
Integrating a Model of Analytical Quality Assurance into the V-Modell XT

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- Analytical QA (reviews, tests, ...) are an important but costly part of software development
- The costs are significant:
 - ◆ Myers (1979): 50% of the total development costs for test
 - ◆ Jones (1987): 30–40% of the development costs for quality assurance and defect removal
 - ◆ *National Institute of Standards and Technology* (2002): 80% for defect detection and removal
- There are models to classify, analyse and manage those costs

- Models for the cost of quality (or quality economics) would be useful for decision makers in software projects:
 1. Which defect-detection techniques do I use?
 2. What effort do I spend on each technique?
- Rai et al. (1998): “A better understanding of the costs and benefits of SQA and improvements to existing quantitative models should be useful to decision-makers.”
- The models often lack
 - ◆ operationalisation and
 - ◆ integration into the development process.
- How do we integrate models of quality economics into process models?

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Quality Economics

Models of Software

Quality Economics

A Stochastic Model

Example: Direct

Costs

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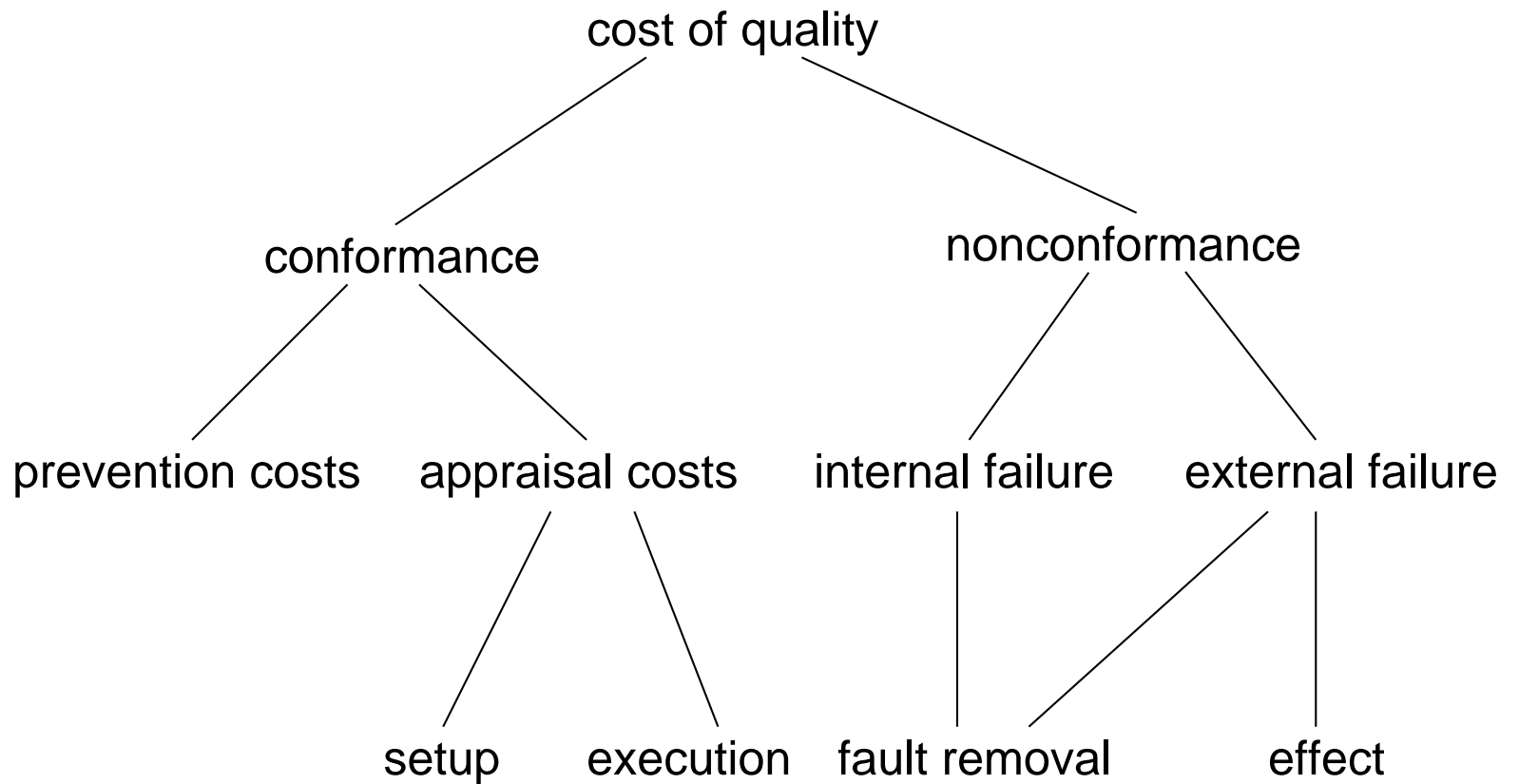
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- Quality economics is the cost/benefit analysis w.r.t. quality
- The benefits are the saved costs



