INF5181: Process Improvement and Agile Methods in Systems Development

Lecture 01:

Introduction into Process Improvement

Dr. Dietmar Pfahl

email: dietmarp@ifi.uio.no

Fall 2011

Structure of Lecture 01

- Hour 1:
  - General Course Information
  - Motivation for Software Process Improvement (SPI)
- Hour 2:
  - History of (Software) Process Improvement
  - Introduction into SPI Concepts
- Hour 3:
  - Detailed Information on Project and Oral Exam

Welcome to INF5181

- Level: Advanced course at master's level (in English)
- Credits: 10
- Prerequisite: INF1050 – Systems Development (or equivalent)
- Overlap: IN331, INF5180
- 11 Lectures (includes exercises)
- Student tasks:
  - 1 Presentation (part of project)
  - 1 Project (individual) – 80% of grade
  - 1 Final exam (oral) – 20% of grade
- Grade scale: A, B, C, D, E, F

Learning Outcomes

- At the end of the course, the participants will …
  - know characteristics and effects of various development processes, including agile methods
  - understand challenges related to improving processes in systems development organizations

- During the course, the participants will …
  - study and apply basic methods and techniques for problem analysis and for process improvement planning and implementation

Detailed Teaching Plan /1

http://www.uio.no/studier/emner/matnat/ifi/INF5181/h11/undervisningsplan.xml

- **Lecture 1:** Introduction into Process Improvement
- **Lecture 2:** Processes and Process Modeling (Section A)
- **Lecture 3:** Processes and Process Modeling (Section B)
- **Lecture 4:** Flow-based Agile Development (KANBAN)
- **Lecture 5:** Student Presentations
- **Lecture 6:** SPI & Measurement

----------> Draft report due on 20-Oct-2011 at 13:30 (via email)

- **Lecture 7:** Problem Solving and Improvement - by Individuals and in Groups

Detailed Teaching Plan /2

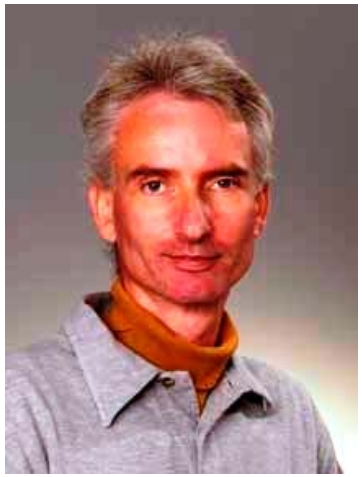
http://www.uio.no/studier/emner/matnat/ifi/INF5181/h11/undervisningsplan.xml

- **Lecture 8:** Industry Presentation: SPI at Skatteetaten (Cost Estimation)
- **Lecture 9:** SPI & Empirical Research Methods
- **Lecture 10:** Learning from Experience
- **Lecture 11:** Process Assessment, Process Improvement Frameworks, Course Review

----------> Final report due on 06-Dec-2011 at 19:59 (via email)

----------> Oral exam on 15-Dec-2011

Instructors

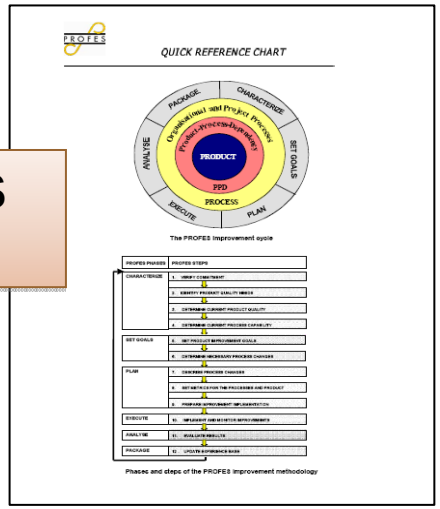


Dietmar Pfahl – dietmarp@ifi.uio.no

Dag Sjøberg – dagsj@ifi.uio.no

Bente Anda – bentea@ifi.uio.no

Literature (Syllabus)



PROFES Manual

- *PROFES - User Manual*, 1999. Profes Consortium.
- *The Goal/Question/Metric method: A practical guide for quality improvement of software development* by Rini van Solingen and Egon Berghout, McGraw-Hill, ISBN 0-07-709553-7, December 1999.
  - NB: Electronic copies of the syllabus will be made available to course participants

- Additionally, the lecture slides are part of the syllabus

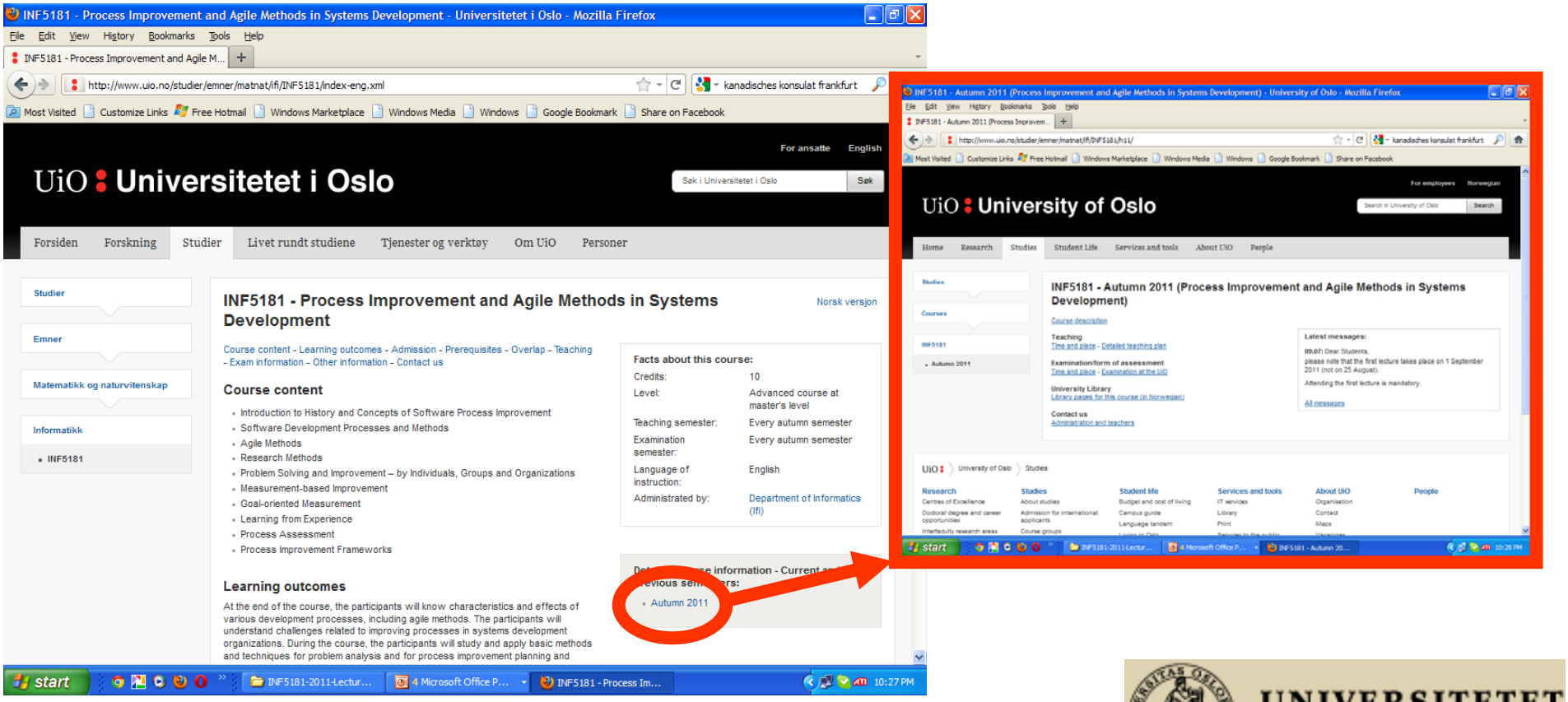
NB: In order to achieve a good project paper & oral exam, self-learning is essential!

Other Literature

- B. Boehm and R. Turner: Balancing Agility and Discipline: A Guide for the Perplexed. Addison-Wesley Longman Publishing Co., Inc, 2003.
- Chrissis, Konrad, Shrum : *CMMI - Guidelines for Process Integration and Product Improvement.* 2003. ISBN: 0-321-15496-7.
- A. Cockburn: Agile Software Development. Boston: Addison-Wesley, 2001. (2nd edition appeared in 2006)
- **T. Dybå, T. Dingsøyr, N. B. Moe: *Praktisk Prosessforbedring*, 2002. Fagbokforlaget. ISBN 8276749143.**
- A. Endres and D. Rombach: A Handbook of Software and Systems Engineering – *Empirical Observations, Laws and Theories*, Addison-Wesley, 2003.
- D. R. Forsyth: Group Dynamics (4th ed.). Pacific Grove, CA: Brooks/Cole, 2006.
- K. Schwaber: Agile Project Management with Scrum. Microsoft Press, 2004.
- P. M. Senge: The Fifth Discipline. The Art and Practice of the Learning Organization. Currency Doubleday, New York, 1990.
- F. Shull, J. Singer and D. I. K. Sjøberg: Advanced Topics in Empirical Software Engineering, Springer-Verlag London (ISBN: 13:978-1-84800-043-8), 2008.

Further Information / Course Web-Page

- URL: http://www.uio.no/studier/emner/matnat/ifi/INF5181/index-eng.xml



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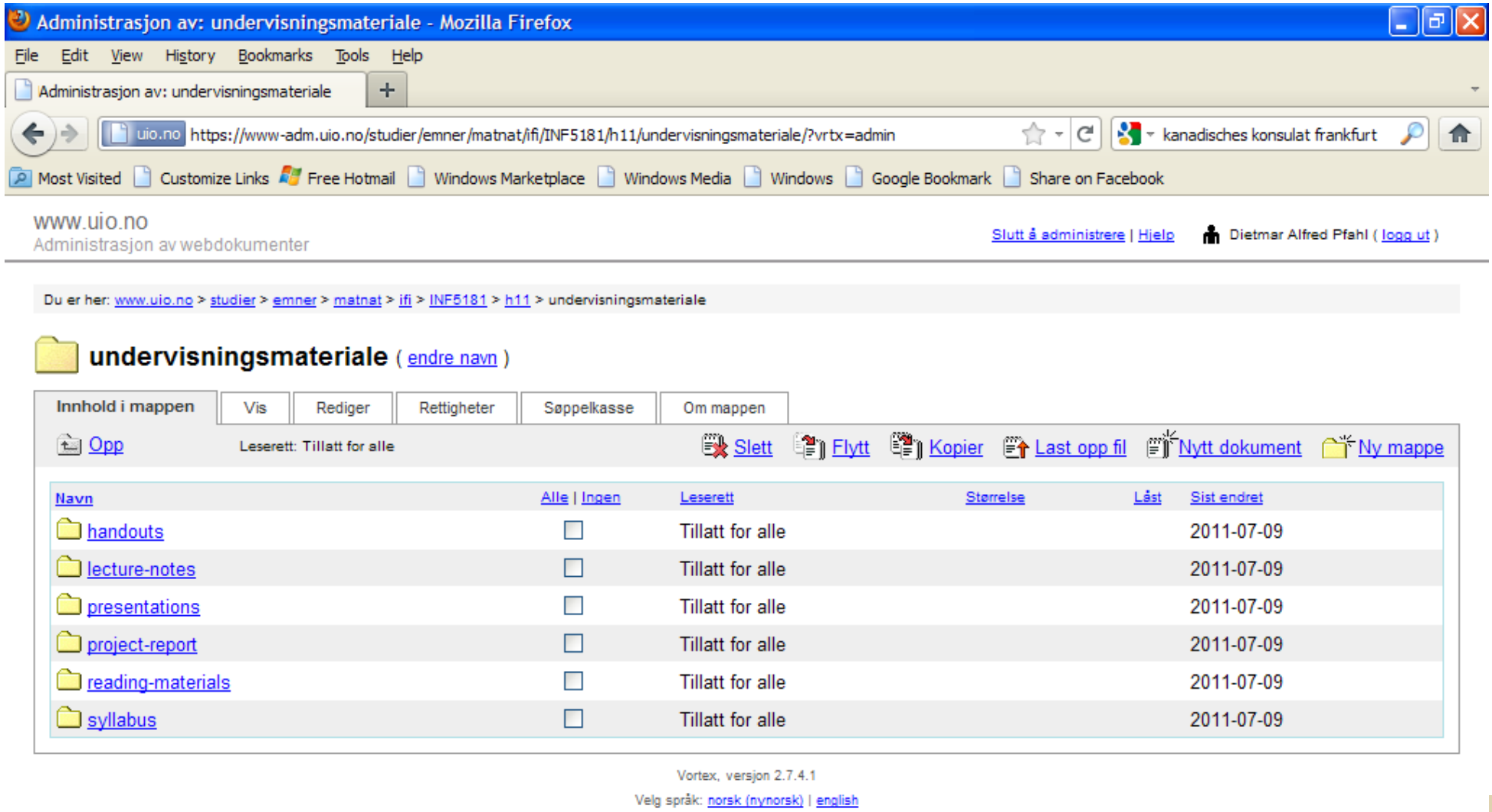
Further Information / Course Materials



