Experiences of Using Role Playing and Wiki in Requirements Engineering Course Projects

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Abstract

Teaching requirements engineering (RE) course is challenging for teachers and a bit of boring for students due to the lack of involvement to a real software development project. Role playing method has been introduced as an effective pedagogical approach that allows students to practice RE methods in a simulated project environment by playing different roles/stakeholders at RE phase. We employ role playing method with a wiki tool support in the RE course projects for the third-year bachelor students running in the academic year of 2009-2010. In this paper, we report our experiences gained in applying role playing method and the wiki tool according to the survey results from the students who participated this course. We believe that the lessons learned in our experiences will help other RE education and training practitioners to improve their RE course projects by using role playing method and appropriate RE tools.

Keywords: requirements engineering education, course project, role playing, wiki

1 Introduction

Requirements engineering (RE) course has been widely introduced in most of software engineering curriculums at universities as a compulsory course. It teaches students fundamental knowledge about the activities, concepts, methods, and techniques needed in eliciting, modeling, analyzing, documenting, validating, and managing requirements for software-intensive systems. Although the importance of requirements engineering in software system development has been well-recognized for decades [5], however, similar to most of software engineering courses, students are not quite active in learning this course, and complaint that the content of this course is a bit of boring without opportunities to practise the RE methods taught in class in a real software development project compared to other computer science subjects, like programming language, database systems etc., according to our previous course evaluation results.

Role playing method has been introduced by Zowghi and Paryani into RE education as an effective pedagogical approach to help students to practise the RE methods taught literally in class [7], especially the communication skills between customers and developers, in a simulated project development environment by playing different roles/stakeholders at RE phase. Meanwhile, wiki tools have been used for education purpose for global software development of students who come from different countries [3]. We introduce the role playing method in our RE course with some modifications and provide a wiki tool to support this method, in order to encourage students to work on the RE course projects more actively and help them to understand the real problems in applying RE techniques in practice. We made a survey about the role playing method and the wiki tool support in the end of the course to all the students who participated this course, and got some useful survey results and comments for the improvement of the role playing method and the wiki tool in RE course.

The rest of this paper is organized as follows. A brief introduction about the setting of the RE course project running in the academic year of 2009-2010 at University of Groningen is given in Section 2. The modification of the role playing method in our RE course context and the wiki tool that supports this method are described in Section 3. The survey results on role playing method and the wiki tool are presented in Section 4, with a discussion on lessons learned and recommendations in Section 5. The major points of this paper are concluded in Section 6.
2 Course Project Setting

At University of Groningen, requirements engineering course\(^1\) is included as a compulsory course in the curriculum for the third-year bachelor students major in computing science. 32 students participated this course in the academic year of 2009-2010, and they are divided into six groups for the course project with 5 to 6 members for each group. The task of the course project is to complete/deliver a Software Requirements Specification (SRS) for a software project in teamwork. The score of the course project is weighted 50% in the final grade of the RE course. All the members in one group will share the same grade for the course project, so it is in their own interest to ensure that every member in the team makes a fair contribution to the final deliverable.

The quality of the course project deliverable (i.e., SRS) is evaluated by clarity, consistency, and completeness of requirements. Every SRS deliverable will be evaluated by the peer group (we will explain what peer group is in role playing method in the next Section), and by the instructor and student assistant of this course as well (i.e., the two authors of this paper). For the running of the course project, the instructor is responsible to evaluate the weekly deliverables submitted by all the groups with feedbacks/comments for improvement. The student assistant is responsible for coordinating the group meeting session between customer and developer team in role playing and answering questions (either technical questions on RE, or questions about the course projects). If the student assistant has some unsolved issues, the instructor will step in through emails or face-to-face meetings.

3 Using Role Playing and RE-Wiki

3.1 Using Role Playing

We followed the role playing method introduced in [7], and presented this method in a tutorial session for about 30 minutes. Students could easily understand the procedure and basic idea of this method and the responsibilities taken by various roles. Role playing method requires that there is a team who works on the project, and members in this team/group play different roles (e.g., team leader, domain expert, etc.) according to the types of the team, i.e., customer team or developer team. A developer team will work closely with their customer team to elicit, analyze, negotiate, and finally document the requirements of the project. So for example, when team A as a developer team works with their customer team - team B on a project, then team B is the peer group of team A, and team B is responsible to review the SRS deliverables submitted by team A as we mentioned in Section 2. This also applies in a real setting that customers need to review the SRS documents submitted by developers for the evaluation of clarity, consistency, and completeness of requirements.

