Research Practices on the Web
in the Field of Technology Enhanced Learning

Peter Kraker
Know-Center, Graz University of Technology
Inffeldgasse 21a
8010 Graz, Austria
+433168739295

pkraker@know-center.at

Stefanie Lindstaedt
Know-Center, Graz University of Technology
Inffeldgasse 21a
8010 Graz, Austria
+433168739260

slind@know-center.at

ABSTRACT

Recently, developments under the banners of Science/Research 2.0 have received a lot of attention in the scientific community. Along with Web 2.0 tools and technologies, a certain change in researcher practices can be observed. The study proposed for this paper was conducted to gain first insight into these practices among researchers in Technology Enhanced Learning (TEL). We conducted two focus groups with a total of 14 participants from the domains of knowledge management and e-learning. Only a limited amount of Science 2.0 practices were identified, mostly related to research design and publication. Potentials for support, however, exist in all steps of the TEL research process. We conclude that tools and technologies must either support existing practice to provide a benefit, or solve obvious shortcomings in existing practice.

Categories and Subject Descriptors

H1.2 [**Models and Principles**]: User/Machine Systems – *Human factors.*

General Terms

Management, Human Factors.

Keywords

science 2.0; tel; focus groups; process map; qualitative research

1. INTRODUCTION

Recently, developments under the banners of Science/Research 2.0 have received a lot of attention in the scientific community. These terms do not have a commonly accepted definition yet; essentially they are describing the support of researchers with Web 2.0 tools and technologies [1]. Some definitions also include notions of a methodological change due to the abundance of data and the nature of socio-technological systems on the web. [2, 3]

Along with Web 2.0 tools and technologies, a certain change in researcher practices can be observed. The study described in this paper was conducted to gain first insight into these practices among researchers in Technology Enhanced Learning (TEL). We

aimed to collect existing practices, find potentials for support, and provide a framework for further evaluations in this direction.

2. METHOD

We conducted two focus groups [4] with a total of 14 participants from the domains of knowledge management and e-learning. Figure 1 depicts the distribution of disciplines in both focus groups. The large number of disciplines named shows the interdisciplinary nature of research in Technology Enhanced Learning. It should be noted that computer science is represented above average, being named as often as education and psychology combined.
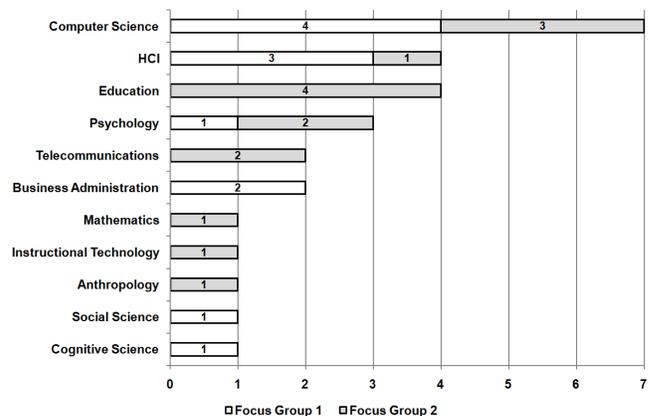

Figure 1. Distribution of participants

In both groups, participants were asked to list their tasks and duties as a researcher on a flipchart in teams of two to three using a classification method of their choice. We used these classifications to create a hit-list of tasks that were discussed in the second part of the focus group. Topics included existing and potential practices, use cases and requirements for applications, and strengths and weaknesses of various approaches. Later, we qualitatively analyzed the data gathered in the focus groups (flipcharts and transcripts from the discussion) using a reductive and interpretive approach.

3. RESULTS

3.1 TEL Research Process

The TEL research process map (see Figure 2) was identified using an aggregated view on the tasks and duties listed by the researchers in the focus groups. We adapted the model from Business Process Modeling (BPM) [5]. The TEL research process is the result of a cross section of a wide variety of TEL

researchers; therefore, this classification cannot hold true for every TEL research institution. Some institutions, for example, might view teaching as a core process that is included in their main value chain. Nevertheless, the TEL research process represents a first empirical model for analyzing researcher practice in context of their tasks and duties. The TEL research process will serve as a frame of reference for the practices discussed.

