

SOCIAL DIMENSION OF WEB 2.0 IN ENGINEERING EDUCATION

WEB 2.0 SOCIĀLĀ DIMENSIJA INŽENIERU IZGLĪTĪBĀ

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**Paper presented at the 14th international student scientific practical conference
"Human. Environment. Technology" at the Engineering Faculty of Rezekne
Higher Education Institution, Rezekne, Latvia, 22nd April 2010**

Abstract. Contemporary engineers need to become more cognizant and more responsive to the emerging needs of the market for engineering and technology services. Social dimension of Web 2.0 which penetrates our society more thoroughly with the availability of broadband services has the potential to contribute decisively to the sustainable development of engineering education. Aim of the following paper is to analyze the student engineers' needs in social dimension of Web 2.0. The meaning of the key concepts of *social dimension of Web 2.0* and *needs analysis* is studied. The results of the empirical study within a multicultural environment emphasize that needs analysis contributes to the use of social dimension of Web 2.0 by student engineers. The conclusion reveals that the social dimension of Web 2.0 in engineering education is an opportunity for enhancing student engineer experience as a condition for creation of new knowledge.

Anotācija. Mūsdienu inženieriem jāklūst informētāki un jāreaģē uz inženierzinātņu un tehnoloģiju pakalpojumu tirgu jaunām vajadzībām. Web 2.0 sociālai dimensijai, kas caurvij mūsu sabiedrība ar platjoslas pakalpojumu pieejamību ir potenciāls būtiski veicināt inženierzinātņu izglītības ilgtspējīgu attīstību. Referāta mērķis ir analizēt studentu vajadzības Web 2.0 sociālajā dimensijā. "Web 2.0 sociālā dimensija" un "vajadzību analīze" pamatjēdzieni tiek analizēti. No empīriskā pētījuma daudz kultūru vidē rezultātiem tiek uzsvērts, ka vajadzību analīze veicina Web 2.0 sociālas dimensijas lietošanu inženieru izglītībā. Secinājums liecina, ka Web 2.0 sociālai dimensijai inženieru izglītībā ir iespēja veicināt studentu pieredzi kā nosacījumu jauno zināšanu izveidei.

Keywords: Social Dimension of Web 2.0 – Web 2.0 sociālā dimensija; Engineering Education – inženieru izglītība, Needs Analysis – vajadzību analīze

Introduction

Web 2.0 is jointly formed by four dimensions, namely, the infrastructure dimension, the functionality dimension, the data dimension, and the social (or socialization) dimension. Socialization, described as taking software or even user-generated content and sharing or jointly using it with others, covers the aspect of user-generated content as it occurs in blogs or wikis, in tagging as well as in social bookmarking (Vossen, 2009, p. 38). Skype, Classroom Management Systems, the eBay seller evaluation, the Amazon recommendation service, or Wikipedia (Vossen, 2009, p. 38), where the increased data exchange within the system is no longer a limiting parameter with the current developments in the infrastructure, are classical examples and have found widespread acceptance in the community.

Aim of the following paper is to analyze the student engineers' needs in social dimension of Web 2.0 within engineering education on the pedagogical discourse.

The meaning of the key concepts of *social dimension of Web 2.0* and *needs analysis* is studied. The study shows a potential model for development, indicating how the steps of the process are related following a logical chain: determining social dimension of Web 2.0 → revealing social dimension of Web 2.0 within engineering education → defining needs analysis → empirical study within a multicultural environment.

The paper is organized as follows: The introductory state-of-the-art section demonstrates the authors' position on the topic of the research. Section 1 introduces social dimension of Web 2.0. Social dimension of Web 2.0 within engineering education is studied in Section 2. The associated empirical results are presented and interpreted in Section 3. Finally, some concluding remarks are provided.

State-of-the-Art

The modern issues of global developmental trends emphasize “a prime importance in sustainable development that is to meet the needs of the present without compromising the ability of future generations to meet their own needs” (Zimmermann, 2003, p. 9). Thus, sustainable personality, and, consequently, user of social dimension of Web 2.0, is “a person who sees relationships and inter-relationships between nature, society and the economy” (Rohweder, 2007, p. 24). In other words, this is a person who is able to develop the system of external and internal perspectives, and in turn the system of external and internal perspectives becomes a main condition for the sustainable user of social dimension of Web 2.0 to develop. For instance, the concern of the European Union, namely, to become “the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion” (European Commission, 2004, p. 2), demonstrates the significance of developing the system of external and internal perspectives for the development of humans, institutions and society. Thus, the life necessity to develop the system of two perspectives, namely, external and internal, determines the research methodology of needs analysis in social dimension of Web 2.0 within engineering education on the pedagogical discourse, as highlighted in Fig. 1.

