Answer for EXAM METHOD ENGINEERING

First final exam, 13 April 2015

17.00-20.00

EDUC-GAMMA

NAME:	STUDENTNR.:

- This exam consists of 5 questions on 14 pages. Please check first whether you have properly obtained **all** pages.
- Enter the answers in the space allocated. In case you need more space you can **use the back** of the pages. Make a proper reference to such an extra part on the back.
- When you have finished the exam you should submit the complete package stapled in the correct order.
- The results of the exam will be communicated to you through the website of the course as soon as possible.

Question	Max. points	Awarded points
1	20	
2	20	
3	17	
4	20	
5	23	
Total	100	
Exam grade		

Good Luck!

1. Situational method engineering

The following questions are based on the paper:

Brinkkemper, S. (1996). Method engineering: engineering of information systems development methods and tools. *Information and Software Technology 38*(4), 275-280.

a. Explain the notion of method assembly in terms of method fragments

3 points

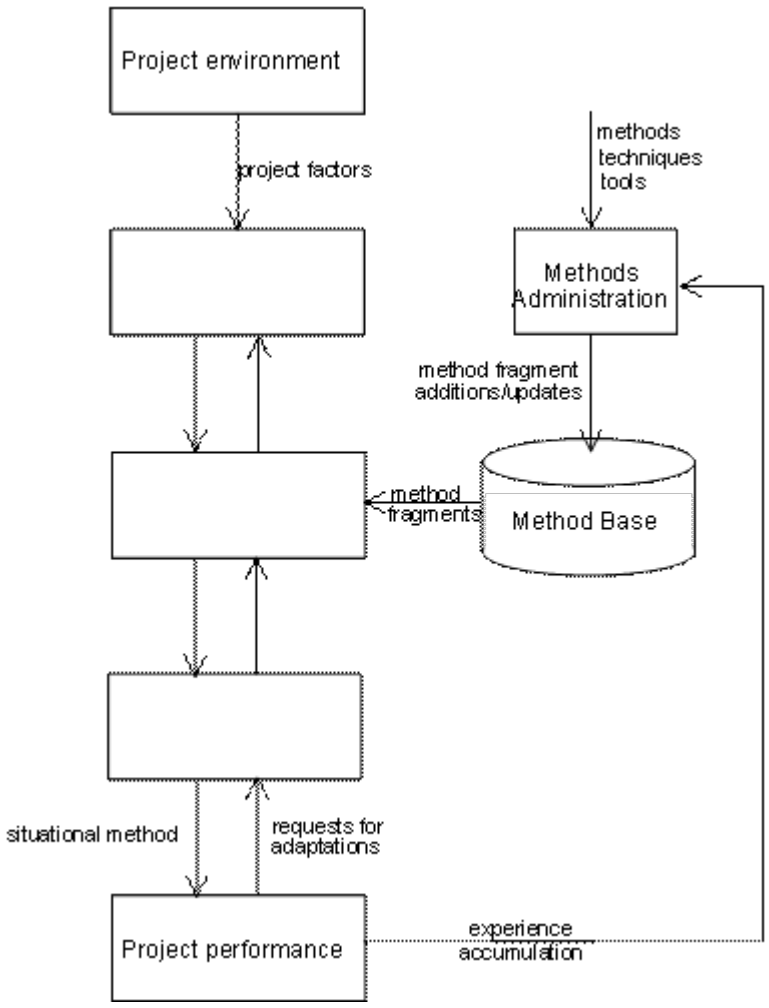
During method assembly method fragments are put together to form a complete method for the project at hand.

b. Fill in the missing names for the 3 processes **and** 4 flows in the figure below.

4 points: process one correct 0; two correct 1 point, three 2; flow correct 0.5 points

Processes: Characterisation of Project; Selection of method fragments; Assembly of method fragments

Flows: 1 down: characterisation, 2 up: validation, 3 down: selected method fragments, 4 up: requests for new method fragments.



c. Explain the usage of a method base in situational method engineering.

