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Using a wiki to facilitate learning on a Requirements Engineering course

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ABSTRACT

In this paper, we describe the introduction of a wiki for collaborative activities in a Requirements Engineering course offered at a distance to part-time learners. The paper describes the course and how wiki activities were incorporated. The paper then discusses the initial feedback from the students which shows that the wiki has been largely effective for developing students' understanding of the course concepts, the effectiveness of team working in Requirements Engineering and the use of wikis in practice. However, there are particular issues related to asynchronous working in distance education/eLearning that need to be better addressed. We conclude with a discussion of how we are tackling these issues and developing the use of the wiki on the course based on the students' feedback.

Keywords

Wiki, collaborative learning, requirements engineering, collaborative writing

INTRODUCTION

The UK Open University (OU) has embarked on an £5m programme to develop an integrated virtual learning environment (VLE) to meet the online learning needs of its 200,000 distance learners (all of whom study part-time). The open source VLE, Moodle (www.moodle.org) has been adopted by the University and is now undergoing extensive development to provide the required functionality. Adoption of blogs, wikis and podcasting are beginning to transform the way that learning is being developed.

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The course team of a postgraduate course, Software Requirements for Business Systems in the OU's Department of Computing has been one of the early adopters of the VLE. The course teaches systematic elicitation, recording, and communication of requirements for software systems. On a software development project, the elicitation of requirements is generally carried out by a team of requirements engineers or system analysts. In software enterprises, requirements engineers often work remotely from one another, in different time zones, and they are increasingly turning to wikis for collaboratively developing requirements specification documents [1].

A wiki is a collaborative authoring environment – a readable and writeable website in which potentially all the visitors to the site can create new pages or modify existing ones, with optional access control to set limits on authorship. Wikis excel at collaboration and are “designed to facilitate exchange of information within and between teams” ([2]. On the Internet, projects using wikis have made some remarkable accomplishments. The most well-known wiki is the Wikipedia, an online encyclopedia that has been written and maintained by thousands of contributors from around the world. The advantage of wikis is that if a person makes an incorrect or inappropriate entry or change, other authors can ‘roll back’ to a previous version or edit and keep the change.

In the most recent presentation (November 2006 - April 2007) of the requirements engineering (RE) course, we (the course team) introduced activities based on wikis to provide students with the opportunity to engage in small group collaboration in order to emulate RE practice, thereby providing students with transferable skills for working with community tools in industry.

We were hopeful that the wiki activities would help facilitate learning and the acquisition of skills. We also hoped that these activities would help with the creation of explicit knowledge from tacit understanding, learning through discussion, disagreement and consensus building, effective communication of ideas to others through networked knowledge environments, articulation,

analysis and synthesis of ideas and knowledge-sharing.

We are now at a stage where we are able to begin to review the success, or otherwise, of our approach and ask such questions as:

- Did the wiki activities facilitate collaborative learning as we intended?
- What other tools might support collaborative requirements development?
- What are the challenges in teaching collaborative RE using a wiki?

In the remainder of this paper we provide some initial findings in relation to these research questions. In Section 2 we describe the wiki activity that we devised for our students to collaborate on. In Section 3 we describe what lessons we've learned so far and, in Section 4, discuss how we intend to progress the development of our teaching of RE based on those lessons learned.

INCORPORATING WIKI IN THE RE COURSE

Our RE course aims to provide students with the skills of elicitation, validation and communication of requirements. This involves interacting with stakeholders who have different needs and requirements, resolving conflicts and ambiguities in the requirements, and dealing with the various perspectives of the several requirements engineers in a project team. The removal of conflicts and ambiguity from a set of requirements is often performed by a small group of engineers who discuss and reformulate the requirements, in consultation with the stakeholders. Therefore, our aim of introducing collaborative activities in a wiki environment was to emulate an experience that students are likely to be engaged in as practicing requirements engineers.

In the OU teaching system, assignments (course work) are used for both summative and formative purposes. On our course there are three pieces of course work and we have progressively introduced wikis and collaborative activities from one assignment to the next. All three assignments require the students to collaborate using the wiki on a variety of aspects of the requirements engineering process. The first assignment was used to introduce students to the wiki, its purpose and its editing facilities. Collaboration was kept to a minimum, with students being asked to read a case study, choose a stakeholder role from the case study and socialize with their fellow group members in the role of the stakeholder. This assignment also included an ice-breaker activity, a vital step towards collaboration in groups [3].

