Students' Acceptance of Web 2.0 Technologies in Higher Education: Findings from a Survey in a Romanian University

Elvira Popescu
Software Engineering Department
University of Craiova
Craiova, Romania
popescu_elvira@software.ucv.ro

***Abstract*—This paper reports findings from a survey on students' attitude towards the use of Web 2.0 tools in a Romanian university. The purpose of the study is threefold: i) establish students' initial level of familiarity with various Web 2.0 tools, as well as their usage habits (time spent, frequency of accesses, purpose of use); ii) capture students' feedback after a practical learning experience involving the use of social software (in terms of ease-of-use, perceived usefulness, advantages and disadvantages); iii) analyze students' general opinion regarding the prospective large-scale introduction of Web 2.0 technologies in education. To this end, students participated in a team project assignment which required the use of blogs and wikis and were asked to fill in two opinion questionnaires. The paper provides a detailed report of the results, together with a discussion of findings and lessons learned.**

Keywords-Web 2.0, social software, blog, wiki, technology acceptance, survey

I. INTRODUCTION

In the last few years, Web 2.0 tools[1] gained a lot of attention and started to be used in educational settings. This interest comes from the fact that the principles Web 2.0 is based on are in line with modern educational theories such as socio-constructivism [12]: knowledge cannot be transmitted but has to be constructed by the individual, by means of collaborative efforts of groups of learners [11].

Paper [5] presents practical guidelines for the use of Web 2.0 technologies to support teaching and learning, illustrating them with actual pedagogical scenarios. Blogs for example can be seen as a means for students to publish their own ideas, essays and homework and as a space where they can reflect on their learning process (i.e., a kind of "learning diary"). Furthermore, posting comments to blog articles represents a means of social interaction, as well as an opportunity to provide critical and constructive feedback. Also, blogs help create a sense of community among students with similar interests ("educational blogosphere"). Similarly, wikis can be used as a means of collaborative creation of knowledge artifacts, Wikipedia being a prominent example. In educational settings, wikis can be successfully used for collaborative writing tasks among the members of a team, as well as for creating and maintaining learning content, both by students and teachers. Social bookmarking tools can be used for storing and sharing links to resources of interest for the course (i.e., a kind of "personal knowledge management tool"). Students can share bookmarks they have discovered with their peers and also tag and rate the collected resources. A comprehensive review of papers reporting actual applications of Web 2.0 technologies and tools in formal learning settings can be found in [7].

Despite the growing number of papers on this subject, the full potential of Web 2.0 for education is yet to be established and many questions still lie ahead, as summarized in [6]: "*To what extent do the new media challenge our conventional understandings of the way in which knowledge is generated and disseminated within the academy, and to what extent do they challenge or mesh with the changing idea of the university in the age of the digital? Do students possess the forms of 'technoliteracy' [8] required to manage and produce academic knowledge within such spaces? What kinds of 'digital pedagogies' work in these spaces, and how are they perceived and experienced by students?*"

In this paper, we mainly aim at addressing the last two questions, in a Romanian university context: what is students' familiarity level with Web 2.0 tools and what is their subjective evaluation of applying these tools in the learning process?

While the general belief is that today's students are familiar with Web 2.0 sites and enthusiastic users, there are also studies which prove that this is not necessarily the case [1], [9]. Therefore, the first objective of our study was to clearly establish the level of familiarity of our students with various Web 2.0 tools, as well as their usage habits (time spent, frequency of accesses, purpose of use). Furthermore, even if students are familiar with these tools, does this mean they are willing to use them in educational settings or do they see them simply as entertainment tools? Are students able to transfer their Web 2.0 skills and knowledge to the new context of formal learning? [2]

In order to answer this question, we provided the students with an environment in which they had to use two such tools (blog and wiki) for educational purposes, more specifically for a team project assignment. Next, we asked students to fill in a questionnaire, describing their experience of interacting

[1] These are also referred to as "social software" and include a wide range of tools for social networking (e.g., Facebook, LinkedIn), media sharing (e.g., YouTube, Flickr), social bookmarking (e.g., Delicious), blogging (e.g., Wordpress, Blogger), wikis (e.g., Wikipedia). For the sake of simplicity, we will use the term "Web 2.0" for the rest of this paper, to cover the notions of social and participative Web.

with the blog and wiki in terms of ease-of-use, perceived usefulness, advantages and disadvantages. Finally, once students acquired a hands-on experience with Web 2.0 tools in the learning process, we polled them again regarding the prospective large-scale use of these tools in educational settings. "What are the main benefits?", "What are the drawbacks?", "What would be the best educational use for each of these tools?" were some of the questions that students gave their opinion about.

