Technische Universität
Kaiserslautern

o1o1seda o1o1oo

software engineering dependability

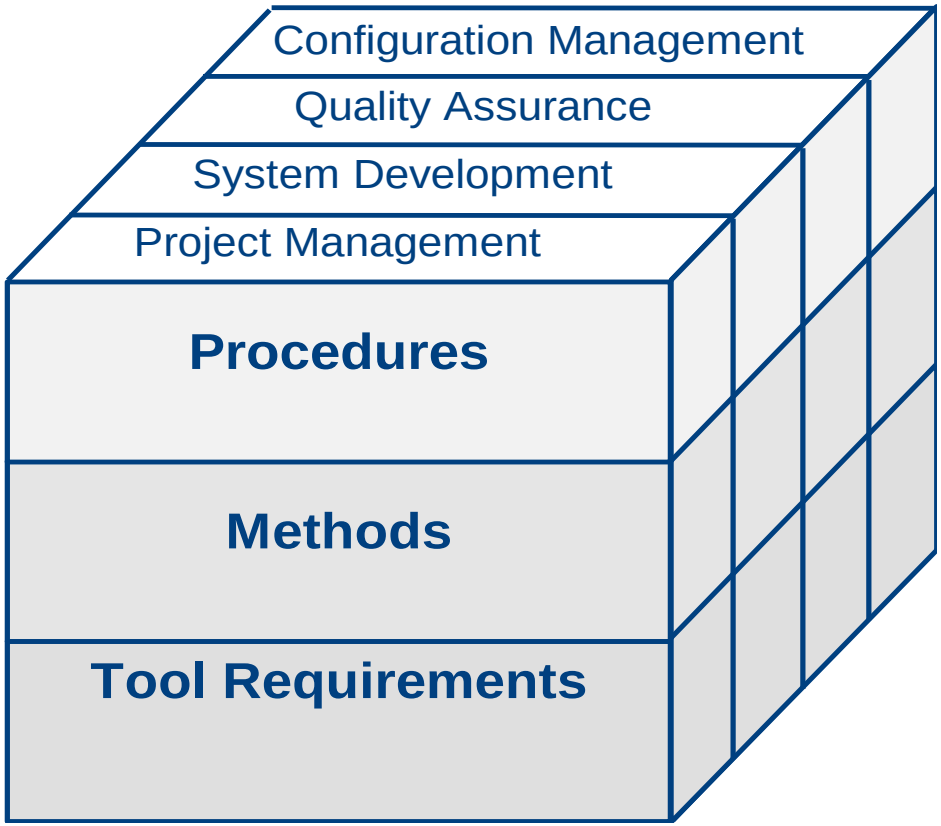
Quality Management of Software and Systems:
Processes and QM

Contents

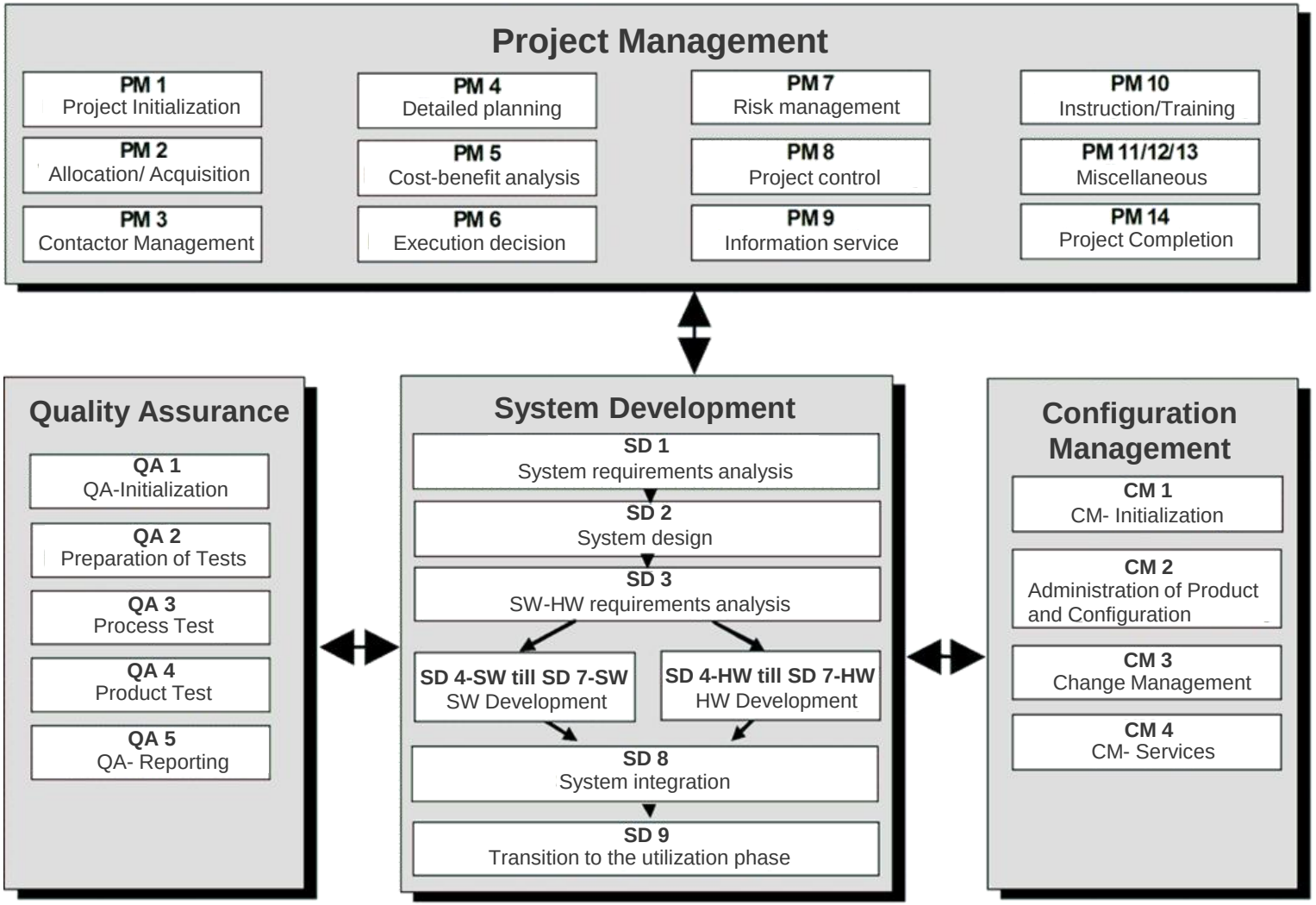
- V-Model XT
- Rational Unified Process (RUP)
- Extreme Programming (XP)
- Processes

V-Model XT
Starting point: V-Model 97

- Broadened guideline for performing IT-projects
  - Generally binding for IT-projects in public and military domains
  - Increasingly applied in business, partially in SMBs, too
- 07/1997: update and release of V-Model ´97
  - No further development since that time
  - V-Model ´97 is not state of the art in all fields