The customer team is composed of at least two roles: a domain expert and an end-user; and the developer team includes a team leader, an administrative assistant, and a requirements engineer. That’s why we make sure that each group has at least five members when we allocate students into groups, so that each role can be played by at least one student. In this way, role playing method provides opportunities for students to fully explore the range of RE issues intuitively. We made two modifications to this method:

- We ask each group to propose candidate projects and ask the other groups to bid for these projects\(^2\). We believe that this way can better simulate a close customer-developer relationship since the group who proposes the project has the domain knowledge of the system-to-be and initial ideas about what the system-to-be should look like, and the group who bids for a project has certain interest to work on this project.

- In role playing method, the face-to-face meetings between customer and developer teams are essential for good communication between two teams. We name this meeting as an external meeting. Accordingly, we set up an internal meeting which takes place inside a developer team, normally right after the external meeting session every week, which provides an opportunity for the members in a developer team to collaboratively discuss and solve the issues posed by the customer team.

3.2 Using RE-Wiki

Students who are involved in a teamwork of a course project always has a limitation that they don’t have much common free time to collect together and work on the course project due to their different schedules. In another sense, this situation is pretty much similar to the context of Global Software Development (GSD), in which developers and customers work together in a geographically distributed way. In order to support requirements documentation with role playing method, in which each role can actively/easily participate the editing and reviewing of the SRS, we developed a wiki tool (called RE-Wiki) that supports the collaborative construction and documentation of SRS.

RE-Wiki\(^3\) is a wiki-based requirements documentation and management tool, which can facilitate and stimulate the

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\(^1\)All the course material, including course slides, course project description, and the wiki tool link, can be found in the course website: http://www.cs.rug.nl/search/uploads/Teaching/RE2009Fall/

\(^2\)http://www.cs.rug.nl/search/Teaching/RE2009FallProjects

\(^3\)http://www.cs.rug.nl/search/uploads/Teaching/RE2009Fall/REWiki/
collaborative construction of SRS. The other objective we introduce RE-Wiki (as an instance of PmWiki⁴) is to set up a collaborative and Web-based RE environment (compared to local and document-based RE environment) when more and more industrial projects are running in a geographically distributed way. We believe that appropriate tool support is quite important for students to understand and practise RE skills at university. In RE-Wiki, we provide a sample SRS of EduLoop project (Education Feedback System), with initial SRS structures and templates (e.g., project description, stakeholders, business goals, etc.) as a reference for students to construct their own SRS. Note that, RE-Wiki is a prototype wiki-based RE tool, which is not specifically designed for RE purpose (e.g., the function of WYSIWYG editing of wiki pages is not available, and creating requirements traceability table is not performed in a user-friendly way), and provides limited functions for requirements documentation.

3.3 Combination of Role Playing and RE-Wiki

We combine the role playing method with RE-Wiki tool support in the RE course project by following steps:

1. The external meeting between customer and developer teams takes place every week during the course period. For each meeting, Team leader from developer team prepares an agenda for the meeting about points to be discussed, and distributes the agenda to all the stakeholders/roles from developer and customer teams before the meeting.

2. The external meeting between developer and customer teams should be short and productive, and is less than 45 minutes.

3. The developer team takes an internal meeting right after the external meeting to solve the requirement issues posed by the customer team.

4. The administrative assistant from developer team is responsible to take the minutes during the internal and external meetings, and upload the minutes to the meeting history page in RE-Wiki.

5. The requirements engineer from developer team is responsible to document new requirements and requirement modifications using RE-Wiki.

6. All the other stakeholders from both customer and developer teams review the latest version of the SRS documented in RE-Wiki, and check whether the issues that are discussed in the external and internal meetings, have been well addressed.

7. If anything missing or not well-specified or documented, the stakeholders can send those issues to requirements engineer by email for correction or clarification, or retain the issues to be discussed in the next meeting.

