

Awareness: An Enabling Feature for Mediated Interaction in Communities of Practice

Denis Gillet, Christophe Salzmann, Yassin Rekik

École Polytechnique Fédérale de Lausanne (EPFL),
CH-1015 Lausanne, Switzerland
{denis.gillet, christophe.salzmann, yassin.rekik}@epfl.ch

Abstract. The École Polytechnique Fédérale de Lausanne (EPFL) is currently using a Web-based experimentation environment to support laboratory activities in engineering education. The key service for the acceptance of the learning modalities and the appropriation of the environment by the students is a shared electronic notebook called the *eJournal*. This service is not only used by students to perform the required laboratory work; it is also used to sustain collaboration between students. Additionally it provides support for exchanges with other services integrated in the learning environment. By tracking the creation, the exchanges and the tagging of the digital assets stored in the *eJournal* database, awareness can be provided. This position paper presents how the *eJournal* and the associated awareness features are currently enhanced to effectively support interaction in laboratory-oriented communities of practice for members using either desktop or mobile client devices.

Keywords: e-Learning, Collaborative Learning, Awareness, Communities of Practice.

1 Introduction

Since the year 2000, the École Polytechnique Fédérale de Lausanne (EPFL) has been developing and deploying the *eMersion* Web-based environment to support remote and virtual experimentation activities in higher engineering education [1]. A shared electronic notebook called the *eJournal* turned out to be the key service for the students' acceptance of the proposed flexible learning modalities and for the appropriation of the Web-based environment. This service is not only used by the students to perform the required laboratory work; it is also used to sustain collaboration. Additionally it provides support for exchanges with other services integrated in the learning environment. By tracking the creation, the exchanges and the tagging of the digital assets stored in the *eJournal* database, real-time awareness regarding individual and group progresses can be provided. Consequently, the added value brought by the *eJournal* features is significant enough to compensate for the expected overhead necessary to learn its usage [2]. In addition, the flexibility given to the students to work collaboratively on campus or at distance using the same

environment helps in better coping with their social habits and with the learning constraints [3].

In the context of the *Palette* European integrated project (<http://palette.ercim.org/>) the *eJournal* and the associated awareness features are currently enhanced to effectively support mediated interaction in academic laboratory-oriented Communities of Practice (CoPs). Only distributed communities interacting through Web technologies or mobile devices are considered here.

Laboratory-oriented CoPs are group of people interacting freely to deepen their knowledge and know-how through interaction and experimentation in a specific domain where laboratory equipment is involved. As example, educators, teaching assistants and students involved in a laboratory course form such a community. Researchers and technicians working on shared equipment or studying samples form another one. Teams of engineers involved in collaborative engineering activities [4] are also laboratory-oriented CoPs.

The roles, rules and assets characterizing the communities evolve as interaction occurs and knowledge level increases. In laboratory-oriented CoPs, the assets produced, exchanged and manipulated by the members can be more volatile, dynamic and rich than the typical information media found in other contexts. In addition to text documents, images, and videos, the laboratory assets also include experiment-related data such as measurements, statistics, mathematical equations and annotations, simulation models or analysis scripts. It has been shown that awareness in general, and context-oriented awareness in particular [5], plays a key role in supporting CoPs.

This paper is organized as follow. Section 2 gives a short overview of the *eJournal* service developed at the EPFL to support laboratory-oriented CoPs. Section 3 defines the hybrid community composed by both the users and the resources involved in laboratory-oriented CoPs. It also details the current developments to provide synchronous awareness. Section 4 finally sketches some envisioned features to provide mobile users with dedicated and ubiquitous awareness. The paper ends with concluding remarks.