V-Model XT
Starting point: V-Model 97



V-Model XT
Goals of V-Model XT development

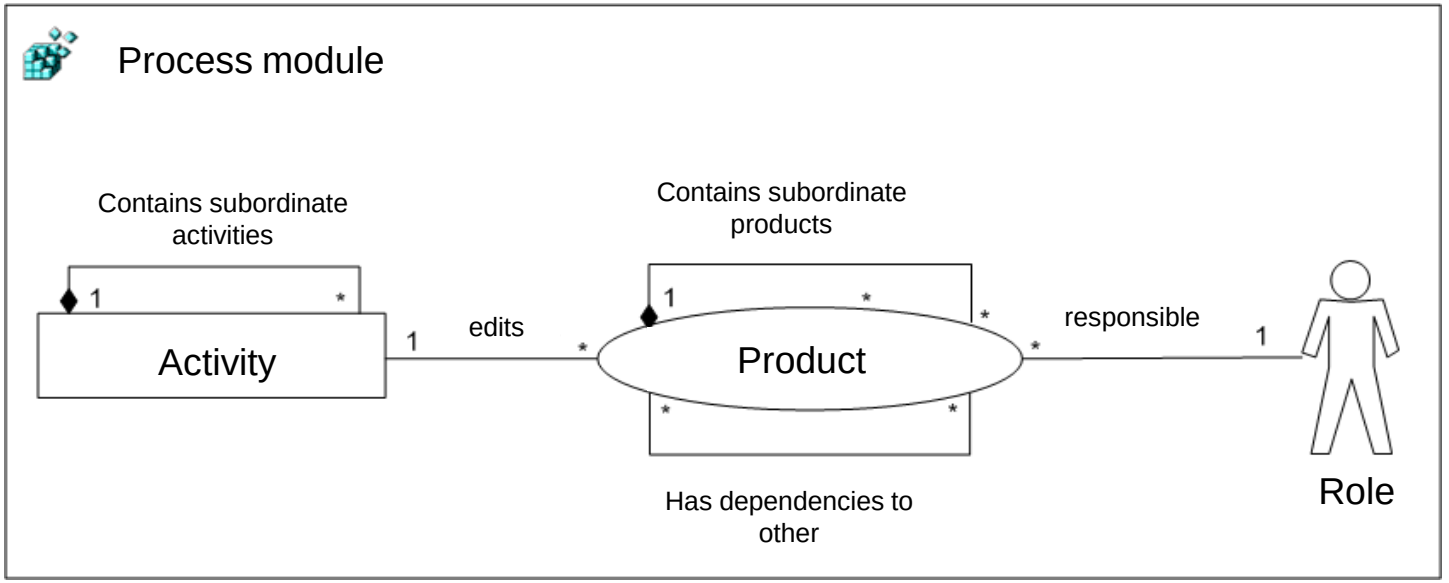
- Enhance support for adaptability, practicability, scalability, changeability and expandability of V-Model
- Consider state of the art and adapt current regulations and standards
- Expand application range with respect to consider the whole system lifecycle in scope of development projects
- Introduce a process of organizational improvements for process models

V-Model XT
Process model and objectives

- V-Model XT is a process model
  - Development model for the customer
  - Development model for the contractor
  - Quality model for companies
- Objectives of the V-Model XT
  - Minimizing project risks
  - Quality improvement and quality guarantees
  - Budget containment for the whole project and system life-cycle
  - Communication improvements between all participants

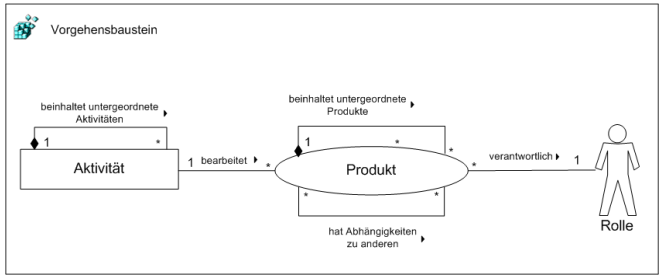
Process modules as modular elements

- The V-Model is composed of modular blocks, so called process modules



- A process module
  - encapsulates roles, products and activities
  - is a unit, which can be independently used
  - is a unit, which can be updated or extended independently

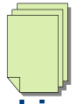
V-Model XT
Model element dependencies



responsible

creates

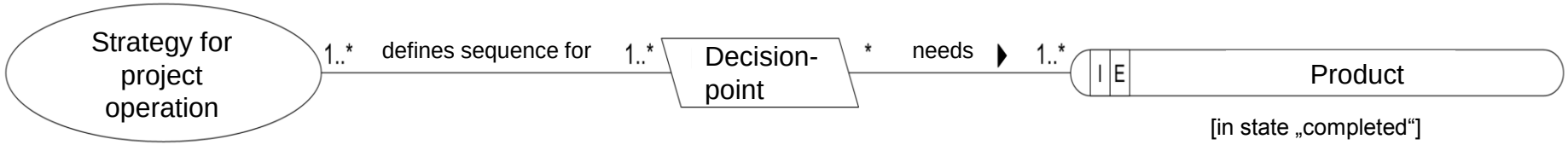
collaborate



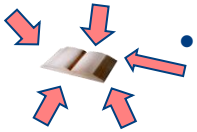
edit

V-Model XT: Project Execution Strategies and Decision Points

- Process components, products and activities do NOT constrain or suggest any order of execution
- A strategy for project operation defines the sequence in which the project-progress-levels have to be reached
- A decision-point
  - Defines a date, which is determined by the project plan, at which a “progress-decision” (GO/NOGO) will be made
  - Defines a set of products, which have to be completed at the decision-point. such that the “progress-decision” can be made.



V-Model XT: Philosophy - Goal and result oriented approach

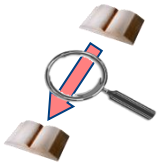


- Products take center stage as they are the (intermediate) results of a project

- Strategies for project operation and decision-points define the sequence of product completion and thus the elementary structure of the project‘s progress

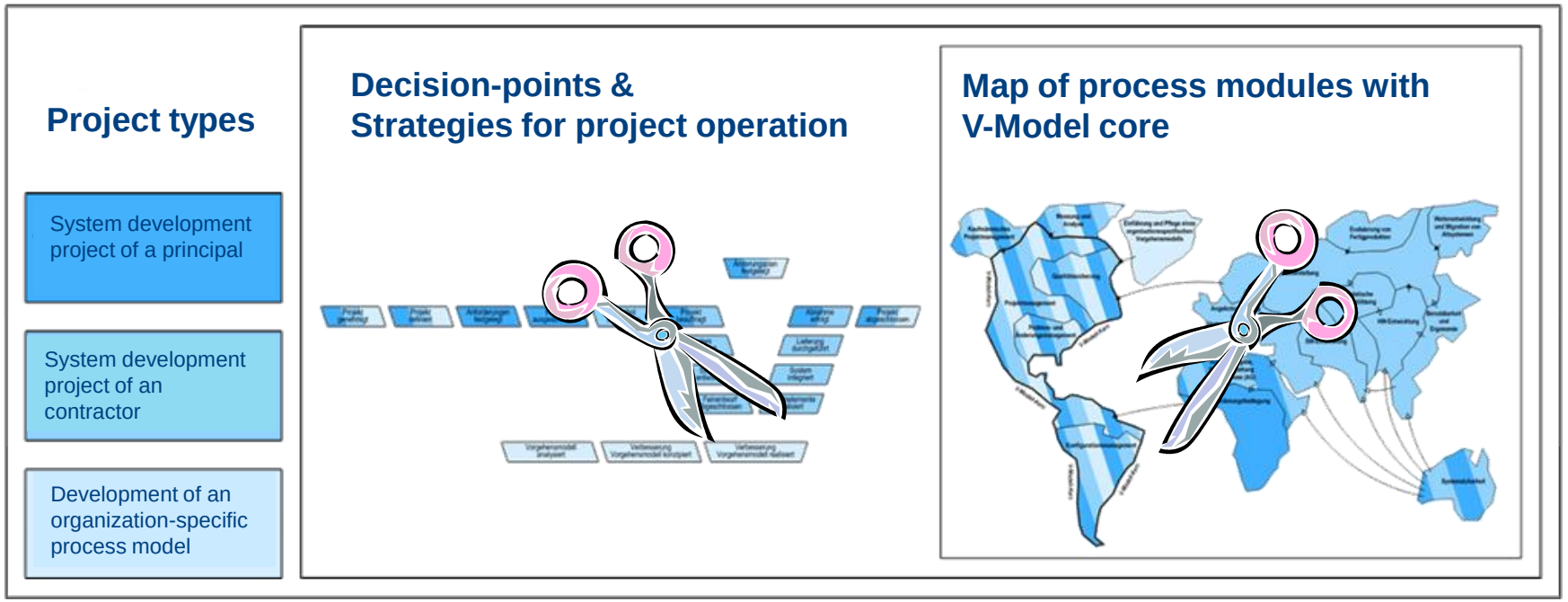
- Detailed planning and controlling will be performed based on development and completion of products

- One role is responsible for each product.



