

Chapter 1

Introduction and Basic Concepts

Processes (1)

- Processes are intended to describe activities and their combinations
- Activities are performed as actions
- The structure of processes makes actions systematic
- Processes occur in many contexts; we are concerned with *software development processes*.
- Processes are
 - Of different nature, depending on where they happen
 - Have some general properties which are shared by all processes

Processes (2)

- For an action we distinguish:
 - Collection of requirements
 - Planning and designing the action
 - Execution of the action: This takes place in reality, outside of any formal model
- All these three phases are connected with different kinds of
 - Costs
 - Benefits
- The organization of processes is a difficult and complex task in order to minimize costs and maximize benefits.
- This requires the use of knowledge.

Traditional View

Processes

Specification



Collect requirements and information

Design



Planning

Execution



Execution

Interface

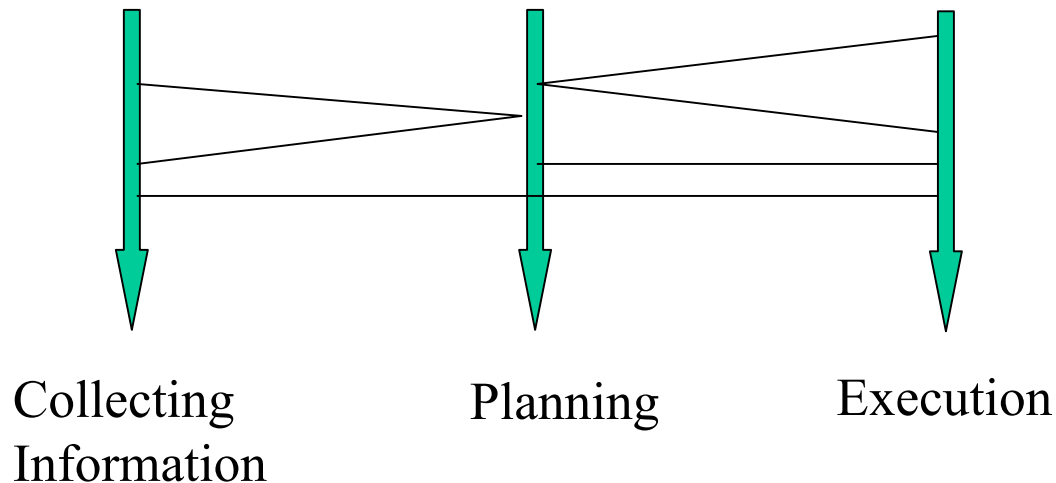
Interface

Plans, Design

All three phases are handled independently

Concurrent View

Concurrent, parallel:



All three arrows represent again complex concurrent activities.
Concurrency creates communication problems!

Humans and Machines

- Some activities are usually (or even necessarily) performed by humans, others by machines (or programs).
- Because of the concurrent view these actions are interleaved.
- Therefore a communication between humans and machines has to take place.
- The difficulty is that humans and machines have their own preferences to express themselves.

Socio-Technical Processes (1)

- Traditional human systems do not involve automatic systems except for purely technical activities.
- The traditional computer systems work fully automatic:
 - They have a task and get their input
 - A program computes a value or an inference engine deduces consequences from the knowledge base and the information obtained from the input. The output contains the solution.
 - In any case there is no way that the user can interfere.
- Interactive systems employ both, humans and machines.
- *Software development processes* are typical socio-technical processes.

Socio-Technical Processes (2)

- Fully automatic systems are weak when abilities typical for humans are needed:
 - Creativity
 - Background knowledge
 - Common sense
 - Working with informal concepts.
- An assistant system is intended to complement and support humans with abilities where computers are strong, in particular working with large sets of data and performing complex computations.
- The problem is to integrate man and machine in a well structured semiformal system: This is a management task.

Socio-Technical Processes (3)

- Assistant systems support socio-technical processes
- This requires a careful organization of the division of labor:
 - What do humans?
 - What do machines?
- Conflicting demands:
 - Machines need precise instructions
 - Humans want to use creativity.
- Plans and Executions:
 - They alternate, before all requirements are present and before planning is finished execution of some actions start.

The Communication Problem

- Giving the right information to the right people at the right time with the right tools



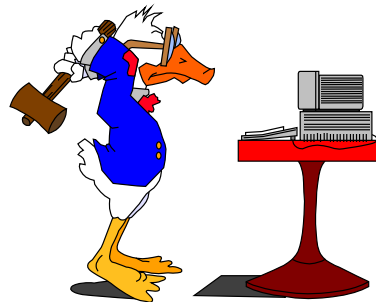
Right Information



Right Person



Right Tool



Intended
Action

Process Representation

- In order to support development processes they have to be formally represented.
- This requires a process representation language.
- In this language all major terms need to be expressed.
- In this language past experiences are also formulated.
- Therefore the process representation is essential for process management.
- In our lecture we will mainly refer to the formalism related to the MILOS-System. It is general enough to be used by other systems.