3 points
The Method Base contains all method fragments that have been collected by the organization based on their relevance. The method base interacts with the assembly process to provide the relevant method fragments for the project at hand.

d. Explain why a meta-modeling technique is necessary for carrying out a situational method engineering project.

3 points → In situational method engineering it is necessary to have a meaningful representation of the method. A meta-modeling technique makes it possible to give this meaningful representation by showing the process and the deliverables and their relations. Furthermore, it provides a means to break up method into method fragments, in order to store the methods or method fragments in a structured way.

e. Give two advantages and two disadvantages of using a situational method over a standard method

3 points → 1.5 each; 1 point for the first and 0.5 for the second (dis)advantage
+ Method fits the situation, so no superfluous activities/deliverables that are needed in the standard
+ Standard method creates generic deliverables, whereas situational method creates specific deliverables. Semantic discrepancy is low as methods fit to the technology platform and to the IS to build.
- Difficult to determine the situation characteristics, so wrong method fragments might be chosen.
- Each method has new steps for which no experience is available and training might be necessary.
Other answers also possible.

f. The company ABC experiences some shortcomings of their current method, called Scrum, as reported by different stakeholders of the company. ABC decides to use a situational method engineering approach to extend the Scrum method with *some* parts of the DevOps method into a new method called ScrumOps.
Explain the steps the company needs to perform in this approach.

4 Points

Steps:

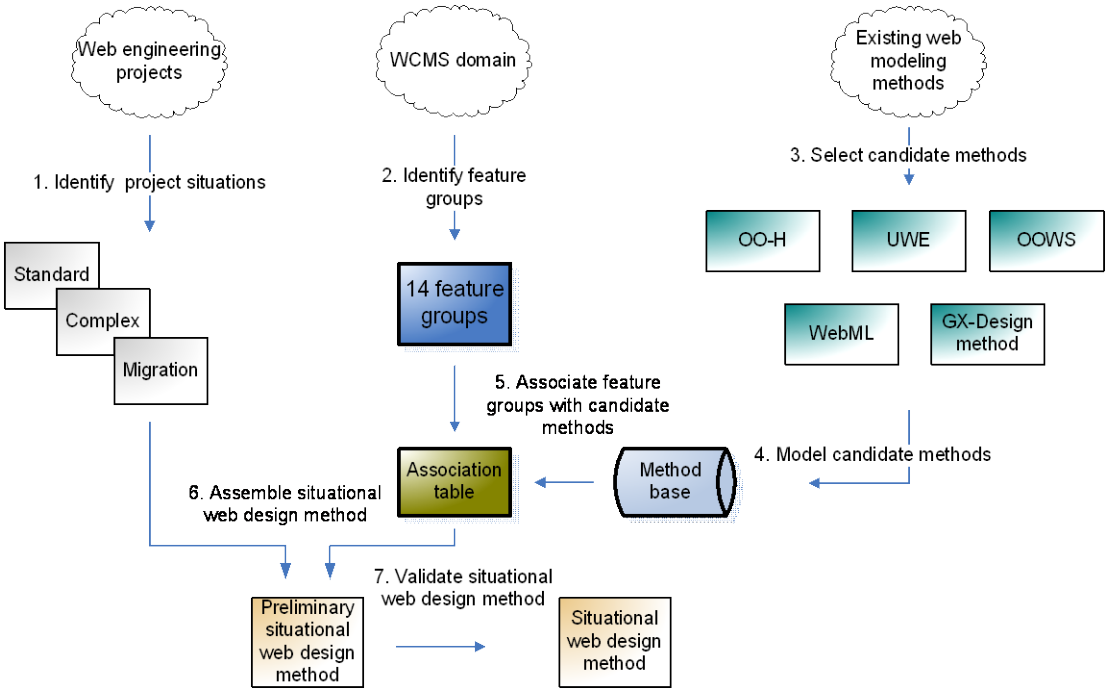
1. Identify needs of the company
2. Create full meta-models (PDDs) of existing Scrum method **and** of candidate method DevOps
3. Identify overlap of Scrum with DevOps: activities, deliverables
4. Extract method fragments from DevOps and assemble in Scrum. Make proper adaptations for the interfacing of Scrum and DevOps
5. Arrange for proper tooling for the DevOps activities that can be included in the existing method infrastructure.
6. Train employees where needed and roll-out in company.