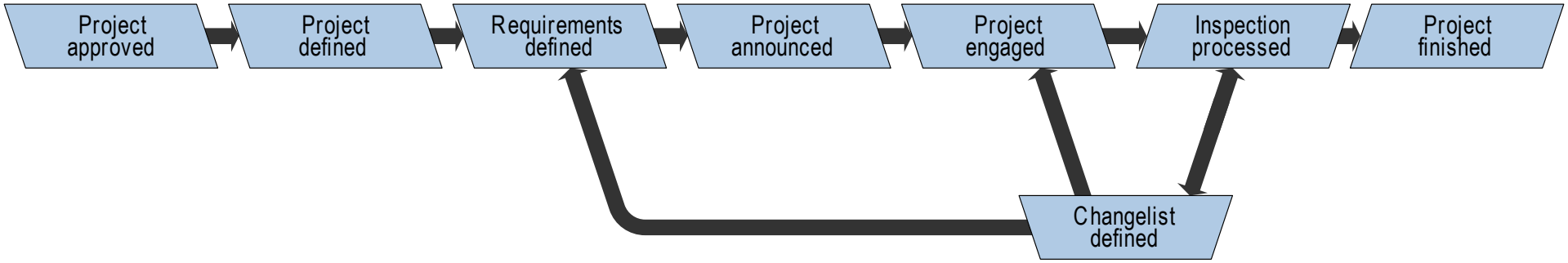
- The quality of products is checkable by using:
  - Product Requirements
  - Existing dependencies with other products

- Choice of project type
- Choice of process modules which will be used
  (products, activities, roles)
- Choice of strategies for project operation including decision points



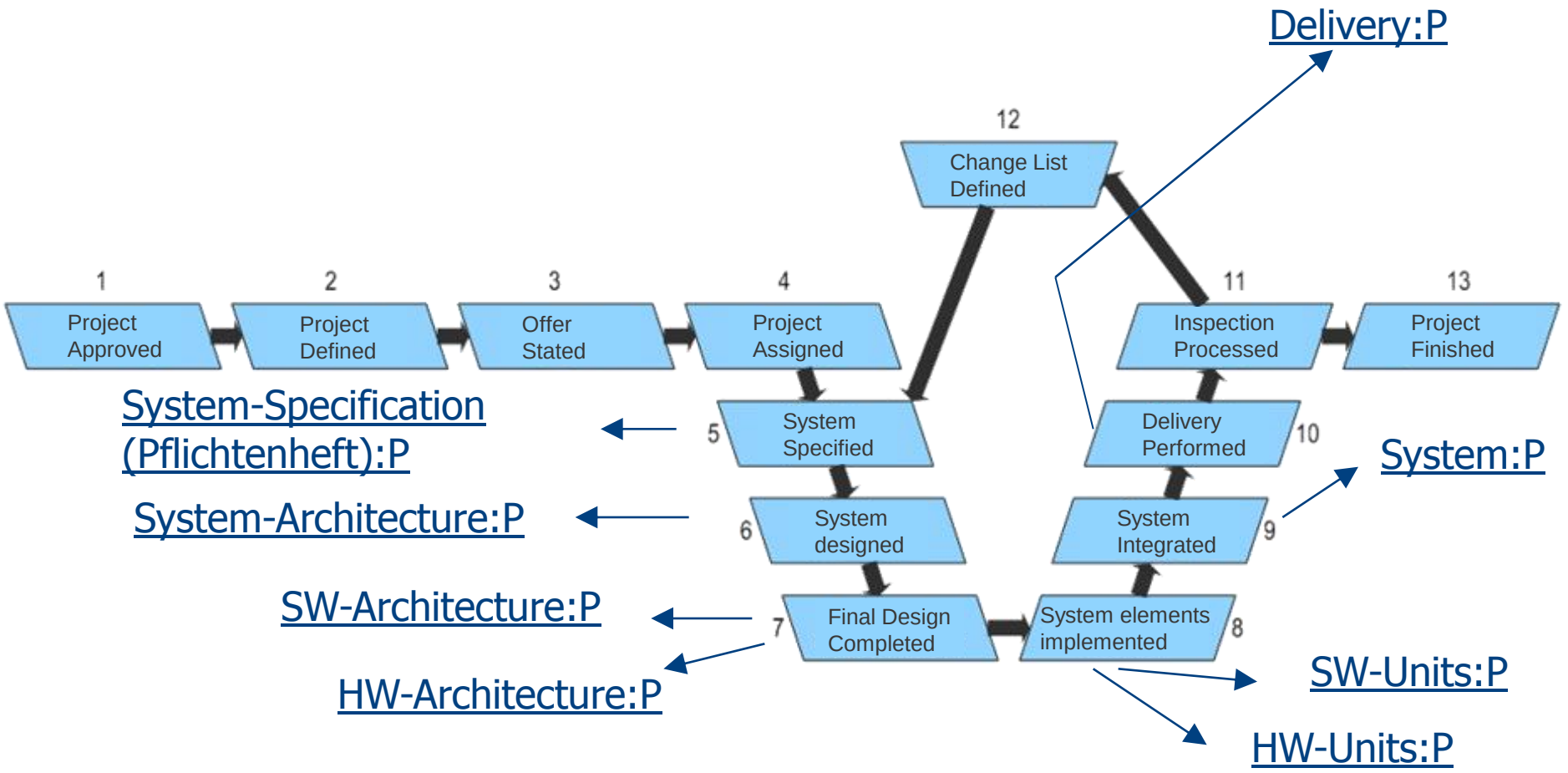
V-Model XT
Project Execution Strategy for Client

- Tailoring delivers
  - Strategy for project operation
  - Process modules (if necessary supplemented)

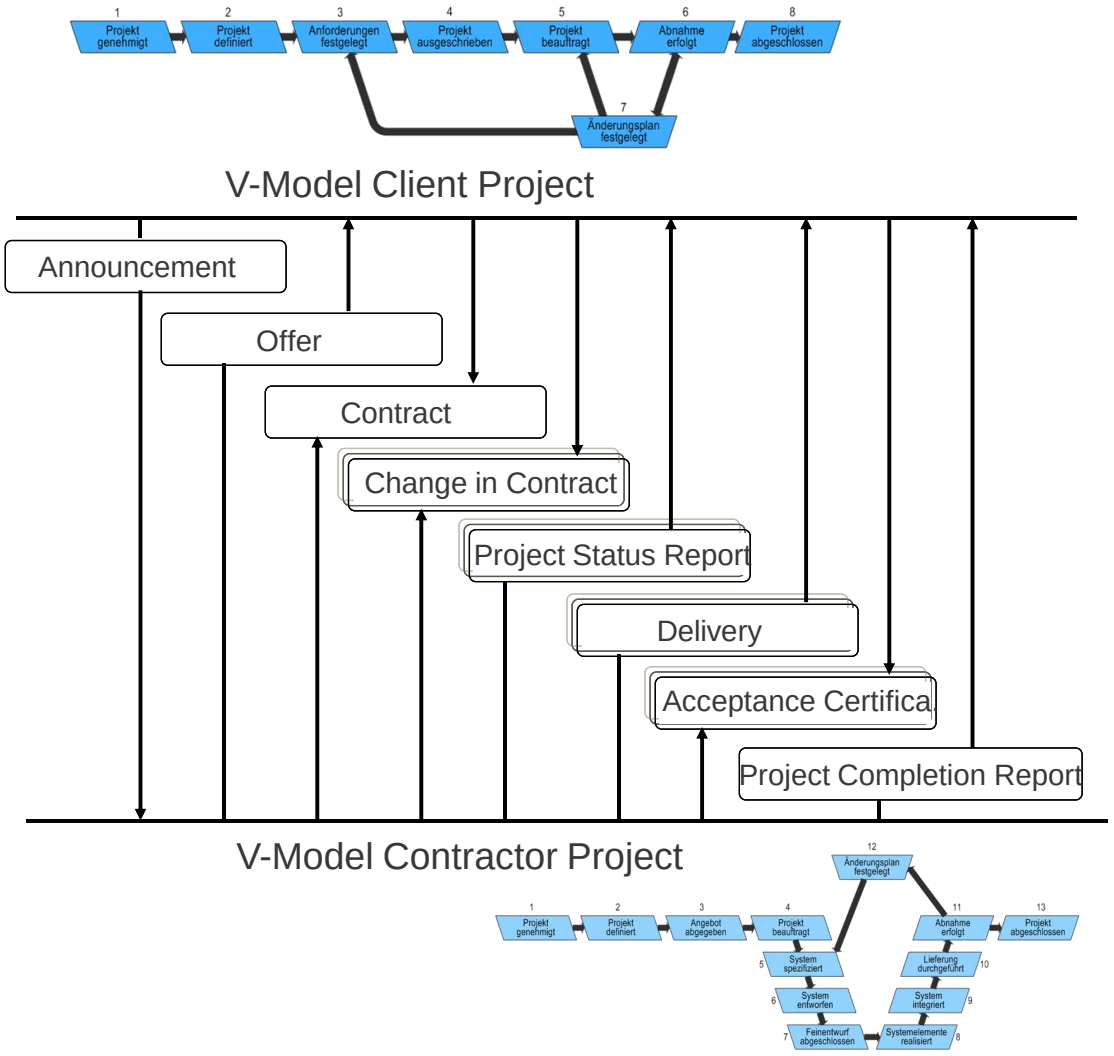


- Process modules define the project's activities and products
- The strategy for project operation has to be concretely instantiated for a specific project