Scheduling

- An important part of process management is scheduling.
- The task of scheduling is to assign resources to process actions and present them in a temporal order.
- This is an optimization problem.
- Because information may change the schedule is also up to change: A schedule must be flexible.
- Scheduling is a very complex task!

Resources

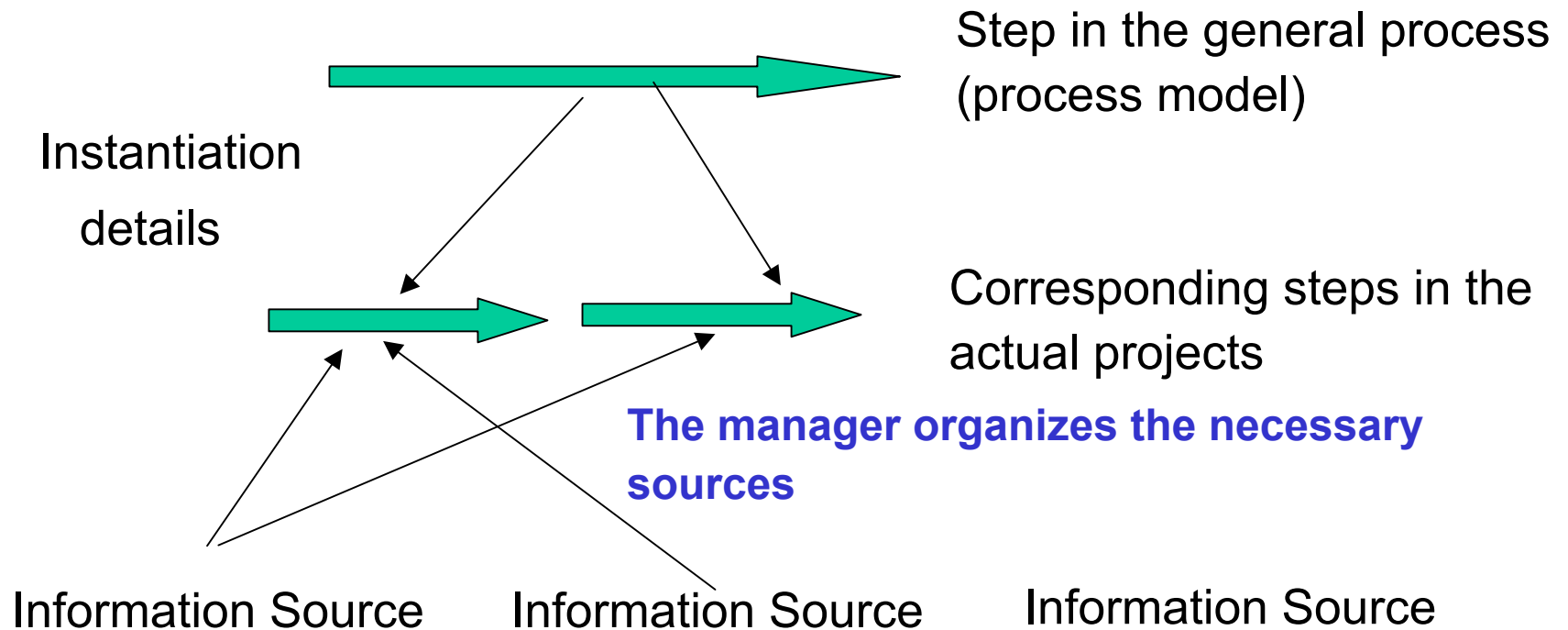
- Tasks require resources
- Planning, in particular scheduling has to respect the available (limited) resources.
- This is a complex optimization problem.

Management Activities: Dynamic View

- Management activities arise dynamically during project enactment.
- They are motivated by the following questions:
 - How can the need to plan/replan, schedule/reschedule etc. be detected?
 - When is it detected? By whom?
 - Who is responsible for the activity?
 - What dependencies exist among management activities and between management activities and technical activities?...

Information and Action Steps

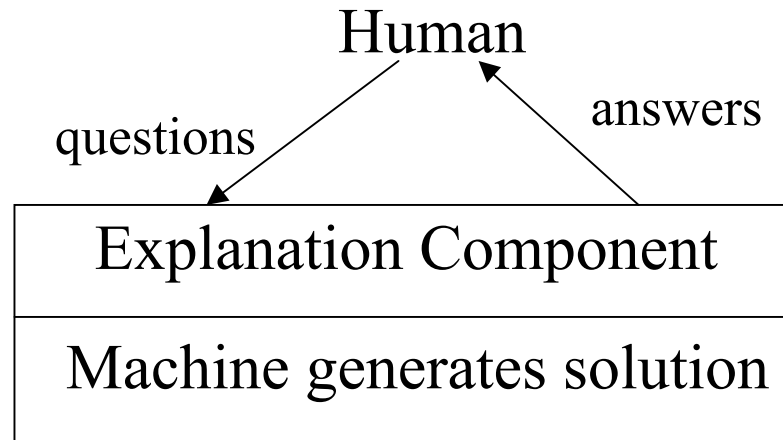
Information improves quality of actions at all levels:



Communication and Explanation

- The communication between human and machine agents requires that both types of agents understand each other.
- Humans have often difficulties to understand the output of a machine.
- To make the output understandable means to *explain* it.
- The mechanism that generates the explanation is called the explanation component:

Explanation is an interactive and knowledge intensive process



Knowledge and Experience (1)

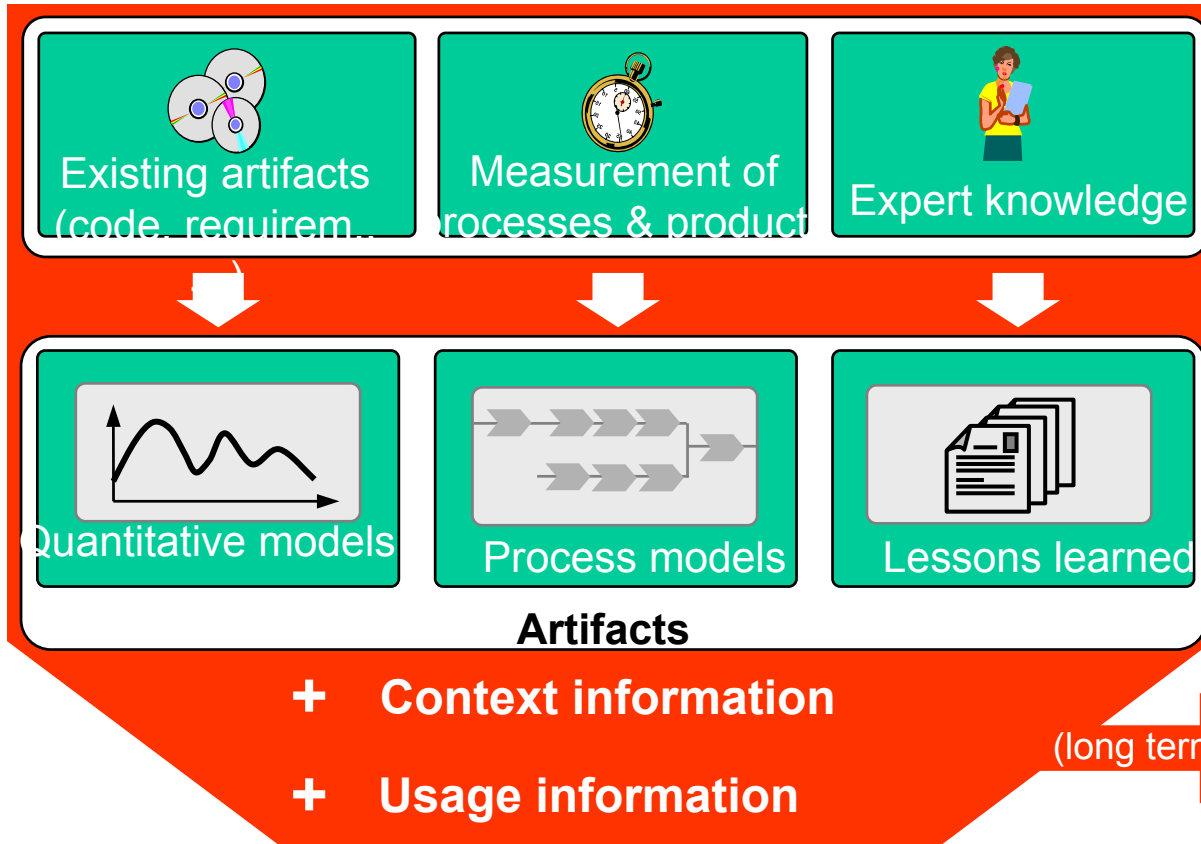
- Knowledge is necessary to perform actions (or to perform them well).
- Therefore knowledge is a valuable property of a company.
- Knowledge Management (KM) =
organizational und technical aspects of the activities for
 - Collecting from various sources (documents, data, experts, etc.),
 - structuring and documenting,
 - Refining/improving,
 - Evaluating and Disseminating
- We will discuss these aspects in more detail.
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Knowledge and Experience (2)

- Some important knowledge is often present in the form of past experiences. They can be recorded and used in an actual context. They represent a value for a company.
- Experience Management = [new field]
 - focus on exemplary knowledge
 - specific, suitable methods and technologies
 - “ingredients“ from various fields such as
 - Experience Factory
 - Ontologies
 - Data Mining und Text Mining
 - Case-Based Reasoning (CBR)
- The most important aspects will be discussed.

Software Engineering

- SE experience:
- scattered over various sources
 - diverse formats
 - only partially formalized
 - only valid in a special context



Content

- 1. Introduction
- 2. Basic Principles of Process Modeling
- 3. Scheduling and Release Planning
- 4. Explanations
- 5. Knowledge Management
- 6. Experiences
- 7. Additions
- Assignment