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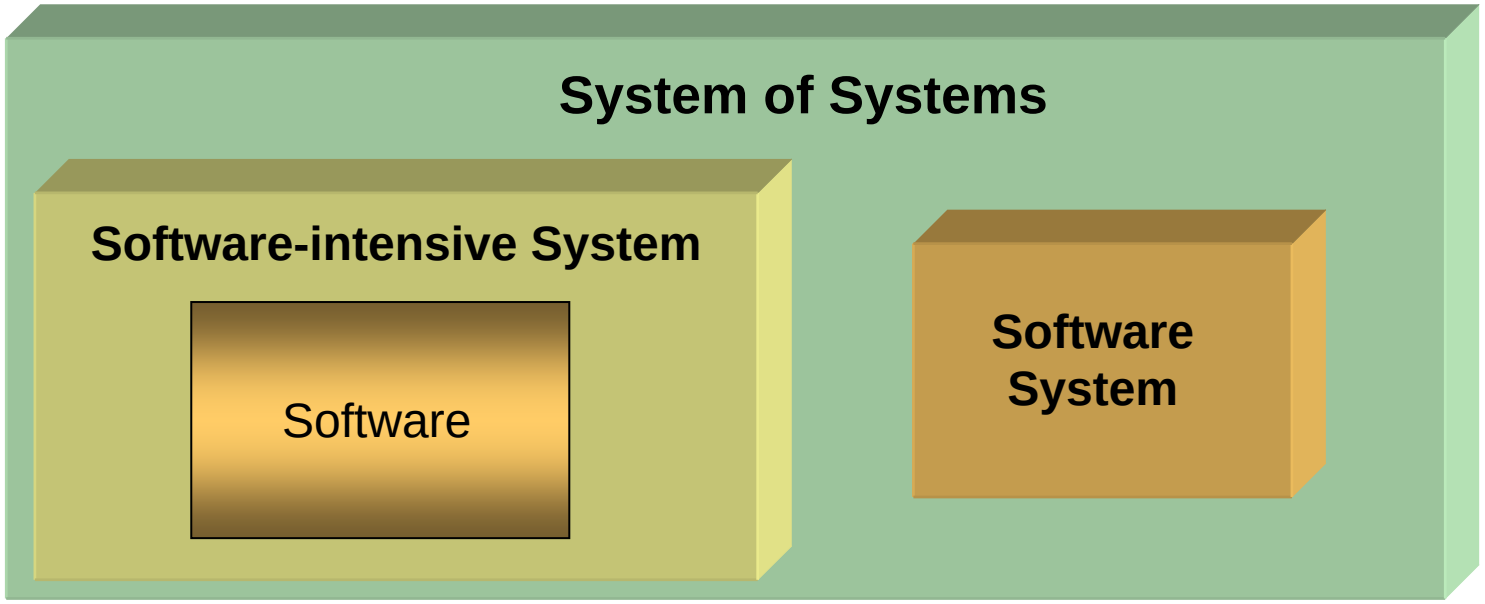
Software/Systems are ubiquitous

- Industry
  - transportation, energy, telecom, medical, fishing, agriculture, …(see next slides)
- Administration
  - banking, insurance, e-government, information systems, payroll systems, HR systems, ERP systems, …
- Science
  - medicine, biology, chemistry, physics, …
- Consumers
  - entertainment, education, information, assistance, …

Software-Intensive Systems /1



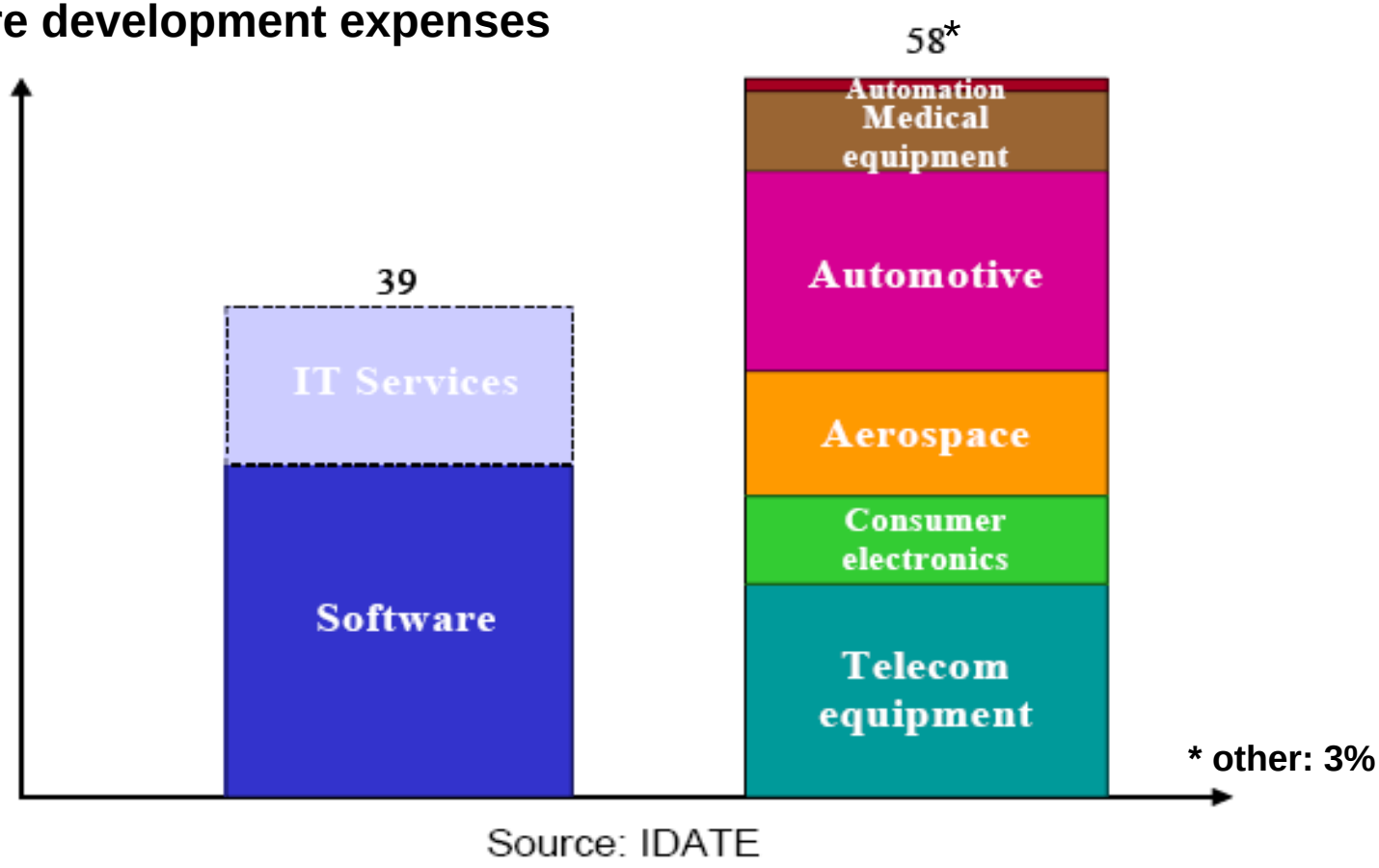
A software-intensive system is a system where software represents a significant element in any of the following:

- system quality (incl. functionality),
- system cost,
- system development risk, time, and resource consumption.

Software-Intensive Systems /2

Shares of software development expenses worldwide (2002)

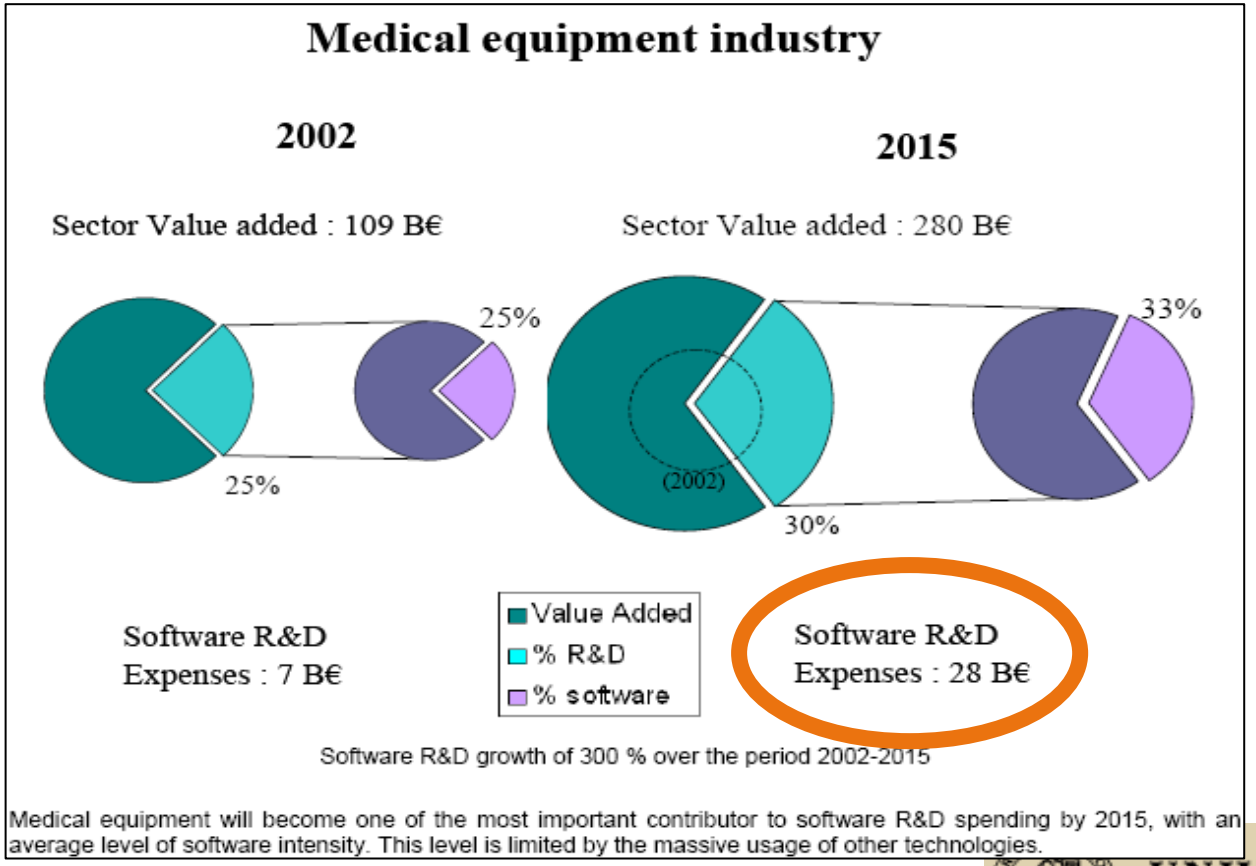
Expenses for software-intensive systems are higher than for IT services or packaged software systems



Software-Intensive Systems /3

- **Example: Increase of Software Intensity in the Medical Equipment Industry from 2002 to 2015 (forecast)**

Importance of software-intensive systems will grow in the future!



