Perceived Usability of Social Software Enabling Self-Directed Learning

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Abstract: In this paper we report our idea of supporting self-directed learning (SDL) with a selection of social software tools, given the assumption that SDL competence can be enhanced by group learning activities. The concomitant research concern is to explore how usable and useful these tools are for fostering online communication and for supporting the development of learning contract. To address this issue, we have developed a simple instrument – tool usage statements - based on the core usability concepts and augmented Technology Acceptance Model (TAM). The instrument was administered at the middle and the end of a three-month user trial. Results showed that the changes in the perceived usability, user experience and acceptance were insignificant, though in general they were on the increasing trend. Some interesting observations about the participants' preference for Weblog (i.e. a general-purpose application) to iLogue (i.e. a specific-purpose application tailored-made for supporting the development of learning contract) were analyzed. It is deemed relevant to improve the tool usage statements and administer it to a larger sample to attain certain psychometric properties, and to further explore other remote evaluation methods.

1. Introduction

Self-directed learning (SDL) has been extensively researched and documented in the pre-digital world, and it is promising to explore whether and how it has been affected by new information and communication technologies (ICT) (Candy, 2004). Of particular interest is social software, because SDL, which is traditionally seen as individualistic, has its social aspect (e.g. Kerka, 1999). Group learning processes can foster individuals' SDL abilities because feedback from collaborators can stimulate the learners to reflect on their own learning activities and regulate them accordingly. Hence, it is reasonable to assume the relationship between self-directed learning and strongly-guided learning that occurs in formal training will be strengthened with the widespread use of social software. When learning is embedded in a formal setting with specific purposes and requirements, the institutional expectations should be addressed. Personal learning contract (PLC) serves as an appropriate means for negotiating resolutions between these external needs and expectations and the learner's internal needs and interests (Hiemstra, n.d.). In a group setting, social software can creatively be used by the individual member to document her/his PLC, which is shared with group-mates to invite feedback, thereby triggering reflection on and then revision of the PLC. Blogs, for instance, can be employed for recording PLC. Whether blogs are fit this purpose is an empirical question we aim to explore. Furthermore, it is intriguing to explore how useful and usable the other social software is for fostering communication among members of an online cross-cultural collaborative learning group.

Like other types of ICT, *usability* is a significant quality attribute of social software in determining user adoption and usage pattern. According to ISO 9241-110 (2006), usability is defined as the extent to which a user can achieve her specific goal with the system in question *effectively* (i.e. task completion without help or error), *efficiently* (i.e. optimal task completion time and effort) and with *satisfaction* (i.e. comfort). Recently, in view of the diversification of user groups and blurred boundaries between work and everyday life – a trend being partly attributed to the popularization of social software, user experience (UX) has drawn much research attention and efforts in the field of human-computer interaction (HCI). Not only instrumental (e.g. improved knowledge) but also hedonic (e.g. pleasure, fun) goals are deemed important. Evaluating usability and user experience can be performed with a variety of approaches, ranging from model-based (e.g. GOMS) through analytic ones without involving real users (e.g. heuristic walkthrough) to empirical ones involving representative users (e.g. think aloud, survey). Specifically, in accord with the extensively validated Technology Acceptance Model (TAM) (David, 1989; Venkatesh et al., 2003), *actual usage* of a system is influenced by a user's *intention to use*, which in turn is affected by the user's *perceived usefulness* and *ease of use* of the system. Perceived ease-of-use also influences perceived usefulness; a person who finds a system easy to use tends to perceive it to be useful. A number of previous empirical studies show that TAM can be applied virtually to any computer technology. The original TAM has augmented to include emergent constructs such as playability and enjoyment (Davis, Bagozzi and Warshaw, 1992). Of particular relevance is *perceived enjoyment*, which is defined as *"the extent to which the*

activity of using the computer is perceived to be enjoyable in it's own right, apart from any performance consequences that may be anticipated" (Davis et al., 1992, p. 1113); it is associated with the user's intrinsic motivation.

In summary, SDL is an old concept that takes on new challenges in face of emergent ICT, especially social software. Our major research question is: *How useful and usable are a selection of social software tools for enabling self-directed learning by fostering online group communications and by supporting the development of personal learning contracts?* We address these questions with user trials in the context of our R&D project iCamp (http://www.icamp.eu). Specifically, we have constructed an instrument – tool usage statements – with reference to the basic usability and UX concepts, and the TAM. A caveat is that we do *not* aim to validate the TAM. In the following sections, we first briefly describe the structure and activities of our user trials, followed by results and discussions, and then conclude with implications for our future work.