2 eJournal Service

The *eJournal* is a more than a digital asset management system [6], an ePortfolio [7] or an electronic laboratory notebook [8]. It can be defined as an assets-based interaction system. Its core feature is designed as a mailbox, a familiar metaphor for users. Instead of simple emails, the *eJournal* contains digital assets of various types. Contrary to a mailbox that belongs to a unique person, the *eJournal* is shared by members of a team. The team members can either tag or annotate the assets at creation or later. Some context-related tags and metadata are also automatically added when the assets are created.

In addition to the mailbox-like area (bottom-part in Fig. 1), the *eJournal* integrates context and awareness areas that are always visible (top-part in Fig. 1). The idea behind this design is that the users should not have to look for basic context and awareness information elsewhere [9]. They should not even have to think about finding such information. It should be implicitly obtained while manipulating assets.

As an example, the *Team* area provides awareness about the role and rights for the user in the given context, as well as indications regarding the possible presence of other team members. The *Activity* area provides information regarding pending tasks. The *Folder* area provides a means to filter the context-oriented assets to be displayed. The *Category* column in the *Asset* area is used to summarize user and system-defined metadata.

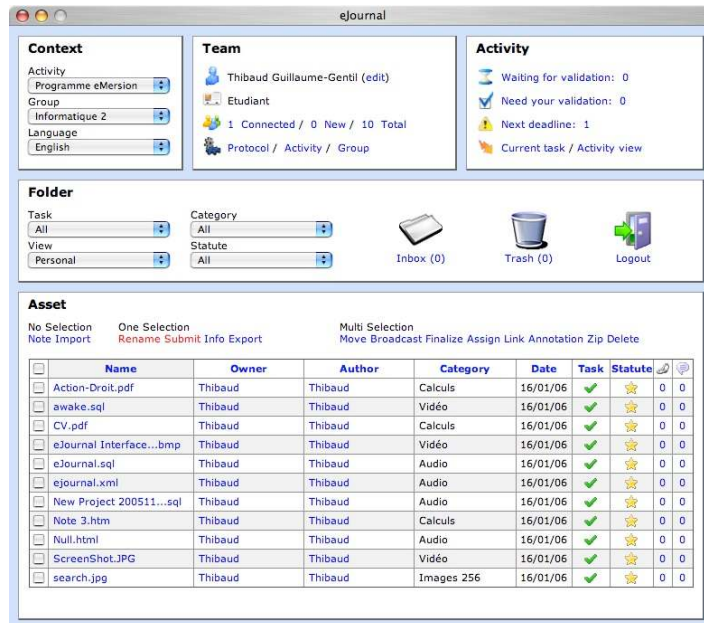


Fig. 1. The current *eJournal* user interface designed for laboratory-oriented CoPs.

The *eJournal* differs from typical digital assets management (DAM) systems in many aspects. First, the *eJournal* was initially designed for e-Learning applications where the process of creating the assets has more value than the assets themselves. DAM systems are typically designed for digital-repository applications (pictures, movies, documents, etc) where the value is only in the assets. In addition, the *eJournal* is a pivotal service to build more comprehensive systems integrating other asset-oriented components/services, while DAM are usually closed systems due to right management constraints. One could also compare the *eJournal* with forums or blogs supporting CoPs. Forums and blogs are driven by comments, some of those comments being possibly augmented by assets. The *eJournal* is driven by assets, some of those assets being possibly augmented by comments.

Interaction within the *eJournal* is mostly asynchronous since many of the actions performed do not required other components or users to be active or online at the same time. For this reason, the *eJournal* user interface only provides simple synchronous awareness indicators (as example, the current number of members online instead of the full list of their names). The state of these indicators may trigger

interest for more detailed or additional information in some contexts. Hence, a supplementary synchronous awareness service with richer visualization features detailed in Section 3 is currently developed.

3 Synchronous Awareness Service for Hybrid Community

In Laboratory-oriented CoPs, not only the members, but also the equipment plays an important role in the knowledge construction and consolidation. Hence, one can consider both the members and the equipment as entities belonging to the community and interacting together in some ways. We define such a community as a hybrid one.

