Information Bachelor Course System Design

Abstract
The bachelor Course System Design is a course for third year students Mechanical Engineering at Buskerud University College. This document provides the program and exercises.

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1 Introduction

This part of the bachelor course *System Design* 2 focuses on multi-view archi-
tecting. During the course the students are guided through the design process in
many small time-boxes. The idea is to let them experience the impact of time-
boxes, iteration, and multiple (technical and non-technical) views. The first day
focuses on the system itself, the second and third day address the customer context
and the life cycle context.

2 Program

Figure 1 shows the program for the two and half days of the course. The course
days have several weeks in between. During these weeks the students make homework.
The homework is a consolidation of the work done during the lecture itself.

<table>
<thead>
<tr>
<th>Step 1, 2 half days</th>
<th>Step 2, 2 half days</th>
<th>Step 3, half day (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-view system design based on CAFCR method;</td>
<td>Customer objectives and application view</td>
<td>Life Cycle view</td>
</tr>
<tr>
<td>Iteration and time boxing;</td>
<td>Story telling</td>
<td>product creation process, manufacturing and logistics,</td>
</tr>
<tr>
<td>Functional, Conceptual and Realization view</td>
<td>Use cases and scenarios</td>
<td>life cycle model</td>
</tr>
<tr>
<td>Functional decomposition, construction decomposition modelling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Program
3 Exercises

3.1 Week 1 Exercises

Figure 2 shows the steps for week 1.

<table>
<thead>
<tr>
<th>Customer objectives</th>
<th>Application</th>
<th>Functional</th>
<th>Conceptual</th>
<th>Realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. select case to work on</td>
<td>2. discuss possible solutions</td>
<td>3. discuss specification</td>
<td>4. make design</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>5. make construction decomposition</td>
<td>6. make functional design</td>
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<td></td>
<td></td>
<td></td>
<td>7. make presentation of specification and design</td>
<td>8. make second and third design</td>
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<td></td>
<td>9. compare three designs</td>
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<td></td>
<td></td>
<td>10. make list of design criteria</td>
<td>11. make list of design choices</td>
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<td></td>
<td></td>
<td></td>
<td>12. update specification</td>
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<td></td>
<td>13. define performance use case</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>14. specify performance</td>
<td>15. make performance model</td>
</tr>
</tbody>
</table>

Figure 2: Exercises Week 1

3.2 Week 1 home work

Figure 3 gives the instructions for sending in home work.

The homework for week 2 is to consolidate the work of the first week. Make a presentation of specification and design, including a list of highlights and risks. Note that this presentation is intended for the management team of your company.

3.3 Week 2 Exercises

Figure 4 shows the steps for week 2.

3.4 Week 2 home work

The instructions for sending in homework are the same as for week 1, see Figure 3.

The homework for week 3 is to consolidate the work of the second day. Make a presentation of customer context and product specification, including a list of
conclusions and consequences for the design. Note that this presentation is intended for the management team of your company.

3.5 Week 3 Exercises

Figure 5 shows the steps for week 3.
Figure 4: Exercises Day 2

1. make core spec
2. why are these specifications needed
3. describe usage
4. make key driver graph
5. make story
6. make use case(s)
7. analyze design impact
8. assess story based on 5 story telling criteria
9. improve story
10. improve key driver graph
11. make cost of ownership model
12. explore alternative designs
13. update specification
14. make draft management presentation

Figure 5: Exercises Week 3

1. specify life time
2. draw dev. life cycle
3. describe logistics and manufacturing
4. describe installation and acceptance
5. describe maintenance
6. update specification
7. analyze design impact
4 Summary

During the lectures we have iterated over the CAFCR+ views in time-boxes of 15 minutes. Figure 6 visualizes the all exercise steps on the CAFCR+ model. The iteration that we followed has been bottom-up: we started with the system and its design and in due time we have spend more time in understanding the customer context and the life cycle context. This order has been chosen on purpose. By exploring the system and its possible design we create feeling for the problem and possible solutions. With this knowledge we can approach the stakeholders and have more meaningful interaction than would be the case if start from scratch.

![Figure 6: Summary](image)

In two and half days we have covered many aspects of the system, the design, the customer context, and the life cycle context. However, we have only started with the system design. Many aspects have not been addressed. Figure 7 shows a number of aspects per view that still needs to be addressed.

We should also realize that we didn’t do any mono-disciplinary design and engineering yet nor did we make any realization and test it. So actually, we have scratched the surface of an actual system development. At the same time, however, we have learned to bring in many different views to the design process.

Keep on iterating!
Figure 7: What we did not do...

References


History

Version: 0.4, date: August 30, 2011 changed by: Gerrit Muller
- added didactic model
- moved slides to course material

Version: 0.3, date: October 28, 2009 changed by: Gerrit Muller
- added cases

Version: 0.2, date: September 4, 2008 changed by: Gerrit Muller
- added text
- changed status to draft

Version: 0.1, date: September 1, 2008 changed by: Gerrit Muller
- added exercises, summary, homework instructions
- changed logo
- changed status to preliminary draft

Version: 0.0, date: August 29, 2008 changed by: Gerrit Muller
- created as subset of MOSAD course
- specific exercises for bachelor level students