Risks in Students’ Software Projects

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TUT: 8 prof., 80 staff. Annually: 90 masters, 1-2 PhD.
UTA: 8 prof., 90 staff. Annually: 50 masters, 4 PhDs.

Contents of this presentation

- project course overview
- risk management on course
- risks from Final Reports (2006-07, 2007-08)
- benefits from risk management
- lesson learnt

- (more about final reports… if time, please ask)
Motivation for a project course

- **Software project courses are important** for all information technology students:
  - The course integrates the knowledge and skills from earlier courses (sw eng, programming, testing, usability, maintenance, databases, data structures, architecture,...).
  - All software products are constructed in industry in “projects” or projects. Project skills are essential for all students, this is a good place (course) to practice.
  - The project course gives a possibility to learn how to make a large software in a (right) way.
- Provides also a natural way to co-operate with industry (and other universities, too)
- These project courses are known to be “heavy”, and are even feared a bit, but they are also much respected.

UTA and TUT project courses’ overview

<table>
<thead>
<tr>
<th></th>
<th>UTA (3rd year)</th>
<th>TUT (4th year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group (5-8 students)</td>
<td>Set, by staff</td>
<td>Free, by students</td>
</tr>
<tr>
<td>Project manager</td>
<td>From senior course</td>
<td>From group</td>
</tr>
<tr>
<td>Project subject</td>
<td>Set, by staff</td>
<td>Free, by students</td>
</tr>
<tr>
<td>Lecture hours</td>
<td>16</td>
<td>34</td>
</tr>
<tr>
<td>Credit units (ECTS)</td>
<td>5-7</td>
<td>6-10</td>
</tr>
<tr>
<td>Duration (weeks)</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Staff (full + part-time)</td>
<td>1+0</td>
<td>1+9</td>
</tr>
<tr>
<td>Possible for int. students</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Project subjects

Project course subjects can be categorised to be e.g.
- www (Java, PHP, Python, ...)
- mobile or embedded (S60, WinME)
- stand-alone applications (on one PC and/or single-user) (C++, C#, .NET).

Clients can be categorised e.g.
- industry companies, small or large
- organisations, associations, clubs, etc.
- individuals
- university projects (only few).

Sample schedules (working hours)

Default project size is 1000-1500 working hours.

150+ hours for each student.
## Project Measurements at TUT and UTA

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Project Size at TUT Avg. (hours)</th>
<th>How Many Groups at TUT</th>
<th>Project Size at UTA Avg. (hours)</th>
<th>How Many Groups at UTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997-98</td>
<td>937</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1998-99</td>
<td>1248</td>
<td>17</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1999-2000</td>
<td>1073</td>
<td>27</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2000-01</td>
<td>1054</td>
<td>26</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2001-02</td>
<td>1152</td>
<td>25</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2002-03</td>
<td>1053</td>
<td>24</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>2003-04</td>
<td>1194</td>
<td>25</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>2004-05</td>
<td>1256</td>
<td>23</td>
<td>-</td>
<td>13</td>
</tr>
<tr>
<td>2005-06</td>
<td>1239</td>
<td>21</td>
<td>1008</td>
<td>19+1</td>
</tr>
<tr>
<td>2006-07</td>
<td>1314</td>
<td>26</td>
<td>1089</td>
<td>18+2</td>
</tr>
<tr>
<td>2007-08</td>
<td>1416</td>
<td>20</td>
<td>997</td>
<td>14+1</td>
</tr>
<tr>
<td>2008-09</td>
<td>1490</td>
<td>19</td>
<td>?? ??</td>
<td>10+1</td>
</tr>
</tbody>
</table>
A sample TUT working hours table

An example of TUT working hours table (G19, 2008-09):
8 students, 1911 working hours, 34000 LOC Java, 113 classes.