2. iCamp Trial Structure and Activities

The iCamp project aims to create an infrastructure for collaboration and networking across systems, countries, and disciplines in Higher Education. We assume that "adult learners can be directed towards certain achievement and competence advancement by introducing them to new ways of self-directing, collaborating and social networking in technologically mediated settings, and by supporting a self-organized restructuring of their personal environments, which include landscapes of tools and services, activities and human as well as material resources" (Fielder & Pata, p.7). This iCamp pedagogical assumption is validated against its interoperable system and tools portfolio. Three validation trials of different foci and scales are implemented within the lifetime of the project. Whereas the first trial (2006-7) was primarily exploratory, the second trial (Trial2, 2007-8) is formative evaluation and aims to *validate how SDL can effectively be supported with the use of social software in online cross-cultural collaborative learning settings*. To achieve this aim, we have collected a body of data with different methods and tools. In this paper, we report our results on whether and how the participants have changed their perceptions as well as usage of the tools recommended over the period of six weeks.

2.1 Participants

Four European Higher Education institutions constituted the trial sites of Trial2: Czech Republic, Poland, Slovenia, and Turkey. There were three major roles:

- *Facilitators*: Five faculty members from the trial sites proposed different project topics about which they are knowledgeable, and facilitated groups of students to accomplish the projects selected;
- *Students*: 27 undergraduates and postgraduates majoring in computer science, electrical engineering, sociology, and management;
- *Research team*: They were responsible to coordinate and monitor the progress of the trial, and provide technical and pedagogical supports

Seven student groups, with the size ranging from two to five, were formed. Each group worked on a specific topic and was supervised by a facilitator.

2.2 Preparation and Execution Stages

Trial2 commenced in April 2007 with groundwork preparations: Facilitator recruitment, development of pedagogical scenarios and evaluation schemes, and selection and adaptation of technical tools, and student recruitment. A blog entitled "iCamp Trial2 Weblog" has been developed as an information hub where there are links to *iCamp Help Centre* (i.e. tutorials for a set of tools), to Project Wiki, and to blogs of all the trial participants. After the Preparation stage, Trial2 entered the Execution stage consisted of four phases, viz. launching, first, second, and third.

2.2.1 Launching Phase (October 2007)

Trial2 was launched by introducing the iCamp Trial2 Weblog to the students who were required to accomplish several tasks prior to the actual project work:

- *Initiating personal tool landscap*e. Students were recommended to deploy a selection of open-source applications that support learning activities of Trial2, including Wordpress (weblog), wiki, videowiki, Scuttle (social bookmarking), Feed-on-feed (aggregating feeds), x-Lite (IP telephony), iLogue (developing learning contract), mydentity (email forwarding), Doodle (meeting planner), Calendar (time management), Flickr (sharing photos), and Objectspot (learning object repository). Students were required to manage and configure some of the tools to meet specific needs;
- *Making self-introduction*. Students were required to create a personal weblog and to attend a kick-off videoconference where they briefly introduced themselves;
- *Registering for a project of interest*. On the Project Wiki there were links to a set of wiki pages with each of which containing the title of a project, the name of the facilitator and a brief description of the project. A student registered for her preferred project by putting her name, email addresses and link to personal weblogs on the corresponding wiki page.

2.2.2 First Phase: Project Group Formation (Nov 2007)

Students were basically free to choose whichever project theme they found interesting. To ease information search, the *feeding mechanism* for aggregating contents from different sources in one place was introduced. For instance, if a student subscribed to her group-mates' and facilitator's blogs, she could then view the contents of these blogs from her own blog. Towards the end of the First Phase the students were asked to fill in the *Periodic Reflection Survey#1* (PRS-1) to indicate how they perceive the trial context (including people, tools, the project topic, resources, etc). The rationale was to encourage the students to reflect on their learning environment.

2.2.3 Second Phase: Project Specifications and Learning Contracts (Dec 2007)

With the help of the project facilitator, students had to decide clearly the content and context of their project, identify goals and objectives to be achieved, specify tasks and who was responsible for which tasks, and select criteria against which they would be evaluated. These discussions took place asynchronously (e.g. email), and synchronously (e.g., IP telephony). When agreements on project specifications had been reached, the students had to develop their personal learning contracts (PLC) in their blog or with the tool iLogue. Students could use the contract template and fill it with their own aims, tasks, tools, resources, and evaluation criteria. After the students had drafted their PLC, the project facilitator commented on it. Group members should also peer-review each other's PLC. Basically towards the end of this phase students should 'freeze' their PLC, though they could still slightly revise it when they got a better understanding about their project work and learning environment.

2.2.4 Third Phase: Project Attainment and Evaluation (Jan 2008)

This phase focused on achieving project goals and evaluating project outcomes. Students continued to communicate and interact with different tools for teamwork coordination, activities regulation and resolution of social issues. Towards the end of the project, students were asked to fill in the *Periodic Reflection Survey#2* (PRS-2) to indicate how their personal and group landscapes (i.e., tools usage, interaction patterns, etc.) changed and to what extent their learning goals were attained.

3. Results and Discussions

We employed mixed-method evaluation approach to capture different types of data from different sources with different techniques and tools (see Section 2). To reiterate, the common tasks that all the participants should achieve are: completing three surveys, developing a learning contract, accomplishing their project, and attending two interviews. In the following, we present and discuss our results gathered with the three surveys. Some of the findings are corroborated with data from the interviews with some students and their personal learning contracts. Owing to the space limit, details of these data will not be elaborated.