4 Survey on Role Playing and RE-Wiki

This is the first time we introduce role playing method and a wiki tool in the RE course at University of Groningen. We made a survey in the end of this course in order to get feedbacks/comments about this pedagogical approach from students. We tried to evaluate the effectiveness of role playing method and wiki tool support, and to collect the points to be improved for the next year. The survey is composed of 12 questions, including objective questions and open questions for comments, in which 6 questions are for the evaluation of role playing method, and 6 questions target to RE-Wiki tool support. The survey form is attached in the appendix of this paper⁵. For getting the true answers/feedbacks from students, we claimed that the answers of this survey had nothing to do with students’ final grade. We totally received 26 eligible survey forms back out of 32 (the number of the students who participate the RE course) survey forms sent out. The initial survey results are summarized in the following:

- **Role playing method is easy to follow**: 24 out of 26 students (92.3%) said that they were convinced that they knew what general responsibilities are for different roles. According to the meeting minutes uploaded after every meeting and as noticed by student assistant during the meeting session, the students play the role playing method very well without much difficulties.

- **Role playing method is useful**: 24 out of 26 students (92.3%) believed that role playing method was useful for them to practice RE skills and understand the real problems during the communications for requirements. One student said that ‘‘Role playing is very nice and very informative, I very much enjoyed it’’. But also some student thought that ‘‘Role playing is helpful, but the problem is that students would most like to play the developer role’’.

- **45 minutes are enough for the external meeting**: 23 out of 26 students (88.5%) thought that 45 minutes were enough for the external meeting between developer and customer team. 2 students thought that one and half hour would be better. According to the meeting minutes, the students who want more time tend

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⁴http://www.pmwiki.org/

⁵The attached survey form only includes the questions that are related to role playing method and RE-Wiki excluding those questions for other survey purpose.
to focus on implementation details or technical issues on requirements, which should not be discussed at RE phase.

- **Changing role every week is useful, but causes difficulties**: 20 out of 26 students (77%) argued that changing role every week was reasonable for each member to experience different roles in a development project, but they also admitted that changing role every week caused some difficulties. The most obvious problem is that “The customer team was very inconsistent about their requirements due to the change of customer role every week”.

- **Structures of RE-Wiki are well-organized**: 19 out of 26 students (73.1%) recognized that the structures and templates for requirements documentation provided in RE-Wiki were well-organized, which helps all the stakeholders/roles to document and follow the SRS easily in RE-Wiki.

- **Examples in RE-Wiki are useful**: 21 out of 26 students (80.1%) thought that the sample SRS (EduLoop project) provided in RE-Wiki was useful for them to get a better understanding of what a decent SRS should look like, how to use style English expression to compose requirement statements, and finally to help requirements engineer to document the requirements in a disciplined way.

- **Most of teams work in a collaborative way**: 20 out of 26 students (76.9%) answered that their group worked in a collaborative way: one member (e.g., the role of requirements engineer) is responsible for updating the content in RE-Wiki, and the other members are responsible to check/modify the content in RE-Wiki.

- **Wiki tool is good for collaboration, but wiki syntax is not appropriate for RE tool**: 21 out of 26 students (80.1%) answered that the major difficulty for them to use RE-Wiki was the complex wiki syntax, and they complained that “The wiki syntax is very disturbing when editing”. 3 students answered that it was difficult to create and maintain requirements traceability table in RE-Wiki using wiki syntax “Making traceability links takes a lot of time. Also removing a requirement and then updating the numbering of requirements takes a lot of time.”.

5 Lessons Learned

In this section, we report on the lessons learned based on the survey results presented in previous section. We believe that the lessons learned from our experiences will help other RE education and training practitioners to improve their RE course projects by using role playing method and appropriate RE tools.

- Role playing is a method of learning-by-playing. So just present the method in a short tutorial session and ask students to play for fun. Don’t worry about the mistakes made by students, which are part of the method.

- Role playing method is useful to provide a simulated working environment for software development, but the instructor has to encourage students to play a customer or developer role seriously, for example, some sort of peer assessment from the customer team about their satisfaction of the developer team would help.

- 45 minutes are decent for a weekly meeting between customer and developer teams to be short and productive. Unsolved issues can be discussed by emails or moved to the next meeting.

- Changing role every week in role playing is useful, but cause difficulties, e.g., different students who play customer roles make various changes to the requirements. In a sense, the changing customer role simulates a real-life customer who is always changing his or her mind about requirements. This issue can be partially alleviated in RE course projects by being a customer role twice for one student, e.g., switching from end-user to domain expert, so that there is always one student as a customer role sitting at the meeting who was there the week before.