<table>
<thead>
<tr>
<th></th>
<th>FeasStr</th>
<th>FuncSpec</th>
<th>Design</th>
<th>Implem</th>
<th>Testing</th>
<th>Ins, U, Max</th>
<th>Other</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuni</td>
<td>6:30</td>
<td>22:30</td>
<td>16</td>
<td>6:30</td>
<td>1</td>
<td>3</td>
<td>55:30:00</td>
<td>2.90</td>
<td></td>
</tr>
<tr>
<td>Meet</td>
<td>29:30:00</td>
<td>116</td>
<td>34</td>
<td>39:30:00</td>
<td>33</td>
<td>4</td>
<td>21</td>
<td>14:50</td>
<td></td>
</tr>
<tr>
<td>Insp</td>
<td>3</td>
<td>22</td>
<td>12:15</td>
<td>13:30</td>
<td>9:30</td>
<td>6</td>
<td>66:15:00</td>
<td>3.47</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>21:30</td>
<td>25:30:00</td>
<td>42:30:00</td>
<td>17:30</td>
<td>17:30</td>
<td>2</td>
<td>126:30:00</td>
<td>6.62</td>
<td></td>
</tr>
<tr>
<td>Docum</td>
<td>25:30:00</td>
<td>60:15:00</td>
<td>84:15:00</td>
<td>16</td>
<td>78:15:00</td>
<td>21</td>
<td>32</td>
<td>317:15:00</td>
<td>16.60</td>
</tr>
<tr>
<td>Pro/D</td>
<td>2:30</td>
<td>23:30</td>
<td>115</td>
<td>18</td>
<td>6</td>
<td>35</td>
<td>200</td>
<td>10.47</td>
<td></td>
</tr>
<tr>
<td>PrjMgmt</td>
<td>9</td>
<td>6</td>
<td>12</td>
<td>7:15</td>
<td></td>
<td>17</td>
<td>51:15:00</td>
<td>2.68</td>
<td></td>
</tr>
<tr>
<td>Work</td>
<td>1</td>
<td>20</td>
<td>97:45:00</td>
<td>55:4:00</td>
<td>67:30:00</td>
<td>41</td>
<td>35:30:00</td>
<td>817:15:00</td>
<td>42.77</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>277:45:00</td>
<td>316:15:00</td>
<td>774:30:00</td>
<td>232</td>
<td>72</td>
<td>151:30:00</td>
<td>1911</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>4,55</td>
<td>14,53</td>
<td>16,55</td>
<td>40,53</td>
<td>12,14</td>
<td>3,77</td>
<td>7,93</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Risk management on course

- chapter 9 on Project Plan document
- appendix A on Project Plan: 10 most remarkable notes from previous course (gathered from statistics www page)
- weekly reports have a section of currently monitored risks (top 3 or more) <NEW ON 2008-09 AT TUT ONLY>
- chapter 4 on Final Report lists
  - what risks had been thought during the project, which of those realised, and how group managed those risks
  - risks not foreseen beforehand (if any), and how they were handled.

What this helps:

- students have to think their project and risks after the project (discussed on Final Meeting)
- risk stories are put to course statistics www page.
### Risks from student project Final Reports

<table>
<thead>
<tr>
<th>RISK NAME</th>
<th>NUMBER OF PROJECTS</th>
<th>ON HOW MANY PROJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication problems</td>
<td>24</td>
<td>32 %</td>
</tr>
<tr>
<td>Requirements</td>
<td>24</td>
<td>32 %</td>
</tr>
<tr>
<td>Illness and social problems</td>
<td>26</td>
<td>34 %</td>
</tr>
<tr>
<td><strong>Tools and skills</strong></td>
<td><strong>46</strong></td>
<td><strong>61 %</strong></td>
</tr>
<tr>
<td>Quitting team members</td>
<td>14</td>
<td>18 %</td>
</tr>
<tr>
<td>Process problems</td>
<td>15</td>
<td>20 %</td>
</tr>
<tr>
<td>Motivation level low</td>
<td>27</td>
<td>36 %</td>
</tr>
<tr>
<td><strong>Technology problems</strong></td>
<td><strong>40</strong></td>
<td><strong>53 %</strong></td>
</tr>
<tr>
<td>Documentation problems</td>
<td>9</td>
<td>12 %</td>
</tr>
<tr>
<td><strong>Scheduling problems</strong></td>
<td><strong>47</strong></td>
<td><strong>61 %</strong></td>
</tr>
<tr>
<td>Working and studying during project</td>
<td>34</td>
<td>45 %</td>
</tr>
<tr>
<td>Client related problems</td>
<td>18</td>
<td>24 %</td>
</tr>
<tr>
<td>Third-party components</td>
<td>15</td>
<td>20 %</td>
</tr>
<tr>
<td>Group work related problems</td>
<td>14</td>
<td>18 %</td>
</tr>
</tbody>
</table>

