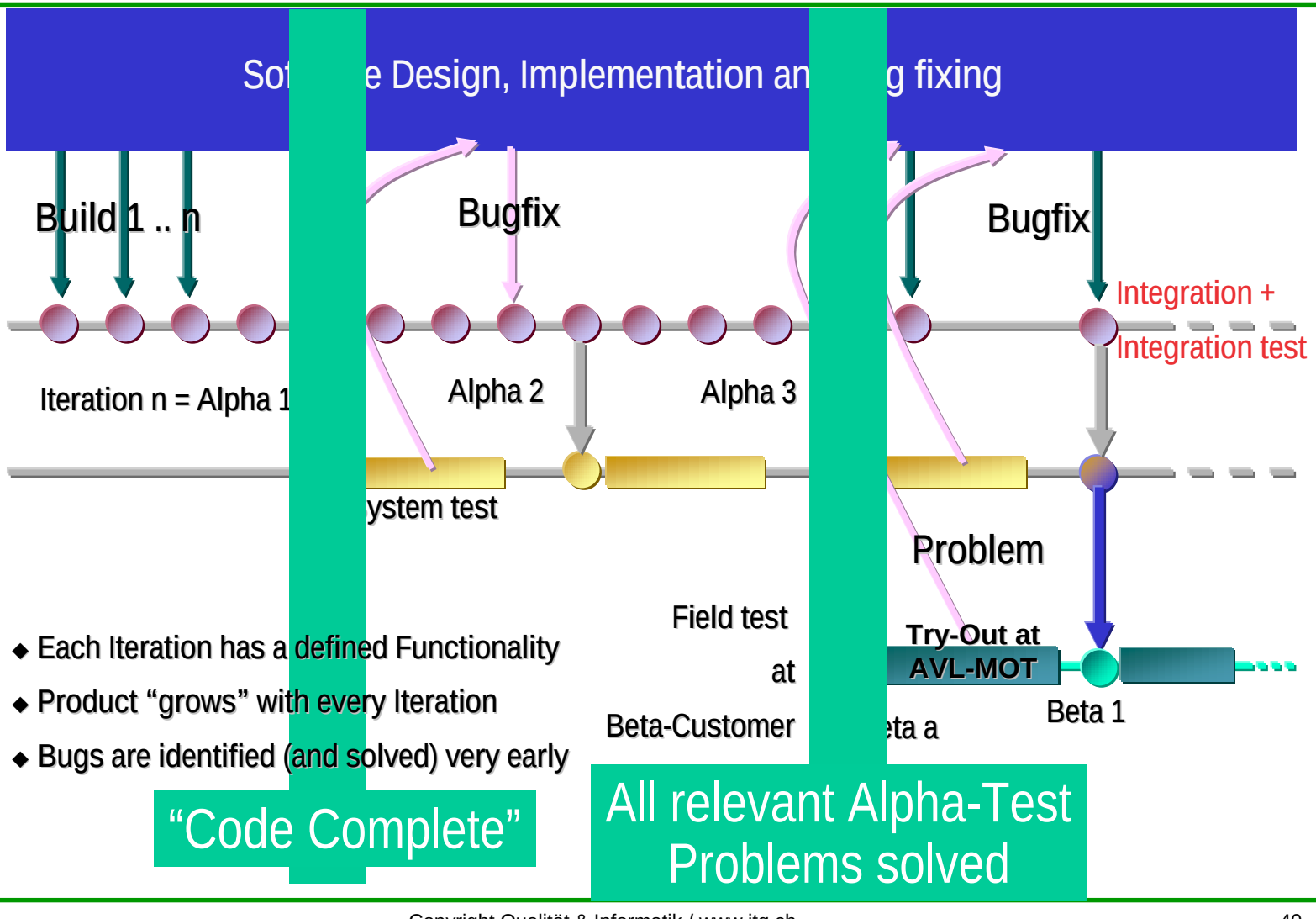

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Iterations, Builds and Versions 2

