Research Statement

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My research falls in the Human-Computer Interaction (HCI) multidisciplinary domain, where there is a cross feeding between Computer and Social Sciences. I am especially interested in working on the usability and user experience issues and also in investigating the collaboration between people as well as the interaction between people and technology in socio-technical environments. I am also interested in anything related to Technology-Enhanced Learning (TEL) or e-Learning.

Past research

My PhD focused on the study of different aspects of interaction and collaboration activities in the context of web-based experimentation in engineering education, in which students could carry out their hands-on activities in a flexible way (e.g. at anytime and from any location of their choice), and the online learning community was composed of users with different roles. Following are the main contributions of my PhD work

Interaction and collaboration modelling: I presented a conceptual model capturing the main features relevant to the complex context of web-based experimentation in engineering education. I also proposed an analysis and design model for web-based experimentation environments. This model represented an interpretation of Activity Theory in the context of web-based experimentation.

Continuity of interaction: The notion of continuity of interaction, which highlights the *uninterrupted* flow of information and sequence of activities among the users as well as between users and the environment, has been seen as a very important concept that could help users obtain a higher quality of interaction and collaboration in a complex environment. I presented an analysis grid including several dimensions of continuity of interaction in web-based experimentation. Based on the hierarchy notion defined in Action Theory as well as the *mediation* role of *shared artefacts*, I proposed a solution for sustaining the continuity of interaction in a web-based experimentation learning community.

Awareness: Awareness about the activities of other co-workers is a basic requirement for group interaction and collaboration. I discussed various crucial aspects and features of awareness in web-based experimentation. I developed several awareness modules based on the *artefact analysis and visualisation*, which can provide not only awareness about others' interaction and learning activities but also about the social structures of the whole online learning community.

The concept of shared artefact was implemented in the form of a web-based laboratory journal, which I called *eJournal,* for students in engineering curricula to store, share, and exchange different kinds of data during their collaborative hands-on sessions. The eJournal was developed as an integrated component of the *eMersion* web-based experimentation environment, and was deployed and utilized in the automatic control laboratory courses, and other courses such as biomechanics and fluid mechanics offered by the School of Engineering at the EPFL. From the 2002 winter to the 2005 summer semesters, there were 454 students using the eMersion environment to carry out their hands-on activities in the automatic control laboratory courses. The eJournal was also selected and deployed at some other European institutions in Spain, Germany and France.

Usability engineering

Usability was also a main subject of my PhD research. I proposed a model for the evaluation of web-based experimentation environments. I also proposed a set of *metrics* for measuring various aspects relevant to the learning community in web-based experimentation. From 2002 to 2005, during the semesters and at the end of each semester, I carried out the evaluation of the eMersion environment to study the web-based experimentation learning community, the role of shared artefacts in this online learning community, and also to improve the usability and user experience of the environment.

Current research

At the University of Leicester I have participated in the European Commission funded iCamp and ICOPER projects. In Leicester, I have been doing research and working on usability issues.

The goal of the iCamp project was to construct an open virtual learning space for Higher Education Institutions (HEI) in Europe. Social software tools were used in the field studies, which were organised as online cross-cultural collaborative learning courses. In Leicester, we applied a mixed method of evaluation and used different evaluation instruments for the evaluation of iCamp courses. We developed a new evaluation scheme that combined content analysis and social network analysis techniques to analyse and visualise the collaborative learning and interaction activities derived from the individual and group messages. Our combined analysis scheme helped evaluate different dimensions of the collaborative learning activities, including both learning and facilitating activities, and also helped validate how self-directed learning and social networking can effectively be supported with the use of social software in entirely online cross-cultural collaborative learning settings. The evaluation also helped develop better understanding of how facilitators use social software to support the students' activities in a complex multi-cultural collaborative learning setting, and whether facilitation style plays a role in influencing learners' working styles and performance in such learning setting.