In the two subsequent assignments, students take on three roles: the stakeholder role in order to develop requirements for the case study that act as a set of data for the remaining activities; the

requirements engineer role in order to amend and develop the requirements in collaboration with others to produce an agreed requirements specification; and as themselves to organize their collaborative interactions.

Since this was a learning activity for the course team, we needed feedback from students on the efficacy of the approach we had adopted. Therefore, we introduced a reflective element into the assignments, asking students to record their experiences and to reflect both on their learning and their use of the wiki in the collaboration process.

We were already aware of some of the problems associated with group-work in a distance learning environment from experiences of an OU undergraduate course on team building in a distributed environment [4]. Distance learning courses (including e-learning courses) tend to have significant drop out [5] and, because they are adults with competing demands on their time, students are not always available to participate in collaborative exercises, particularly if the timetable for the activities is determined at a late stage. Therefore, a balance has to be struck between a group size that is large enough to allow for non-participation of some individuals yet is small enough to be effective for all members of the group. We decided on a group size of 6. In addition, rules have to be determined for dealing with the situation in which the size of a group falls below a threshold for effective communication, particularly on how to deal with those students who want to participate but whose fellow-group members do not.

An issue that is always of concern in group working relates to the rewards for participation: ensuring that good participation is rewarded and non-participation is not. We adopted a scoring system that was based both on the results of the group activity and an individual's contribution to the group. In fact, we were more concerned to weight the requirements engineering process adopted by students more highly than the quality of the requirements specification produced by the group.

Several pedagogical issues arose because we were adapting an existing course whose pedagogy was based around the notion of the independent learner to include an element of social constructivism. It has long been recognized [6], [7] that the traditional linear learning paradigms need to be changed to social constructivism. The challenge is to change the distance learning student's expectations from one of almost total flexibility in study pattern in which the only deadlines are associated with assessment (coursework and examinations) to one in which further deadlines are introduced to cope with collaboration with other students. While wiki collaboration is asynchronous, there have to be synchronization points if a group is to reach

agreement. A degree of management of wiki usage has to be introduced.

Perhaps the most important issue is that of motivation: the need to convince students that collaboration is a worthwhile activity from which they will benefit. The way we approached this issue was to ask students to read articles and papers that discussed how wikis are being used in requirements engineering.

There have also been technical challenges in which we have had to amend the Moodle wiki to meet our requirements. Moodle is based a model of teaching founded on the idea of a course administered by an academic, which is quite different to that of the OU. We have had to amend Moodle to allow small, independent groups each with their own wikis to be set up requiring a scheme of individual access rights to be developed.

LESSONS LEARNED

In this section we turn to the views of the students in order to determine whether the wiki activities have facilitated collaborative learning of RE in terms of both the RE process and the quality of the product, that is the quality of that part of the requirements specification which the students collaboratively develop in the assignments. We had asked the students to reflect on their experiences throughout the course and to share those experiences with their tutor and the course team via e-mail or the discussion forum of the course. We included a question in the third assignment which asked students to report their reflections in terms of: problems experienced during collaboration; their perceptions of collaborative learning of the RE process; their views on the effectiveness of wiki as a tool for collaborative authoring. In particular, we were keen to obtain their views on the significance of collaborative authoring on the RE process. We received 117 responses to the question (representing almost all students on the course) many of which were positive and of which the following are representative of the benefits to the students' own development.

The collaborative activity allowed me to see how the others addressed this question and evolve my own contribution and understanding based on these.

The discussions from this activity helped me to reflect on my own views and potentially modify them (and the requirements).

It was useful to share ideas on generating and improving fit criteria [an RE/course concept] as a group, to make them [the requirements] as unambiguous, complete and testable as possible.

My understanding of the requirements engineering process has been enhanced by the collaborative activities.

I have gained a better understanding of why a requirement needs to have a Fit Criterion rather than just a description.