Some related studies regarding the use of Web 2.0 technologies in educational settings are reported in: [2], [3], [6], [9]. The first two studies involve students aged 11-16 from UK schools, while the last two studies refer to UK higher education, including students from BSc and MSc programs. To the best of our knowledge, the study presented in this paper is the first to report on the use of Web 2.0 tools in a Romanian university. Furthermore, the novelty of the study is that it was designed to capture both the initial familiarity level of the students with Web 2.0 technologies and their subjective evaluation of the Web 2.0-supported learning experience, as well as the way this experience influenced students' general opinion about the use of Web 2.0 tools in education.

The rest of the paper is structured as follows: in section 2 we present the context of the study (course settings, participants, procedure). The survey findings are reported in detail in section 3. Finally, in section 4 we conclude with some discussions and lessons learned from our study.

II. STUDY SETTINGS

A. Course Context

The context of the study is a course on "Web Applications' Design" (WAD) for fourth (last) year undergraduate students in Computer Science from the University of Craiova, Romania. The course was held during the first semester of the 2009-2010 academic year. 36 students were enrolled in this course. The course had an associated project activity, for which students received a separate degree, with its own ECTSs. Students were split in teams, according to their preferences (between 4 and 6 students per team, depending on the difficulty of the assignment). A total of 7 teams were formed, each with their own project theme (i.e., design and implementation of a particular Web application). The project activity was done in a blended mode, with weekly face-to-face meetings in which students could directly interact with the instructor, asking for help and clarifications, doing hands-on exercises, discussing contributions, checking the assignment progress, and presenting the final project results. Furthermore, students were asked to use a blog for communicating with their peers, documenting the progress of the project (reporting each accomplished activity, describing problems encountered and asking for help, providing solutions for peers' problems, sharing their experience with a technology/tool, etc.) and reflecting on their learning experience. They were also instructed to use a wiki for gathering and organizing their knowledge and resources regarding the project theme; the wiki would also represent a space for collaboratively writing the project documentation.

Both the blog and the wiki were team-oriented (i.e., each team had their own blog and their own namespace on the wiki). However, teams were encouraged to visit each other's blogs and offer feedback (e.g., offer help for a problem encountered by a peer, give a piece of advice, etc.). As far as the wiki is concerned, the collaboration between teams was restricted to visualizing each others' contributions, but without having the possibility to intervene (only the members of a team had write access within their namespace).

From a technical viewpoint, WordPress [13] was chosen as blogging platform (due to its simple and friendly interface and the range of functionalities offered) and DokuWiki [4] as wiki software (because of the ease of use and simple and flexible user access control).

Using the blog and the wiki were compulsory activities; an active contribution (in terms of actual content, frequency, periodicity, feedback for peers) counted for 50% of the final mark.

Figure 1 includes a snapshot from a blog post pertaining to Team 5, in which a student reports on his experience of creating a Java feed reader.

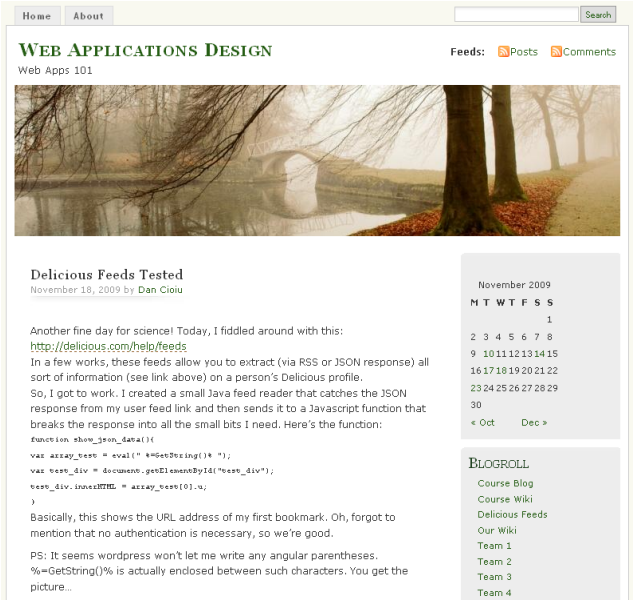

Figure 1. Snapshot from a team's blog

B. Participants

Out of the 36 students, only 30 (18 male, 12 female) completed both the initial and the final questionnaires and will be further considered in our analysis. The average age of the participants was 21.9 (with the youngest student being 21 and the oldest 23).