3.1 Surveys

Survey is one of the most popular instruments for evaluating a learning environment. We conducted 3 different surveys; each of them was documented as a Word file and uploaded to the iCamp Weblog at a different time. Students were required to download the file, fill it in and send it back to the evaluator as an email attachment.

3.1.1 Background Survey

It was administered shortly before the beginning of Trial2. It gauged the students' demographic data, ICT competence, cross-cultural collaboration experience, self-directed learning knowledge, and expectation as well as motivation for participating in Trial2. Eighteen students (12 male) returned this survey. The data showed that most of the respondents majored in computer science or other engineering domains and only four of them majored in social sciences. In general, 67% of them have used online communication tools frequently. Surprisingly, 39% and 28% had never used blog or wiki, respectively. Further, 15 out of 18 students had involved in group projects and only 3 had experience in online courses before they took part in Trial2. The students' motivation at the time of joining Trial2 was relatively high with 15 students rated 3 or above on a 5-point scale. The students' expectations were analyzed; the most frequent category (25%) was "to make new friends" followed by the category "to learn new skills and acquire new experience" (21%).

3.1.2 Periodic Reflection Surveys

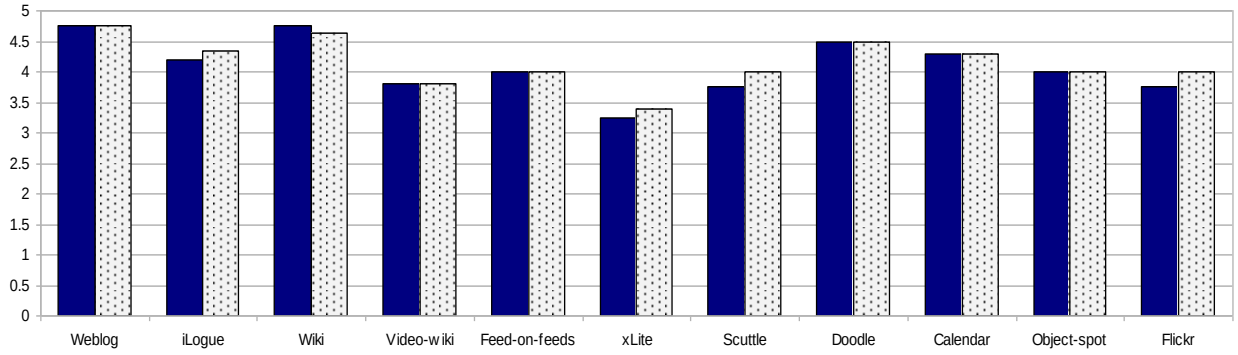
The first and second *Periodic Reflection Surveys* (denoted as PRS-1 and PRS-2) were distributed in the middle and at the end of Trial2, respectively. In PRS-1, students were required to report their perception and usage of all the eleven tools provided. They were also asked about the use of the feeding mechanism (Section 2.2.2). The last part of PRS-1 consisted of some open questions asking students about their purposes and activities when using the tools. The PRS-2 was similar to PRS-1, and additionally contained some open questions to collect students' comments on their personal learning contract and self-directed learning. We aimed at tracking how the perceived usability, user experience and acceptance of the selection of social software tools for Trial2 (Section 2.2.1) have changed over time. Table 1 displays the twelve statements (S) and their associated constructs. In both PRSs, students were required to rate each statement with a 5-point Likert scale, with 1 being "strongly disagree" and 5 "strongly agree". An option of "Not Applicable" designated as 6 was given as well. It was not compulsory for the students to complete the two PRSs, though they were strongly encouraged to do so and would earn some bonus points for the final score by filling them in. Thirteen students returned the first PRS, and another batch of 13 students returned the second one; there were nine overlaps from the two batches. Hence, one should bear in mind that comparisons between these two surveys could only be done on those nine students who returned both surveys. Other analyses were carried out independently for each of the surveys.

Statement*	Associated Construct
S1. I learned how to use X on my own (e.g., tools tutorial, website)	Usability: Learnability
S2. I learned how to use X with the help of facilitators and peers	Usability: Learnability
S3. My group-mates used X in a way different from I did	Usability: Understandability
S4. I frequently use X, at least once per day	TAM: Actual usage
S5. It was easy to use X	TAM: Ease-of-use
S6. I had problems of using X	TAM: Ease-of-use
S7. I needed help to solve the problems of using X	TAM: Ease-of-use
S8. Using X could *increase* the quality of my project work	Usability/TAM: Effectiveness
S9. I could accomplish my project work in *less* time with the use of X	Usability: Efficiency
S10. I was satisfied with using X	Usability: Satisfaction
S11. It was fun to use X	Extended TAM and UX: Enjoyment
S12. I would continue using X *after* the project is over	TAM: Intention to use

Table 1: Tool usage statements and their associated constructs
NB: X stands for the tool evaluated (e.g. weblog, wiki, iLogue, etc.)