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- There is a variety of models on different levels of abstraction
- Examples:
 - ◆ Boehm et al.: iDAVE
 - ◆ Slaughter, Harter, Krishnan: ROSQ
 - ◆ Kusumoto et al.: inspection efficiency
 - ◆ Morasca and Serra-Capizzano: test efficiency
 - ◆ Pham: reliability model with costs

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- Mainly published at this years ISSTA
- For analytical quality assurance
- Three main components:
 - ◆ Direct costs $E[d_A(t_A)]$
 - ◆ Future costs $E[o_A(t_A)]$
 - ◆ Revenues / saved costs $E[r_A(t_A)]$
- Currently not covered:
 - ◆ Time to market
 - ◆ Net present value

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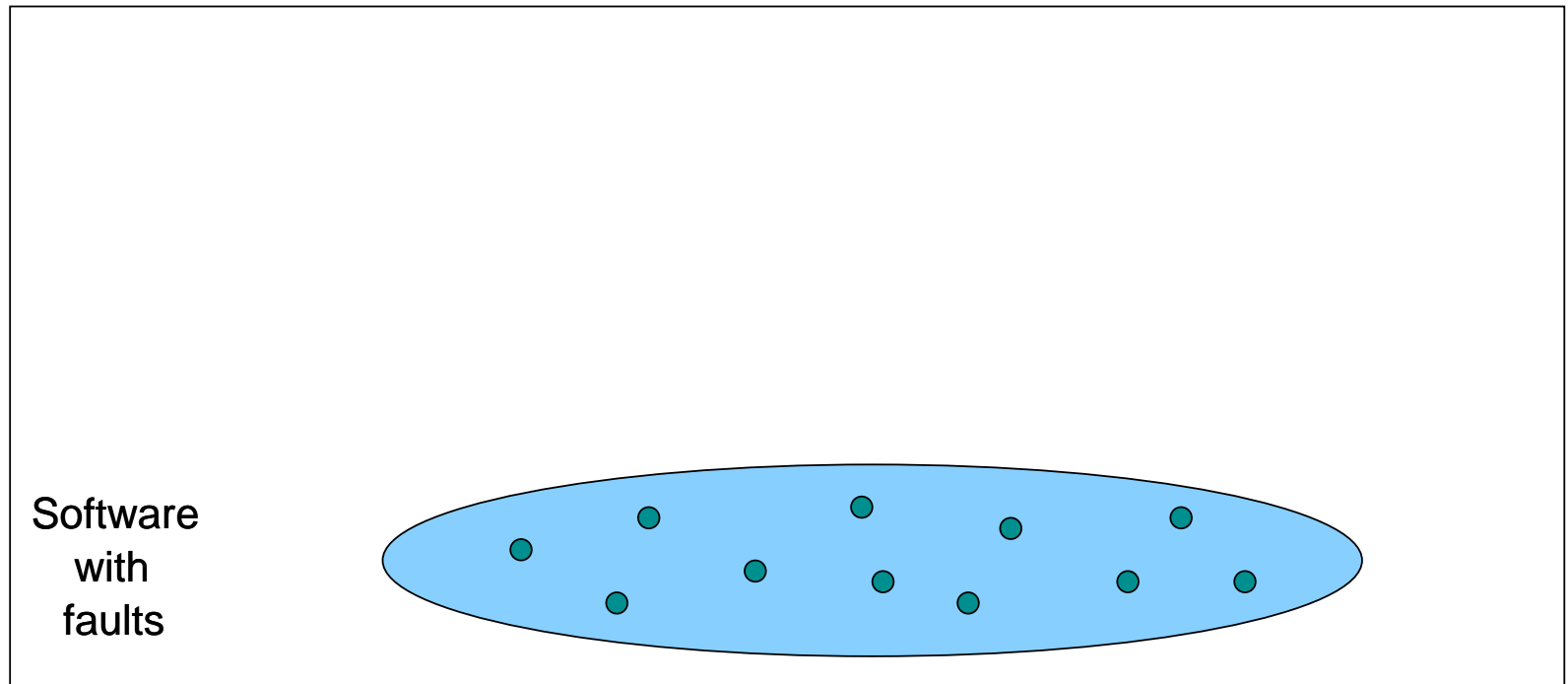
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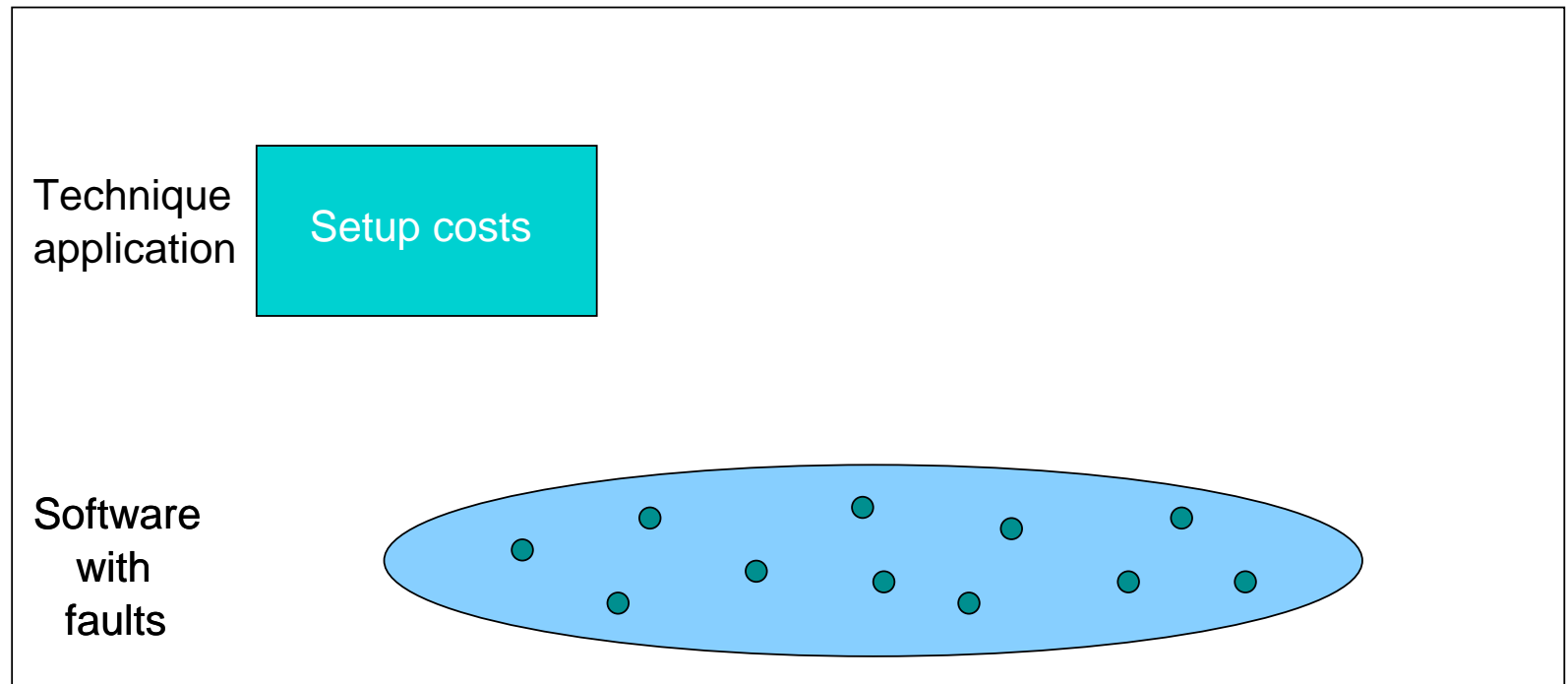
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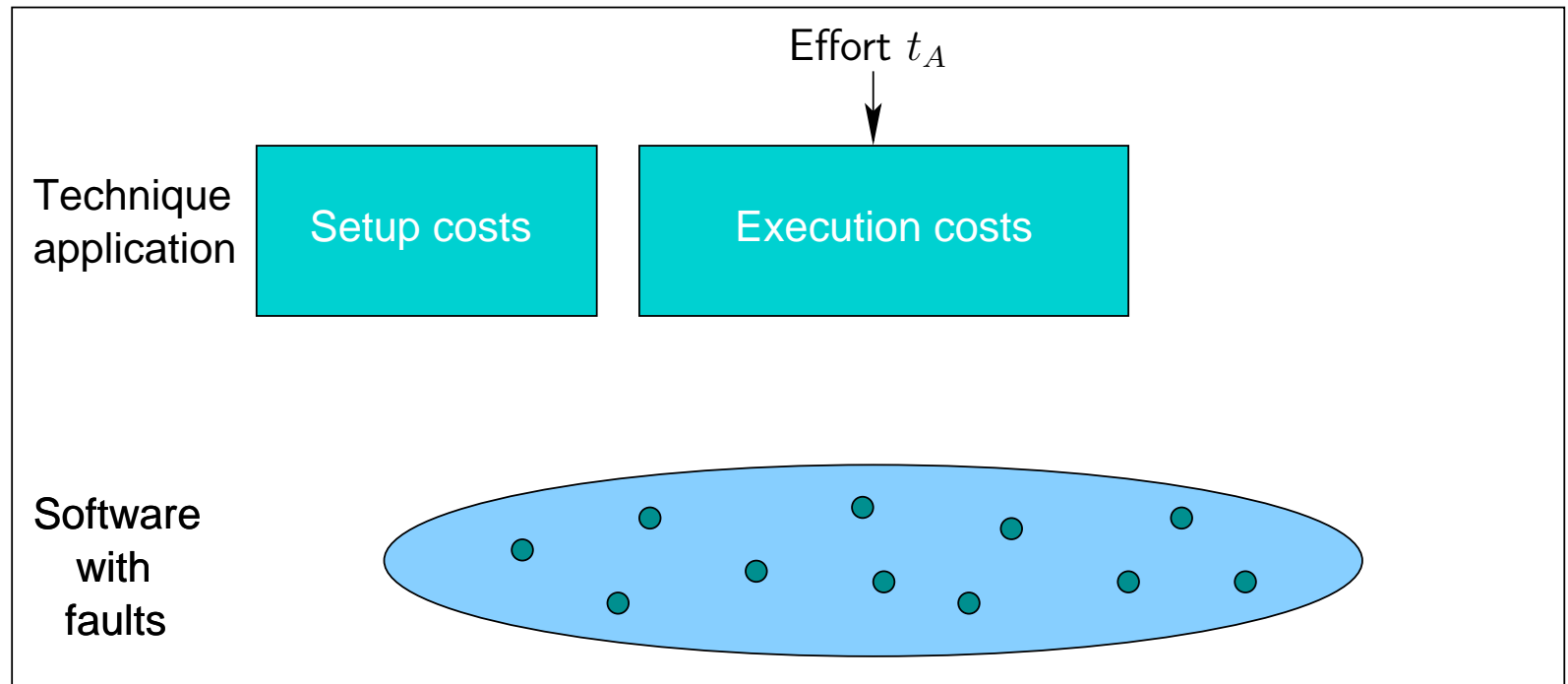
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- Those costs that can be directly measured while applying a technique