C. Method

At the beginning of the course, students were asked to fill in a questionnaire regarding their use of Web in general and Web 2.0 sites in particular. For the following 14 weeks, students followed the WAD course and contributed to the

team blog and wiki. At the end of the course, students were asked to fill in another questionnaire, reflecting their experience with the blog and wiki, as well as their general attitude towards the use of Web 2.0 tools in education.

III. RESULTS

A. First Questionnaire (before the WAD Course)

All students reported having Internet access from home. The average amount of time spent online is 25.83 hours per week: 35.8% of this time is spent for leisure, 39.27% for study and assignments and 22.31% for work (since some of the students also have part time jobs).

Next, students were asked to rate their familiarity with various Web 2.0 tools, providing also the average time spent using that tool and the frequency of accesses. The results are summarized in Tables 1 and 2 respectively.

TABLE I. STUDENTS' FAMILIARITY WITH WEB 2.0 TOOLS

Response options	Blog	Wiki	Social networking	Social bookmarking	RSS	Podcasts	Media sharing sites
Very good	16.67%	16.67%	23.33%	0%	0%	0%	43.33%
Good	36.67%	26.67%	26.67%	23.33%	13.33%	10%	23.33%
Average	20%	36.67%	36.67%	30%	16.67%	20%	30%
Poor	16.67%	6.67%	10%	33.33%	20%	26.67%	3.33%
Very poor	6.67%	13.33%	3.33%	10%	40%	13.33%	0%
Don't know at all	3.33%	0%	0%	3.33%	10%	30%	0%

TABLE II. USAGE PATTERNS OF WEB 2.0 TOOLS

	Response options	Blog	Wiki	Social networking	Social bookmarking	RSS	Podcasts	Media sharing sites
Frequency of access	Several times per day	3.33%	20%	16.67%	0%	0%	3.33%	43.33%
	Once per day	3.33%	13.33%	16.67%	3.33%	6.67%	3.33%	10%
	Several times per week	36.67%	33.33%	23.33%	16.67%	6.67%	16.67%	26.67%
	Once per week	16.67%	10%	16.67%	13.33%	6.67%	6.67%	13.33%
	One-two times per month	26.67%	0%	20%	26.67%	20%	16.67%	3.33%
	Never	13.33%	23.33%	6.67%	40%	60%	53.33%	3.33%
Hours per week		1.83	3.27	3.22	0.77	0.45	0.62	5.55

The self-rating scores on Web 2.0 knowledge are in accordance with the findings reported in [1] and [3]; students are relatively familiar with Web 2.0 tools, but generally they are not expert or sophisticated users. The highest level of familiarity is reported for media sharing sites (with 96.67% of the students having at least average knowledge), followed by social networking sites (with 86.67% of the students having at least average knowledge). The blog and wiki are ranked next, while the social bookmarking sites, RSS and podcasts seem to be less known by the students. These results are also reflected in the usage patterns of the students, with the highest amount of time spent on the media sharing and social networking sites, and the least amount of time spent using social bookmarking, RSS and podcasts. It is worth mentioning that the amount of time spent on the wikis is second highest (marginally higher than the time spent on social networking sites).

When asked about why they are using these Web 2.0 sites, the most cited reasons were (ordered according to their frequency of appearance in students' answers): i) entertainment, fun, playing; ii) keep in touch with friends and make new ones; iii) social networking; iv) search for information; v) exchange thoughts and ideas; vi) find latest news; vii) study, do homework; viii) job-related tasks; ix) get feedback from other users.

Next, we wanted to find out the role students generally assume on media sharing sites. 20% of the students reported never uploading any content, 60% rarely uploading content and 20% sometimes uploading content. This confirms the findings reported in [3], that students are mainly consumers rather than producers of Web content.