Software-Intensive Systems /4

- **Forecasts for 2015: Software R&D effort worldwide for software-intensive systems**

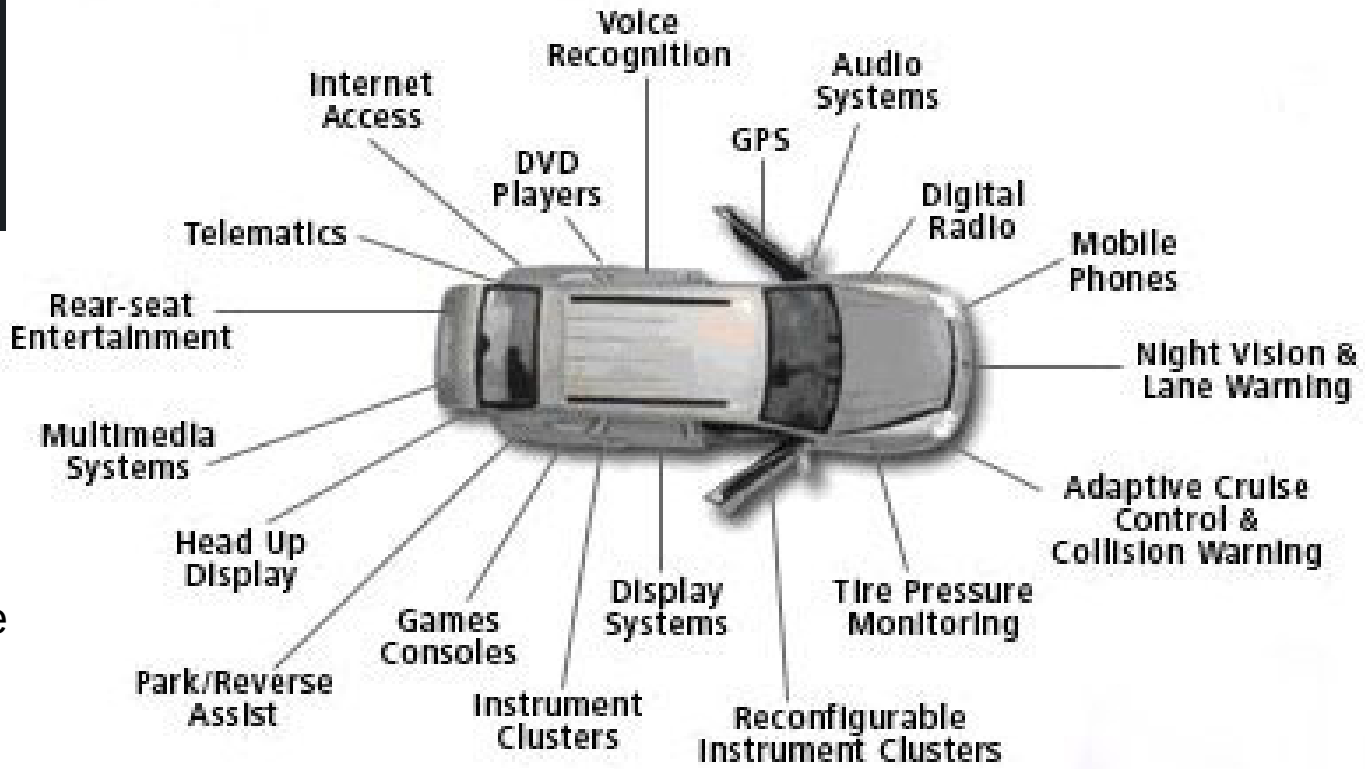
Importance of software-intensive systems will grow in the future!

2015	R&D expenses (Billion EUR)	Software R&D expenses as a percentage of total R&D expenses	Software R&D expenses (Billion EUR)	WW market size (Billion EUR)	Value added (Billion EUR)
Aerospace	51	45%	23	341	191
Automotive	129	35%	45	1 355	705
Consumer Electronics	21	60%	13	197	110
Medical Equipment	84	33%	28	471	280
Telecom Equipment	36	65%	23	257	144
Automation	3	15%	0.5	42	30
TOTAL	**EUR 324 Billion**		**EUR 132 Billion**	**EUR 2 663 Billion**	**EUR 1460 Billion**

Source: IDATE

Software-Intensive Systems /5

- Example: Embedded systems in a car



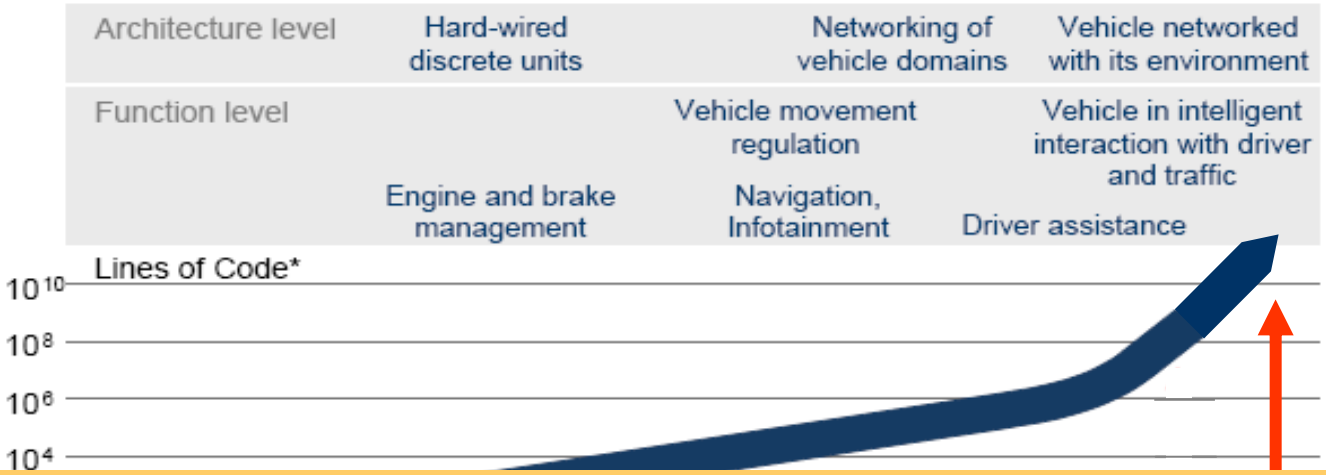
State-of-the practice

- 40-80 ECUs
- 500K-2M Lines of code
- > 50 MB Software
- 3-5 Bus systems

ECU = Electronic Control Unit

Software-Intensive Systems /6

- Example: Embedded systems in a car



State-of-the practic
- 40-80 ECUs
- 500K-2M Lir
- > 50 MB Sof
- 3-5 Bus syst

- Continuously increasing demands for Software-intensive Systems
  - → **Growing complexity**
  - → **Cost and quality problems**
- Consequence:

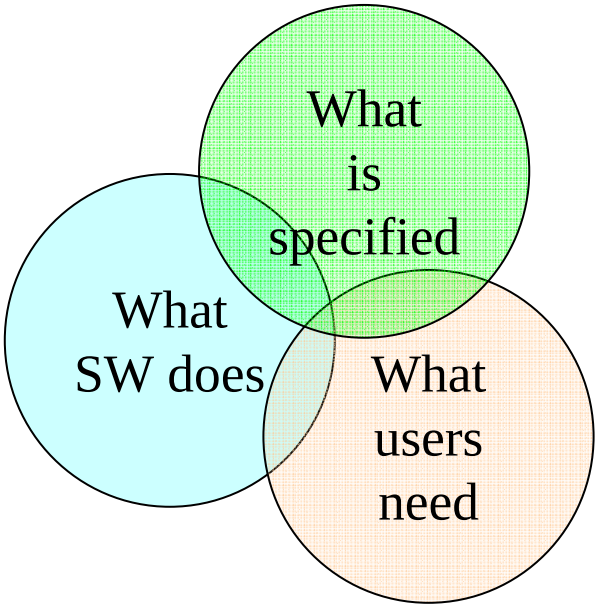
Higher demands for methods, techniques, (development) tools on both technical and managerial level

Software/Systems satisfy needs

- First definition of “Quality” in a standard (1986):

  “*The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs*”

- The “Requirements”-Problem:



Definition of "(Software) Quality"

Entity

- ISO 8402-1986:

  The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs

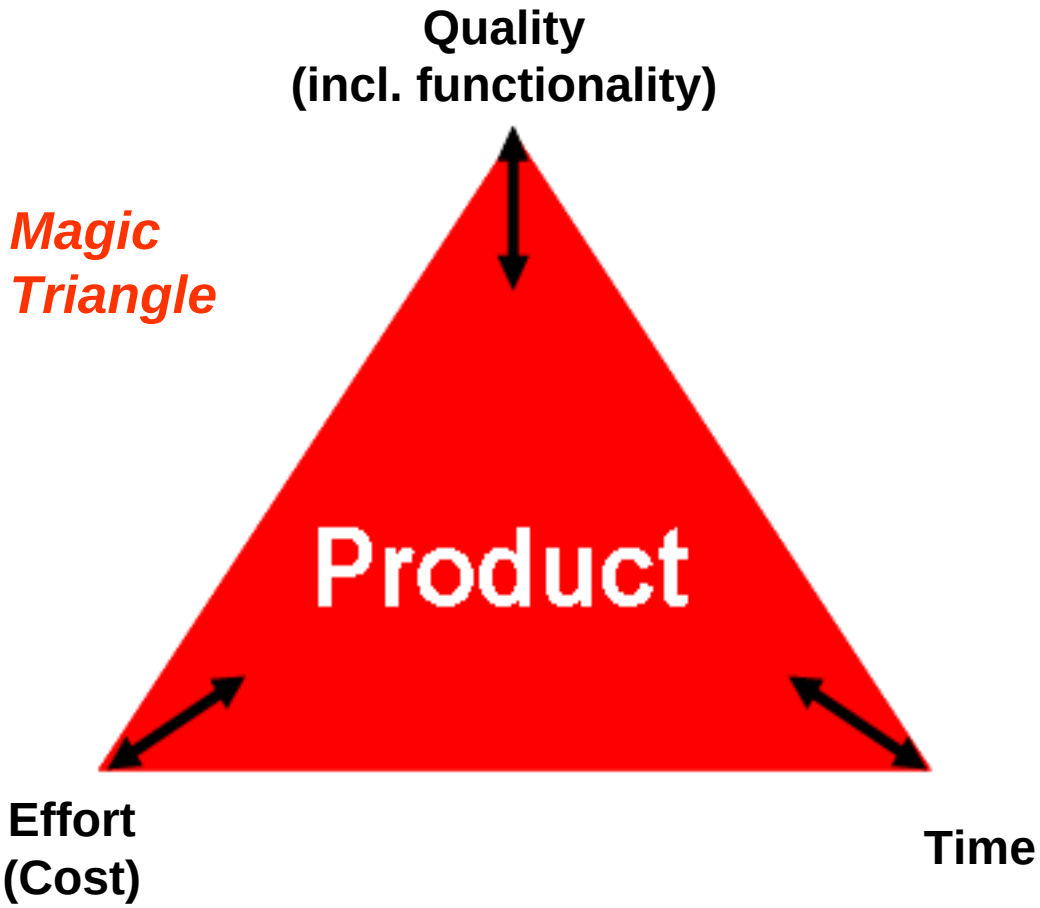
- ISO 9126-1991:

  The totality of features and characteristics of a software product that bear on its ability to satisfy stated or implied needs

- ISO 9000-2005:

  Degree to which a set of inherent characteristics fulfills requirements

Software/Systems consume resources



- 6 Quality Characteristics (ISO 9126 / ISO 25000):
  - Functionality
  - Reliability
  - Usability
  - Efficiency
  - Maintainability
  - Portability
- Effort/Cost and Time:
  - Development
  - Maintenance

Problems with Software/Systems

- Unsatisfactory quality (incl. functionality)
- Exceeding budget
- Late delivery

"Chaos Report" by The Standish Group (1994):

Cost ($)	Succeeded	Challenged	Failed
< 750K	55%	31%	14%
750K-1.5M	33%	45%	22%
1.5M-3M	25%	47%	28%
3M - 6M	15%	52%	33%
6M-10M	8%	51%	41%
> 10M	0%	51%	49%

- Examples of software disasters on next slides

Software Disasters /1

The first quartet of Cluster satellites is destroyed when Europe's Ariane 5 explodes soon after launch on June 4, 1996. Source video: ESA (216k, 18sec QuickTime file).