Ease-of-use: Ratings for S1 were considered an appropriate measure for this construct. As the majority of students were from some technical domains, it was easy for them to learn how to use the given tools without asking for help. Furthermore, social software tools are so designed that they should be in general lightweight with high learnability

(Nielsen, 1993) (i.e. flat learning curve). As shown in Figure 1, all the tools except xLite (open-source IP telephony) had the rating of above 3.5. For all the tools, the ratings in PRS-2 were equal to and higher than those of the first one. This is consistent with the assumption that the intrinsic enjoyment is the antecedent of perceived ease of use whose effects increase over time as users gain more experience and perceived control with the tools (Venkatash, 2000).



Legend: filled bar = first survey; dotted bar = second survey
Figure 1: Ratings for ease-of-use

Actual usage: Ratings for S4 approximated the actual usage of the tools. Figure 2 shows that the students only agreed with this statement on Weblog, which can be attributed to the fact that Weblog was singled out as an important tool for Trial2. Except for iLogue, the ratings for the tools slightly increased in the second survey.

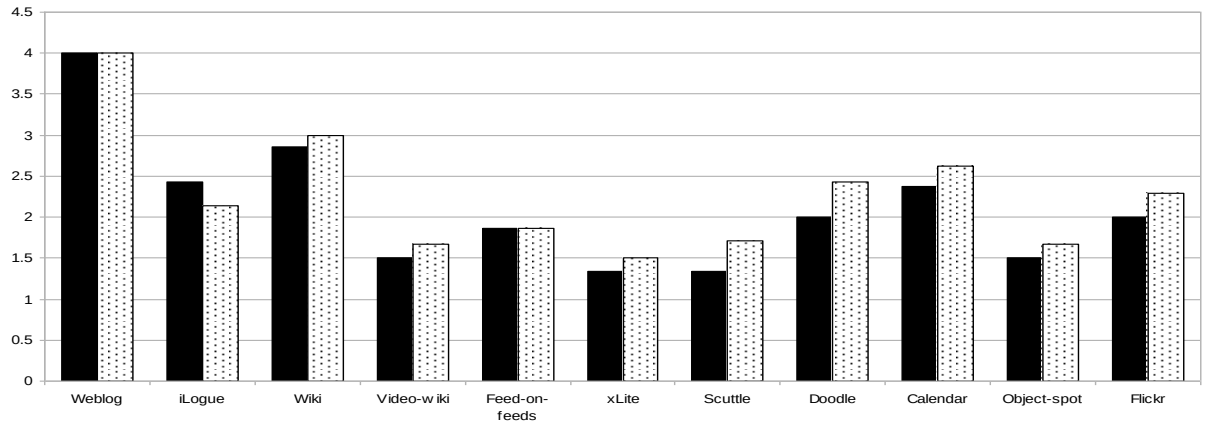


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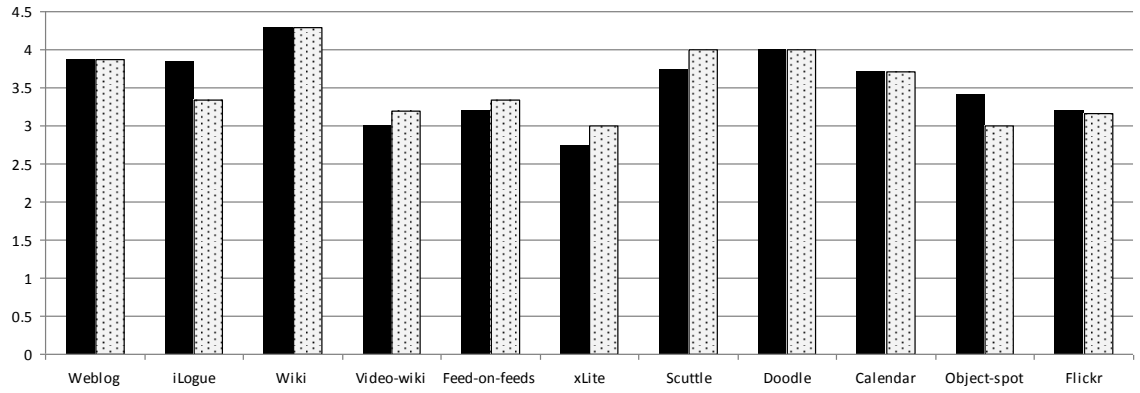
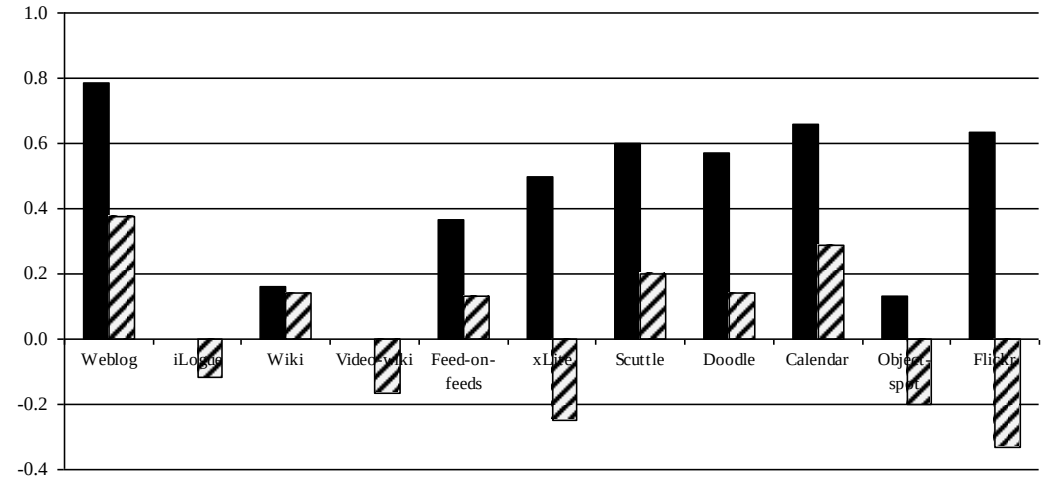
Figure 2: Ratings for approximated usage (S4)