+ case specific information.

- All steps: 4
- Only description of global process. No real steps, but the idea is right: 1,5
- Every missing step: -0.5

2. Method Association

In the lecture on method association, the following figure was presented for the creation of a situational web design method for a particular Web content management system (WCMS).



a. Step 1 identifies the project situations. Explain how the process of identification of project situations is performed.

3 points
By analyzing a representative set of completed projects and by interviewing experienced project managers the different project types can be identified: Standard, Complex and Migration. By analyzing the similarities and differences in the phases, deliverables and activities these project types can be determined. Special care has to be taken that uncommon projects are excluded from this process. Furthermore, the number of project situations is to be restricted to a low number, say 2-5.

b. Explain the concept of feature groups and give two examples in the domain of Web Content Management Systems.

3 points; 2 for explanation, 0.5 per example
Feature groups are categorizations of functionalities of the domain of the software product. This means existing ***and*** future functionalities.

The full list of examples are:

- E-forms / Transaction management

- Personalization
- Authoring
- Authorization management
- Community technologies
- Connectivity management
- Content repository
- Deployment and replication
- Digital Asset Management
- Layout and presentation management
- Multi-channel delivery and syndication
- Site Management
- Web usage Mining
- Workflow

c. In step 3 the candidate methods are selected. Explain the necessity of this selection.

3 points
A manageable selection is made to provide input for the meta-modeling step 4. In this way it is prevented that too many unrelevant methods need to be modeled.

d. Explain the association process in step 5.

4 points
For each feature group, it is analyzed to what extend the available method fragments in the Method Base support the modeling (or creation / analysis/ etc.) of this feature. An association matrix lists the support of the feature modeling by the fragment.

e. Describe the necessity of the validation in step 7 and describe a possible way to perform this step.

3 points
This step is necessary to check whether the Preliminary SWDM really suits the application domain. Completeness, consistency, learnability, etc. of the method can be verified before the method in taken into production.
This can be performed by
- an expert evaluation, or by
- a pilot project
Just one needs to be mentioned.

f. Explain which steps of the Method Association approach should be adapted for a completely different type of software application.

4 points: 1 step 1 point, 2 steps 2; 3 steps 4 points.

In step 1: other project types

In step 2: other domain of product

In step 3: other domain of methods

3. Method comparison

This question is based on the paper on the method comparison approach, as described by Hong, van den Goor and Brinkkemper (1993).

a. Give two reasons why comparison of methods should be done by using meta-models.

4 points; 2 each
- Uniform description
- Formal description
- Unbiased or objective description

b. During the method comparison process, as described in the literature and presented in the lectures, a *supermethod* is created. Give the definition of super method and explain the usage of a supermethod in method comparison.

5 points: 2 for definition; 3 for explanation

The paper states:
This super methodology is defined as the smallest common denominator of all activities in the meta-process models of the OOADMs. I.e. a method which contains all activities and concepts that appear in at least one of the OOADMs.
The comparison of the processes is performed by aligning the steps of the OOADMs side by side and revealing the similar and different activities of the analysis and design. There are several approaches of comparison, such as comparing all OOADMs to one of them or creating an entirely new methodology to which these OOADMs are compared. After carefully evaluating the possible alternatives, based on the principle of unbiased comparison, we take the approach of creating a so-called super methodology as the target to compare.

c. Give two advantages of using PDDs instead of the Task Structure diagrams and the Extended Entity Relationship diagrams as described in Hong, van den Goor and Brinkkemper (1993).

4 points; 2 each
1. PDDs give an overview of both the activities and the deliverables in the meta-process model, whereas Task Structure diagrams only give the process perspective
2. More detailed process hierarchies and control flow can be expressed in PDDs and not in Task Structure diagrams

d. The activities of methods are compared utilizing four operators. Explain their meaning.