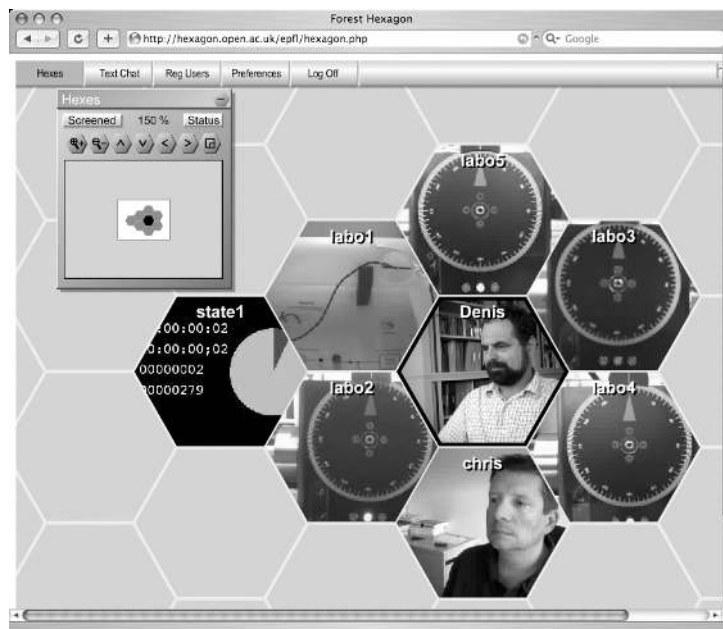


Fig. 2. Awareness about the people, the resources and the activities in a hybrid community.

Synchronous awareness in such a community may require knowledge about the presence of the members, the state of the equipment and the status of the activities. To provide this variety of information in a simple way, we have adapted the Hexagon tool (<http://kmi.open.ac.uk/technologies/>) developed by the Knowledge Media Institute of The Open University in the United Kingdom. The Hexagon is basically a virtual video chat room. The online members are visible and can be clustered or put away according to the user interests (Fig. 2). To be suitable for supporting a hybrid community, any relevant piece of equipment should also be considered as a member of the community. Hence, devices, such as the electrical drives displayed in Fig. 2, are visible in the virtual video chat room. To push further this idea of non-human entities joining the community, composite images are built using additional awareness

information and pushed in video channels of the room (left-hand side hexagon). This feature is implemented by using a special video digitizer.

This enhanced awareness service complement the simple information provided in the *eJournal*. It is relevant for members at their workplace. In the next Section, a lighter and ubiquitous awareness service supporting mobile members is described.

4 Ubiquitous Awareness Service

Providing ubiquitous awareness to mobile members of a community does not mean cloning what is available on a desktop computer. One should focus on the necessary and sufficient requirements for people on the move, as well as the actual capabilities and features of current and next generation mobile devices. In other word, the service should be designed for the Today high-end devices which correspond to what the majority of people will be using in a one or two years horizon. In terms of PDA, mobile phones, portable play stations and audio/video players; we should consider audio and video Input/Output, GPRS, WiFi and/or 3G networks as available features.

According to these features, the proposed solution to provide ubiquitous awareness to mobile members of laboratory-oriented CoPs is to implement a feed-oriented client interface instead of a traditional email, calendar or agenda-like one. This service should be always active. In fact, RSS (Really Simple Syndication) or Atom feeds displayed by the so-called *Feed Navigator* client have the necessary structure to support awareness broadcasting, knowledge dissemination or assets delivery. A feed can be updated right away when something occurs in the laboratory-oriented CoPs (creation, event, action, discussion). It has a creator, a title, a summary (annotation), metadata (tags) and possibly an attached file (asset) or the URL of an asset-oriented service. The *Feed Navigator* will be designed to display these relevant elements in the most convenient way for minimizing the users actions and maximizing context-awareness. Feeds navigation through scroll wheels like the one found on *Blackberry* devices (<http://www.blackberry.com/>), or even more advance *iPod*-like tactile wheels will improve usability. The main difference between the *Feed Navigator* and an email client is that the user subscribes only to the feeds he or she wants to receive. In addition, instead of being only classified by date, size, sender, etc, the feeds could be classified according to elements like action request, action report, asset request, asset received, comment request, comment received, priority or deadlines.