I did gain something from it. By working [through] the activity it did improve my understanding of gathering and refining requirements."

Most students seemed to appreciate that collaborative authoring does contribute to a better requirements engineering process:

A major barrier to understanding requirements is that people make assumptions. It is only when these people get together and discuss the problem that missed requirements and inconsistencies are identified.

However, there were problems; in particular the difficulty of students 'meeting' at mutually convenient times or to take out additional time for collaboration:

I found the collaborative [activity] very difficult to participate in, with the job I have I travel a lot and the collaboration relied on you being available for the last 5 days or less before deadline to see everyone's contribution. So whilst I see it a valuable benefit ... for the requirements engineering process I see the emphasis ... on the Wiki work as being slightly biased against the individual that doesn't have this flexibility in their life style.

I tend to study once every few weeks and do several chapters at once - basically, I organise my studying around my life. Now ... I'm being asked to organise my life around my studying."

Some students definitely found that the wiki helped in collaborative work:

It is difficult to see how our group could have produced and reviewed a set of requirements in the space of 2 – 3 weeks without the Wiki. I found the group discussion pages useful to make suggestions to other members of the group and to make arrangements for editing the TMA [Tutor Marked Assignment] Wiki. In conclusion, a wiki is a good medium for OU collaborative work.

Many students were less enthusiastic about the use of group work in distance education for part-time students:

I spent a lot of time waiting for other group members to contribute.

Where a wiki does not work well with OU studies is the sporadic nature of group members' contributions. Some will contribute a lot at one time and then not return for a number of days. Effective collaboration requires regular contributions.

Then there were issues of peer-reviewing and critiquing (as is common in group-work).

Some students just weren't professional and felt they had the right to criticise other students work without being constructive."

NEXT STEPS

The feedback that we have received during the first use of the wiki on the course has encouraged us to look at *four areas* for further development.

We have adopted a non-prescriptive approach and deliberately not discussed with the students about the group management issues, such as coordinating the group responses or organising the dates and times for group discussion. However, in the next presentation of the course we shall be mentioning these factors – but still expecting students to be self-organising – and recommending the use of an online meeting scheduler.

Unlike several other wikis, the Moodle wiki does not have an embedded discussion forum and it is essential that students have a usable discussion medium. In the last presentation we asked students to use a separate wiki page for discussion to keep discussion apart from the specification document and to provide a record of the discussion for our analysis. The OU is developing the Moodle wiki to incorporate a discussion forum and we shall be incorporating its use at the earliest opportunity. Alternatively, students will be encouraged to use other discussion tools of their choice such as a group-blog, a discussion forum or even an e-mail list. Giving them this flexibility will enable them to choose tools that meet their skills and needs.

Perhaps the most important drawback of the present scheme is the relative lack of socialisation between group members. The students do not meet face-to-face in this course and, therefore, it is only through online socialisation activities that the students will get to know one another. Whilst we did incorporate an 'ice-breaker' into the first wiki activity, this has proved to be inadequate and several students have commented on the difficulty of working with a group of relative strangers. We have decided, therefore, to experiment with a group blog that will be active from the very start of the course.

A major disadvantage with our course is its short presentation period (around 5 months) and the need to involve students in wiki activities at an early stage. The result is that there is little time to allow students to engage in essential socialisation activities.

Regarding the time-constraints for group-working in part-time learning, we can only address this by offering or suggesting appropriate tools to be used in conjunction with the wiki and which can make the collaborative process more smooth and less time-consuming than it has been previously. Also, the more we emphasize to the students about the significance of wiki activities for the pedagogy of the

course and for the skills they require in software enterprises, the more students will be convinced about the role the wiki activities play in their learning of RE and acquiring skills such as time-management, project-management, stakeholder-interactions, team working and working with collaborative authoring tools.

CONCLUSIONS AND FURTHER WORK

The course is offered twice a year. This means that the assignments for the next presentation (May 2007 – October 2007) were set before the students took the examination for the current presentation. Therefore, we have to evolve the course as additional information becomes available. We intend to gather additional feedback via: student- and tutor-interviews, student discussions on the forum (an asynchronous discussion conference); and students' performance in the assignments and examination.

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