In the analysis, five core processes were identified: design, development, implementation, evaluation, and publication. These processes are part of the main value chain of a TEL institution. Design denotes the initial phase of the research process where the concept is generated, research questions are formulated, and research methods are established. Development includes both development of instruments/analytical frameworks and development of software; the latter plays an important role in Technology Enhanced Learning. Implementation encompasses the implementation of software in certain environment (e.g. in a school, or at the workplace), as well as conducting fieldwork, such as observations, case studies, experiments, and surveys. Evaluation denotes analysis and interpretation of the data gathered during the implementation process. Finally, publication stands for

the production of written outcomes of the aforementioned processes (e.g. conference and journal papers, books and book chapters).

In addition to the five core processes, we deducted 15 support processes. Support processes signify processes that are not part of the main value chain but they are important, and sometimes even necessary for core processes to work. Some of the more general support processes, such as communication, collaboration, and networking are important for all core processes, whilst more specific support processes such as editing are only important to a single core process (publication in that case).

Next to core and support processes, five management processes were identified. Management processes are processes which create the necessary environment for core and support processes to run. These are: research strategy, including project and publication planning, human resource management, knowledge management, financial management (which involves funding and project acquisition), and resources management, including all other resources such as IT infrastructure and lab equipment.
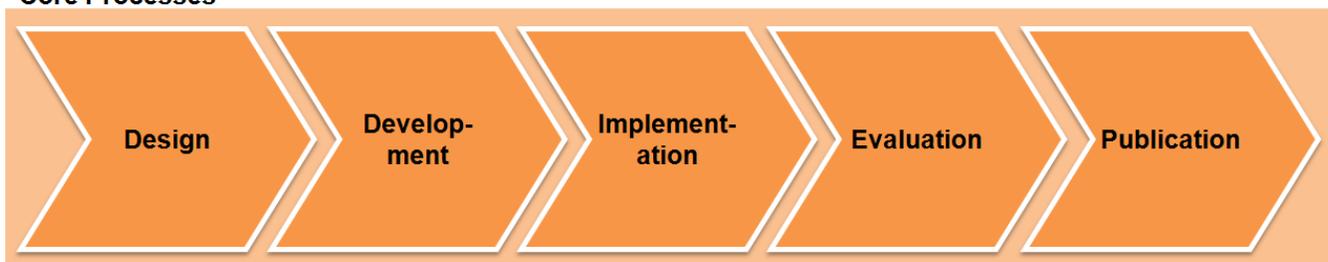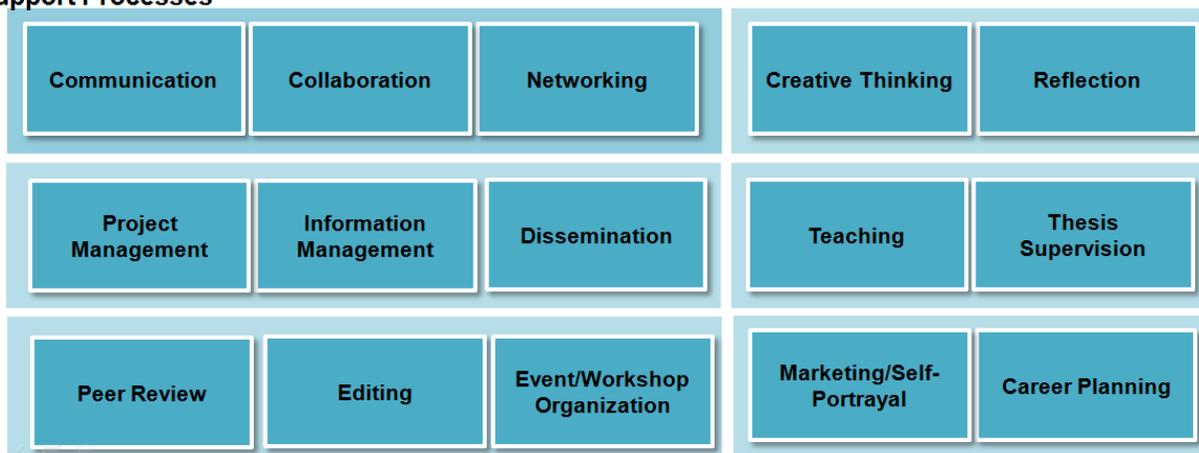