4th June1996, Kourou / Guyana, ESA

- Boeing 747 (1969)
  - 8.000.000 lines of software
  - Equals about 250.000 pages
- One defect can be fatal!
  - Ariane missile: € 0.5 Billion loss (1996)
  - Lockheed's F-22 Raptor: systems switched off when crossing the date line (2007)
  - UK air traffic centre: 6 years delay due to bugs
  - German Telecom: € 50 million in wrong bills
  - Postbank (NL): 55.000 double withdrawals
  - ... many other examples exist!!!

Software Disasters /2

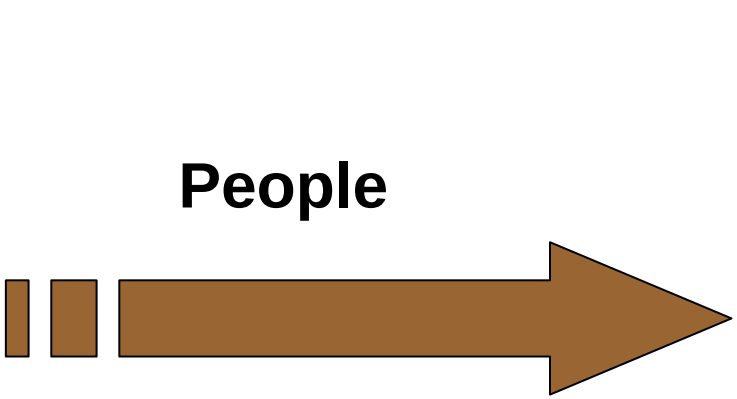
Automated baggage system at Denver International Airport

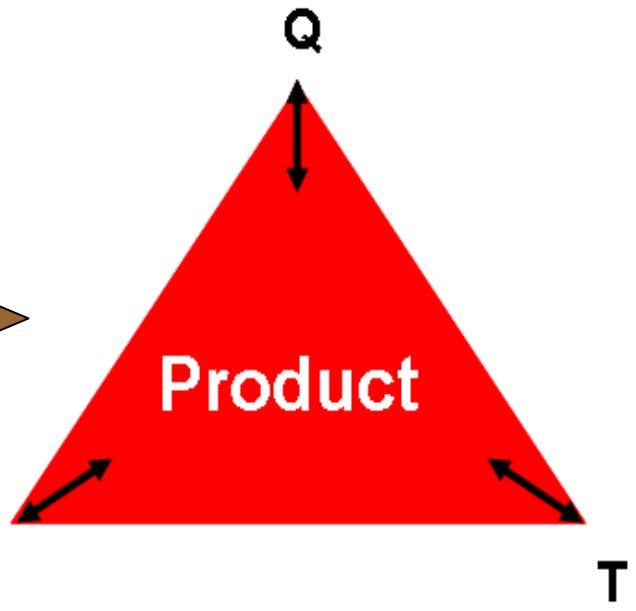
- The airport's software-controlled baggage system was supposed to reduce flight delays, shorten waiting times at luggage carousels, and save airlines' labor costs.
- An opening originally scheduled for October 31, 1993 with a single system for all three concourses turned into a February 28, 1995 opening with separate systems for each concourse, with varying degrees of automation.
- The system's $186 million in original construction costs grew by $1 million per day during months of modifications and repairs.
- Incoming flights never made use of the system, and only United, DIA's dominant airline, used it for outgoing flights.
- The automated baggage system never worked well, and in August 2005, it became public knowledge that United would abandon the system, a decision that would save them $1 million in monthly maintenance costs.
- The 40-year-old company responsible for the design of the automated system, BAE Automated Systems of Carrollton, Texas, at one time responsible for 90% of the baggage systems in the U.S., was acquired in 2002 by G&T Conveyor Company, Inc.

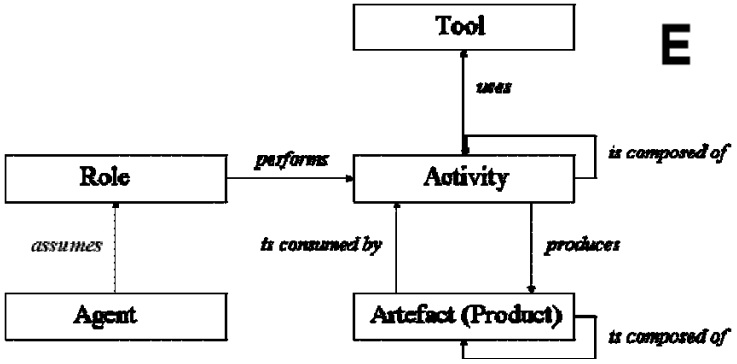
(Source: Wikipedia http://en.wikipedia.org/wiki/Denver_International_Airport)

Central Role of People & Process

- People:
  - High variation of productivity
- Process:
  - A set of activities or operations for obtaining something.
  - A method (= a way of doing something in order to achieve a goal)







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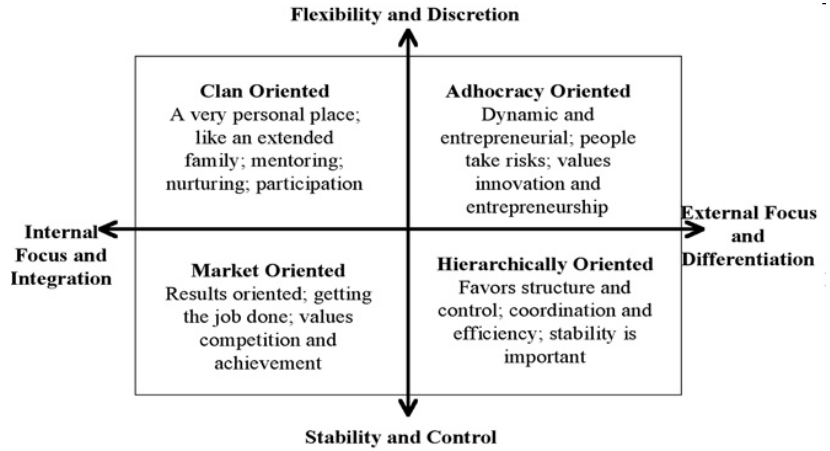
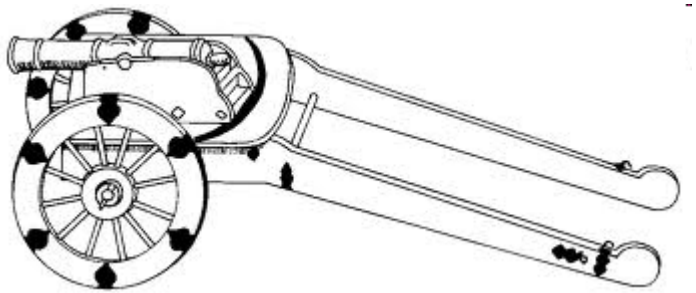
Aspects/Elements of (Process) Improvement

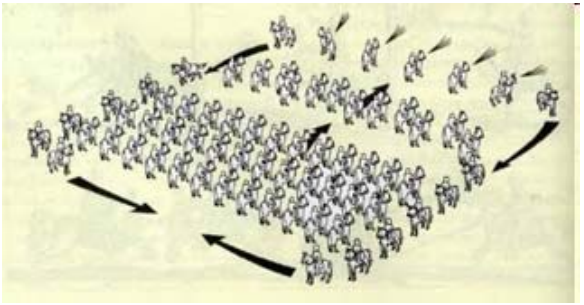
- Tools
- Techniques
- Measurement
- Standardisation
- Education/Training
- Motivation
- Organisation
- Goals
- Culture
- …



Warfare /1



- Tools: weapons (club, lance, bow and arrow, pistol, rifle, cannon, horse, stirrup, wagon, ship, plane, tank, missile, radio, radar, satellite, encryption, …)
- Techniques: tactics (formation, firing, cavalry attack, siege, strike team, integrated battle group, …)
- Measurement: size, distance, firepower, body count, …
- Standardisation: uniform, marching step, rank, language, barracks, weapon systems, …



Warfare /2

- Education/Training: drill, basic training (boot camp), military academy, research, …
- Motivation: conscription, propaganda, reward, punishment, …
- Organisation: plan-driven, flexible, centralised (hierarchical) versus decentralised (autonomous), …
- Goals: common goal? accepted goal? known goal?
- Culture: appreciation of discipline and fulfilment of duty, appreciation of fighting as a means for conflict resolution, patriotism, heroism, nationalism, …
- …

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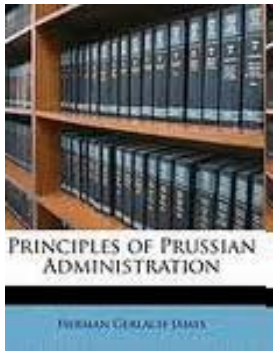
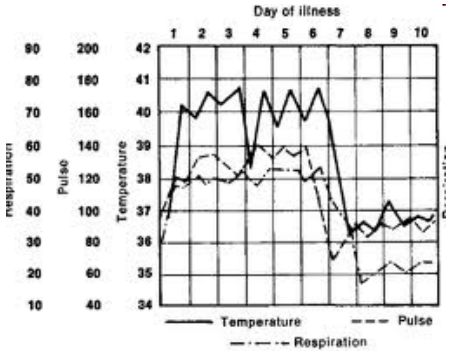
Public Administration

- Imperial China: strict education and selection of public servants exclusively based on knowledge and merit
  - → Little corruption
  - → High efficiency and effectiveness

- Prussia (19th century): highly standardised education and processes, strict obedience, high degree of identification with state and duty
  - → High public esteem
  - → High efficiency and effectiveness



Medical Care



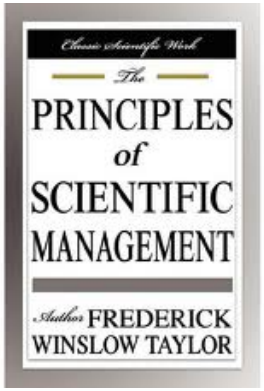
- Florence Nightingale (1820-1910)
  - Probably the first process improver in the health sector (see her book: *Notes on Nursing*, 1860)
  - Introduced, among other things, visualizing the ”quality” in hospitals. This led to enormous improvements – death rates decreased from 42% to 2% (according to Jens Dahlgaard)

- BTW: Recently, it was estimated that there are approximately 98,000 deaths per year in the United States resulting from medical errors. (Kohn, L.T., Corrigan, J.M., Donaldson, M.S., (eds.): To Err is Human: Building a Safer Health System. National Academy Press, Washington DC (1999)

Production /1

- In Frederick Winslow Taylor's book «Principles of scientific management» (1911) the following principles were highlighted:
  - Replace rule-of-thumb work methods with methods based on a scientific study of the tasks
  - Scientifically select, train, and develop each worker rather than passively leaving them to train themselves
  - Cooperate with the workers to ensure that the scientifically developed methods are being followed
  - Divide work appropriately between managers and workers:
    - Managers apply scientific principles to plan the work tasks
    - Workers perform the work tasks
  - [See URL: http://www.netmba.com/mgmt/scientific/]

(1856 – 1915)

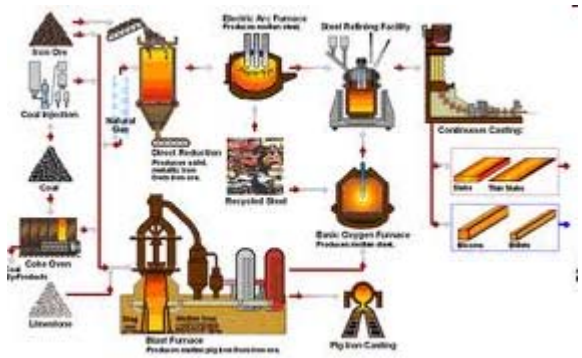


Production /2

- One of the methods Taylor frequently used in the improvement work was:
  - Find 10 to 15 workers (preferably from different groups) who have shown particularly good performance in the work at hand.
  - Study the sequence of the elementary operations and also how the operations are carried out.
  - Measure the time which is required to carry out the elementary operations and choose the fastest methods to do operations.
  - Eliminate all erroneous movements, slower movements and unnecessary movements.
  - Arrange in a sequence only the fastest (efficient) and best (effective) movements.