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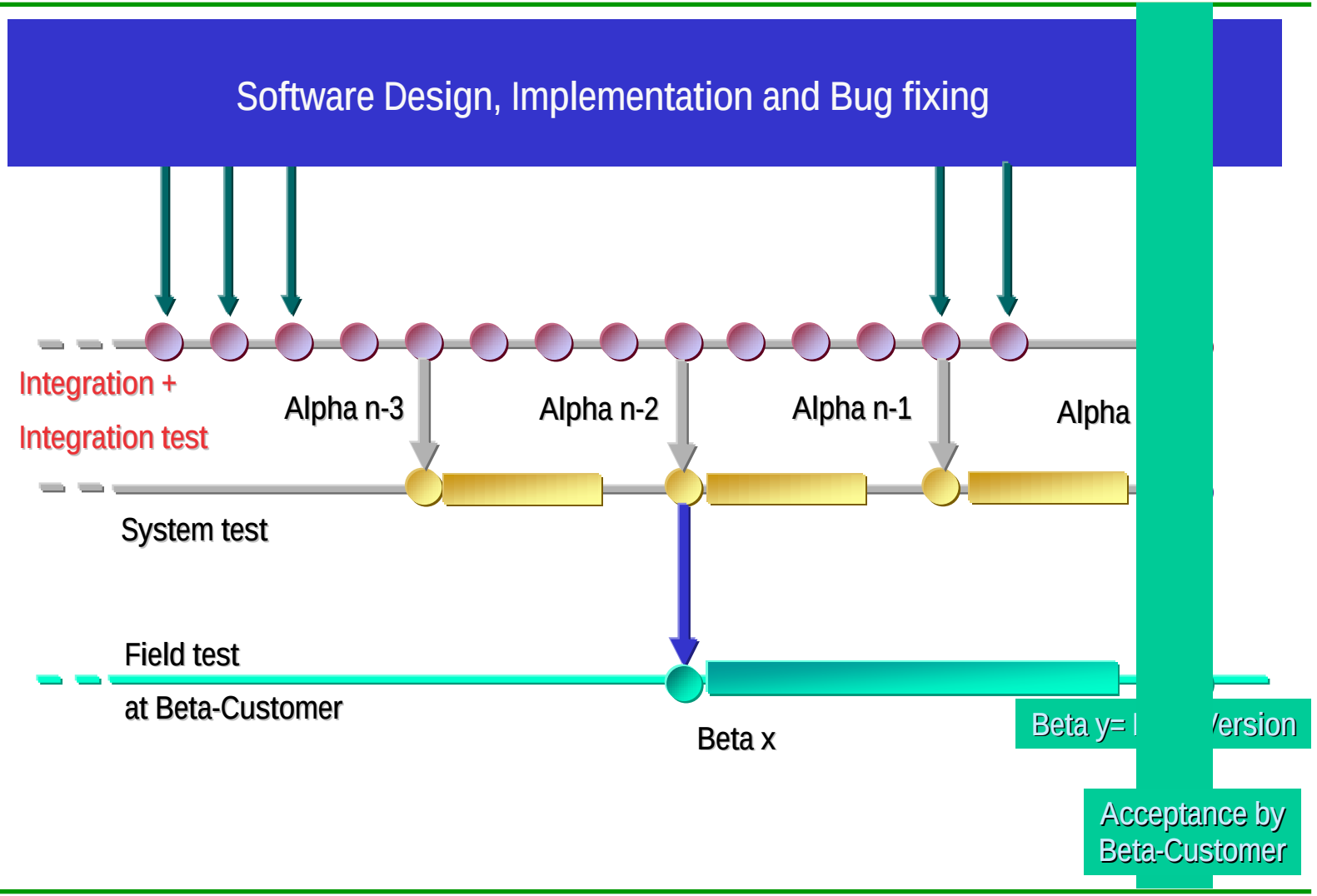

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SW Development Process Rules