4 points; 1 each

Activity A = Activity B:

A is the same as B

Activity A < Activity B:

A does less a than B

Activity A > Activity B:

A does more that B

Activity A >< Activity B:

A overlaps partly with B

4. Incremental method evolution

a. Explain the concepts *method snapshot* and *method history*, and how they interrelate.

4 points: 1 for each definition, 2 for correct relationship
A method snapshot is a model of the method that was valid at a certain moment in time : M_t
So it is a meta-model (both meta-data and meta-process) of a method at a fixed moment in time.
A method history is a set of method snapshots in a subsequent series of moments in time: {Mt}t=1,2,…n
So method history contains a number of method snapshots.

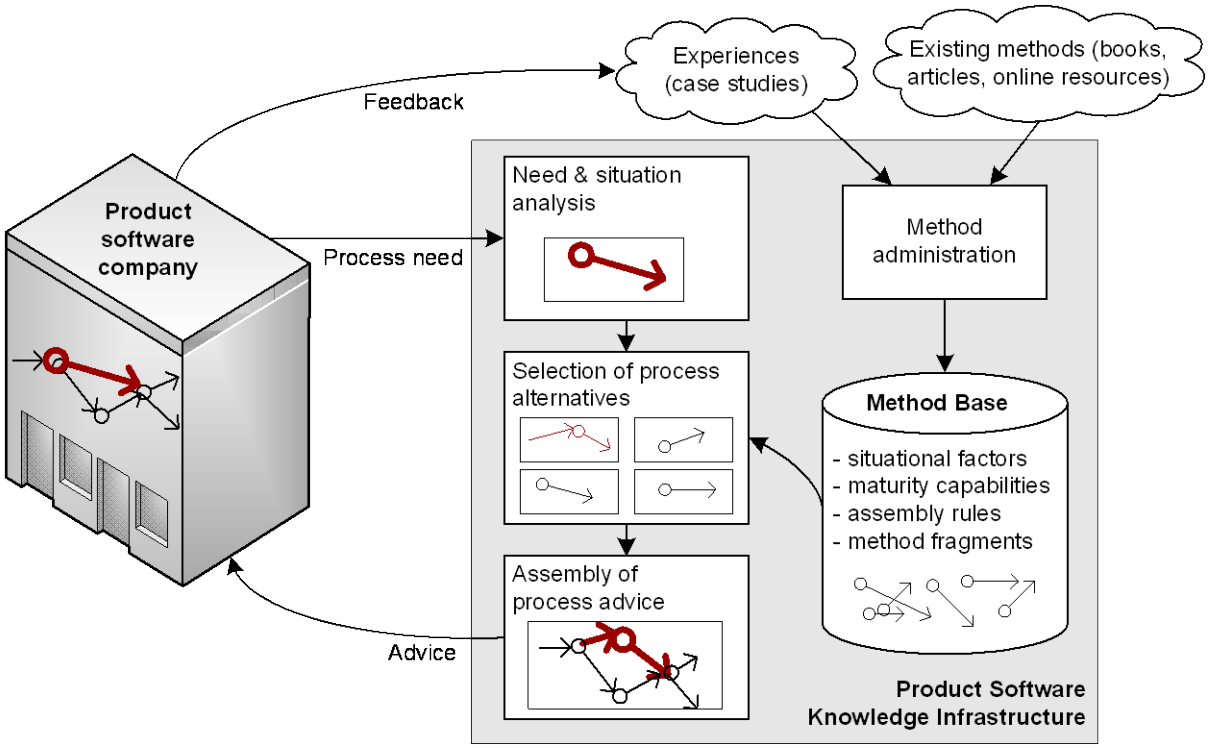
b. A method increment is an adaptation of an existing method resulting into a new method in order to improve the overall performance of a method.
Is it possible to have a method increment in which the newest snapshot contains fewer activities than its preceding method snapshot? Explain.