However, in real life sustainable user of social dimension of Web 2.0 is often realized from one of the perspectives:

- from the internal perspective accentuating cognition (Vossen, 2009),
- from the external perspective accentuating social interaction (Tapscott, Williams, 2006) and
- finding a balance between the external and internal perspectives (Surikova, 2007).

The methodological foundation of the present research on the student engineers' needs in social dimension of Web 2.0 within engineering education is formed by the System-Constructivist Theory based on Parson's system theory (Parson, 1976). The application of this approach to learning introduced by Reich (Reich, 2005) emphasizes that human being's point of view depends on the subjective aspect (Maslo, 2007, p. 44): everyone has his/her own system of external and internal perspectives (Fig. 1) that is a complex open system (Osberg, 2008, p. 1; Rudzinska, 2008, p. 366) and experience plays the central role in a construction process (Maslo, 2007, p. 42). Thus, four approaches to student engineers' needs in social dimension of Web 2.0 within engineering education on the pedagogical discourse are revealed, namely, from the internal perspective accentuating cognition, from the external perspective accentuating social interaction, finding a balance between the external and internal perspectives and developing the system of the external and internal

perspectives. Therein, the fourth approach, namely, developing the system of the external and internal perspectives, is considered to be applicable to the present research on the student engineers' needs in social dimension of Web 2.0 within engineering education.

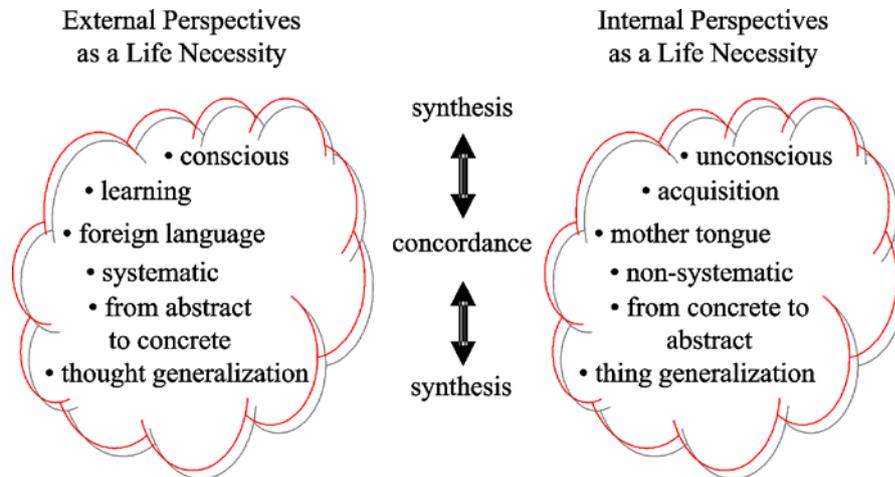


Figure 1: Developing the system of external and internal perspectives as a life necessity

Results and Discussion

1. Social Dimension of Web 2.0

The paradigm change, namely, the move towards mass collaboration (Tapscott, Williams, 2006) and/or mass socialization (Vossen, 2009, p. 38) – from person to people and from systems to service (Jones, 2008), puts the emphasis on the use of social dimension of Web 2.0.

Typical social dimension of Web 2.0 techniques and technologies include “social software” and online social networks (Vossen, 2009, p. 38-39).