Effectiveness: Ratings for S8 measured this construct. Figure 3 shows that the students strongly agreed on wiki and agreed on Doodle. The interviews also showed that many students appreciated Doodle for its simplicity and effectiveness in arranging meetings. The students almost agreed on weblog (the rating was nearly 4). The rating for Scuttle increased from "almost agreed" to "agreed". The ratings for iLogue decreased in the second survey.



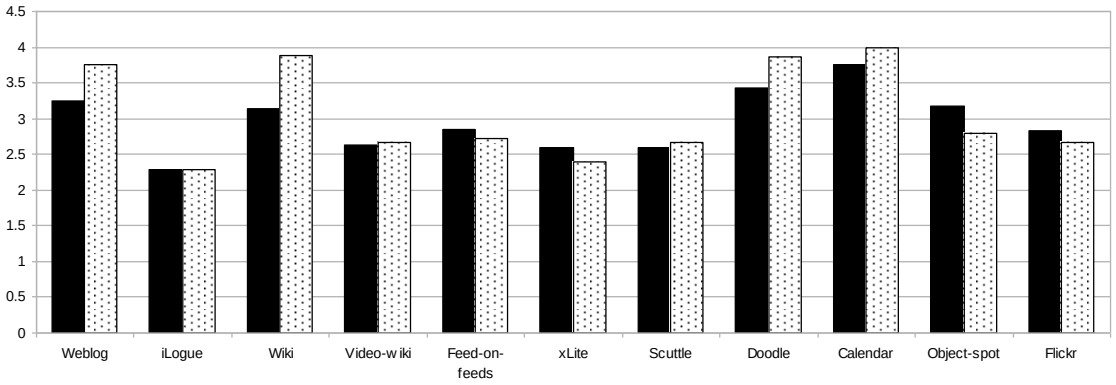
Legend: filled bar = first survey; dotted bar = second survey
Figure 3: Ratings for effectiveness

Satisfaction and Fun: Ratings for the perceived satisfaction and fun were measured by S10 and S11, respectively. The average satisfaction ratings over the two surveys were all above 3.0 except Objectspot (2.9) – learning object repository, and Weblog had the highest value of 4.2. In contrast, the average fun ratings for three of the tools were below 3.0, namely iLogue (2.8), xLite (2.8) and Objectspot (2.7), and Weblog again had the highest rating of 4.1. In studying the differences between the two surveys, we notice some interesting observations. The ratings of fun remained the same for two of the tools (iLogue and Videowiki) and increased for the rest, whereas the ratings of satisfaction dropped for five of the tools (the largest drop was for Flickr) and improved for the others (Figure 4). The largest increase was for Weblog, 0.8 and 0.4, for the fun and satisfaction rating, respectively. These results seem to suggest that the students perceived satisfaction differently from fun. It somewhat supports the current debate in HCI that usability and UX address different quality attributes (Law, Hvannberg & Hassenzahl, 2006).



Legend: Filled bar = Fun ratings; Shaded bar = Satisfaction rating
Figure 4: Difference in fun and satisfaction ratings over the two surveys

***Intention to Use*:** Ratings of S12 measured this construct. Figure 5 shows that the students agreed that they tended to continue using Calendar after the project was over. Such a tendency increased for Weblog, wiki and Doodle, as shown by their higher ratings in the second survey. In contrast, the ratings dropped for xLite, Feed-on-feeds, Objectspot, and Flickr.