$$E[d_A(t_A)] = u_A \quad (1)$$

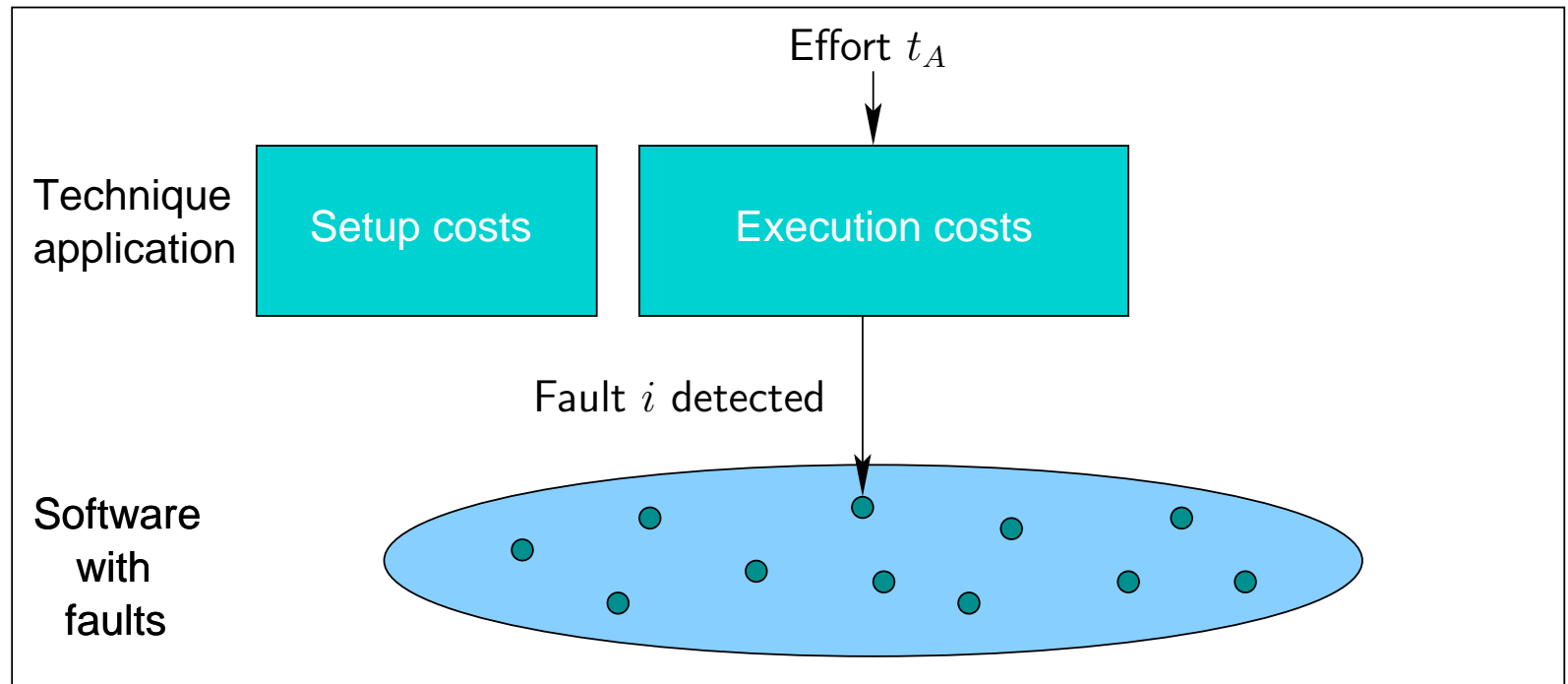
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- Those costs that can be directly measured while applying a technique