- Wiki tool, as a Web-based editing platform, can encourage and promote the collaborations among stakeholders in requirements documentation. Wiki tool is well-suited for role playing method in RE course project, in which group members can work in a distributed way.

- The examples and pre-defined structures and templates for requirements documentation (i.e., SRS) are necessary and beneficial for the introduction and employment of new requirements management tools in course projects.

- The complexity of wiki syntax is the major obstacle for students to use RE-Wiki in course projects. Some other sort of shared and WYSIWYG editing environments (e.g., Google Docs) would be considered as a better solution, for example Google Document for SRS documentation, and Google Spreadsheet for requirements traceability management, etc.

- RE-Wiki should provide basic functions in a user-friendly and explicit way, e.g., as links in a wiki page.
For example, according to the survey results, nobody knew or had used the versioning function supported by RE-Wiki, which is a basic and important function to view the change history of requirements.

6 Conclusions

Collaboration has been a key component at RE phase in order to involve all the stakeholders, who either work locally or globally [4], and wikis have been widely employed to promote the collaboration in RE activities (e.g., requirements negotiation [6] and general RE process [2]). In this paper, we describe our experiences of using role playing method with a wiki tool in RE course projects for the third-year bachelor students. Our experiences according to the survey results show that role playing method can be easily adopted and applied in RE education and training without too much tutorial effort. Most of students welcome this pedagogical approach in RE course projects, and think that it is useful to practice RE methods and understand real RE problems. RE-Wiki, as an open and collaborative editing platform, provides basic functions for requirements documentation, but the usability of RE-Wiki is a big issue that may prevent it from wide application in RE course projects.

Current evaluation results of role playing method and wiki tool support in RE course projects are based on the survey from students in a subjective way (i.e., judgement by students themselves). The quality of SRS deliverables constructed by role playing method and RE-Wiki should be further evaluated against the SRS deliverables without using role playing methods and RE-Wiki, in order to evaluate the effectiveness of role playing method and RE-Wiki in an objective way (i.e., judgement by the quality of deliverables).

We also plan to extend the role playing method for RE course projects to a global context, for example, to the students from the Netherlands and China. The student groups from two universities can act as customer and developer teams respectively, which forms a real global development environment. In this global setting, the external meeting can be performed in a conference call instead of face-to-face meeting, and the distributed team can also use RE-Wiki to document requirements collaboratively. Some lessons learned from practice in global requirements engineering, including cultural, organizational, and knowledge sharing issues, have been reported in [1], and the research results will be taken into account in applying role playing method in a global context. We will report our experiences and lessons learned of using role playing method and wiki in the global RE course projects in the next REET.

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References

*Please mark your choice in red font, for example: Yes No No opinion*

Questions about Role Playing

- Are you convinced that you know what general responsibilities are for different roles according to the description of role playing in the course?
  - Yes
  - No
  - Not sure

- Is role playing method beneficial for you to practice RE methods and understand RE problems?
  - Yes
  - No
  - Useful, but not so much
  - No opinion

- Is the time 45 minutes for the external meeting (developer-customer meeting) enough?
  - Yes
  - No
  - No opinion

- Is that reasonable to change role (especially customer role) every week?
  - Yes
  - No
  - No opinion

- What are the major difficulties you found/encountered during the external and internal meetings?

- Comments on Role Playing (any positive/negative comments for us to improve the Role Playing method)

Questions about RE-Wiki

- Is the structure (wiki pages and content structure) of RE-Wiki well-organized and easy to follow?
  - Yes
  - No
  - No opinion

- Are the examples and references material provided in RE-Wiki useful and understandable?
  - Yes
  - No
  - No opinion

- Did you use the versioning function (?action=diff) of RE-Wiki to view the revision history of a wiki page during the project?
  - Yes
  - No
  - I don’t know this function

- What is the organization pattern in your group? e.g., (1) Collaborative pattern: one member (e.g., the role of Requirements Engineer) is responsible for updating the RE-Wiki, and the other members are responsible to check/modify the content. Or (2) Individual pattern: each member in a group is responsible for only one part of the RE-Wiki.
  - (1)
  - (2)
  - Others (please specify)

- What are the major difficulties you found/encountered when using RE-Wiki?

- Comments on RE-Wiki (any positive/negative comments for us to improve RE-Wiki)

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1 The purpose of this survey is to collect information for the improvement of RE course next year. The answers of this survey have nothing to do with your final grade.