Legend: Filled bar = first survey; Dotted bar = second survey
Figure 5: Ratings for intention-to-use

3.1.3 Personal Learning Contracts (PLC)

Two tools – iLogue and Weblog- support the development of PLC. Figure 6 illustrates the distributions of ratings for these two tools, when only the positive statements are considered (i.e. S1, S4, S5, S8, S9, S10, S11 and S12). To recapitulate, the rating 1 denoted strongly disagreed, 5 strong agreed, and "NA" Not Applicable. The NA rating suggests that the students have not bothered to try that tool.

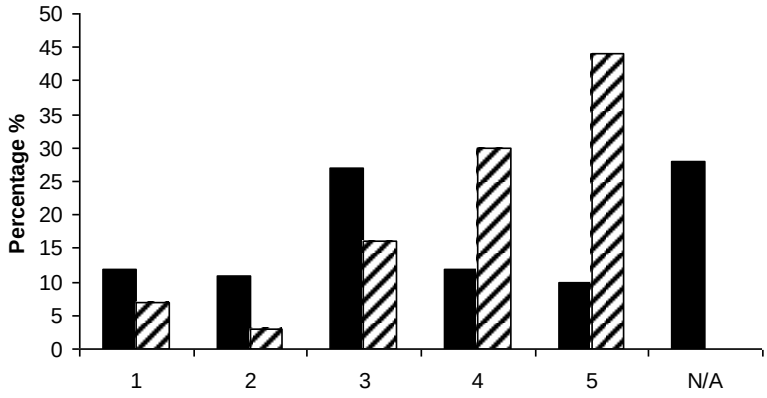


Figure 6: iLogue/Weblog ratings in the two surveys
Legend: filled bars = iLogue; Striped bars = Weblog

Results show that NA was the most frequent rating for iLogue in both surveys. Most students also rated 3 for iLogue. An interesting point to notice is that the difference between the number of students who rated 5 in the first and second surveys, 15 and 10, respectively. It implies that the acceptance of this tool has lowered over time. In contrast, students mostly rated Weblog with 3 or above. It implies that they appreciated this tool. This high acceptance can be attributed to the fact that 61% of the students have already used some blogs before Trial2.

In fact, iLogue (Figure 7a) has especially been designed to support the development of PLC. It is built on the concept and technique of wiki and thus enables easy editing, versioning and feeding. The four basic elements of a PLC (i.e. goals, actions, resources and self-evaluation criteria) are given in iLogue as a template, whereas students needed to type these elements manually in Weblog (Figure 8). As Weblog does not support versioning, for each revision of PLC students had to copy-and-paste the older entry to a new message; some students creatively used different font styles and sizes to indicate the changes made. In contrast, iLogue tracks changes automatically and allows users to view all the changes of individual elements along a timeline with the function "Birdview" (Figure

7b). In principle, iLogue should be the preferred tool for the development of PLC. In reality, the students showed stronger preference for Weblog. This observation can be explained by several factors: First, most of the students had used blogs before the trial; the role of familiarity in the tool selection was important. Second, the design of Trial2 emphasized using Weblog as an information hub both at the group level as well as individual level; it might then pre-empt the students from adopting the other option. Third, the students preferred having all things in one place. Though feeding the content of iLogue to their personal weblog was possible, they did not bother to implement this mechanism, as shown by the low number of feeding instances. Fourth, most of the students developed only one version of PLC because of the relatively simple project tasks they needed to deal with and the short duration of Trial2, the changes tracking function enabled by Birdview could thus be deemed excessive or non-useful.