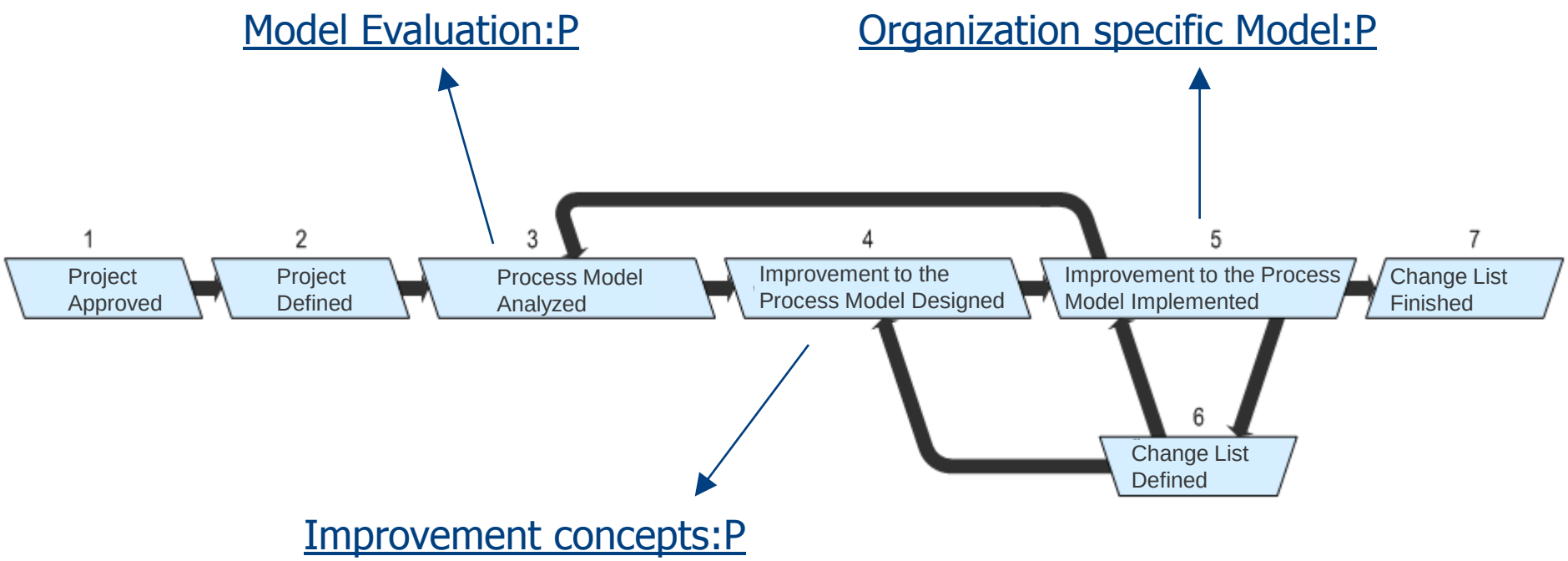
V-Model XT
Project Execution Strategy for Contractor



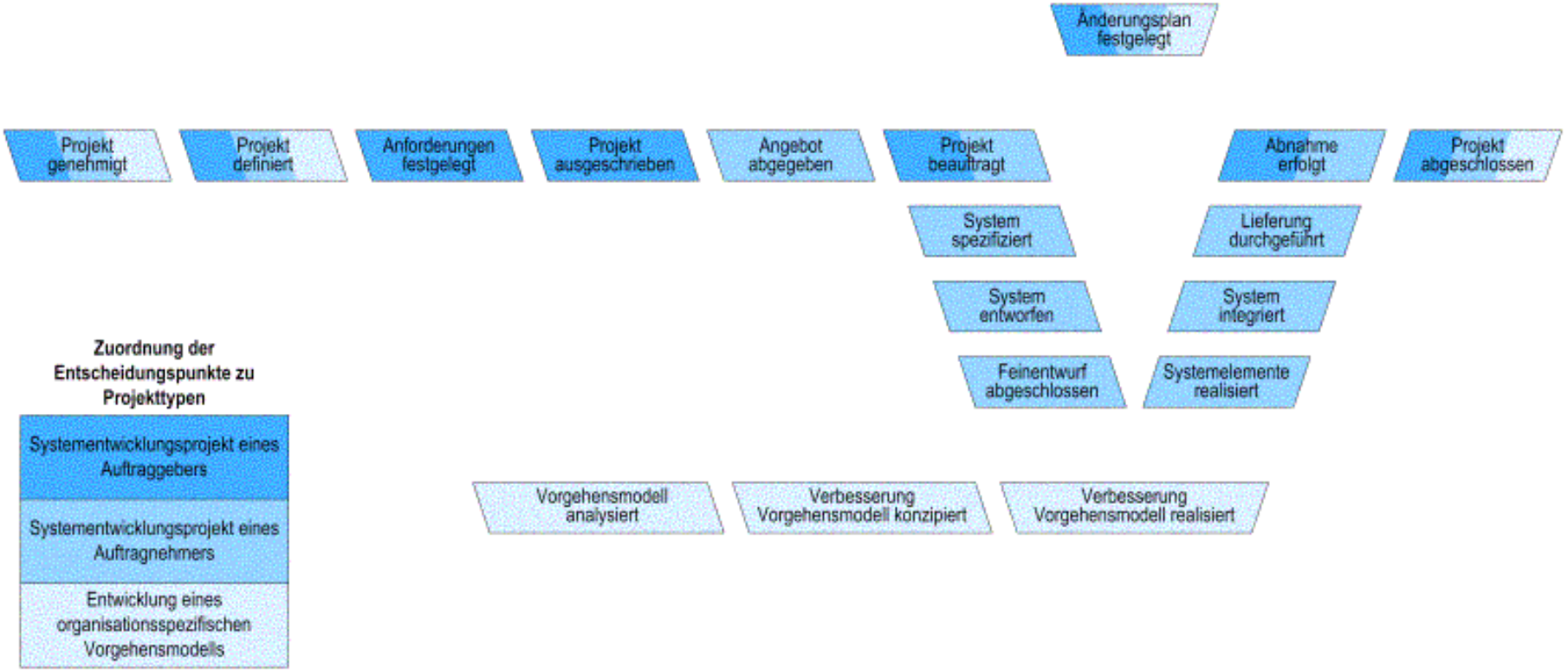
V-Model XT
Interface between Client and Contractor



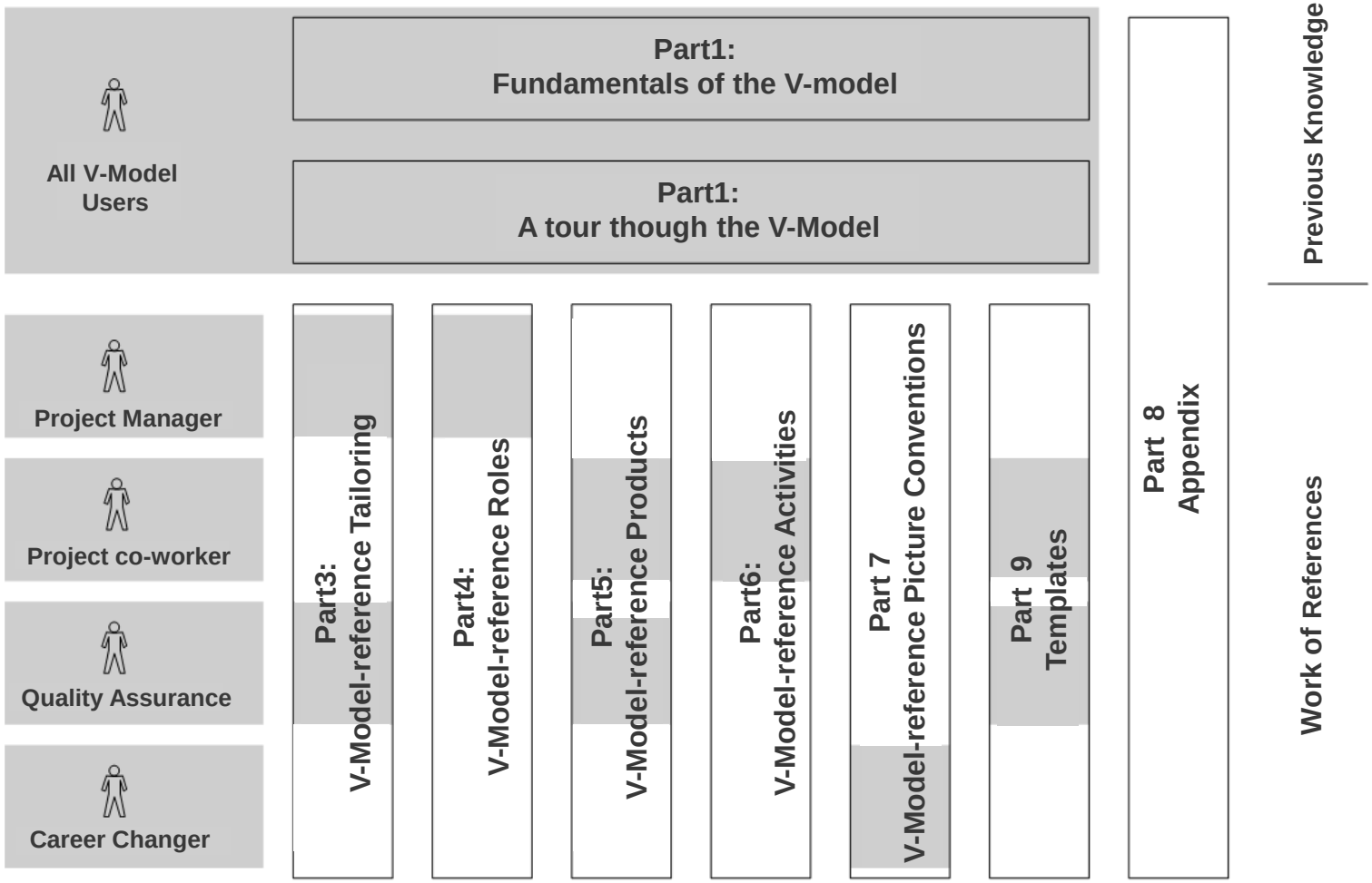
V-Model XT: Project Execution Strategy – Organization Specific Model