5 Concluding Remarks

This position paper first presented the *eJournal*, an assets-based electronic notebook designed to support laboratory-oriented communities of practice. In addition to the assets themselves, the *eJournal* displays awareness information about the members, the resources and the activities of the community through compact indicators.

Validation carried out within laboratory-oriented communities of practice involved in e-Learning has shown that awareness about the ongoing activities is as important as the assets themselves to develop and sustain mediated interaction.

Considering the above observation, dedicated solutions to strengthen awareness for members using either desktop or mobile client devices have been proposed. The desktop solution relies on a virtual chat room. All the human and virtual entities belonging to a laboratory oriented CoPs can join this room. As a consequence, the presence of the members, the state of the resources and the achievement of the activities are visible in a glance. The mobile solution relies on a *Feed Navigator* that enables ubiquitous browsing of selected assets and activity-related information.

Acknowledgments. The elements presented in this paper result from various e-Learning projects and activities carried out with the support of the Board of the Swiss Federal Institutes of Technology and of the European Union in its sixth framework program (*ProLEARN* Network of Excellence and *Palette* Integrated Project).

References

1. Gillet, D., Nguyen Ngoc, A.V., Rekik, Y.: Collaborative Web-Based Experimentation in Flexible Engineering Education. *IEEE Transactions on Education*, Vol. 48, Num. 4 (2005) 696-704
2. Fakas, G.J., Nguyen Ngoc, A.V., Gillet, D.: The Electronic Laboratory Journal: A Collaborative and Cooperative Learning Environment for Web-Based Experimentation. *Computer Supported Cooperative Work (CSCW)*, Vol. 14, Num. 3 (2005) 189-216
3. Gillet, D.: Introducing E-Learning Solutions and Flexibility in Higher Education: Objectives and Challenges. In: *Innovations - 2006: World Innovations in Engineering Education and Research*, iNEER in Cooperation with Begell House Publishers (2006)
4. Gräther, W., Koch, T., Lemburg, C., Manhart, P.: SAGE: Self-organized cooperative task management and group awareness for the coordination of distributed software development. *Workshop on Challenges in Collaborative Engineering*, Prague, Czech Republic, April 19-20 (2006)
5. Gross, T., Prinz, W.: Modelling Shared Contexts in Cooperative Environments: Concept, Implementation, and Evaluation. *Computer Supported Cooperative Work (CSCW)*, Vol. 13, Num 3 (2004) 283-303
6. Natu, S., Mendonca, J.: Digital asset management using a native XML database implementation. In: *Proceedings of the 4th Conference on information Technology Curriculum (Lafayette, Indiana, USA, October 16-18, 2003)*. ACM Press, New York (2003) 237-241
7. Carroll, N.L., Calvo, R.A.: Certified Assessment Artifacts for ePortfolios. In: *Proceedings of the Third International Conference on Information Technology and Applications*, Vol. 2 (2005) 130-135
8. Talbott, T.; Peterson, M.; Schwidder, J.; Myers, J.D.: Adapting the electronic laboratory notebook for the semantic era. In: *Proceedings of the 2005 International Symposium on Collaborative Technologies and Systems (2005)* 136-143
9. Y. Rekik, Y., Gillet, D., Nguyen Ngoc, A.V., Guillaume-Gentil, T.: Framework for Sustaining Collaboration in Laboratory-Oriented Communities of Practice. *7th Conference on Information Technology Based Higher Education and Training (ITHET)*, Sydney, Australia, July 10-13 (2006)