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Rule 1	OPF	Organizational Process Focus	derived from CMMI
Rule 2	OPD	Organizational Process Definition	
Rule 3	MA	Measurement and Analysis	
Rule 4	REQM	Requirement Management	
Rule 5	PP	Project Planning	
Rule 6	RD	Requirement Development	
Rule 7	PMC	Project Monitoring and Control	
Rule 8	CM	Configuration Management	
Rule 9	PPQA	Process and Product Quality Assurance	
Rule 10	SAM	Supplier Agreement Management	
Rule 11	OT	Organizational Training	
Rule 12	PI	Product Integration	
Rule 13	DAR	Decision and Analysis Resolution	
Rule 14	RSKM	Risk Management	
Rule 15	TS	Technical Solution	
Rule 16	IPM	Integrated Project Management	
Rule 17	VERVAL	Verification and Validation	
Rule 18	LOCDOC	Localization of User Documentation	AVL specific
Rule 19	NOM	Nomination of functions in SW processes	
Rule 21	ESCAL	Escalation procedures	
Rule 22	NUMB	Product Numbering	
Rule 23	TAILOR	Tailoring Guidelines	
Rule 24	REVIEW	Review and Walkthrough Guideline	
Rule 25	TERMS	Terms in SW Product Structure	
Rule 26	LOCSW	Localization of SW	
Rule 27	CUS	Customer specific SW Development and delivery	

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SW-Maintenance Process “Q-days”

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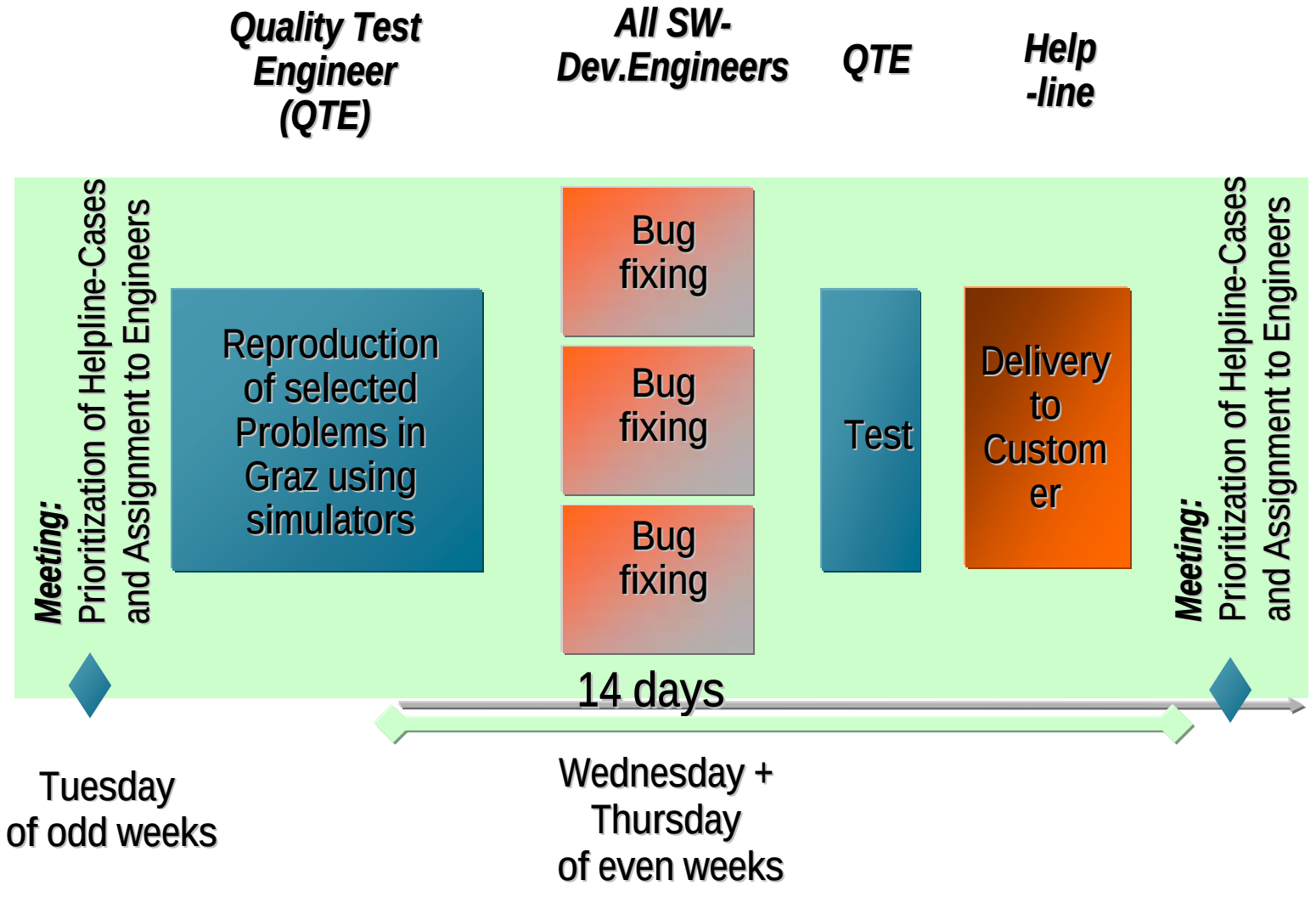