“Social software” is seen by Vossen (Vossen, 2009, p. 38) as software that gets better (or at least more useful) the more people use it. While most of the time the software itself, i.e., the program system, does not change based on the number of its users or the frequency with which it is used, it is the application that the software is enabling. Examples include Skype, the eBay seller evaluation, the Amazon recommendation service, or Wikipedia. Especially the latter is a perfect example for what so-called mass collaboration (Tapscott, Williams, 2006) or crowdsourcing can achieve. There is also another impact that socialization can have, namely, that of improving some given software on a constant or perpetual basis. Traditionally, software has never been free of bugs, security holes, or errors, and it has been common for a software company to fix them and distribute new releases or versions of the software from time to time. The new approach is to do this at a much higher pace. Software on the Web may nowadays be in a permanent beta state of release and never finished. Thus, for outsiders maintenance occurs on a permanent basis. Such a state of perpetual beta may apply to a service that can only be accessed through an API (application program(ming) interface), in which case a user is not bothered by constant release changes, at least as long as the behaviour of the API is only extended, but not fundamentally modified.

Then, Vossen (Vossen, 2009, p. 38) considers that online social networks, another form of mass socialization today, bring a dimension to the Web that goes beyond simple links between pages; they add links between people and between communities.

In such a network, direct links will typically point to our closest friends and colleagues, indirect links lead to the friends of a friend, and etc.

A social network on the Web is typically the result of employing some software that is intended to focus on building an online community for a specific purpose. Social networks connect people with common interests and may be as simple as a blog, or as complex as Facebook or MySpace for mostly private applications, as LinkedIn or Xing for professional applications, or as Twitter for both. The primary impact that the current Web developments are having in this area are that connecting people and communities constantly becomes easier, and it is not difficult anymore to maintain a professional or personal network of buddies worldwide. Yet another impact is that a social network may open up novel sources of revenue, in particular through advertising. Finally, Vossen (Vossen, 2009, p. 38) underlines that two aspects should have become clear by the discussion so far: on the one hand, the most obvious change that has recently occurred on the Web is that it has changed from a pure read Web as designed by Berners-Lee (Berners-Lee, 2000) to a read/write Web, where users not only draw information from, but also add information to it. On the other hand, the dimensions we have discussed exhibit various overlaps. Indeed, technology enables functionality, which as a “byproduct” leads to data collections, and users have a new tendency to socialize over the Web, by exploiting that functionality and the technology.

Hence, social dimension of Web 2.0 techniques and technologies, namely, “social software” and online social networks, is seen as an integral part of engineering education.

2. Social Dimension of Web 2.0 in Engineering Education

The change in engineer entering the service area, namely, not working permanently at a large-scale enterprise but accepting project-related orders of large-scale enterprises by free engineers’ office (Bassus, Wolfgramm, 2009, p. 38) reveals the significance of e-business applications of Web 2.0 technologies to be integrated into the processes and environments of engineering education.

A proper integration of Web 2.0 technologies into engineering education is provided by needs analysis. However, the emphasis of the System-Constructivist Theory on the subjective aspect of human being’s point of view and experience that plays the central role in a construction process does not allow analyzing the student engineer needs objectively: human beings do not always realize their experience and their wants (Maslo, 2007, p. 44). In accordance with the research methodology, namely, developing the system of the external and internal perspectives, needs analysis is revealed to be of three levels, namely, individual needs, organizational needs and professional needs as introduced by Ahrens and Zaščerinska (Ahrens, Zaščerinska, 2010). Moreover, needs analysis includes four domains to analyze, namely, student’s needs, student’s wants, student’s lacks and student’s expectations (Karapetjana, 2008, p. 15). Thus, needs analysis has the potential to contribute decisively to the sustainable incorporation of social dimension of Web 2.0 technologies into engineering education.

Moreover, regular needs analysis of students’ needs becomes a means of development of students’ use of social dimension of Web 2.0 (Lūka, 2008, p. 7).

3. Empirical Results

This study is oriented towards the revealing of efficiency of use of social dimension of Web 2.0 within the Baltic Summer Schools *Technical Informatics and Information Technology* in 2009.

The sample of the present empirical study involves 22 participants of Fifth Baltic Summer School *Technical Informatics and Information Technology* at the Institute of Computer Science of the Tartu University, August 7-22, 2009, Tartu, Estonia.

All 22 participants of Fifth Baltic Summer School *Technical Informatics and Information Technology* have got Bachelor or Master Degree in different fields of Computer Sciences and working experience in different fields. The aims of the Baltic Summer Schools *Technical Informatics and Information Technology* are determined as preparation for international Master and Ph.D. programs in Germany, further specialization in computer science and information technology and learning in a simulated environment. The Summer School *Technical Informatics and Information Technology* contains a special module on Web 2.0.

