

Designing learning support for mobile workers

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Abstract

Through this article we describe our design approach to offer learning support inside professional and mobile activities. This work is done in the scope of a three year research project with a corporate partner involved in logistics and associated services. In order to introduce pervasive learning technologies into work activities we follow a participatory design approach. The article describes the design methodology and experimentation and discusses the first result of the prototype architecture.

1. Introduction

Training and competency evolution to face the challenges of a concurrent market and evolving technologies is a major challenge for enterprises. This is even more complicated when considering a mobile workforce because the organization of the work does not allow much time for training without disrupting the service and because people are mostly alone and on the road. In this context, mobile technologies can provide a useful complement to traditional corporate training (both face to face and e-learning) by providing the means to access training and corporate knowledge in mobile situations.

The work presented here is done with a corporate partner involved in logistics and associated services in the scope of a three year research project about the introduction of pervasive learning technologies into work activities and the usage transformations it involves. The project is broken into three iterative experimentation phases including participatory design, field experiment and analysis of the transformation induced by the introduction of new means to access training and corporate knowledge. Here, we present the process and results from the first phase of experimentation.

The paper is structured as follows: we first give a description of our participatory design approach. In a second part, we detail the architecture and features of our prototype. Then we present the results of this first experimentation phase. These first propositions and results are compared to existing works. Finally we will

give a synthesis of the results so far and the future developments of the work.

2. Participatory design approach

The objective of the p-LearNet project is to explore the use of pervasive technologies to incorporate learning *inside* work activities and to study its impact. A participatory design approach is a good approach in our case since it is fundamental to keep faithful to the actual work activities and situations [1]. Based on this, we can understand how the available technologies can be used to provide pertinent learning resources and activities in context. This kind of approach has already been used in other projects about mobility [2].

We engaged with our partners in several meetings, in order to understand their current practices in work activity. We used questionnaires as a tool to assess the information about their current use of technologies and their learning strategies.

2.1. Building scenarios

A mean to construct a shared view of the design with the stakeholders is to build scenarios in the form of stories. In our case the scenarios demonstrate the use of the target mobile learning system in the work situations and activities. We then have chosen a cartoon like scenario approach for the description of the use of the system; figure 1 shows an excerpt from one scenario. In other cases we have created more dynamic artifacts for instance using flash.



Figure 1. Cartoon like scenario for design

Based on these meetings we have proposed a set of use scenarios corresponding to our understanding of the business and in which we describe how the mobile learning system assists the worker. These scenarios have then been refined and validated based on the remarks from the stakeholders. These scenarios fall into two broad topics:

Knowledge revision. The mobile learning system can be used to retrieve information about procedures and product information. This type of use is clearly a complement to the more traditional corporate training and information (face to face or e-learning) where this knowledge should have been learned beforehand.

Collaboration and community of practice. Here the focus is more on the sharing of knowledge and know-how between the workers. People can solicit advice and help from others. The cases can feed a F.A.Q or any other mean to build a shared knowledge base.

2.2. Prototype validation

For our first experiment, we have selected some scenario parts for which we would provide a prototype supporting the required functions. During the next iterations of the project and based on the experience gained, we will provide a more comprehensive support for the different scenarios. We had chosen mobile phone to support the mobility of the workers. We developed the prototype using the Java 2 Mobile Edition (J2ME) development kit provided by Nokia. The interaction design has been validated through an expert evaluation within the research team and by the users during the early stages of the experimentation.

3. Architecture

In the first scenario we tried, we focused on the collaboration and community aspect. For that we based our approach on a CMS enhanced with services for mobility. The representation of the overall architecture of our system is depicted in figure 2. The client side of the prototype is composed of a rich client application. To develop the different services offered to the user, we followed a Services Oriented Architecture. The pedagogical content is stored in a CMS. The main idea here is to offer the possibility to annotate the resources and to link them with elements of the e-portfolio of each learner [3].