$$E[d_A(t_A)] = u_A + e_A(t_A) \quad (1)$$

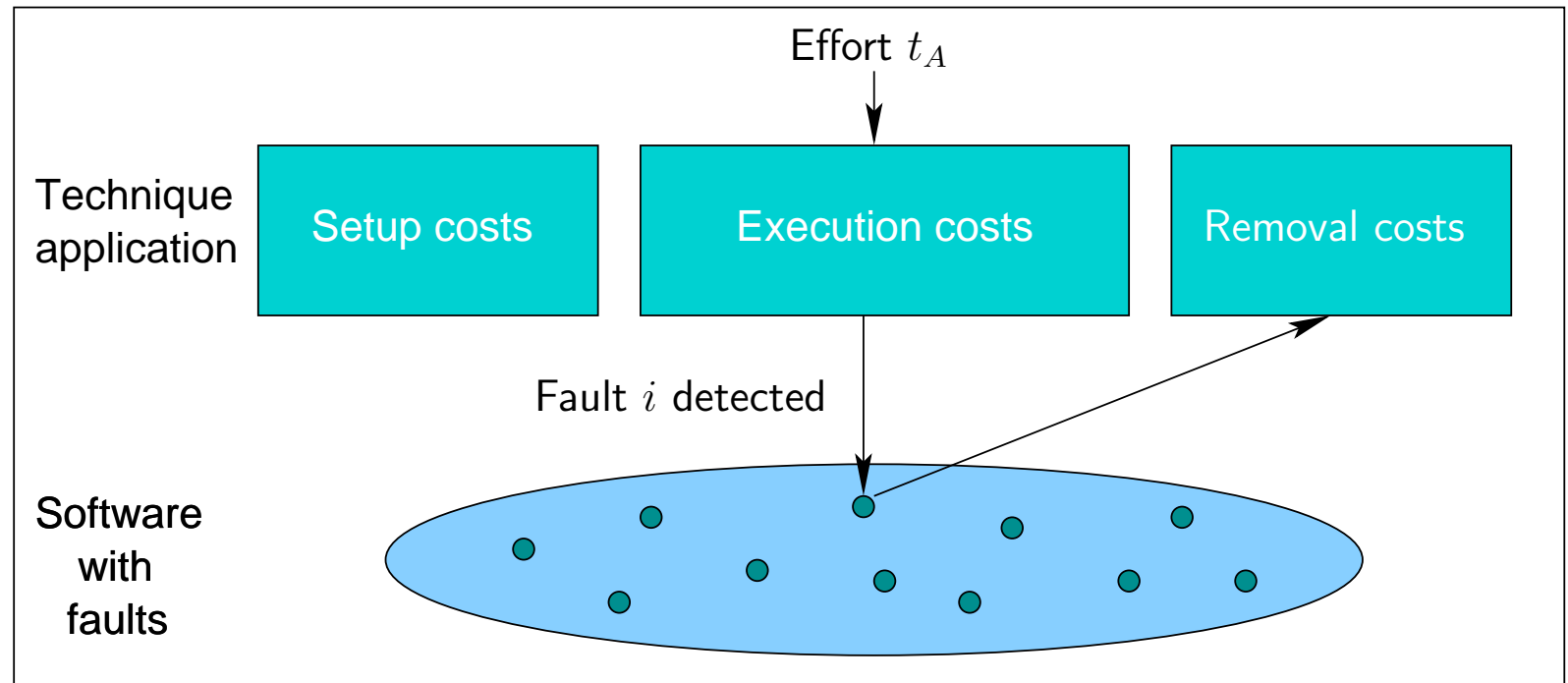
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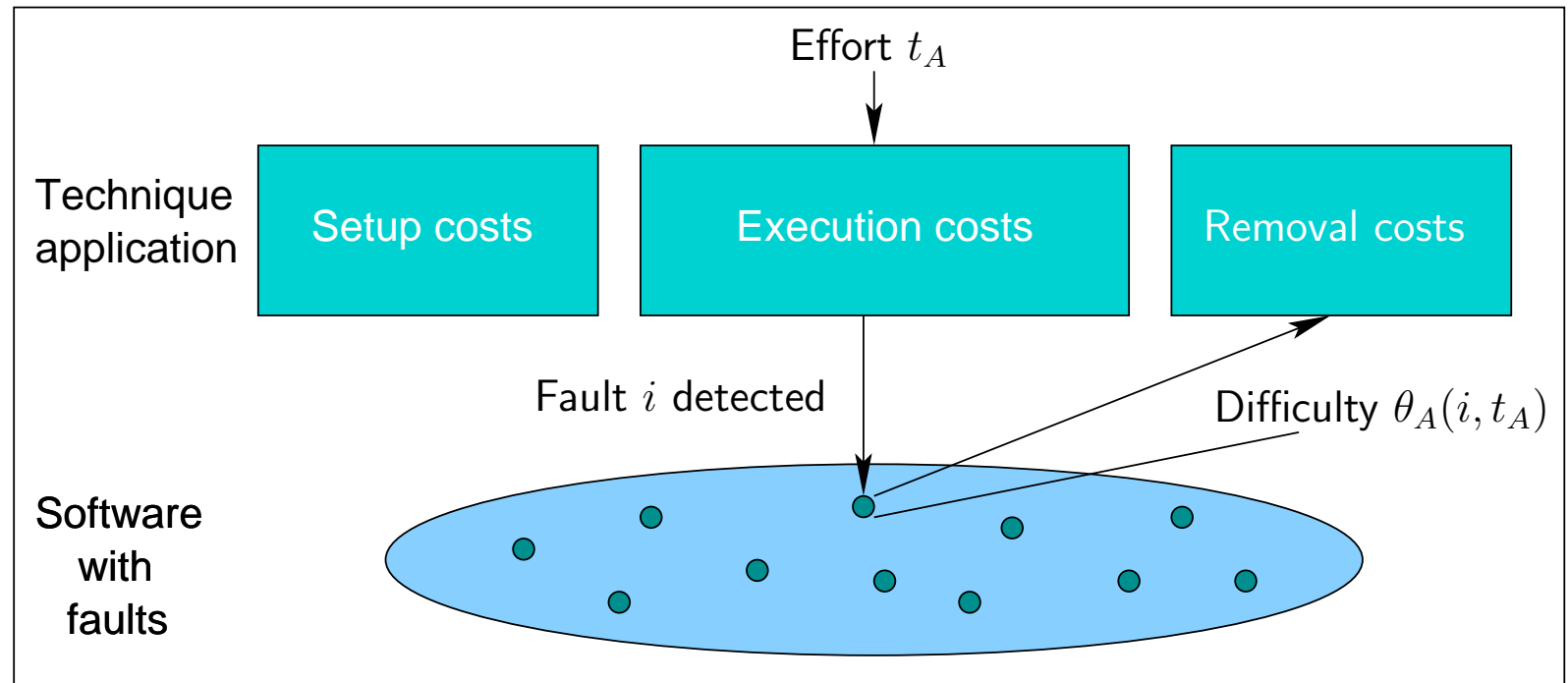
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- Those costs that can be directly measured while applying a technique

$$E[d_A(t_A)] = u_A + e_A(t_A) + \sum_i v_A(i) \quad (1)$$

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- Those costs that can be directly measured while applying a technique

$$E[d_A(t_A)] = u_A + e_A(t_A) + \sum_i (1 - \theta_A(i, t_A))v_A(i) \quad (1)$$

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- Approach
 - ◆ Group defects to (useful) defect types
 - ◆ Collect data inside your company
 - ◆ Predict for new project based on historical data
 - ◆ Optimise the effort distribution
- Questions
 - ◆ How to do that in a real project environment?
 - ◆ How does that fit to my process model?