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### Most common risks realised

- **tools and skills**: new (open source or 3rd party) tools, not working well, not documented well, or you just don’t get used to the tool in a few weeks
- **technology problems**: breaking hw, new technologies, internet connection lost
- **scheduling problems**: project didn’t went as planned, tasks took more time than estimated
- **working and studying during project**: about 50-70 % of students are working part-time or full-time while studying, they also do some other courses at the same time as the project (not much social life during the project course...).
What to learn from risk management

- all the problems that student groups encounter, have already been seen in earlier courses
- if the risk management have been done well, nothing serious happens
- sometimes there are problems that group did not consider as a risk, but also those problems have been seen earlier in previous courses
- so most problems would have been avoided if “old lessons” would have been studied well by the students.

How to utilise this

- course personnel warns project groups about the common risks in the beginning of the course
- earlier courses’ comments (“old lessons”) are available on the statistics www page
- student groups can look and read those “old lessons” any time (if they only bother...)
- these most common risks are not a surprise to any experienced teacher or project worker/manager
- one challenge would be to get new student project groups take those “old lessons” seriously (...that can’t happen to me...).
Quality issues: Final Report, Presentation and Meeting

- After the project, groups have a public Final Presentation. Groups also write a Final Report.
- Main issues (chapters) in the Final Report are
  - risks and risk management during the project
  - project management
  - methods and tools
  - working hours
  - experiences and lessons learnt
  - comments about the course (+/-/?)
  - statistics.
- Final report is discussed with the group in the Final Meeting (after Final Presentations).

Project failure factors

Failure = overtime, poor quality, not a controlled project,…

- Working while studying (most students do)
- Poor understanding about project's subject and client's business (application area)
- New tools (it takes time to learn to use them)
- No experience in estimating project size; starting with low speed and the working nights at the end, not to start implementation early enough
- Third party components (not documented/working well).

Success: No known suicides or divorces among project course students ! :-)

Tero Ahtee and Timo Poranen: Risks in Students' Software Projects

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Future development ideas

- risk monitoring on weekly reports (used in TUT course 2008-09, looks promising)
- somehow structuring the statistics www page
- perhaps more emphasis on “old lessons” to project groups, e.g. on lessons and inspection meetings.

There is still a major challenge: students do not learn project work and risk management by reading a book. They have to complete a real project to learn those skills, and that takes time.

Conclusions

- a Final Report document is a must for educational purposes, both to students and course personnel
- risk management is an important part of student projects, as one should not do the same mistakes as previous projects have done
- risk monitoring on weekly reports (current risks)
- from Final Report documentation we can find out the encountered risks
- put the “old lessons” risks available for the next course.

Lecturer: “No pain, no gain.”   Students: “Not all pain is gain.”
We would like to hear other project courses’ experiences and statistics!

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SOFTWARE ENGINEERING PROJECT, FINAL REPORT

Cover page
Version history
Table of contents
Table of figures (if necessary)
Table of tables (if necessary)
Table of appendixes (if necessary)

1. Introduction
   1.1 purpose and scope
   1.2 definitions, acronyms and abbreviations
   1.3 references
   1.4 overview

2. Overview
   2.1 purpose
   2.2 environment
   2.3 program's function as part of system
   2.4 restrictions and limitations
3. Organisation
3.1 group
3.2 client
3.3 others

4. Problems and risks
4.1 foreseen risks
4.2 risks not foreseen

5. Management
5.1 group meetings
5.2 weekly reports
5.3 inspections and reviews
5.4 other

6. Methods and tools
6.1 tools
6.2 methods and techniques

7. Project phases and working hours

8. Conclusions
8.1 experiences from the project
8.2 what to do better next time
8.3 other (matters worth mentioning)

9. Rejected ideas

10. Ideas for further development

11. Comments about the course
11.1 good, more
11.2 bad, take away
11.3 new wanted subjects
11.4 other matters
