Teaching Requirements Engineering with Virtual Stakeholders without Software Engineering Knowledge

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Motivation

• Requirements engineering important to success of software engineering projects

• SE students tend to be solution oriented but not problem oriented

• SE students not sensed to importance of RE

• Teaching RE successfully requires a realistic experience to students

• Experience the need for RE methods by experiencing the problems these methods try to solve first hand
Motivation

• What is a realistic experience?
  1. semantic gap during elicitation (G1)
  2. consistency issues when synthesizing information gathered during an interview (G2)
  3. usual problems when validating requirements due to inappropriate presentations (G3)

• How to create a realistic experience?
  1. realistic stakeholders with real needs
  2. realistic sessions (elicitation, specification, validation)
  3. Authentic environment
Motivation

• What do we need for a realistic experience?
  • Real stakeholders form real companies
    • Not feasible in teaching RE because they have real needs and, thus, want real values
    • Not replicable!

• Students without SE knowledge as virtual stakeholders?

PRO
uncomplicated
easy to motivate
no SE experts
reproducible

CONTRA
no needs
no stakes in results
no authenticity

Hypothesis: teaching RE successfully with moderate costs and efforts by employing virtual stakeholders without SE knowledge
Agenda

1. Preparing Virtual Stakeholders
2. Teaching Requirements Engineering
3. Evaluation
4. Lessons Learned
Preparing Virtual Stakeholders
Preparing Virtual Stakeholders

• We need **multiple** virtual stakeholders which
  1. have the same needs
  2. are authentic -- can play a role convincing

• Casted 9 out of 200 non-faculty students to enact as virtual stakeholder for 36 SE students

• Conducted a 3 hours **preparation session** with all virtual stakeholders:
  1. briefly explain RE and our goals
  2. explaining the case study (online supermarket)
  3. interactive development of scenarios of their role as stakeholder
Teaching Requirements Engineering
Teaching Requirements Engineering

- Teaching RE embedded into a SE course
  - SE students are 2nd semester undergraduates

- Implementation
  - **Lecture**: modeling software systems with UML
  - **Project**: modeling real-world scenarios

- Current issues
  - Predefined assignment
  - No elicitation and validation sessions
Teaching Requirements Engineering

- Integrated explicit requirements **elicitation**, **specification** and **validation** sessions into the project

- “… predefined assignment is incomplete … one role of the client’s company was forgotten”

- 4 students per project group (9 groups) have participated in the sessions
  - 1h elicitation
  - 2h specification
  - 1h validation
Evaluation
Evaluation

- Data foundation
  - Questionnaires after each part of a session (for students and stakeholders)
  - Visual recordings of each session
- Efforts and costs?
  - Low efforts because ...
    - ... students are very flexible
    - ... one preparation session for all virtual stakeholders
- Whole setup was possible with a funding of 1.200 €
### Evaluation

- **Atmosphere**

<table>
<thead>
<tr>
<th></th>
<th>Students rate atmosphere as...</th>
<th>Stakeholders rate atmosphere as...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>disagreement</strong></td>
<td>1.66</td>
<td>1.58</td>
</tr>
<tr>
<td><strong>weak disagreement</strong></td>
<td>1.81</td>
<td>1.67</td>
</tr>
<tr>
<td><strong>neutral</strong></td>
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<td>2.33</td>
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<tr>
<td><strong>weak agreement</strong></td>
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<td>3.89</td>
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<tr>
<td><strong>agreement</strong></td>
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<td>2.22</td>
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<tr>
<td></td>
<td>2.11</td>
<td>2.11</td>
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</tbody>
</table>

- **Categories:**
  - **relaxed**
  - **constructive**
  - **funny**
  - **stressful**
  - **productive**
  - **authentic**
Evaluation

• Atmosphere

<table>
<thead>
<tr>
<th></th>
<th>Students rate</th>
<th>Stakeholders rate</th>
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<tbody>
<tr>
<td>relaxed</td>
<td>1.86</td>
<td>1.96</td>
</tr>
<tr>
<td>constructive</td>
<td>1.81</td>
<td>1.87</td>
</tr>
<tr>
<td>funny</td>
<td>2.92</td>
<td>2.33</td>
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<tr>
<td>stressful</td>
<td>4.28</td>
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<tr>
<td>productive</td>
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<td>2.22</td>
</tr>
<tr>
<td>authentic</td>
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</table>

• Mutual assessment

<table>
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<tr>
<th></th>
<th>Students consider</th>
<th>Stakeholders rate</th>
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</thead>
<tbody>
<tr>
<td>confident</td>
<td>1.83</td>
<td>2.00</td>
</tr>
<tr>
<td>curious</td>
<td>3.19</td>
<td>2.00</td>
</tr>
<tr>
<td>relaxed</td>
<td>2.03</td>
<td>1.39</td>
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<tr>
<td>intelligent</td>
<td>1.94</td>
<td>1.57</td>
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<tr>
<td>competent</td>
<td>1.69</td>
<td>1.78</td>
</tr>
<tr>
<td>authentic</td>
<td>1.45</td>
<td>2.00</td>
</tr>
</tbody>
</table>
Evaluation

- Did students experience a \textit{semantic gap} during elicitation (G1)?
  - Students that were „leading“ the interview had to reformulate their questions several times
  - All stakeholders perceived that questions were asked multiple times
  - Not recognized by students just writing down
Evaluation

• Did students experience a semantic gap during elicitation (G1)?

• Students that were „leading“ the interview had to reformulate their questions several times

• All stakeholders perceived that questions were asked multiple times

• Not recognized by students just writing down

Result: at least several students experienced a semantic gap
Evaluation

- Did students experience **consistency issues** when synthesizing information gathered during an interview (G2)?

- Perceived a process of agreement when talking about their inconsistent individual views

Before you modeled your findings, were you and your team in agreement about the structures within the company?

After you modeled your findings, were you and your team in agreement about the structures within the company?
Evaluation

- Did students experience **consistency issues** when synthesizing information gathered during an interview (G2)?

- Perceived a process of agreement when talking about their inconsistent individual views.

Result: consistency issues were experienced by the students.
Evaluation

• Did students experience **usual problems** when **validating** requirements because of inappropriate presentations **(G3)**?

• Students did not think that their formal models were technical (UML)

• Stakeholders generally agreed that they understood what the students presented

• Depends highly on individual capacity of stakeholders to provide critical feedback
Evaluation

- Did students experience usual problems when validating requirements because of inappropriate presentations (G3)?

- Students did not think that their formal models were technical (UML).

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- Depends highly on individual capacity of stakeholders to provide critical feedback.
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- Depends highly on individual capacity of stakeholders to provide critical feedback.
Evaluation

• Did students experience **usual problems** when **validating** requirements because of inappropriate presentations (**G3**)?

• Students did not think that their formal models were technical (UML)

• Stakeholders generally agreed that they understood what the students presented

• Depends highly on individual capacity of stakeholders to provide critical feedback

**Result:** we could not clearly observe that students indeed experienced problems when validating requirements
Lessons learned
Lessons learned

• Give feedback to students immediately
  • What has happened and what is important
  • They might miss the point
• More iterations of the sessions with more time in-between
• More time for preparing virtual stakeholders
• Introduce virtual stakeholders with different roles in a company
• ... <many more>