The users can search and consult the content but they can also provide more complete information to use case or enhance the corporate knowledge about local adaptations or problems. Each information item or pedagogical resource is tagged with metadata. This

information is used by the ontology engine so as to infer the more pertinent resources to provide to the user.

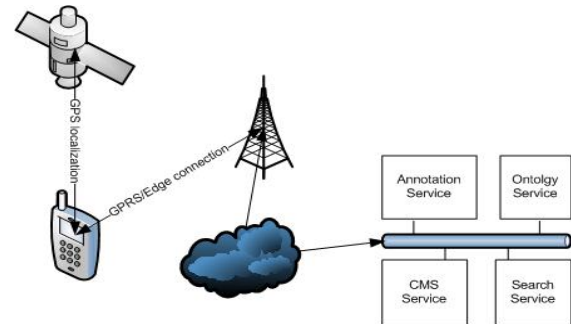


Figure 2. Overall architecture of the prototype

4. Evaluation: experimentation and primary results

So as to get a first feedback on the proposed system, we have selected a limited population of young apprentices in the organization. There is still a high opportunity for them to be in learning situations during their professional activities and they are familiar with technologies. The population is composed of 12 persons aged 19 to 26 years old. Half of them are women. The experimental phase has been broken into different phases described hereafter.

4.1. Problem gathering

During a period of two weeks, apprentices took notes of the problems they had during their professional activities. The purpose of this first activity was to detect the issues that the population had with the performance of their activity so as to double check the initial scenarios as well as the questionnaire results. 24 usable forms have been gathered. 88% of the problems are encountered while in the field. 52% of the problems were in relation to a private client and 12% with a corporate client. 32% of the problems were related to client information about services and prices. In 66% of these cases, the answer was brought back to the client the following day after getting the information at the office. 48% of the problems are solved with the help of the manager.

4.2. Ergonomic evaluation

Before trying the prototype in real situations, it has been submitted to corporate trainers and to the population. They used the prototype to perform activities ranging from locating themselves using the GPS to submitting information to the collaborative system using text, audio or photos. Based on this

assessment of the prototype, we were able to provide enhancements to the usability.

4.3. In the field use

Due to organizational problems, the field evaluation has been very limited since only two persons could participate in the evaluation. To be able to gather more information a final session has been set up including the learners and their corporate tutors which are mostly managers. They had to perform scripted activities in the same spirit as the ergonomic evaluation.

From these evaluations we have learned that there is a high acceptance of the prototype and a positive feeling about its usefulness also from the tutors which discovered the prototype for the first time during the last activity. The main problems are about the form factors of the chosen devices which have a small screen. Entering information is also difficult and a touch screen would have been appreciated. Considering usability, the presentation of information has to be enhanced greatly maybe with more graphical presentation and information has to be organized in order to provide the most used first.

5. Related works

In the same approach, the JITOL project [4] and the "Virtual eBMS" eLearning platform [5] are treating just in time learning: access to information only when necessary. JITOL proposes to make the training and the knowledge exchange possible when and where it's wanted to be, while "Virtual eBMS" eLearning platform is based on the resolution of activity linked problems of learners. This problem-based approach enriches the contents by the comments and different solutions provided by the other learners.

6. Conclusion and Future Work

This article presents the first results from the development of pervasive learning systems to support learning and corporate knowledge inside the professional activities. This context is particularly important since the acceptance of the system is directly related to its ability to support and enhance the activity rather than hinder it. What we have learned from this first phase is that the learning part of the prototype should be embedded into work oriented services to ensure the motivation of the user to bring the device with them and use it. Starting from that point we must offer the opportunity to access corporate knowledge and learning resources.

During this part of the project, we followed a participatory design approach that helped us understand the business of our partner and design with them the functions of the ideal system. In a second phase, we defined the most suitable technologies and started a work on the user interface. Working with the future users of the system and the different actors and managers of the organization helped raising the interest for the prototype and facilitates acceptance.

At a technical level, we will also add processes as resources which can help users perform procedural activities related to logistics for instance [6].

7. Acknowledgements

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