FIGURE 4.—STOP WATCH WITH DECIMAL FACE

Production /3



- Taylor claims that with his principles in the steel industry productivity increased from 12.5 tons per worker per day to 47.5 tons per worker per day

- The success of the conveyor belt (assembly line) re-confirmed the idea of scientific management
  - Ford Motor Company

Service

Attempts to transfer Taylorism to service industry

- Call centers
- Fast food restaurant chains

Example checklist (fast food restaurant):

Contact the customer	Yes	No
1. Smile	_	_
2. Genuine greetings	_	_
3. Eye contact	_	_
.....		
Say thank you to the customer and welcome her/him back		
1. Always say “thank you”	_	_
2. The “thank you” must appear as “real”	_	_
3. Eye contact	_	_
4. The customer is welcomed back	_	_

Construction

- Streets (Roman Empire, French Revolution)
- Bridges (wood, stone, iron, steel)
- Houses (wood, stone, brick, multi-storey)
- Skyscrapers
- Transportation systems (ship, locomotive, car, plane, missile)

→ Involves design processes!
→ Civil Engineering, Mechanical Engineering, …
… with well-defined tools, techniques, standards, education
… based on physics, chemistry, mathematics

What's special about software?

- SW development is a design process
  - Requires knowledge and creativity (not only skill and experience)

- Software is not tangible (not "physical")
  - Natural laws irrelevant (only relevant for HW)
  - Often large design teams

  } **"Soft Factors" dominate!**

  - High degree of flexibility/changeability of artefacts
  - Measurement of size, complexity, quality characteristics not (yet?) well-defined (different to physics)

Milestones in improving SW development

- Tools (generic): operating system, programming language, compiler, editor, data base, modeling language, code generator, case tool, IDE, framework, …
- Techniques: abstraction, modularisation, information hiding, structured analysis & design, object-orientation, modeling, estimation, quality assurance
- Standardisation: coding standards, architecture and design patterns, COTS, …
- Organisation: hierarchical, functional, cross-functional, local, distributed, agile …
- Education & Training: computer science, software engineering

BUT: There is no silver bullet!

Which process is best depends on the situation/context:

- Type of product (requirements: quality & functionality; level of consequences in case of failure)
- Type of project (size, geographical distribution, configuration, novelty/familiarity)
- Type of people available (education, experience with and knowledge about product, experience with development tools/techniques/process, “chemistry”, personal goals, motivation)
- Type of culture (company, country/region)
- …

And …

… there are people who think that advances in software development productivity and quality are mainly due to the huge (and fast) advances in HW tool support (processor speed, storage size, computer architecture, …).

Scientific Management and “Modern” Process Improvement

- Similarities between scientific management and today’s product and process improvement frameworks with regard to
  - Principle of systematic approach to improvement
  - Focus on people
  - Description of processes
  - Division of work
- Thus it’s worthwhile to study the successes of scientific management – but also their disadvantages (in order to learn from both).

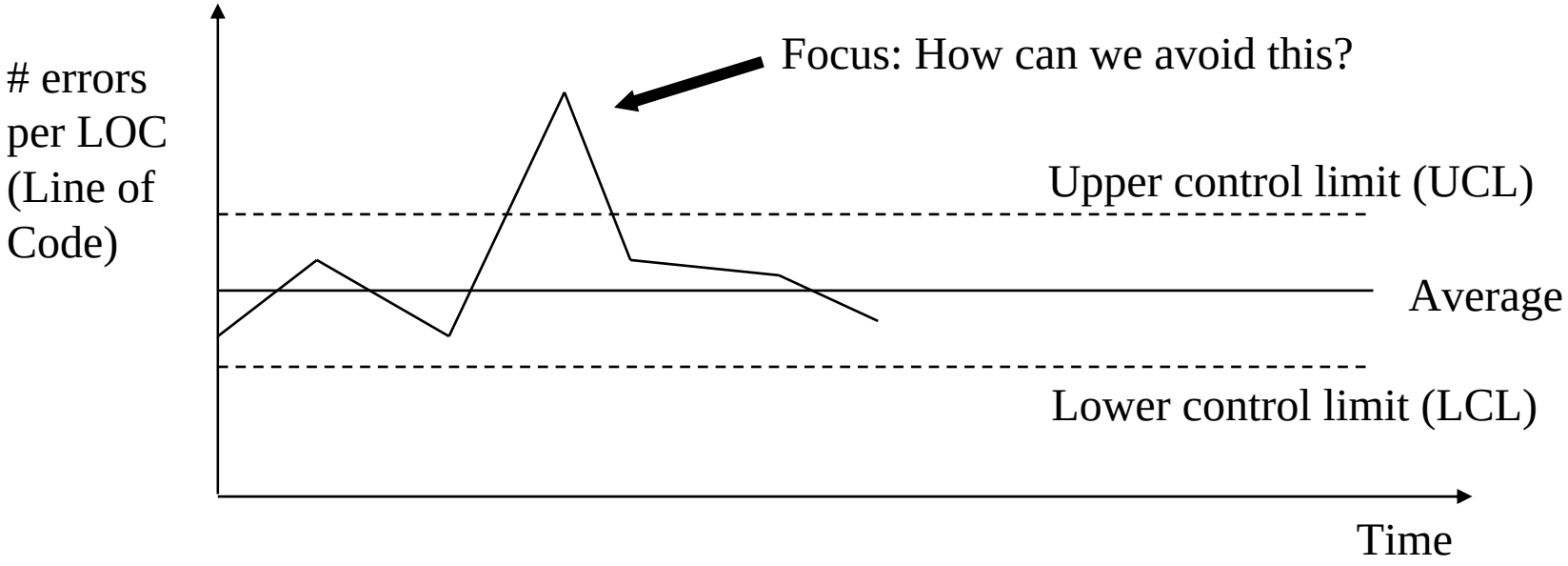
William Edwards Deming

- Doctorate in “mathematical physics” from Yale. Taught mathematics and statistics from 1930 to 1946, head of department from 1933
  - Invited Dr. Walter Shewhart to give lectures in his department.
  - Shewhart is the “father” of the main principles behind statistical processes control and also was the inventor of the “Plan – Do – Check – Act” cycle
- Strong instigator for the use of statistics and measurement in production processes
- Puts much stress on management and leadership.
  - While workers might only be able to (individually) influence quality by a small percentage (say 15%), there rests much responsibility on management to design the processes right and to pick the right processes for monitoring.
  - 14 Management Principles (→ Handout)
- Played an important role in Japan’s development to become a leading industrial nation after the second world war.

“In God we trust, all others must bring data.”

W. E. Deming (1900-1993)

Statistical Process Control (→ Six-Sigma)



Assumption: Variation of values between the dashed lines are due to many small single occurrences ("normal variation"), while deviation beyond this is due to single occurrences with a big effect. It is these single occurrences that process improvers want to understand

NB: Deviations can be positive or negative → learn from both!

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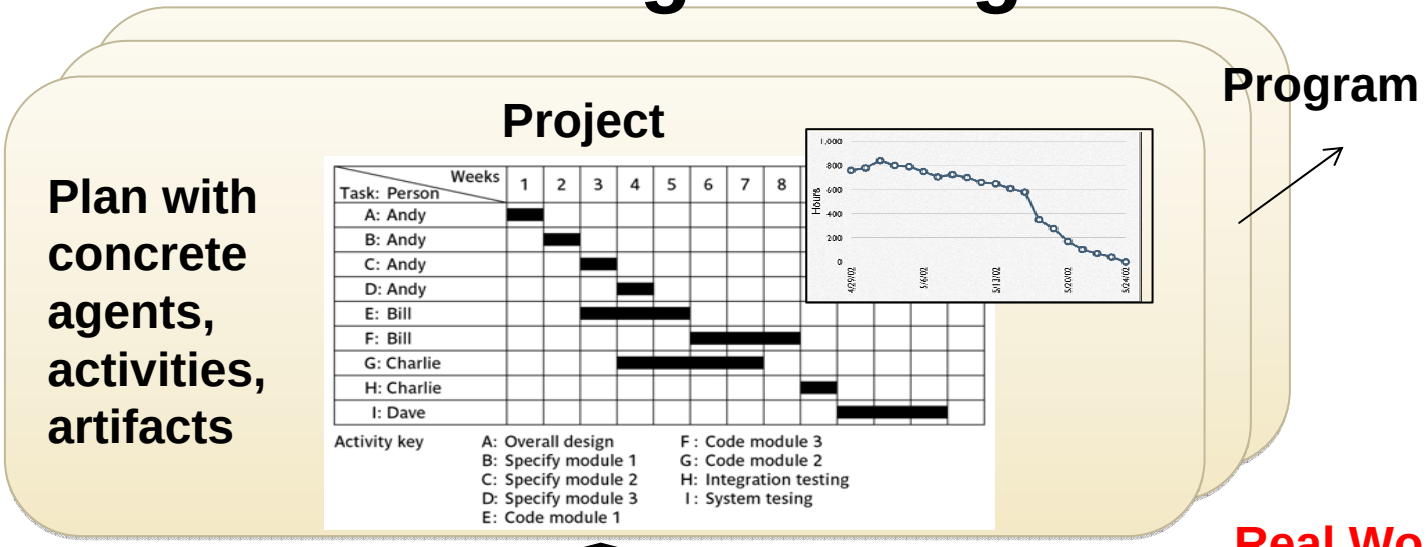
The six Ps in software engineering

- **Product**
- **Process**
- **People**
- Program
- Project
- Plan

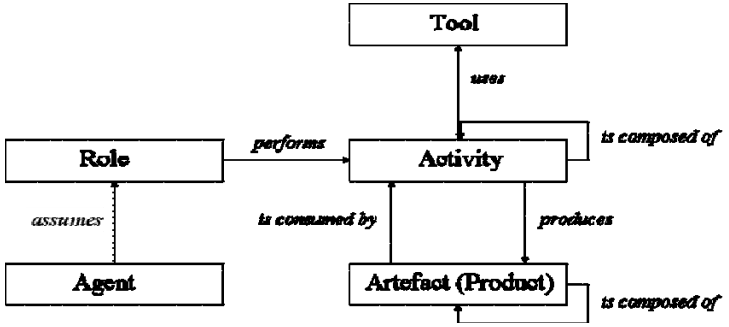


Real World

Model World

Process (prescriptive & descriptive)

People (abstract)



Products (abstract)