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SW-Maintenance Process “Q-days”

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QDay Rules

Rule 1	Mandatory Input for Q-Day Work Orders
Rule 2	Priority Assessment Meeting
Rule 3	Definition of Q-day states, WO states, Q-day classes and severity types
Rule 4	Task Assignment Meeting
Rule 5	Content of Report in Preparation for Task Assignment Meeting
Rule 6	Preparing SW at test environment if SW at customer site differs from delivered SW
Rule 7	Q-Days Bug Fixing Process
Rule 8	Delivery of Bug Fixes
Rule 9	Activity, if Bug Fix doesn’t work at Customer Site
Rule 10	Procedure, if Bug Fix Effort exceeds the Q-day Capacity
Rule 11	Procedure, if a problem is not reproducible after receiving additional information
Rule 12	Contents of a Service Pack
Rule 14	Procedure to determine the severity, safety- Q-Day Instrumentation & Test Systems relevance and priority level (Q-Day Class) of a Q-Day Case
Rule 15	Escalation Procedure
Rule 16	Guideline for necessary information for creating work orders
Rule 17	Problem Analysis Meeting
Rule 18	Q-Day Support from Developers outside Qdays

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- By tailoring the Standard Software Process you get the Customer Specific Software Process
- The Product Innovation Process (PIP) triggers the Standard Software Process
- PIP design Reviews are very important Quality Gates and control the progress of your projects
- Iterations help you improving and increasing the functionality of your product
- SW-Maintenance Process is called “Q-days” and organizes the work in a cycle of 14 days
- Product and customer specific development use the same process. The differences are described in Rule 27 (CUS)