V-Model XT
Decision Points: Overview

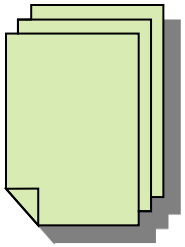


V-Model XT
Document Size



V-Model XT Availability

- V-Model
  - Hardcopy, PDF, Word und HTML, (XML)
  - Training material
  - Tutorial
  - Example Projects



- Product Templates (RTF)

- V-Model XT Editor: Open Source Tool for editing and enhancing V-Model XT
- V-Model XT Project wizard: Open Source Tool for Tailoring of V-Model XT
- Open Source: http://now-portal.c-lab.de/projects/foureveredit/
- Binary: http://www.v-modell-xt.de

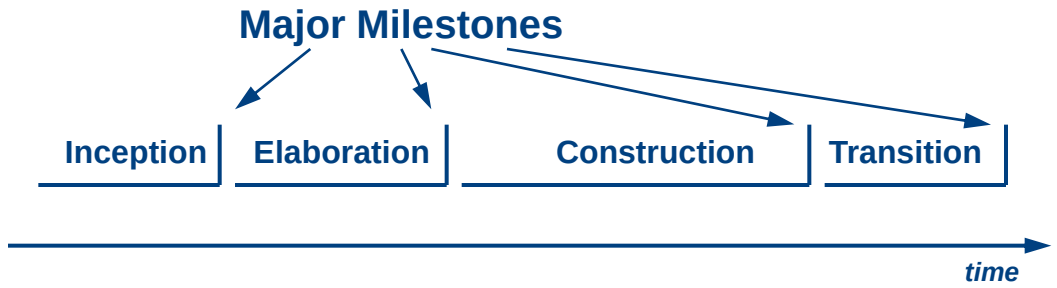
For more information visit
http://www.v-modell-xt.de

Rational Unified Process (RUP)

- Software development process
- Customizable and extensible framework
- Language used is UML
- Use-Case driven
  - Use-cases are the starting point and the base for the development
- Architecture centered
  - The System is divided in components und subsystems through the architecture
- Iterative and incremental process
  - Segmentation in smaller projects
  - Iterations are steps within the workflow
  - Increments are extensions and improvements of the product

Rational Unified Process (RUP) Overview

- Development consists of multiple cycles
- Each cycle finishes with a product release, i.e. after each cycle a product is delivered to the customer
- Each cycle consists of four phases
  - Inception
  - Elaboration
  - Construction
  - Transition



- Each of these phases in divided in nine workflows

Rational Unified Process (RUP)
Best Practices

- Iterative development
- Requirements management
- Architectural centered development
- Visual modeling (with UML)
- Quality assurance
- Change management (configuration management)

- The „Best Practices“ are the design principles for RUP and can be found within the workflows

Rational Unified Process (RUP)
Inception Phase - Conceptualization

- Formulation of the product idea, the vision
- Specification of essential business use cases
- Definition of project size
- Prediction of costs and risks
  - Simplified cost estimate

- **Life Cycle Objective Milestone**

Rational Unified Process (RUP)
Elaboration Phase – Analysis/Design

- Specification of product features
- Architectural design
- Scheduling of necessary activities and resources

- **Life Cycle Architecture Milestone**

Rational Unified Process (RUP)
Construction phase - Implementation

- Product creation
- Development of the architecture
- Result: finished product

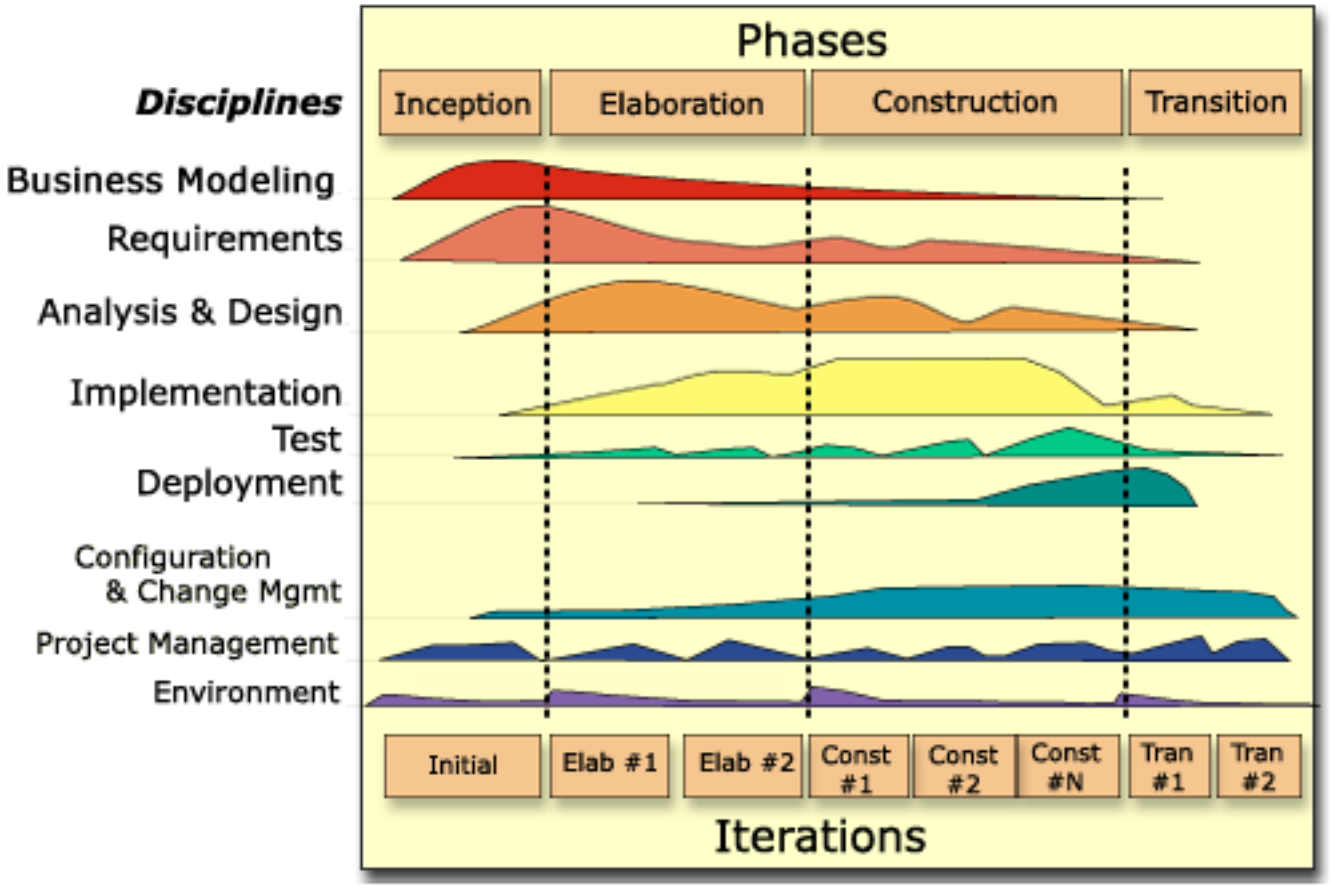
- **Initial Operational Capability Milestone**