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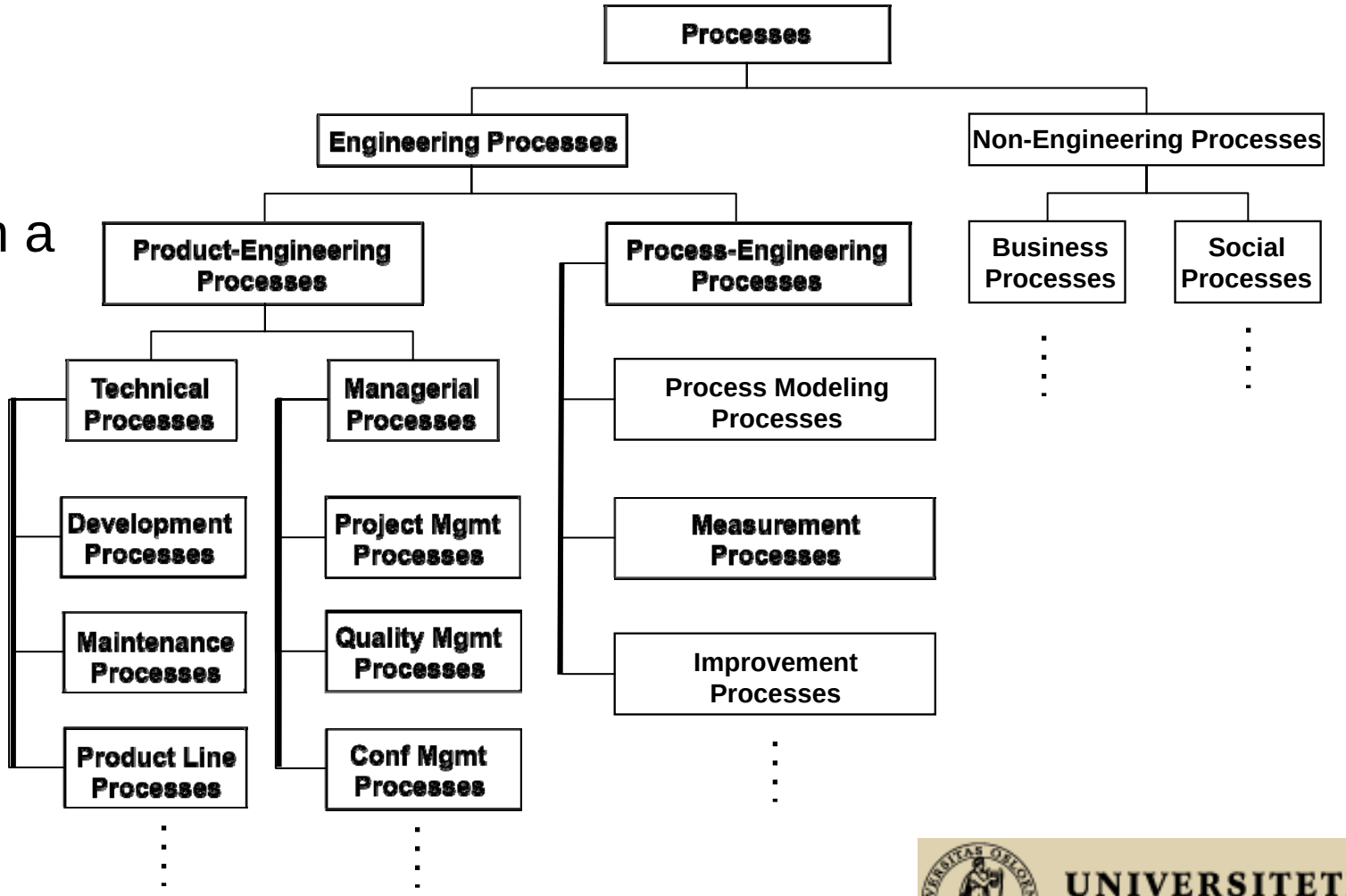
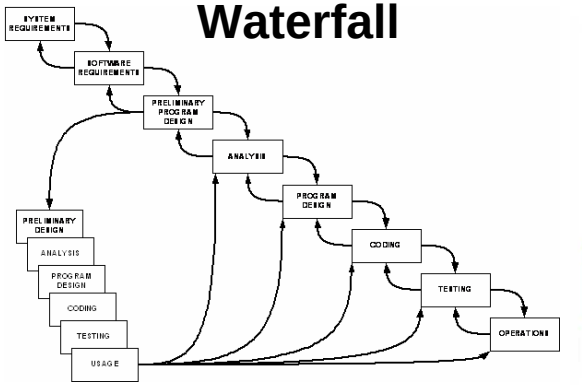
Process taxonomy

- What are typical processes in a software project?

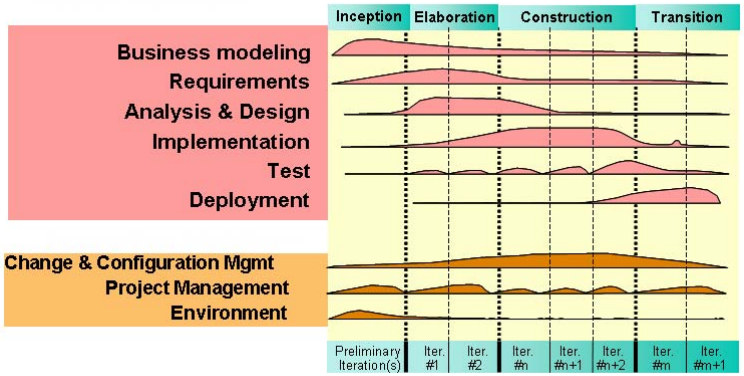


Software process examples

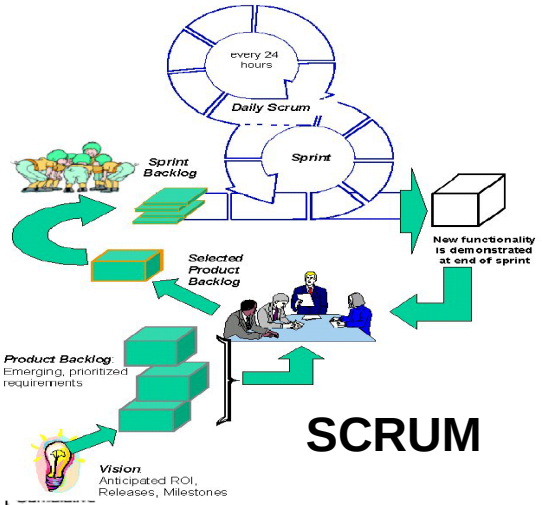
Waterfall



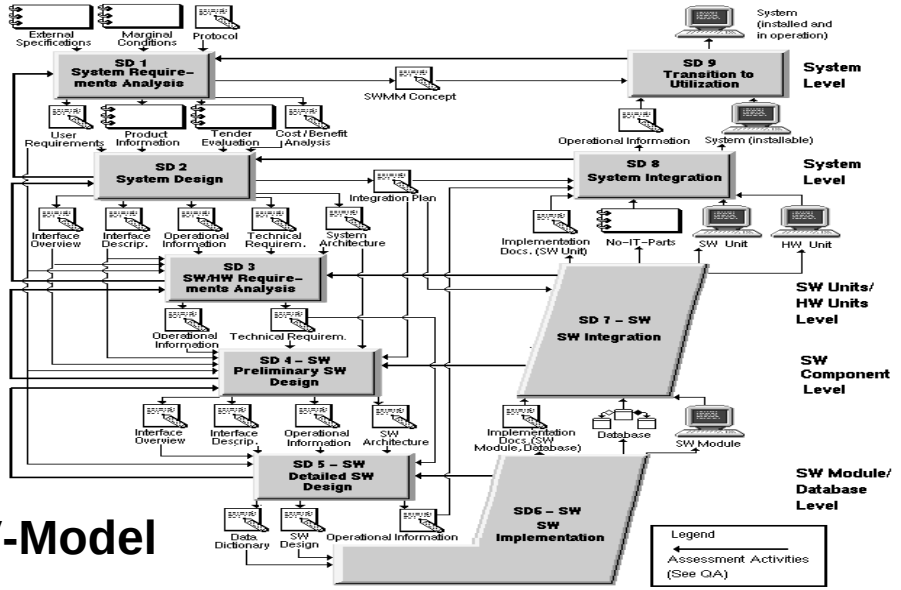
RUP



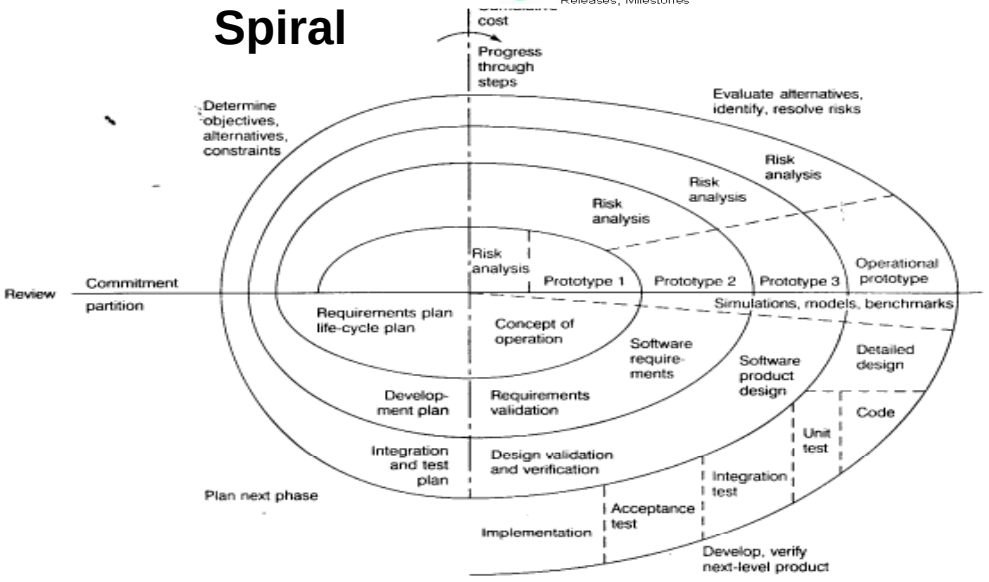
SCRUM



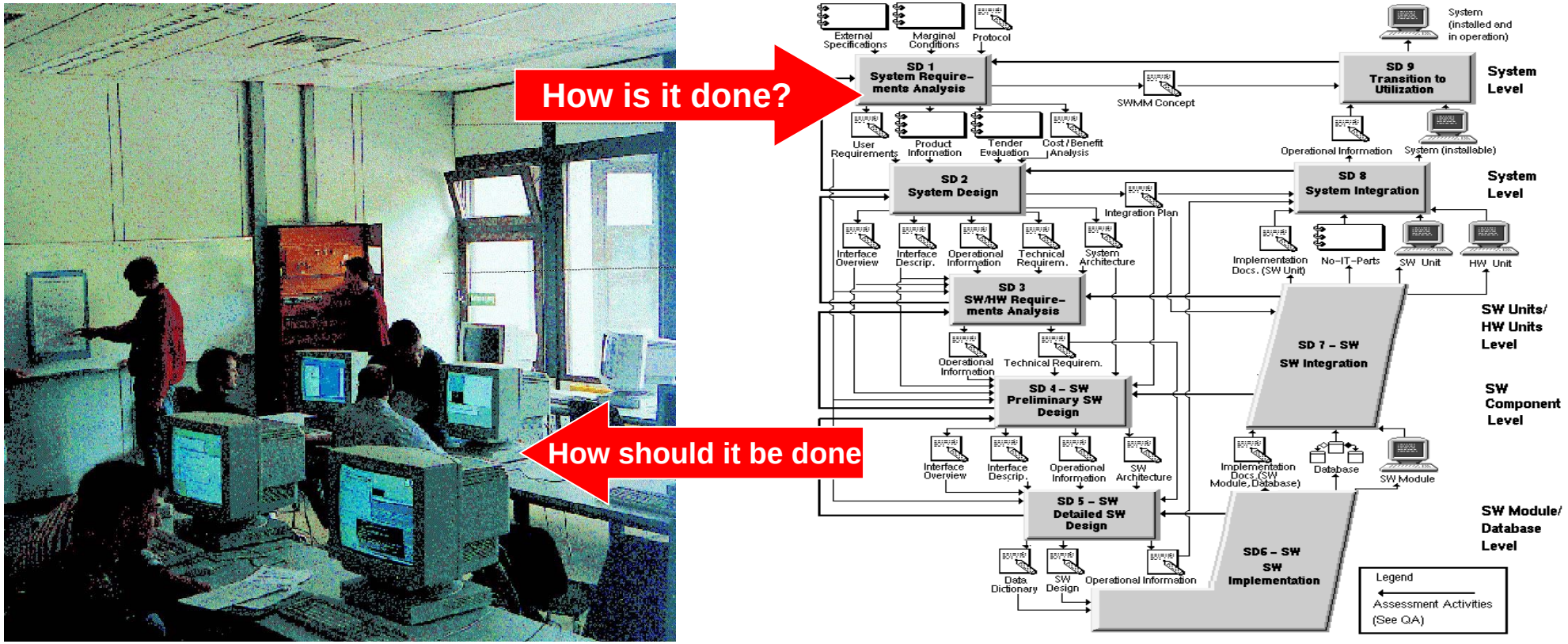
V-Model



Spiral



Descriptive vs. prescriptive process models



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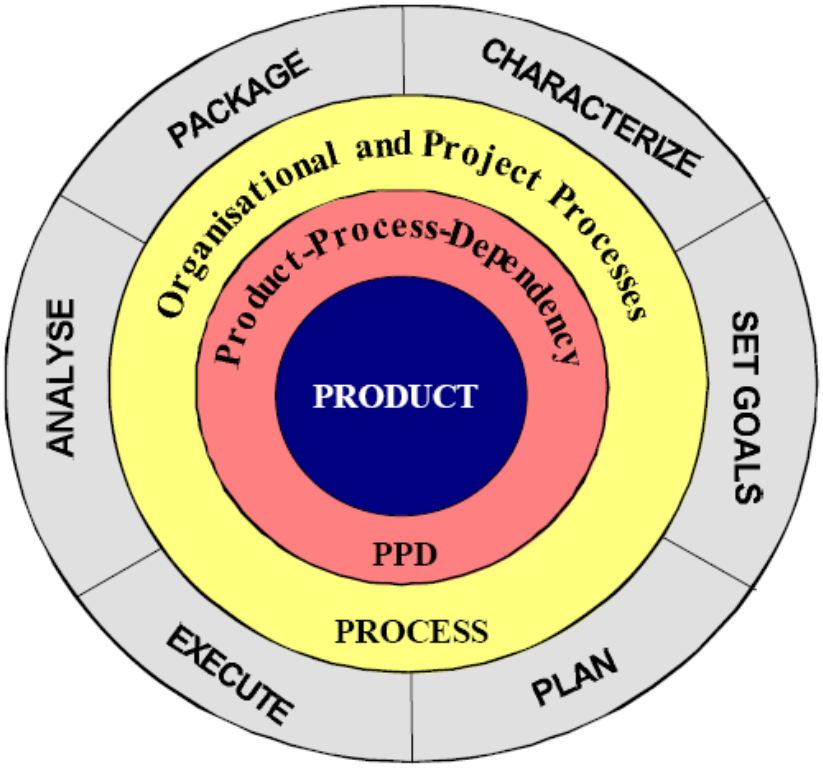
A systematic approach to Software Process Improvement (SPI)