The module on Web 2.0 examined the advantages and problems of this technology, which makes new social communication forms possible, namely, architecture and management, protocol design, and programming.

Analysis of the use of Web 2.0 is based on needs analysis as a basis for designing (Surikova, 2007) the following questionnaire:

- Question 1: Do you know the word *Web 2.0*?
- Question 2: Do you know the basic idea of Web 2.0?
- Question 3: Have you already used Web 2.0, namely, Facebook, Twitter, Wikipedia, etc?
- Question 4: Do you think Web 2.0 requires a lot of profound knowledge, namely, math, physics, etc?
- Question 5: Do you think Web 2.0 is useful for your individual needs?
- Question 6: Do you think Web 2.0 is useful for your organizational use?
- Question 7: Do you think Web 2.0 is useful for your professional use?

The evaluation scale of five levels for each question is given where “1” means “disagree” and low level of experience in use of Web 2.0 technologies and “5” points out “agree” and high level of use of Web 2.0.

The participants’ use of Web 2.0 was evaluated by the participants themselves on the first day of the Baltic Summer School, namely, August 7, 2009.

The analysis of the survey (Fig. 2) reveals the following: the use of Web 2.0 by the Baltic Summer School (BaSoTi) participants is heterogeneous and the participants consider Web 2.0 to be most useful for their individual needs.

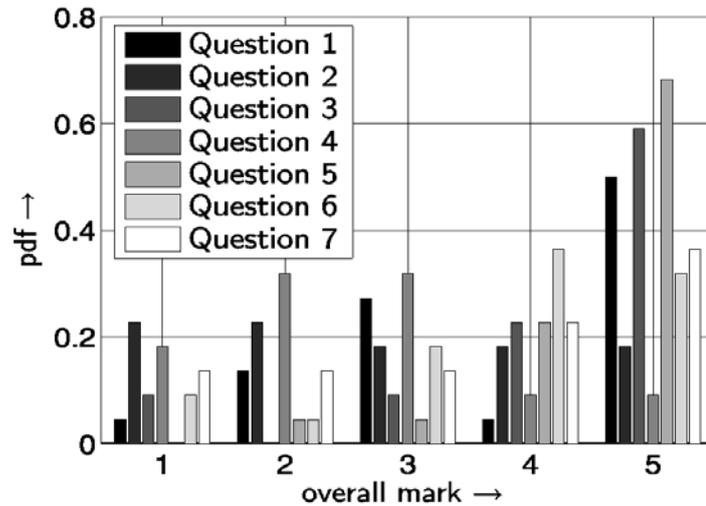


Figure 2: PDF (probability density function) of the BaSoTi participants' evaluation on August 7, 2009

Hence, the use of Web 2.0 by the BaSoTi participants is provided by the knowledge the participants obtained in Bachelor or Master studies in different fields of Computer Sciences and by their working experience in different fields thereby putting the emphasis on developing the internal perspective.

Between Survey 1 and 2 of the participants' experience in use of social dimension of Web 2.0 teaching/learning activity involved courses in Technical Informatics and Information Technology (German and English), preconference tutorials for introduction into advanced research topics, attendance of conference *Advanced Topics in Telecommunication*, tutorials and practical tasks, language training for talk and presentation (optional in English or German), leisure activities and social contacts, practical work at an IT company.

Then, the analysis of the second survey (Fig. 3) reveals that the participants' experience in use of social dimension of Web 2.0 has become homogeneous and the participants have put the emphasis on use of Web 2.0 for professional needs.