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Break

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Roles - Job Contracts

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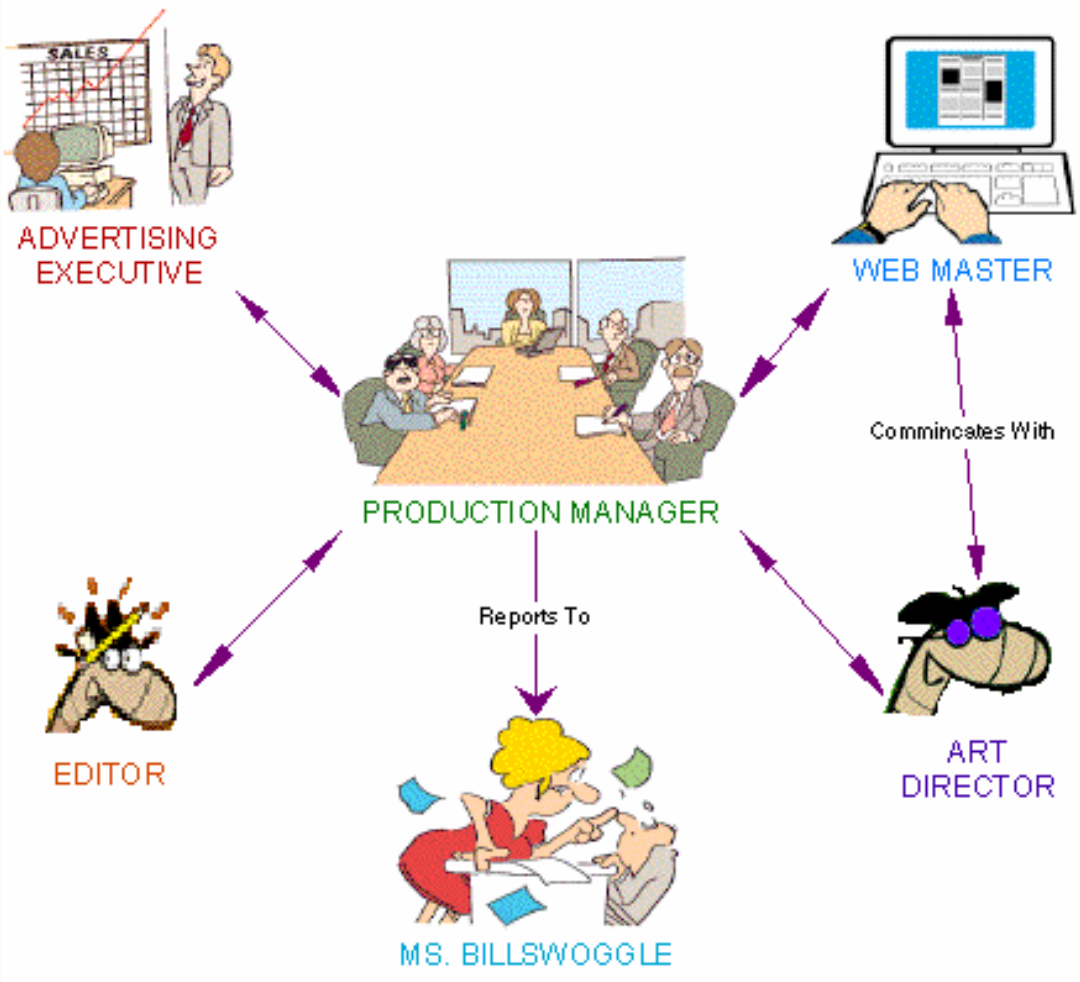

Overview of Job Contracts (Roles)

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Please have a look on the collection of job contracts

- **Questions:**
  - **Who is a GPM**
  - **Who is a PL-DP**
  - **What else?**

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Elements of a Job Contract

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- Duty
- Business Development Tasks
- Operative Task
- Responsibility / Authority

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Exercise Job Contract

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- **Method:** Working in groups of 4 people
- **Timing:** 60‘
- **Form:** One of the group plays the role of head of development. He has to hire a RM, a QTE, and a SLMA. First he has to explain the job contract. The others put questions on duty, business development tasks, operative tasks, and responsibilities / authority.
  For one session of hiring a person for a job contract you have 5 minutes for preparation and 10 minutes of dialogue.
  After one hiring session the role of head of development is changed.
- **Documents:** none
- **Deliverable:** none

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- For each process or rule you have to use job contracts (roles)
- A job contract assigns you duty, tasks and responsibilities
- For hiring project resources and for skill development you need to know job contracts