- **PLAN** what you want to accomplish over a period of time and what you might do, or need to do, to get there
- **DO** what you planned to do
- **CHECK** the results of what you did to see if the objective was achieved
- **ACT** on the information – standardize or plan for further improvement

PROFES

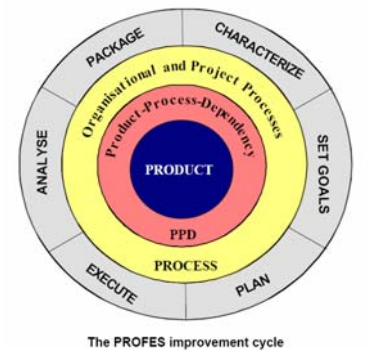


The PROFES improvement cycle

PROFES PHASES	PROFES STEPS
CHARACTERIZE	1. VERIFY COMMITMENT
	2. IDENTIFY PRODUCT QUALITY NEEDS
	3. DETERMINE CURRENT PRODUCT QUALITY
	4. DETERMINE CURRENT PROCESS CAPABILITY
SET GOALS	5. SET PRODUCT IMPROVEMENT GOALS
	6. DETERMINE NECESSARY PROCESS CHANGES
PLAN	7. DESCRIBE PROCESS CHANGES
	8. SET METRICS FOR THE PROCESSES AND PRODUCT
	9. PREPARE IMPROVEMENT IMPLEMENTATION
EXECUTE	10. IMPLEMENT AND MONITOR IMPROVEMENTS
ANALYSE	11. EVALUATE RESULTS
PACKAGE	12. UPDATE EXPERIENCE BASE

Phases and steps of the PROFES improvement methodology

PROFES –
Product-Focused Process Improvement in Software Engineering



The PROFES improvement cycle

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Phases and steps of the PROFES improvement methodology

***Step* 1 Verify commitment**	
Goals	**Activities**
• The organization's business needs and improvement objectives for product and process quality are identified. • Product quality characteristics, ongoing improvement initiatives, and their priorities are identified. • Commitment of top and middle management is verified. • Commitment of project members is verified. • Contextual info of the organization & projects is defined. • An overall plan for improvement activities is defined.	• Identify the organization's business needs and improvement objectives • Motivate top and middle management • Motivate project members • Define organizational context • Define overall plan and schedule
Input	**Output**
Organizational level: • General organizational information • Business goals • Customer survey results • Market research results • Customer feedback • Organizational context information Project level: • Project environment specifics • Product development goals	Organizational level: • Commitment of top and middle management • Preliminary product and process improvement needs • Organization's classification • Overall improvement plan Project level: • Commitment of project management and members • Project classification • Overall improvement plan

***Step* 2 Identify product quality needs**	
Goals	**Activities**
• Product quality needs are known and presented in the form of a product quality profile • Preliminary product quality goals are set	• Survey product quality needs • Document product quality needs • Set preliminary product quality goals
Input	**Output**
• Customer survey results • Market research results • Customer feedback • Business goals • ISO9126 • Preliminary product quality needs	• Product quality needs • Product quality profile • Preliminary product quality goals

***Step* 3 Determine current product quality**	
Goals	**Activities**
• Determine current status of product quality	• Acquire product quality data • Evaluate current status of product quality
Input	**Output**
• Application domain characteristics • Measurement data • ISO9126 • Product quality profile • Experience base	• Current status of product quality

***Step* 4 Determine current process capability**	
Goals	**Activities**
• Current process capability is determined • Process improvement recommendations are documented and communicated	• Preparation • Execution • Reporting
Input	**Output**
• Business goals • Process descriptions • Quality manuals • Organizational characteristics • Project plans • Design documents • Measurement data	• Process capability profiles • Process assessment report and profiles • Descriptive process models • Preliminary improvement plan

Step 5 Set product improvement goals

Goals	Activities
• Set Product improvement goals	• Analyse product quality discrepancies • Identify product improvement areas • Prioritize product improvement areas • Set the product improvement goals
Input	**Output**
Business goals Product quality needs • Product quality target profile • Current status of product quality • Process assessment reports and profiles • Descriptive process models • Preliminary product quality goals • Product characteristics	• Product improvement goals

Step 6 Determine necessary process changes

Goals	Activities
• Identify and select process changes necessary to achieve the product improvement goals. • Document the decisions on necessary process changes for later evaluation of the improvement programme	• Identify product quality goal • Identify processes to be improved • Retrieve relevant PPD models • Construct characterization questionnaire • Characterize the project • Rank PPD models • Select improvement actions
Input	**Output**
• Product improvement goals • Process assessment reports and profiles (from Step 4) • PPD repository • Preliminary improvement plan (from Step 4)	• Process changes to be implemented in the improvement programme • Characterization of the forthcoming project or improvement programme

Step 7 Describe process changes

Goals	Activities
• Agree and document prescriptive process model • Achieve clear understanding of the processes in order to define the metrics in the following step	• Mark processes/practices in the current process model, which have to be changed • Develop prescriptive process model • Communicate prescriptive model to process participants
Input	**Output**
• Descriptive process model (from Step 4) • Selected list of process changes (from Step 6)	• Prescriptive process model (including selected process changes) • Training/presentation material for the new process

Step 8 Set metrics for the processes and product improvements

Goals	Activities
• Define questions and metrics related to the product quality goals • Define questions and metrics related to the process performance goals • Define questions and metrics related to the product-process dependency goals • Construct GQM plan and measurement plan	• Define measurement goals • Conduct GQM interviews • Define questions and hypotheses • Define and check metrics • Produce GQM plan and measurement plan
Input	**Output**
• Prescriptive process model (including selected process changes) • Product quality and target profile (from Step 2) • Current status of product quality (from Step 3) • Product improvement goals (from Step 5) • Process assessment reports and profiles (from Step 4) • PPD models (from Step 6)	• GQM abstraction sheets • GQM plan • Measurement plan

Step 9 Prepare improvement implementation

Goals	Activities
• Plan process changes and allocate sufficient resources to implement them • Plan improvement progress meetings	• Plan process improvement progress meetings • Make time planning and resource allocation • Kick-off process changes
Input	**Output**
• Development project plan • Preliminary improvement plan (from Step 4) • Selected list of process changes (from Step 6) • Prescriptive process model (from Step 7) • GQM deliverables (from Step 8)	• Process improvement action plan • On-line process support

Step 10 Implement and monitor improvements in the development project

Goals	Activities
• Implement selected process changes according to process improvement plan • Collect data and prepare measurement results for each feedback session • Hold feedback sessions	• Implement process changes • Collect measurement data • Prepare and select measurement data • Perform GQM feedback sessions
Input	**Output**
• Prescriptive process model • GQM plan • Measurement plan • Process improvement plan • Development project plan	• Measurement data • Feedback session report(s) with visualized measurement data • Description of corrective actions taken • Prescriptive process model applied in practice

Step 11 Evaluate Results

Goals	Activities
• Evaluate effect of the improvement programme on final product quality • Evaluate changes to the software engineering process, methods, and tools • Gather and evaluate "lessons learned" • Support, modify, or reject used PPD models	• Evaluate the measurement results • Support, modify, or reject used PPD models
Input	**Output**
• PPD models • Prescriptive process model • Abstraction sheets • GQM plan • GQM measurement plan • Measurement data • Feedback session reports	• Preliminary experience packages • Evaluated PPD models

Step 12 Update Experience Base

Goals	Activities
• Package and store all information gained during the project in the experience base for future reuse	• Package information • Store relevant information in the experience base
Input	**Output**

• Evaluated PPD models
• Experience base
• Process models
• GQM plan
• Feedback session reports
	• Updated experience base with generalized:
	  • PPD models
	  • Process models
	  • GQM plans

Plan-Do-Check-Act → "Plan"

Where are we today?

Where do we want to be?

How do we get there?

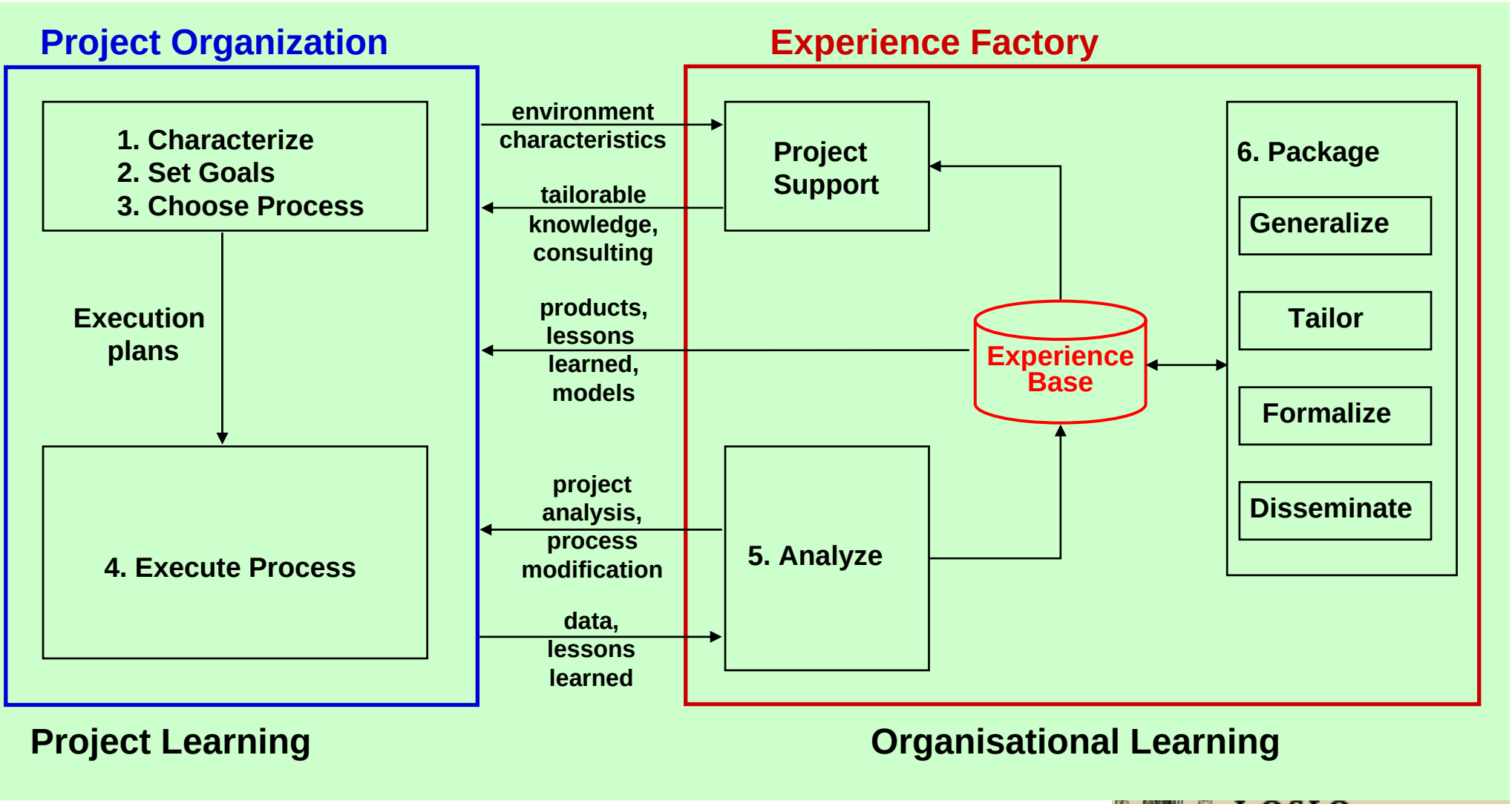
How do we monitor?