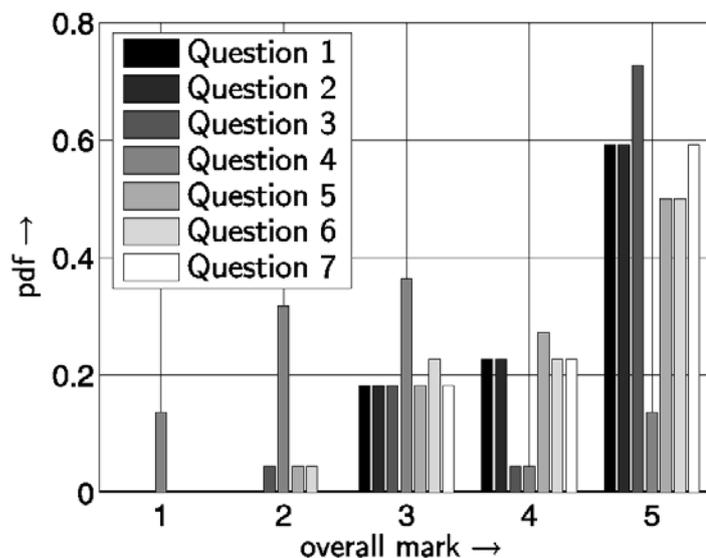


Figure 3: PDF (probability density function) of the second BaSoTi participants' evaluation on August

The result summary of two surveys of the participants' experience within the Baltic Summer School 2009 demonstrates the positive changes in comparison with Survey 1:

- the level of the participants' experience in terms of use of Web 2.0 has been enriched;
- the level of the participants' experience in terms of knowledge of basic idea of Web 2.0 has been improved;
- the level of the participants' experience in terms of use of Web 2.0 for individual needs decreased, thereby developing the system of the external and internal perspectives;
- the level of the participants' experience in terms of use of Web 2.0 for organizational and professional needs increased, thereby developing the system of the external and internal perspectives.

The results reveal that the level of the participants' experience in use of social dimension of Web 2.0 has enriched. The results' comparison of Survey 1 and Survey 2 of the participants' experience in use of social dimension of Web 2.0 emphasizes the decrease of the participants' number who have obtained the low and critical level of experience and the increase of the participants' number who have achieved the average and optimal level of experience.

Moreover, teaching/learning activity that involved a variety of methods and forms has improved experience in use of social dimension of Web 2.0 of all the participants involved into the research.

Conclusion

The conclusion reveals that social dimension of Web 2.0 in engineering education is an opportunity for enhancing student teacher experience as a condition for creation of new knowledge. Particularly, use of social dimension of Web 2.0 for professional purposes was emphasized.

Teaching/learning activity with the use of social dimension of Web 2.0 influences and determines the students' success or failure for acquiring engineer's education and profession as illustrated in Figure 4.

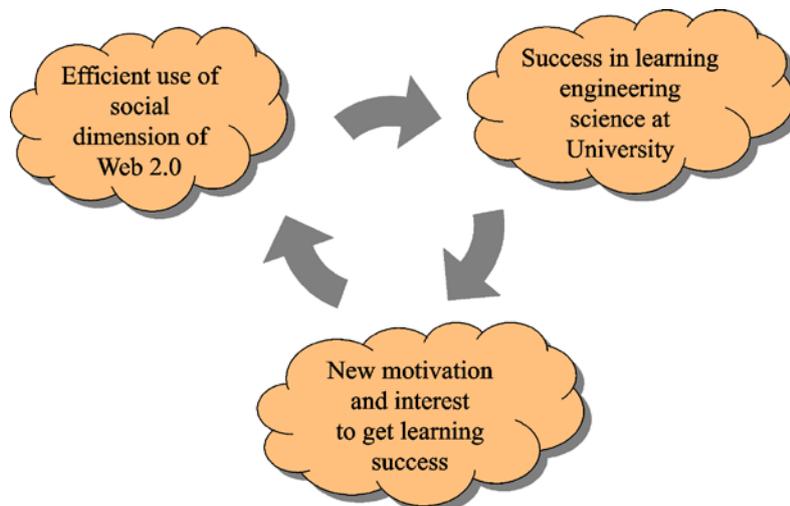


Figure 4: Successful use of social dimension of Web 2.0 in engineering education

Discussion

The recommendation here is the role of educators as mentors for student engineer self-discovery and self-realization; to motivate student engineers, to stimulate their interests, to help them to develop their own structure and style, as well as to help them to evaluate their performance and be able to apply these findings (Maslo, 2007, p. 45) to improve their further use of social dimension of Web 2.0. The recommendation here for an objective analysis is the role of educators as researchers (Zaščerinska, 2009, p. 78) that is to develop continuously educators' experience in social interaction and cognitive activity.

Acknowledgment

The authors would like to thank Prof. Clemens Cap from the Rostock University, Germany, for giving an opportunity to carry out the empirical study within the Baltic Summer School 2009 in Tartu, Estonia.

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