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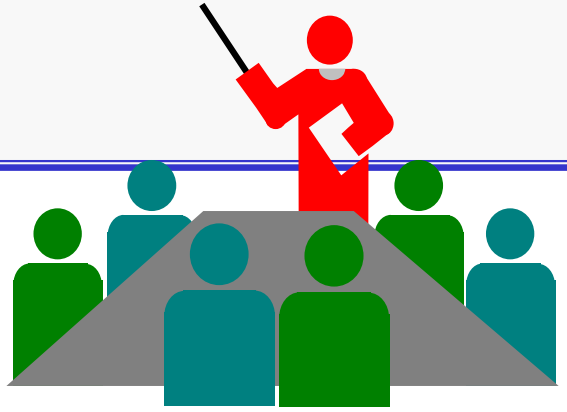
Process Improvement Organization of AVL



Objectives:
Knowing who improves the rules and how
Discuss the elements of process culture

- **Understanding the offerings**
- **Knowing the contact person if you have improvement hints**

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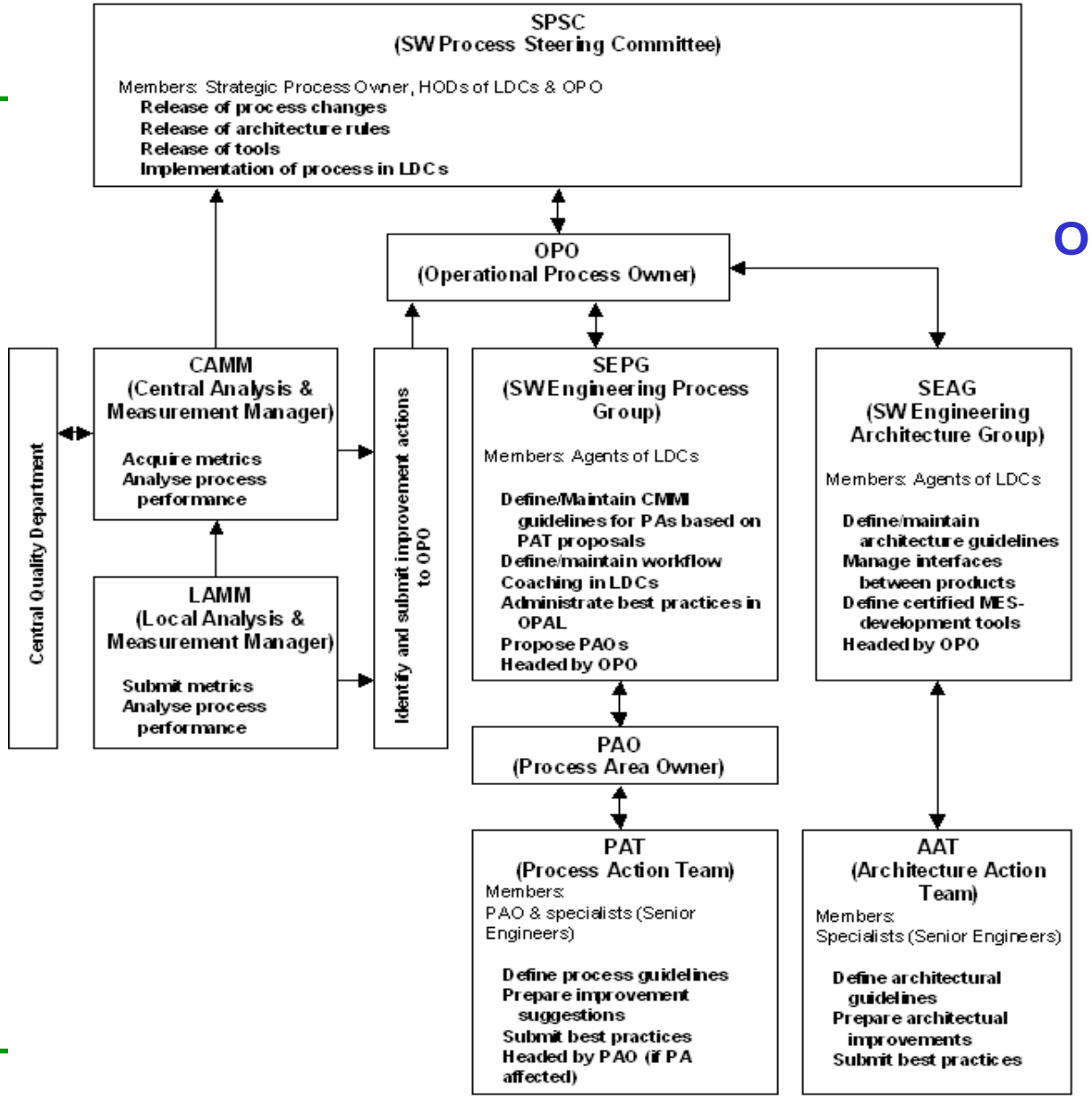
and its SPI Organization