Rational Unified Process (RUP)
Transition phase – Market release

- Product release to the customers
- Examination of quality level
- Delivery, training, service support, maintenance

- **Release Milestone**

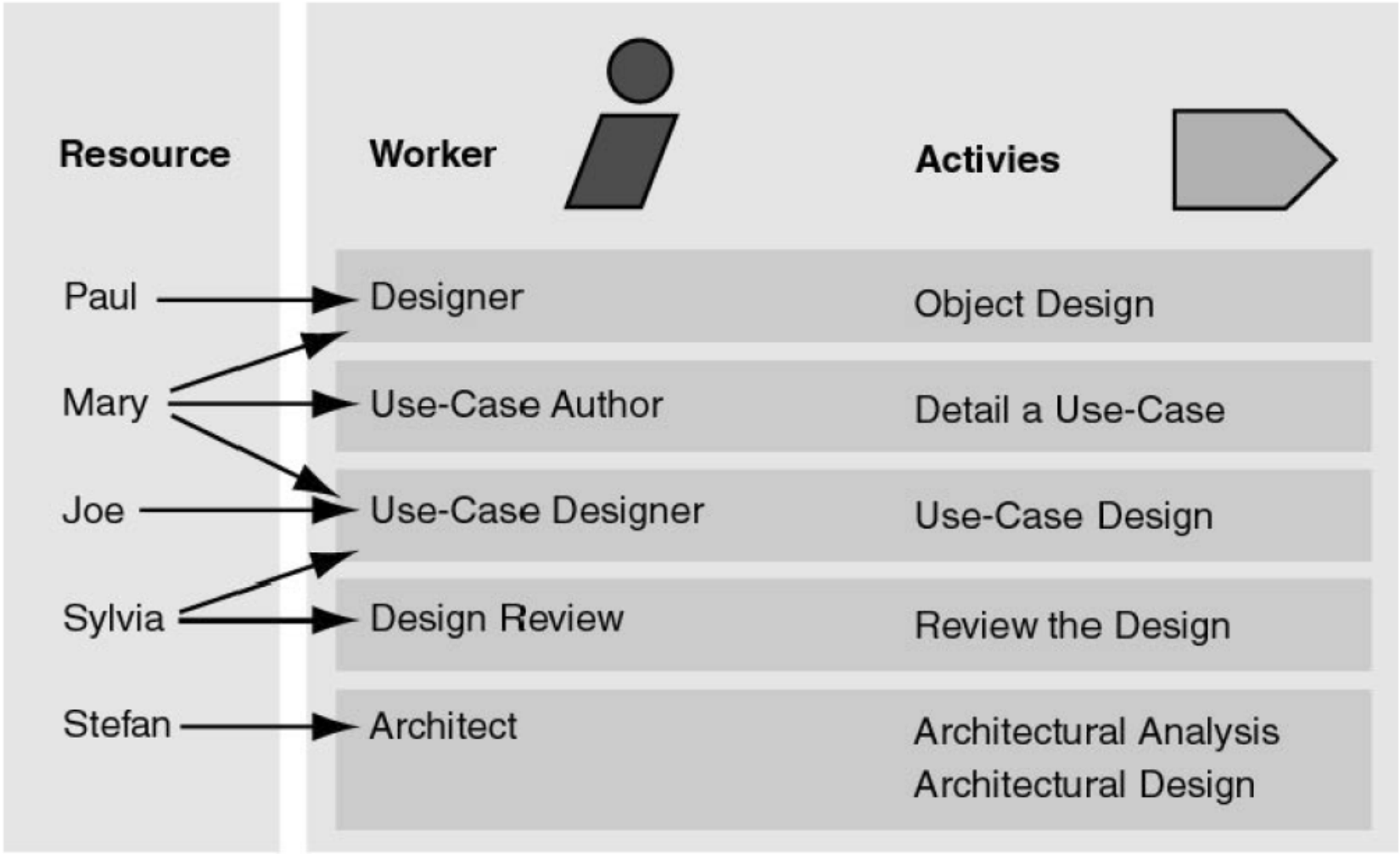
Rational Unified Process (RUP)
Process structure



Rational Unified Process (RUP)
Process structure

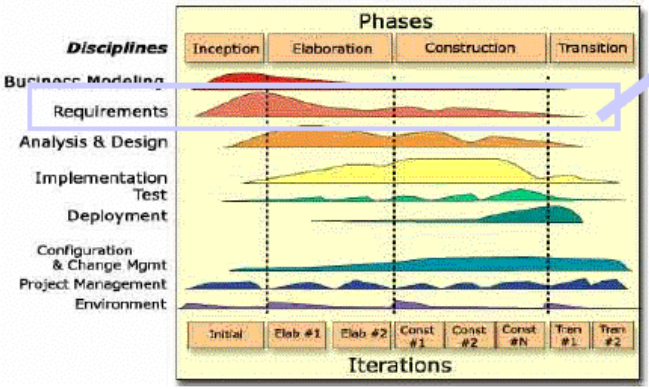
- Each phase consists of at least one iteration
- Each iteration is composed of workflows
- Workflow elements are roles („*Workers*“), activities, and artifacts
  - Worker: „who“
  - Artifact: „what“
  - Activities: „how“
  - Workflows: „when“
- Thus, it is specified who does what, when and how for the whole process

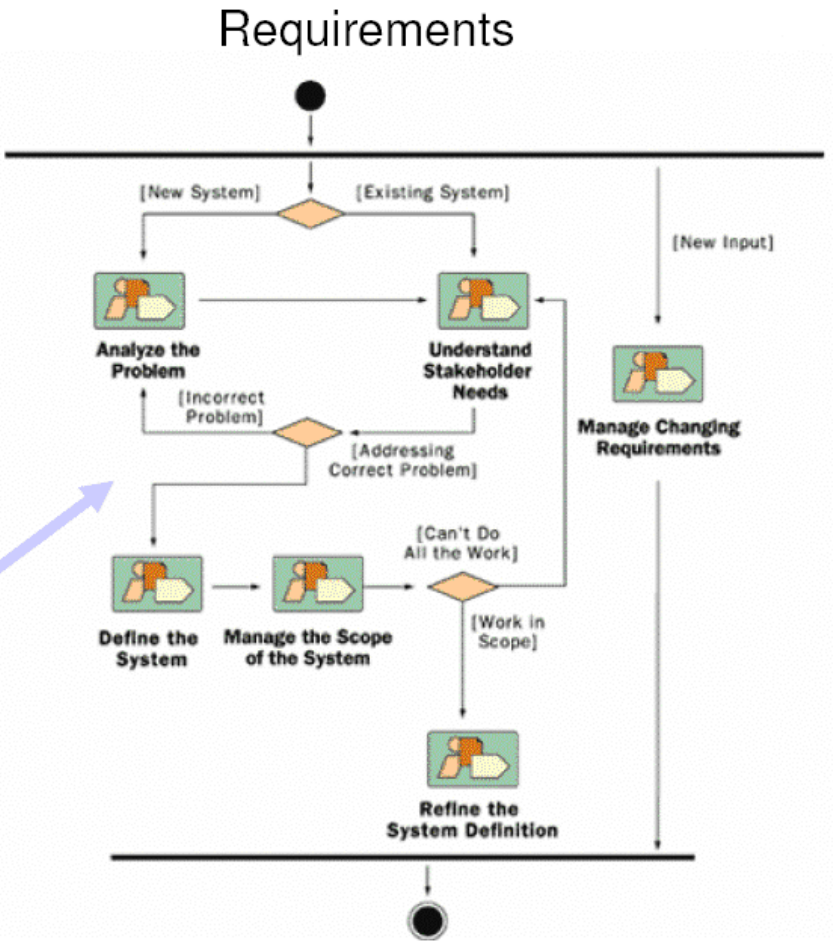
Rational Unified Process (RUP)
Persons and Workers