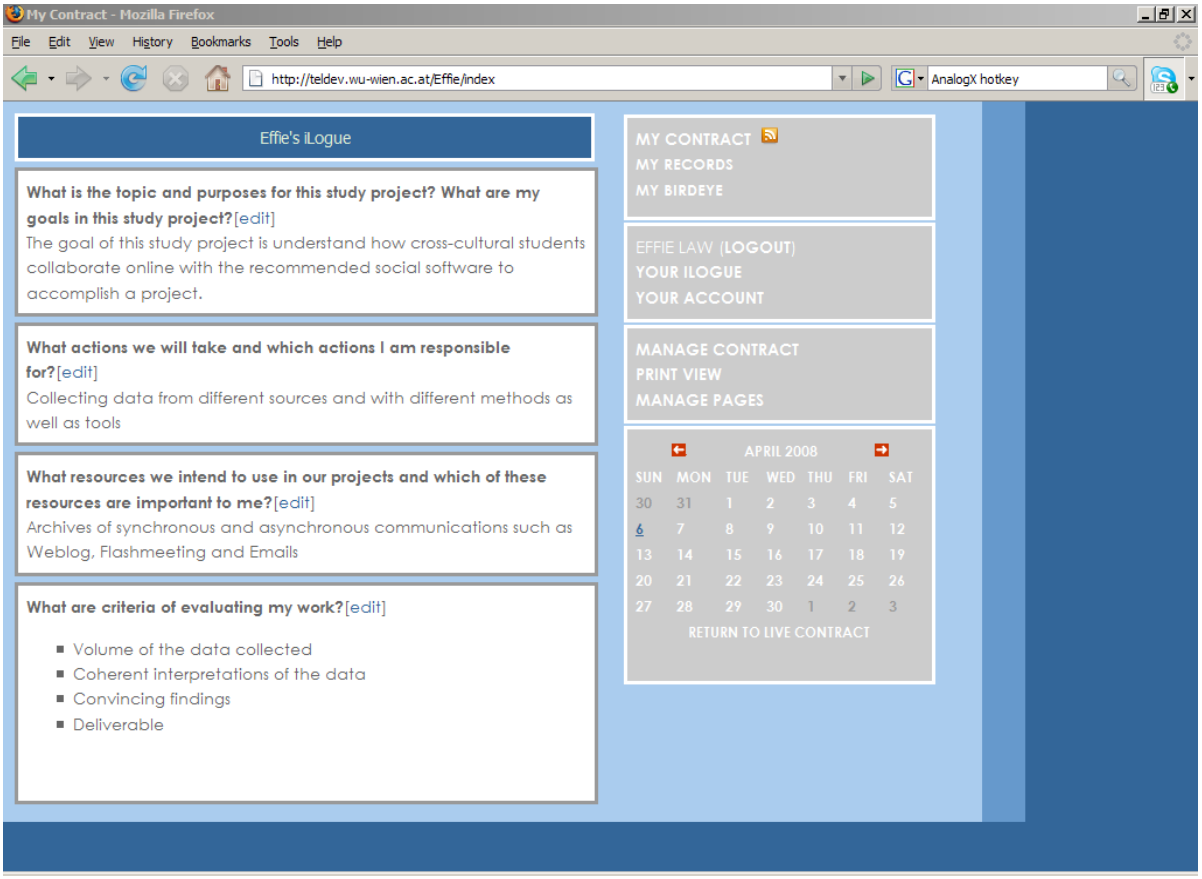


Figure 7a: iLogue with a learning contract

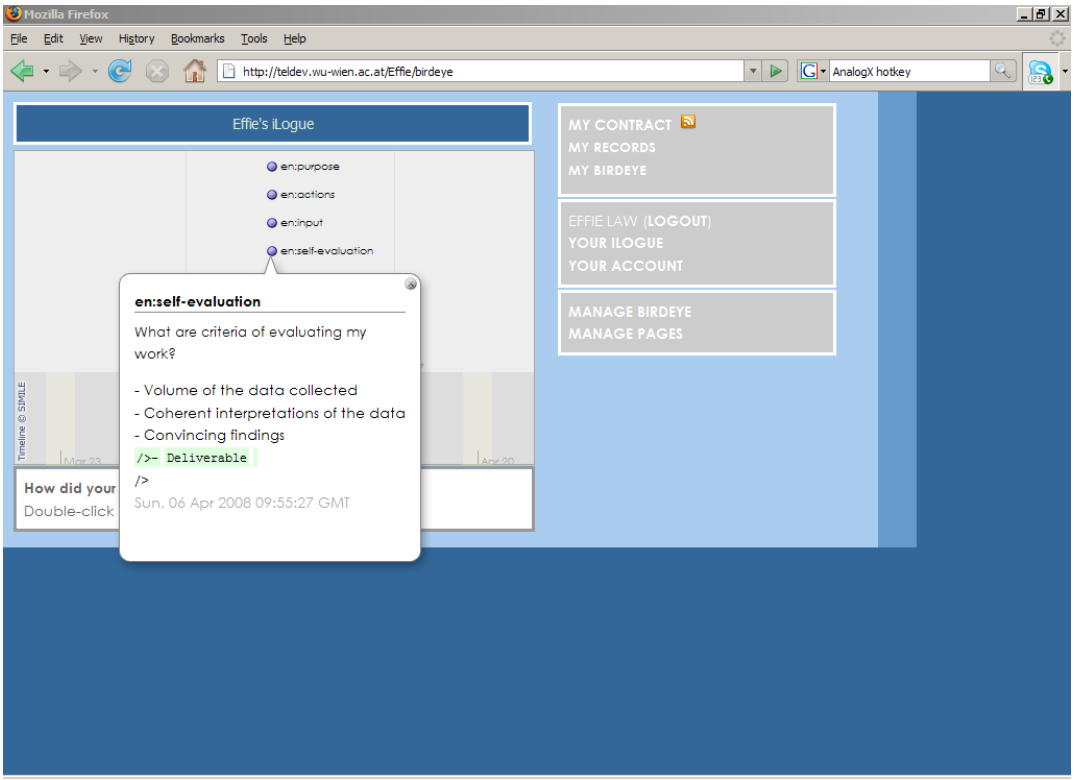


Figure 7(b): The "Birdeye" view of iLogue tracking the changes in the learning contract