Offering of Process Goodies

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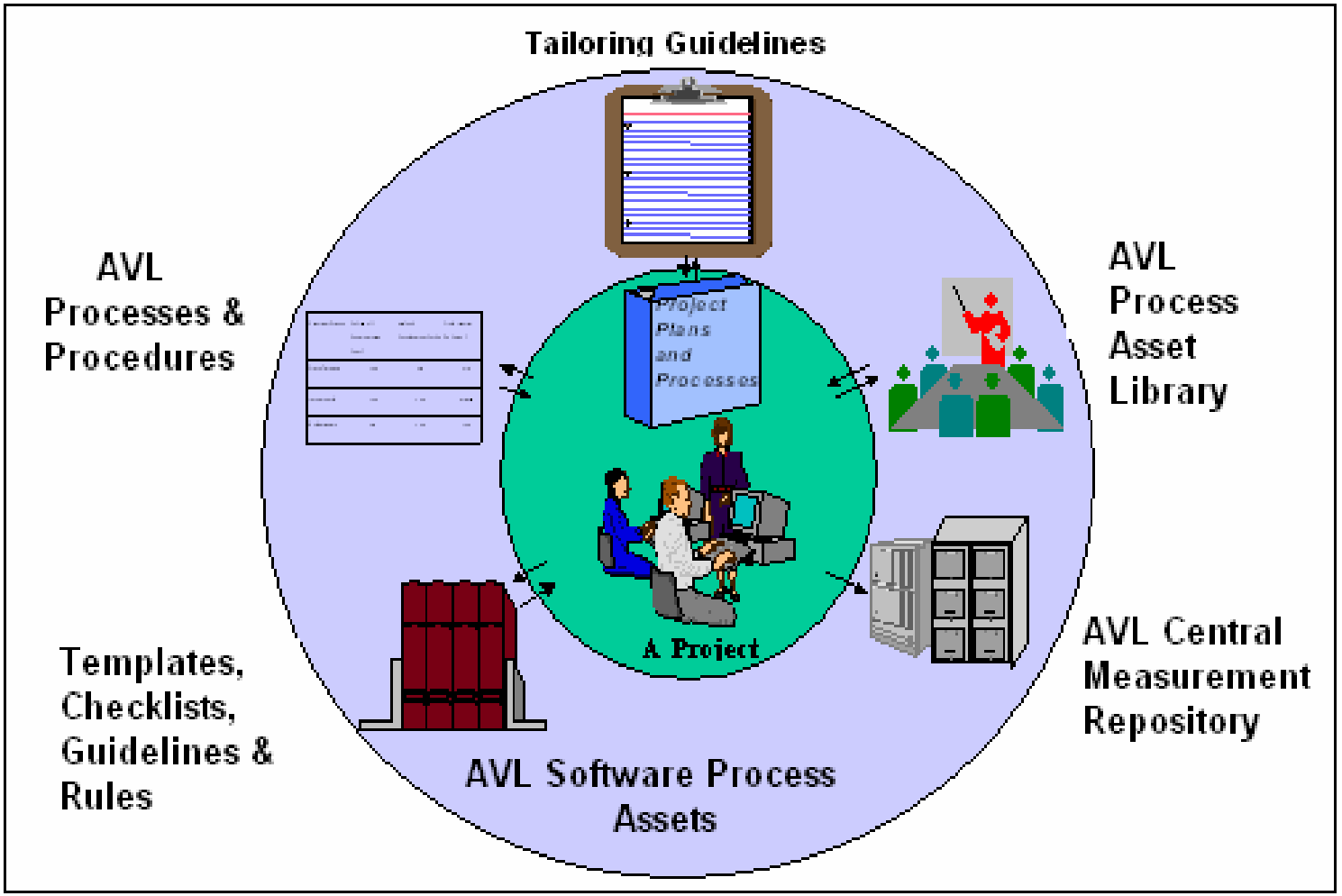