Rational Unified Process (RUP) Workflows

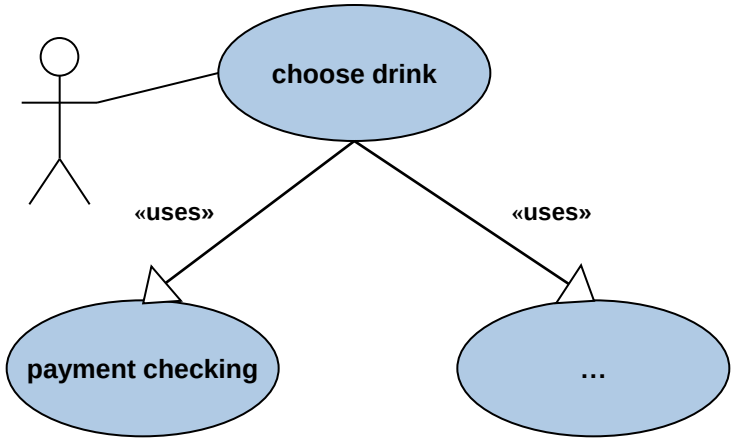
- For each workflow, starting from business modeling, the implementation, up to the project management, RUP provides tool supported procedures





Rational Unified Process (RUP)
Use-case based

- User interacts with system, system executes a series of activities
- A use-case is the description of an interaction and specifies the **functional requirements the users have**
- Initiated through an actor and consists of several activities
- A set of use-cases specifies the requirements for the whole system
- Use-cases are modeled using UML
- Use-cases are the basis for all subsequent parts of RUP

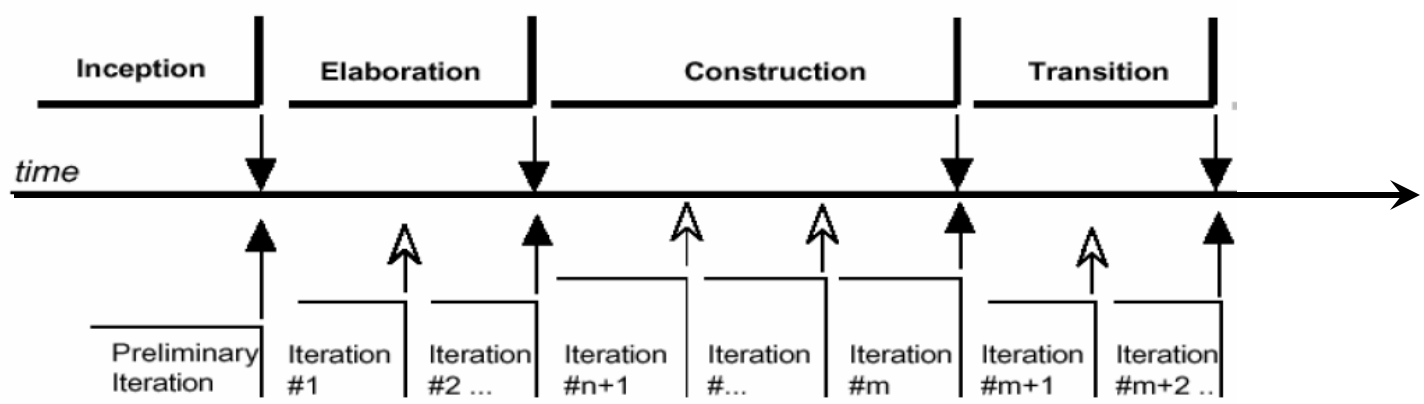


Rational Unified Process (RUP)
Architecture centered

- The architecture structures the system, using components and subsystems
- Provides ‘views’ for the static and dynamic system aspects
  - Logical view
  - Implementation view
  - Process view
  - Distribution view
  - Use-case view
- Affected by
  - Important use-cases (functional requirements)
  - Platform (OS, …)
  - Reusable components (Frameworks,…)
  - Existing applications (Integration of Legacy Systems,…)
  - Non-functional requirements (Performance, reliability, …)
- The most important use-cases constitute subsystems, classes, or components

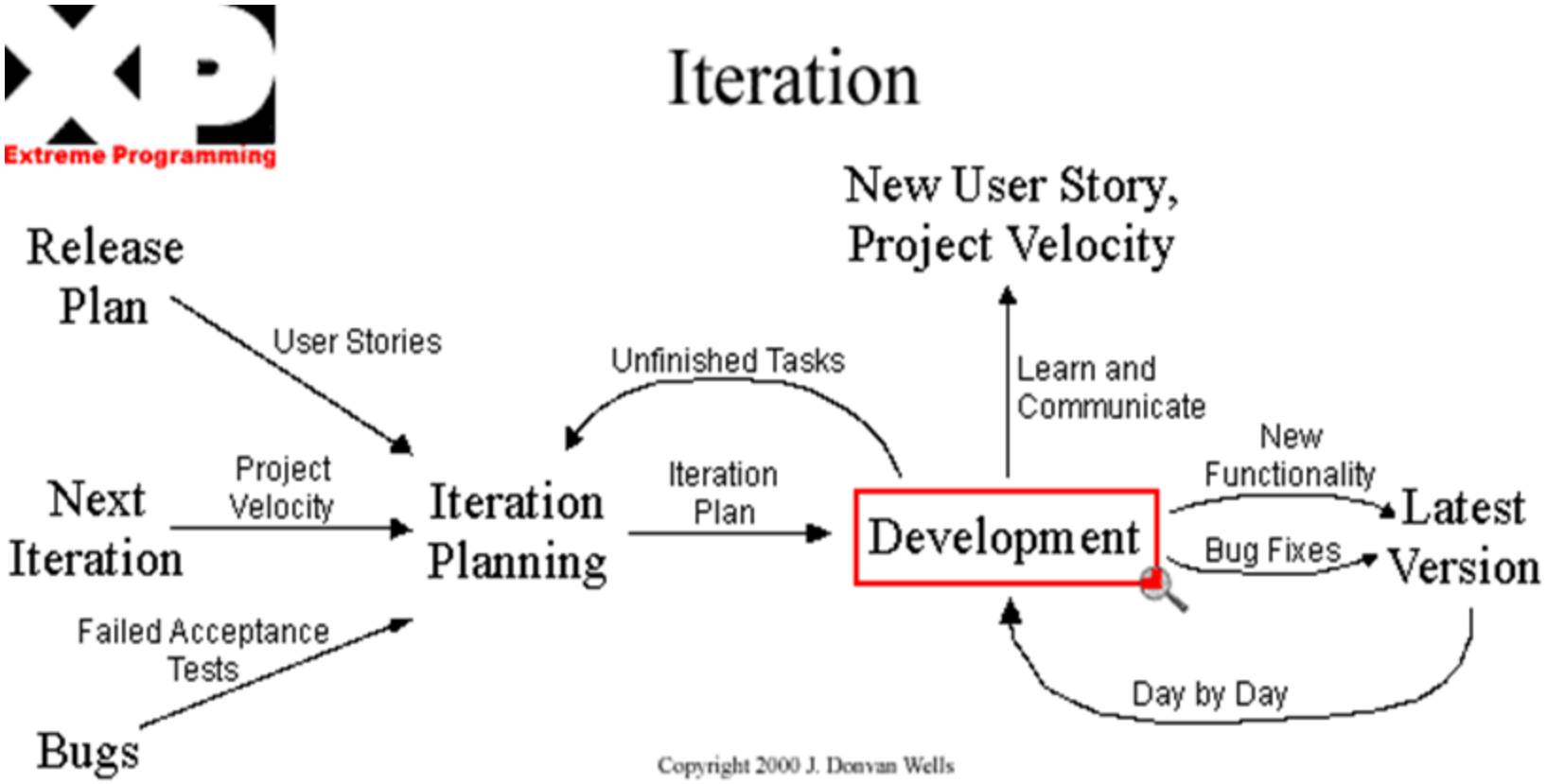
Rational Unified Process (RUP)
Iterative and incremental