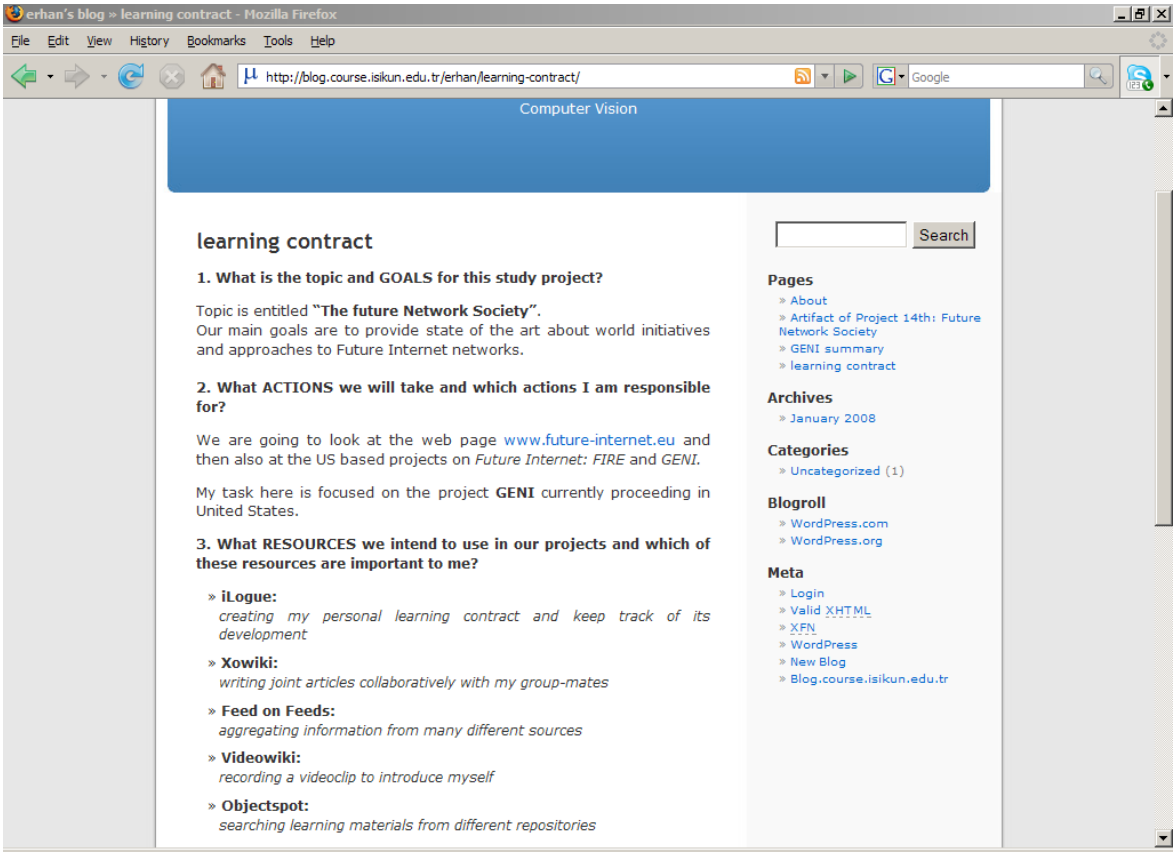


Figure 8: Weblog with the learning contract

In summary, the results showed that the changes in the perceived usability, user experience and acceptance were insignificant, though in general they were on the increasing trend. As these constructs are underpinned by certain psychological attitudes such as intrinsic motivation, they may not be changed easily within the relatively short duration of the trial.

4 Concluding Remarks

In this paper we describe our ideas on how to support self-directed learning with a selection of social software tools. Furthermore, we illustrate how to evaluate the users' perceived usability and their acceptance towards individual tools with a relatively simple instrument – tool usage statements. The design of our online cross-cultural collaborative learning was relatively complex and inherently messy. As the trial participants were widely distributed in different sites, it was extremely difficult for the evaluators to track the tool usage on a fine-grained level. Some in situ observations could in principle be done but practically rather implausible, because the students performed their project tasks on flexible schedules and places (e.g. late in the evening at home). In fact, we did employ some automatic data logging instruments (e.g. myDentity – an application for tracking email transactions). Unfortunately, some students failed to follow the instruction; the data thus collected were incomplete. Consequently, we had to rely mostly on subjective, self-reported data, despite our awareness of the limitation of this methodology. Nonetheless, the empirical data collected with the surveys could be triangulated and substantiated by other data sources such as interviews, and the related data analysis is still ongoing. Furthermore, some enhancement of the instrument - tool usage statements - is deemed relevant for future projects. The sample sizes of the current study are somewhat too low to allow any inferential statistics to be performed. Hence, the inter-correlations of the twelve statements (Table 1) cannot be computed. The improved instrument can be administered to a larger sample to establish some psychometric properties. In addition, other remote usability evaluation methods (Paterno & Santoro, 2008) should be explored to support automatic data logging in a valid and reliable manner. In the same vein, how to integrate a large volume of qualitative and quantitative data from different sources effectively and efficiently remains a significant research challenge for us to tackle in our future work.

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