How do we check whether we got to where we wanted to get to?

What have we learnt and how do we follow-up?

- **Characterize**
- **Set Goals**
- **Plan**
- **Execute**
- **Analyse**
- **Package**

Organisational framework for SPI



Structure of Lecture 01

- Hour 1:
  - General Course Information
  - Motivation for Software Process Improvement (SPI)
- Hour 2:
  - History of (Software) Process Improvement
  - Introduction into SPI Concepts
- Hour 3:
  - Detailed Information on Project and Oral Exam

Course Evaluation, Marking, and Grades

Part 1: Project / 80% of grade [40 marks]

Final Project Report (max. 15 pages incl. cover)

Evaluation criteria:

- Content [24 marks]
- Consistency [12 marks]
- Language and formality (title, captions, referencing, etc.) [4 marks]

Note:

- A mandatory short presentation and draft report is required
- Failing to do the oral presentation or to submit the draft report in time will automatically generate a penalty of 2 marks each!
- Not submitting the draft report at all (or more than 1 week after the deadline) will generate a penalty of 4 marks (instead of 2 marks for late submission)!

Part 2: Oral Exam / 20% of grade [10 marks]

Duration: approximately 15-20 minutes

Subject:

Questions about the course and about your project

Evaluation criteria:

- Correctness and completeness [6 marks]
- Clarity and conciseness [2 mark]
- Relevance (→ is the answer to the point?) [2 mark]

Mapping of Total Marks to Grades (Tentative!)

Grade	Description	General, qualitative description of evaluation criteria	
A	**Excellent**	*An excellent performance, clearly outstanding. The candidate demonstrates excellent judgment and a high degree of independent thinking.*	≥45
B	**Very good**	*A very good performance. The candidate demonstrates sound judgment and a very good degree of independent thinking.*	≥40
C	**Good**	*A good performance in most areas. The candidate demonstrates a reasonable degree of judgment and independent thinking in the most important areas.*	≥35
D	**Satisfactory**	*A satisfactory performance, but with significant shortcomings. The candidate demonstrates a limited degree of judgment and independent thinking.*	≥30
E	**Sufficient**	*A performance that meets the minimum criteria, but no more. The candidate demonstrates a very limited degree of judgment and independent thinking.*	≥25
F	**Fail**	*A performance that does not meet the minimum academic criteria. The candidate demonstrates an absence of both judgment and independent thinking.*	

Project Assignment – Task

Task:

- Prepare a (realistic) software process improvement plan for a software/systems development organization
- A project template with detailed guidelines is available
- The scope of the SPI plan could be (examples):
  - complete process
  - a sub-process of the complete process
  - an activity of a sub-process
  - a method/technique used in an activity
  - …

Project Assignment – General Information

- No group submissions, but informal collaboration between students is ok.
- Some lecture time will be devoted to reflection about the project (report).
- The system/software development organization and its requirements may be real or fictitious. In any case, suggested improvement actions must be clearly related to identified problems and defined goals.
  - You might contact a software development organization in order to find a real-world problem/challenge/issue.
  - *Note: It is not necessary to mention the organization's name.*
- If you happen to find (or even be involved in) a real-world improvement project, you should not make yourself completely dependent on the reality, because a real-world project might have a longer time-frame than our course.
- To be able to develop your improvement plan, you might need to study some materials before they are presented in a lecture.

Project Assignment – Topic Ideas

Examples of problems and related improvement goals:

- *Customers find too many defects* – Improve software quality
- *Inaccurate planning / estimates* – Improve planning methods/models
- *New technologies or standards make their way into the market (e.g., model-driven development/testing)* – Adapt existing processes to accommodate the new technology/standard
- *Software is hard to maintain / difficult to evolve* – Improve software architecture
- *Increasing competition* – Speed-up development, issue releases more frequently
- *Customer are dissatisfied with deliveries* – More customer participation and more flexible process
- *"Old-fashioned", heavy development process* – Modernize dev. processes, methods, and tools
- *Little diffusion of competence, low motivation* – Improve training & enhance involvement of people

FIND A REALISTIC APPROACH TO SOLVING A REALISTIC PROBLEM.
MAKE USE Of YOUR IMAGINATION (but choose "probable" problems/goals/solutions).

Project Assignment – Report Template

Cover Page

INF5181 – Process Improvement and Agile Methods in Systems Development

Title:

Date:

Author:

E-mail:

Status:

Draft report: ___

Final report: ___

Table of Contents

1 Introduction 1
1.1 Context description 1
1.2 Method 1
1.3 Issues 1
1.4 Goals 1

2 Baseline process 1
2.1 Elements of the baseline process 1
2.2 Descriptive model of the baseline process 1
2.3 Performance of the baseline process 1

3 Target process 2

4 Implementation of target process 2

5 Measurement and control 2
5.1 Measurement plan 2
5.2 Action plan 2

6 Discussion 3
6.1 Underlying rationale of proposed changes 3
6.2 Risks of proposed changes 3

7 References 3

Project Assignment – Report Template

Introduction

1 Introduction

<In this section describe the SPI context, method, issues, and goals>
<Length of Section 1 = approx. 1 page>

1.1 Context description

<In this sub-section briefly describe the organisational context in which the SPI initiative takes place>

1.2 Method

<In this sub-section briefly describe the software process improvement method(s) applied in the SPI initiative, e.g., process modelling, measurement, PROFES, GQM, Plan-Do-Check-Act, … >

1.3 Issues

<In this sub-section describe the issues that shall be addressed/overcome by the SPI initiative>

1.4 Goals

<In this sub-section describe in precise terms, which process-related performance measures (sometimes called: indicators or metrics) shall be improved and by how much; performance measures can relate to activities, artefacts, and roles/people>

Project Assignment – Report Template

Baseline Process

2 Baseline process

<In this section describe the elements of the current (baseline) process and how these elements are related>
<Length of Section 2 = approx. 3 pages>

2.1 Elements of the baseline process

<In this sub-section provide the following lists:

- List of artefacts produced/used in the current process
- List of activities performed in the current process
- List of roles involved in activities of the current process
- List of methods/techniques/tools used in activities of the current process

Each element in a list must be briefly described>

2.2 Descriptive model of the baseline process

<In this sub-section present the descriptive model of the current process, either as graph, or as table; if you use a table, describe in each row one activity with name (column 1), input products (column 2), output products (column 3), roles involved (column 4), methods, techniques, tools applied (column 5); if you use a graph, start out with a product flow (consisting of activities and artefacts) and then connect roles and methods/techniques/tools to it.>

2.3 Performance of the baseline process

<In this sub-section present quantitative data for the performance measures (as defined in sub-section 1.4) of the baseline process.>

Project Assignment – Report Template

Target Process

3 Target process

<In this section describe what parts/elements of the current (baseline) process shall be changed and how the new process looks like; how you present the target depends on the scope of change; if you change/replace the complete process, then you should present a prescriptive process model of the new process, clearly stating what has been changed/replaced as compared to the baseline process; if you change/replace only a sub-process or an activity or a method/technique used in the baseline process, then describe precisely what will be different in the new process with regards to the changed/replaced sub-process, activity or method/technique and how the changed/replaced sub-process, activity, or method/technique fits into the old (baseline) process>

<Length of Section 3 = approx. 3 pages>

Project Assignment – Report Template

Implementation of Target Process

4 Implementation of target process

<Describe precisely what steps have to be taken in order to implement the new process; use table with four columns: what – when – who (by whom) – how; each row should then contain the following information:

- What: name of the activity/step to be performed
- When: start and end date of the activity/step to be performed
- Who: who will be responsible, and who will be involved in the activity/step to be performed
- How: how will the activity/step be performed; describe the activity; this may include description of entry/exit conditions, dependency on previous activities/steps, etc.

<Length of Section 4 = approx. 2 pages>

Project Assignment – Report Template

Measurement and Control

5 Measurement and control

<In this section describe the following:

- How you measure the performance measures defined in sub-section 1.4
- How you decide whether your SPI initiative was successful
- What actions you will take in case of success and failure of the SPI initiative>

<Length of Section 5 = approx. 2 pages>

5.1 Measurement plan

<The measurement plan contains for each measure defined in sub-section 1.4 the following information: name, measurement unit, element of the process to which the measure relates, when the measure will be taken, by whom the measure will be taken, who is responsible for quality control of the measurement, what tools will be used (if any), etc.>

5.2 Action plan

<In this sub-section describe how you will make decisions about the success/failure of the SPI program, and what actions you may take depending on the possible outcomes of this decision>

Project Assignment – Report Template

Discussion

References

6 Discussion

<In this section present the underlying rationale of your SPI plan and associated risks>

<Length of Section 6 = approx. 2 pages>

6.1 Underlying rationale of proposed changes

<In this sub-section describe the motivation for the type of changes proposed in the SPI plan, i.e.: Why did you propose exactly these changes? Did you have alternatives of the proposed changes in mind? If so, why did you not go for the alternatives? Etc.>

6.2 Risks of proposed changes

<In this sub-section describe risks related to the proposed changes, i.e.: What may go wrong? Why might it not work? What risk mitigation strategies will be used? Etc.>

7 References

<In this section list the literature referenced in this document; follow an established referencing standard, e.g., IEEE, ACM, Springer>

<Length of Section 7 = approx. 1 page>

Project Assignment – Evaluation /1

- Content: 24 marks (60% of total project marks)
  - Relates to completeness, depth and clarity of information given in Project Report Sections 1 to 6 (as defined in the report template).
  - The split per section is as follows:
    - Section 1: 2 marks
    - Section 2: 6 marks
    - Section 3: 6 marks
    - Section 4: 2 marks
    - Section 5: 4 marks
    - Section 6: 4 marks

Project Assignment – Evaluation /2

- Consistency: 12 marks (30% of total project marks):
  - Consistency between issues (1.3) and goals (1.4): 1 mark
  - Consistency between goals (1.4), performance of baseline process (2.3), and measurement plan (5.1): 4 marks
  - Consistency between elements (2.1) and descriptive model (2.2) of baseline process: 4 marks
  - Consistency between elements and descriptive model of target process (3): 2 marks
  - Consistency between target process (3) and implementation of target process (4): 1 mark

Project Assignment – Evaluation /3

- Formality: 4 marks (10% of total project marks)
  - Correct formatting (cover page with complete information, table of contents, page numbers, headings, table and figure captions, table and figure referencing, literature referencing, font size, etc.): 2 marks
  - Correct referencing style (in Section 7); also: each document listed in the reference section must be referenced from the text at least once: 1 mark
  - Language: no spelling/grammar errors, clarity of expression, appropriateness of expression (no slang!), correct usage of terminology: 1 mark
  - Observe page limit (14 pages): no penalty but I will stop reading after page 14 (excluding cover page and table of contents)

Project & Exam Schedule

- 06-Oct-2011: **Student Presentation** (5 min, mandatory)
  - Should cover Section 1 of Report Template
- 20-Oct-2011: **Draft Report** (mandatory)
  - Should cover Sections 1 to 3 of Report Template
  - Deliver by email to dietmarp@ifi.uio.no no later than 13:30
  - You will receive feedback (by email) within 2 weeks
- 06-Dec-2011: **Final Report** (mandatory)
  - Should cover all Sections of Report Template
  - Deliver by email to dietmarp@ifi.uio.no no later than 19:59
- 15-Dec-2011: **Oral Exam** (15-20 min)

Next Lecture

- Topic: Processes and Process Modeling (Section A)

- For you to do:
  - Familiarise with Syllabus
  - Start thinking about your project (topic)