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Content of a Organizational Process Asset Library

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OPAL

• Software Engineering Policy	• Software Version History
• Process Descriptions	• List of Process Owners
• Forms and Templates	• Process Improvement Suggestions
• Examples of Documents Produced	• Training Material
• Business Case Examples	• Quality Assurance Reports (e.g. reports from audits)
• Proposal examples	• Quality Data (e.g. results from inspections)
• Software Development Plans (SDP)	• List of Software Tools under configuration
• Tailored Processes	• Historical Data (e.g. project estimates)
• Tailoring Guidelines	• Software Methods Documentation
• Process Definition Process	• Charter of Software Engineering Process Group
• Lessons Learned	

Process Assets : All artifacts concerning definition, implementation and improvement of all processes and rules as well as data from measurements

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"Let's use it - nothing is better!"

M. Paulweber, 1997

"Only what you can measure, you can improve!"

H. Neuhold, 2005

"One pattern that emerged very strongly was that successful project managers were good process managers."

Th. Haller, 2000

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Any Questions ?

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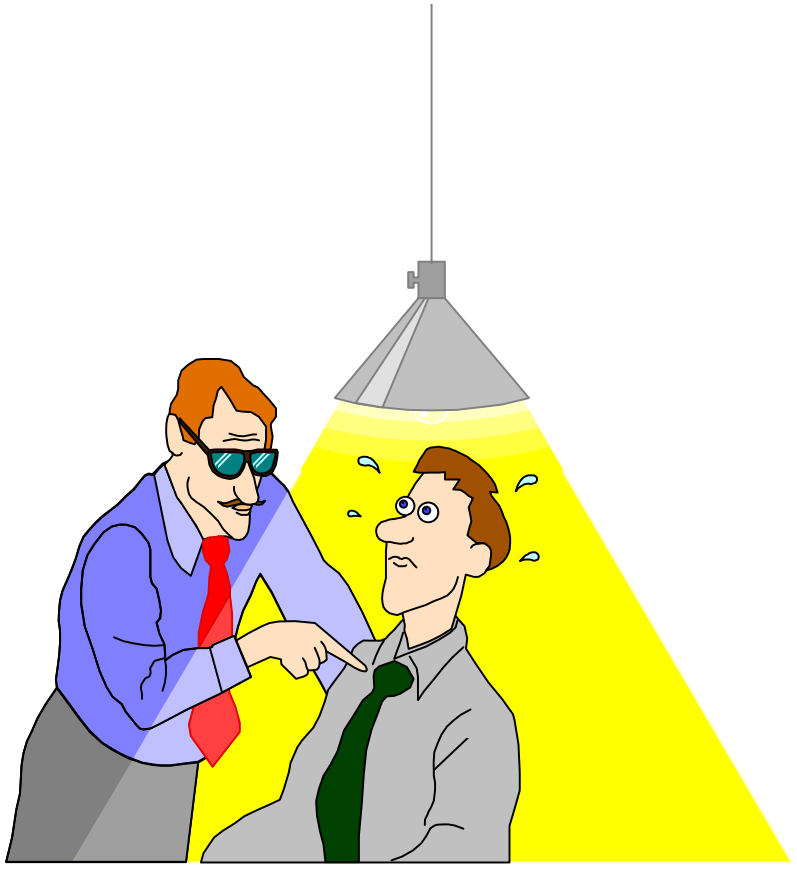

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