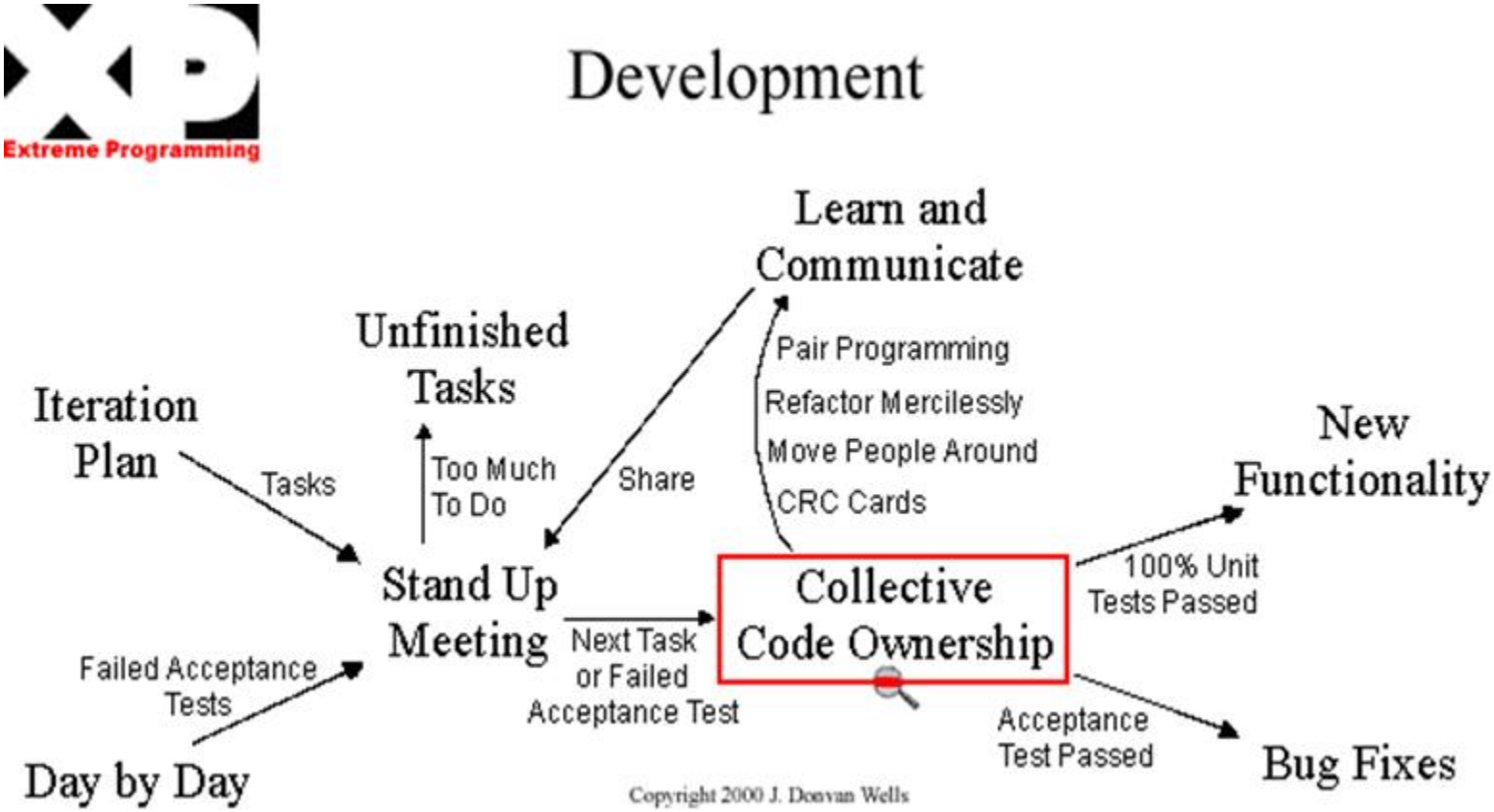
- Project is splitted in several mini projects
- Each mini project is an iteration
- Iterations are steps within the workflows
- Each iteration leads to a product growth
- Each phase consists of at least one iteration



Rational Unified Process (RUP) Adaptable Framework

- Realizing RUP is very complex
  - > 30 roles
  - > 130 activities
  - > 100 result types (artifact types)
- But RUP can be adapted to a company's or project's needs
- Workflows can be shortened or left out, if they are not required


Extreme Programming
Iteration
New User Story,
Project Velocity
Release
Plan
User Stories
Unfinished Tasks
Learn and
Communicate
New
Functionality
Project
Velocity
Iteration
Plan
Next
Iteration
Iteration
Planning
Development
Latest
Version
Bug Fixes
Failed Acceptance
Tests
Day by Day
Bugs
Copyright 2000 J. Donvan Wells

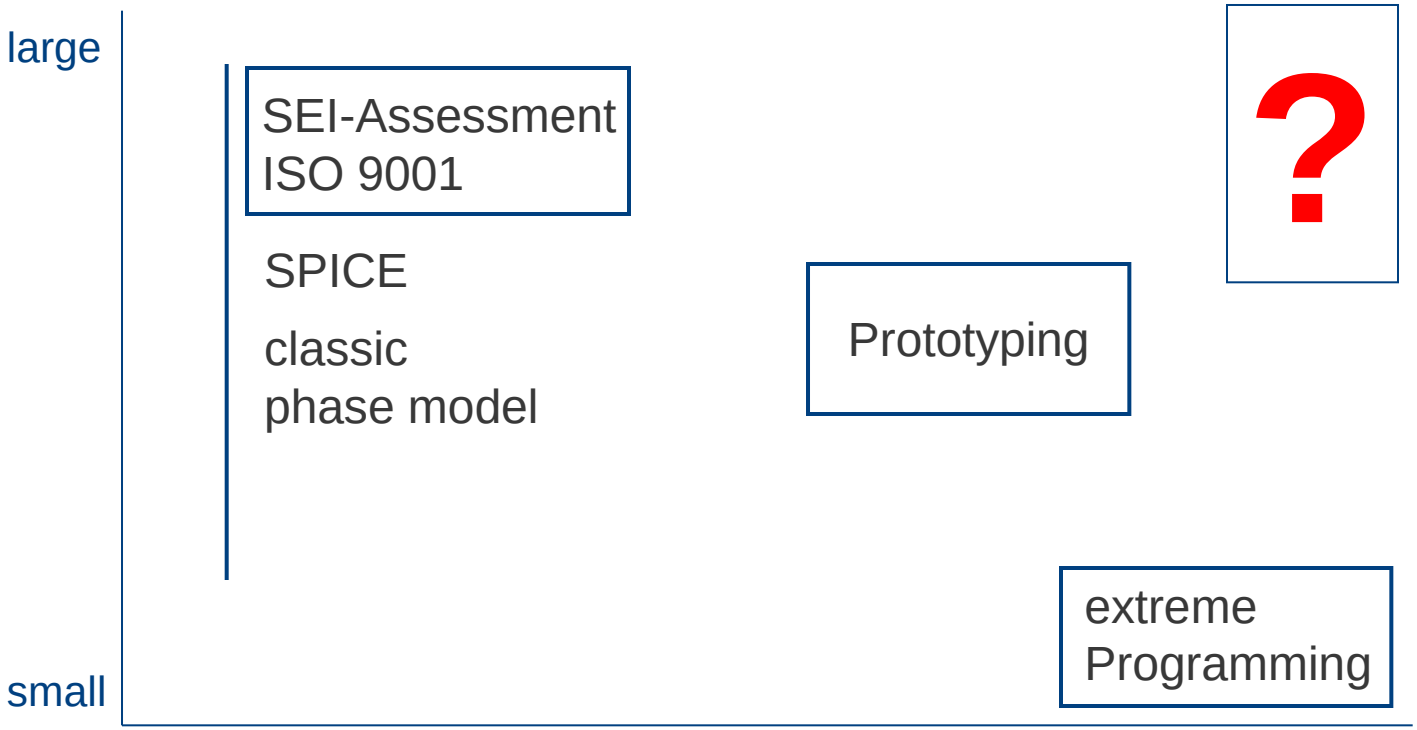

Extreme Programming
Development
Learn and Communicate
Unfinished Tasks
Pair Programming
Refactor Mercilessly
Move People Around
CRC Cards
Iteration Plan
Tasks
Too Much To Do
Share
New Functionality
Stand Up Meeting
Collective Code Ownership
100% Unit Tests Passed
Next Task or Failed Acceptance Test
Failed Acceptance Tests
Acceptance Test Passed
Day by Day
Bug Fixes
Copyright 2000 J. Donvan Wells

Extreme Programming (XP)

- Small projects (approx. 10 collaborators)
- Unstable or unknown requirements
- Contributory customers
- Strong focus on the customer
- Strong focus on quality

- Danger of leading to chaos (legitimating ad-hoc working procedures)

Processes



Processes Prediction

- Assessments will play a major role in large companies
- The DIN ISO 9001 certificate will be considered necessary, but not sufficient
- Waterfall models will remain
- Waterfall models will be supported by prototyping, to deal with unclear requirements
- Extreme Programming can be used for small projects, if the customer is willing to collaborate and if certain documents are not necessary