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- The V-Modell XT is a recent German standard for software and system development
- Based on its predecessor V-Modell 97
- Emphasis on easy adaptation (XT = eXtreme Tailoring)
- Mainly developed at the Technische Universität München and the Technische Universität Kaiserslautern
- See also: <http://www.v-modell-xt.de/>

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- Based on a meta-model
- Work products (project results and artefacts)
- Product dependencies (consistency relations between work products)
- Activities (actions for creating work products)
- Roles (responsibilities for work products)
- Process modules (groups of work products, activities and roles)

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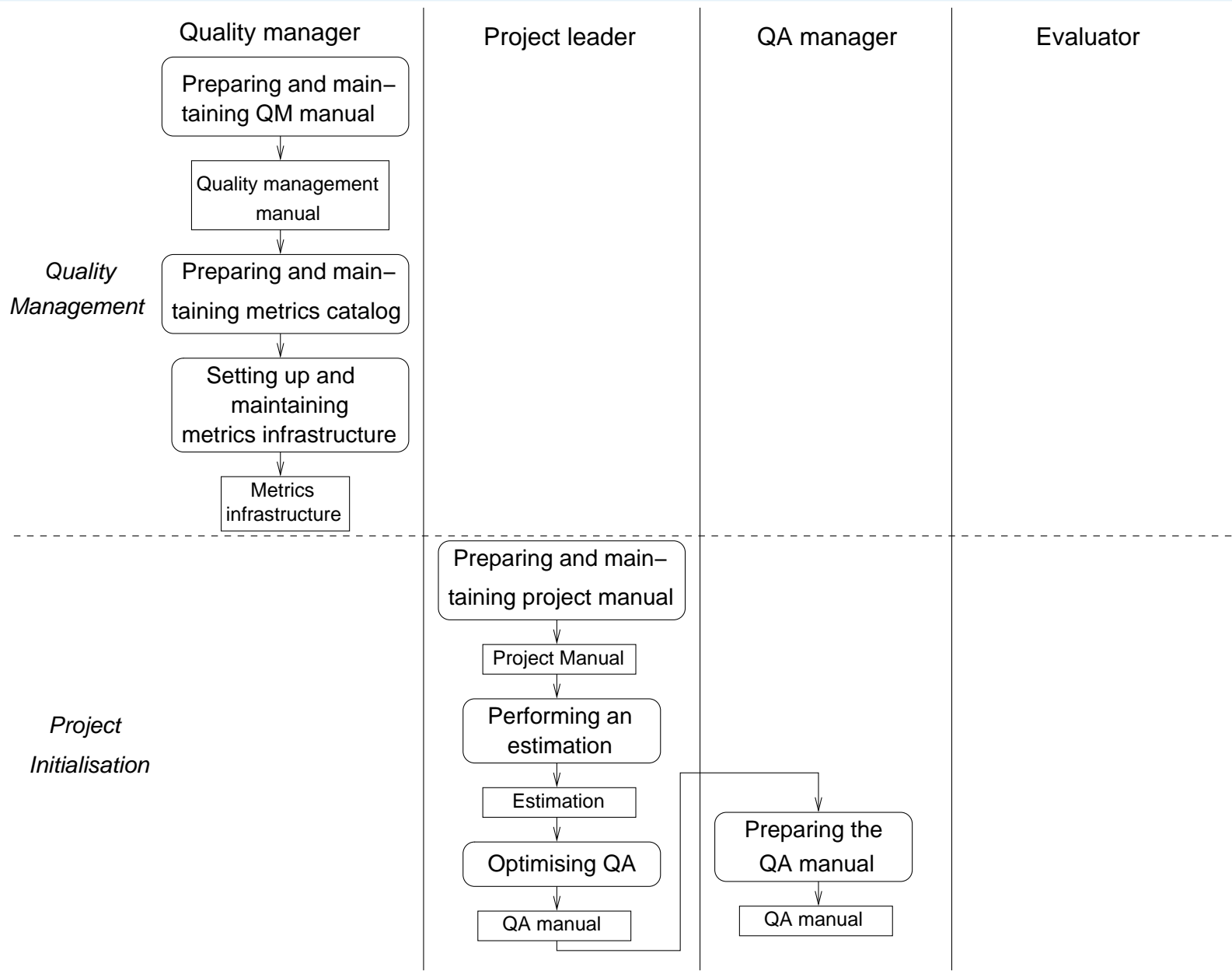
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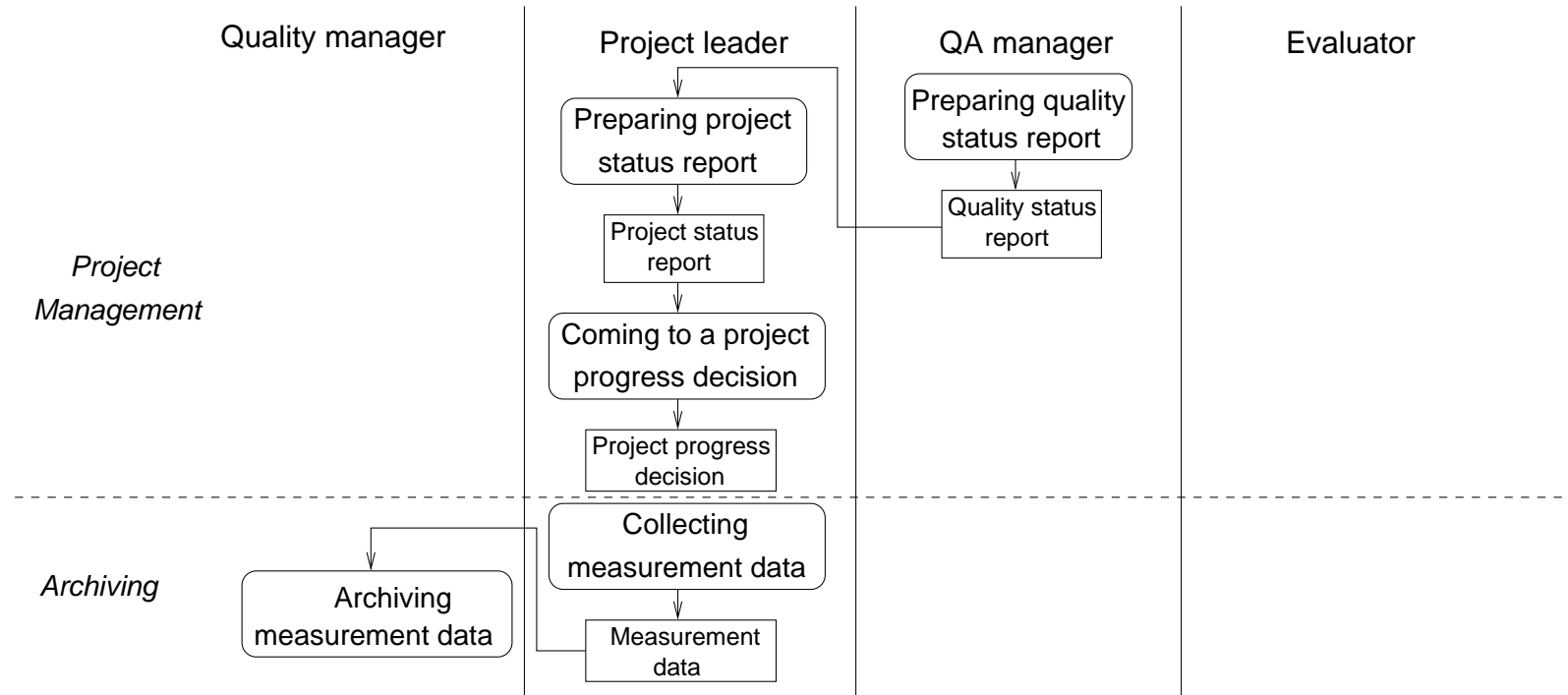
- The V-Modell XT has extension mechanisms
- We decided to define a new process module *Measurement and Analysis of Analytical QA*
- We need to refine and extend existing work products, roles and activities
- We need to define new activities and work products

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- The structures of the V-Modell XT fit well
- No major difficulties in the integration
- The V-Modell XT does not cover organisation-wide QA but project-specific
- Some redundancy because of the modular extension

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Thank You!

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- Costs and benefits are a central factor in planing QA
- Models of those can help decision makers
- Most existing models lack an integration into the general process model
- An exemplary integration of one model of analytical QA into the process model V-Modell XT showed
 - ◆ An integration is feasible
 - ◆ Depends on the process model
 - ◆ Probably easiest with a model that covers the organisational QA as well



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