In the ICOPER project, I was a coordinator responsible for planning the end-user evaluation strategy and for coordinating the evaluation of the usability and user experience of several software modules that were developed to support the edition, delivery and reuse of learning content. I conducted research on the usability and user experience issues when using software in designing and delivering learning designs. I also participated in working to improve the assessment and evaluation in Higher Education context in Europe.

Future directions

I am interested in extending the experience acquired during my research work and applying it more broadly to the domain of HCI in online environments. The main possible directions of my future research are as follows

Usability and user experience studies

I am extremely interested in continuing to carry out research on new methods and approaches that help enhance the field of usability and user experience in different contexts, for example

evaluation methods applicable to the new generation user interfaces (e.g. handheld devices, assistive technology devices, etc.), or to complex socio-technical systems (e.g. Web 2.0 based environments for healthcare or education or software engineering communities).

Social software in software engineering

Particularly, software development is a highly social activity, which can be well supported by social software. This creates a complex socio-technical context that needs to be studied. Much research effort is still required to study the role, the impact and limitations of social software in software engineering. To study the usability and user experience of social software in software engineering is challenging but interesting and necessary. It is also important to study and evaluate how social software should be deployed and used locally and globally, what particular features of software communities should be taken into account when designing and developing new social software that support them, what the critical factors for the success of using social software in software engineering should be considered, how social software could improve the software quality and the software development process, etc. Those are just a few of the questions that need to be addressed. This research direction could also be applied to other contexts such as healthcare or education.

Elderly assisted technologies

Elderly people are a particular community I would like to take into consideration. There are many physical, mental and cognitive barriers that have great impact on the elderly lives. Besides health and ability maintaining, the elderly desire services and technologies that support their social relationships and their entertainment. As social networking sites are becoming more and more popular infrastructures, they could be a place where the elderly share similar experiences, support and understanding. Entertainment such as gaming is also widely experienced as a means for social interaction and enjoyment, and playing games can have physically, cognitively and emotionally positive impact on the elderly and can help improve their quality of life. To do research on the patterns and nature of interactions among the elder people in social networking sites and/or research on technologies that assist the elder people' living and entertaining are still a great challenge.

Structural models of online communities

To my best understanding, there seems a lack of study that aims to develop a structural model that can describe and predict complex relationships among variables in online cross-cultural collaborative learning environments. A structural model specifies how well some variables could predict some other variables whereas a measurement model, as the name implies, involves metrics, measures and data collection. I plan to do research on the models emerged from the interaction and collaboration activities in online communities. By studying the relationships among those variables and by predicting the change of some variables when manipulating some others is deemed useful and necessary for understanding how the students collaborate as well as providing valuable information for evaluating the effectiveness of the design of the learning setting and identifying improvement suggestions.

Roles of shared artefacts in online communities

Another useful direction for future work is to continue to study the impact and the usage of shared artefacts in different kinds of socio-technical environments. The concept of shared artefacts in my PhD was explored in only one community of practice. How the concept of shared artefact, or any other kind of shared data, can help sustain the meanings of work as well as the collaboration between and across different communities of practice, how shared artefacts can help pass information and data from one community of practice to another is another open and interesting research thread that can be addressed.

Conclusion

During my research activities, I have collaborated with many researchers, developers, and students with different technical and cultural backgrounds. I co-authored several papers with

many of them. It is clear for me that an important part of doing research is collaborating and exchanging ideas with others. I have worked very actively in my research groups at the Ecole Polytechnique Fédérale de Lausanne (EPFL) and at the University of Leicester.

As a conclusion, I have developed a sound knowledge and skills in the fields of Human-Computer Interaction (especially focusing on usability engineering and user experience), Technology-Enhanced Learning (TEL), online communities and other related areas. Furthermore, my background has been well developed and practiced since I have participated in several research and development projects. I enjoy working on real-world problems that might have a demonstrated impact on different contexts such as home life, organisations, education, software development and so on.