Since blogs and wikis were the tools used in the WAD course, the next questions focused on students' experience with these technologies. More specifically, we wanted to find out whether students have their own blogs and have written on a wiki before. Only 5 students reported currently keeping or having kept a blog in the past, with subjects ranging from IT to holidays and personal thoughts for friends and families. One student mentioned using his blog as an archive for when he wants to remember something later, and another one mentioned using blog APIs for a recent programming assignment.

As far as the wiki is concerned, again only 5 students reported having contributed to a wiki in the past: one used it at work for writing the documentation, 3 edited pages on Wikipedia (some related to IT) and one created and edited pages on a wiki dedicated to a community of programmers.

B. Second Questionnaire (after the WAD Course)

The second questionnaire comprised three sections: i) questions regarding the use of blog for the WAD project; ii) questions regarding the use of wiki for the WAD project; iii) questions regarding students' general opinion about the use of various Web 2.0 tools in education. In what follows, we will treat the first two sections in parallel.

As you can see from Table 3, both the blog and the wiki were considered quite easy to learn and use by the students, with wikis being perceived as slightly more difficult.

TABLE III. PERCEIVED EASE OF LEARNING AND EASE OF USE FOR THE BLOG AND WIKI

Response options	Blog		Wiki	
	Ease of learning	Ease of use	Ease of learning	Ease of use
Very easy	46.67%	53.33%	30%	36.67%
Easy	46.67%	40%	40%	33.33%
Neutral	3.33%	6.67%	26.67%	23.33%
Difficult	3.33%	0%	3.33%	6.67%
Very difficult	0%	0%	0%	0%

As far as encountering problems when using the tools, only one student reported having problems with the blog (i.e., "publish button wouldn't work all the time") and 5 students with the wiki ("the server failed one time", "if we write something wrong and modify it, the old page is still kept, which is annoying", "I had a problem when adding photos to the project documentation").

According to Table 4, the main purposes fulfilled by the blog were (ordered based on the importance assigned by the students): i) exchange experience; ii) learn how to use a blog; iii) facilitate communication and collaboration between team members; iv) receive feedback; v) increase interest and motivation; vi) reflect on one's own learning experience and the experience of others; vii) increase involvement. Similarly, the main purposes fulfilled by the wiki are: i) help organize knowledge; ii) learn how to use the wiki; iii) improve collaborative skills; iv) facilitate communication and collaboration between team members.

TABLE IV. MAIN ROLES FULFILLED BY THE USE OF BLOG AND WIKI IN THE WAD PROJECT (PERCENTAGES OF STUDENTS SELECTING EACH ROLE)

Role	Blog	Wiki
Learn how to use a blog/wiki (if not used before)	66.67%	60%
Help organize knowledge	30%	70%
Receive feedback	53.33%	30%
Give feedback	40%	20%
Exchange experience	70%	40%
Reflect on your own learning experience and the experience of others	50%	30%
Improve critical thinking skills	16.67%	20%
Improve writing skills	36.67%	23.33%
Improve collaborative skills	40%	53.33%
Increase interest and motivation	53.33%	30%
Increase involvement	50%	40%
Increase competitiveness	36.67%	23.33%
Facilitate communication and collaboration between team members	63.33%	53.33%
Facilitate communication and collaboration between different teams	26.67%	33.33%

Subsequently, we wanted to identify the main drawbacks of using blogs and wikis from the point of view of the students. While a large majority indicated no perceived disadvantages of blogging (66.67%), two issues were mentioned by several learners: i) low level of involvement from some of the team colleagues; ii) high amount of time needed for blogging. Another student mentioned that "everyone can see your posts and can criticize them. So you must be very informed about that subject before posting". As far as the wiki is concerned, time was again mentioned as a disadvantage, together with the lack of cooperation from the peers and with the somewhat cumbersome editing functionalities (since no WYSIWYG editor was available). However, the large majority of the students didn't mention any drawbacks of using the wiki (63.33%).

The final section of our questionnaire referred to students' general opinion about the place of Web 2.0 tools in education. As can be seen from Table 5, 93.33% of the students declared themselves in favor of the use of these tools in formal learning settings.

TABLE V. STUDENTS' ANSWERS TO THE QUESTION "DO YOU THINK WEB 2.0 TOOLS SHOULD BE USED IN THE EDUCATIONAL PROCESS?"