Figure 2. The TEL Research Process Map

3.2 Practices

In both focus groups, we identified only a limited amount of Science 2.0 practices. Most practices can be attributed to the core processes "design" and "publication". In the context of design, TEL researchers are using the web for information acquisition through search, feed aggregation (from blogs, Twitter etc,), and information suggestions/requests in social networks. A certain change in practice can be observed in this area, as one of the participants noted: *"My search is not a search anymore; it is more like asking my community peers."* Other uses of social networks include (i) keeping in contact with colleagues, (ii) finding information for career planning, (iii) coordinating research groups, and (iv) finding speakers for conferences.

In the context of publication, participants are collaboratively sharing references on dedicated platforms such as Bibsonomy. Furthermore they use Web 2.0 tools to jointly write papers in wikis or on Google Docs. These tools are, however, perceived to be worthwile only up to a certain point. They are used for brainstorming and setting up the initial structure. After that, documents are transferred into the final format (Word or LaTeX), because Web 2.0 tools do not provide essential formatting options. Furthermore, existing Web 2.0 solutions miss crucial features, such as track changes and reference management.

In the other core processes ("development", "implementation", and "evaluation"), participants mentioned that they in part use wikis for software development to document their projects. For data collection, participants use Web 2.0 tools to create and disseminate questionnaires. Moreover, they use analytics software to collect usage data. Apart from that, mostly usage scenarios were discussed. These scenarios include social support for conducting evaluations, both (1) in the form of guidance in preparing the evaluation, and (2) in the form of finding test users for their systems.

In our analysis we also found several strengths and opportunities, as well as weaknesses and threats concerning the use of the web in research. Regarding strengths and opportunities, participants repeatedly named factors relating to collaboration and knowledge transfer. Examples include collaborative knowledge building, information management and sharing, and getting more feedback on one's own work. Regarding weaknesses and treats, participants often mentioned missing benefit and motivation. It is not simply possible to transfer existing practices in Web 2.0 to Science 2.0. Commentary facilities that work very well in Web 2.0 are not readily accepted in research. Also, some tools, which are used within other disciplines, such as open notebooks in natural sciences, did not resonate at all with TEL researchers. Another major issue was privacy, both for the researchers themselves and for the subjects of research.

4. CONCLUSIONS

Potentials for support exist in all steps of the TEL research process; nevertheless, especially within development, implementation, and evaluation only few web applications already exist. When developing such an application, the special circumstances in research must be considered. Researchers in TEL are very much aware of the practices that are accepted and acknowledged within their community/discipline. Therefore, tools and technologies must support existing practice to provide a benefit.

There are, however, practices that have obvious shortcomings from the point of view of TEL researchers such as disclosure of evidence. In these cases, researchers are open to experiment with new approaches that were made possible by the web, such as openly providing data sets along with published papers. In the future, we will further investigate these shortcomings and their potential solutions. It would also be interesting to test the applicability of these findings to other fields of research.

5. ACKNOWLEDGMENTS

6. REFERENCES

[1] M. Waldrop, "Science 2.0," *Scientific American*, vol. 298, 2008, pp. 46-51.

[2] B. Shneiderman, "Science 2.0," *Science*, vol. 319, 2008.

[3] J. Burgelman, D. Osimo, and M. Bogdanowicz, "Science 2.0 (change will happen...)," *First Monday*, vol. 15, 2010.Tavel,

[4] R.K.L. Ko, "A computer scientist's introductory guide to business process management (BPM)," *Crossroads*, vol. 15, Jun. 2009, pp. 11-18.

[5] D.L. Morgan and R.A. Krueger, "When to use focus groups and why," *Successful focus groups: advancing the state of the art*, D.L. Morgan, ed., SAGE Publications, 1993, pp. 3-19.