3 points
Yes, this is possible. It can be that one decide to delete activities from the method because they are not relevant anymore, then the newest snapshot of the method contains fewer activities than the preceding snapshot.

c. Explain the difference between situational method engineering and incremental method engineering.

3 points
Situational method engineering starts to build a completely **new method for a project**.
Incremental method engineering **changes an existing method** at some places.

Given is the model of the Product Software Knowledge Infrastructure.



d. Explain the process of 'Need and situation analysis'

3 points

The needs of the company are analyzed, which means what is the precise problem of the company, in which process is the problem, what are the method, the activities and deliverables of the problematic process.
Furthermore, the situational factors are determined: age and size of the company, age and type of product, market sector and size, systems development tools that are in use.

e. Explain the process of 'Selection of process alternatives'

4 points

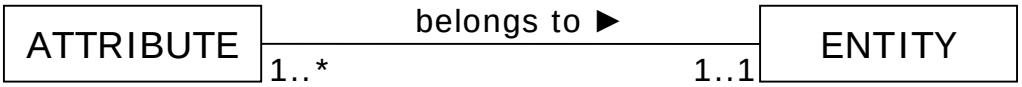
Based on the needs analysis and the situational factors, a set of possible method fragments is retrieved from the the method base. These fragments are compared and the fragment that fits the problem process and the situation best is selected for assembly into the existing method.

f. Explain three activities that are part of ‘Method administration’

3 points (1 for each)

- Existing methods are meta-modeled and the resulting method fragments are inserted into the method base (right incoming arrow in Method administration)
- Experiences and feedback from method improvement projects are codified and inserted into the method base. (left incoming arrow in Method administration)
- Situational factors and maturity capabilities are linked to method fragments in the method base. (outgoing arrow from Method administration)

5. *The following meta-model on a part of the Entity-Relationship diagramming technique is given.*



The Algebraic structure consists of two sets and one predicate:

A: set of Attributes
E: set of Entities

Predicate belongs **over** A x E
where *belongs(a,e)* means attribute *a* belongs to entity *e*

a. Express the axiom R1 in natural language
R1:∀e∈E ∃a∈A : belongs(a,e)

3 points
All Entities have at least one attribute.

b. Express the axiom R2 in predicate calculus.
R2: All attributes belong to **just an** entity Both answers are good
3 points
R2a: All attributes belong to **an** entity

R2:∀a∈A ∃e∈E : belongs(a,e)

R2b: All attributes belong to **just one** entity

R2:∀a∈A ∀e1,e2∈E : [belongs(a,e1) **and** belongs(a,e2) ⇒ e1=e2]

c. Indicate where R1 and R2 are expressed in the meta-model.

d. Express the axiom R3 in predicate calculus.
R3: An attribute belongs just to one entity

3 points
R3: $\forall a \in A\ \forall e1,e2 \in E : [belongs(a,e1)$ **and** $belongs(a,e2) \Rightarrow e1=e2]$

e. What are the names and purpose of the four semiotic levels of communication?

6 points: max 2 points good names, 1 point per good purpose

1. **Empirics** is the study of the signals used to carry a message; the physical characteristics of the medium of communication, e.g., sound, light, electronic transmission, paper and ink, etc..
2. **Syntax** is concerned with the formalism used to represent a message.
3. **Semantics** is concerned with the meaning of a message. Semantics considers the content of communication.
4. **Pragmatics** is concerned with the purpose of communication. Pragmatics links the issue of signs with the context within which signs are used.

f. Are the predicate calculus above formalizing the syntax or the semantics of the ER diagramming technique? Explain your answer.

2 points
Syntax, as we are formulating rules on the formalism, i.e. what is allowed in the model and what is not allowed.

g. Give three motivations of formalization of diagramming techniques.

3 points; 1 per good answer

- Formalization establishes a precise meaning of properties of techniques
- Rules determine a syntactically correct diagram
- Design of tools can check the correctness of a diagram
- Scientific work is greatly improved by formalization