Response options	Percentage of students
Definitely yes	43.33%
Probably yes	50%
Neutral	3.33%
Probably not	3.33%
Definitely not	0%

When asked to cite the main advantages of using these tools, the most frequent answers were: i) "easily checking the progress of the team"; ii) "organizing and sharing documentation and other resources"; iii) "more fun and interesting", "increased motivation and involvement"; iv) "increase the efficiency of the team work"; v) "better communication"; vi) "increased competitiveness between teams"; vii) "share experiences"; viii) "receiving feedback". Among the most cited disadvantages there were: i) "some students may not have access to the Internet and they may feel neglected"; ii) "some students may post incorrect information, either due to lack of knowledge or even on purpose"; iii) "lack of face-to-face interaction"; iv) "all these tools may sometimes be distracting from the actual task"; v) "lack of safety and privacy of the information"; vi) "too many tools may cause confusion and using all of them may be a time issue".

Finally, students were asked to provide a short description of how they would like Web 2.0 tools to be used in education. The most common answers are summarized below:

- Blogs: "write an activity report"; "writing comments and ideas about the project"; "share experiences"; "ask and give solutions to problems"; "communicate between team members".
- Wikis: "online platform for the documentation"; "share information"; "share lecture notes"; "organize and structure information and resources"; "give solutions to problems, tips & tricks, etc."; "a common document to be updated collaboratively by the team members".
- Social networking sites: "stay connected with the others", "communicate with students having the same interests", "create a specialized subgroup, for a specific interest"; "interact with your contacts and exchange content"; "get to know your peers better".
- Social bookmarking sites: "save interesting pages related to the course"; "discover more sites related to a

particular subject"; "organize and annotate online resources"; "share interesting links with team colleagues".

IV. Discussions and Conclusions

This paper reported on a successful case of application of social software in a team-based project assignment. Students' opinions and attitudes towards the educational use of Web 2.0 tools were captured by means of questionnaires and reported in the previous section. In what follows we present a summary of the main findings of our study:

1. Students have a **relative familiarity with Web 2.0 tools**, but they are not necessarily advanced users. Most of them are mainly consumers, not producers of Web content (with only 5 students having kept blogs and 5 students having contributed to a wiki before the course). Hence the **need for a clearly guided approach, with detailed instructions and explanations** from the teachers, as pointed out in [1].

2. While **entertainment and keeping in touch with friends** are the most common uses of Web 2.0 sites, some students also rely on them for **finding information** (especially in case of Wikipedia), as well as for various **study** and job-related tasks.

3. Both **blogs and wikis were easy to learn and use** by the students, with virtually no technical problems encountered.

4. Both **blogs and wikis were found very useful** by the students, facilitating communication and collaboration between team members, increasing interest, motivation and involvement, helping to organize knowledge, supporting experience exchange and feedback from peers.

5. A few drawbacks were also pointed out: **team work may sometimes be disadvantaging** for students if they have to rely on the work of their peers who refuse to cooperate. As far as the **high amount of time needed,** this can be explained by the fact that this experiment was a premiere for the students, so they needed some time to get accustomed with the required tasks and the new collaborative work approach. Finally, **exposing one's work, ideas and thoughts to the others may be frustrating for some** (although usually it has the contrary effect: increased motivation and competitiveness).

6. The high majority of the students showed **willingness and enthusiasm towards the large-scale introduction of Web 2.0 tools** in the instructional process.

7. Many students found **useful and creative purposes** in education for the tools they have already interacted with in practice (i.e., blog and wiki).

8. For the other tools (which they have not yet experimented in educational settings), students could think of fewer ways of repurposing them. A couple of students even mentioned that they "cannot see their place in education", experiencing what Clark et al. called **digital dissonance** (i.e., a certain tension associated with the use of Web 2.0 tools in formal educational contexts) [2]. Hence the need to find methods for releasing this dissonance, **blending the out-of-school Web 2.0 activities with the formal learning settings**.

To sum up, the conclusions of this study are encouraging, reflecting a high level of acceptability and enthusiasm from the students regarding the introduction of Web 2.0 tools in education. However, it should be kept in mind that the subjects involved in this study have a strong technical background, so these findings cannot be automatically generalized. Future studies will be carried out regarding the Web 2.0 technology acceptance in different populations, with various ages, fields of study and technical backgrounds.

Furthermore, as other papers suggest [7], some educational topics and some audiences may be more suitable for the application of Web 2.0 tools than others. Further studies are envisaged in order to investigate these hypotheses.

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