Design of a pervasive workplace learning solution for retail

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Abstract
The work presented in this paper is part of a three years project involving three different types of stakeholders (retail industry, postal services, medical world). Here, we concentrate on the user-centered design and experimentation of a pervasive learning solution for sellers in a retail store. In the conclusion we balance the finding from this particular field with those in the other cases to show the key issues related to the introduction of pervasive and mobile workplace learning.

Keywords
Pervasive learning, workplace learning, retail, user-centered design

ACM Classification Keywords
J.1 Administrative Data Processing: Education, H.5.2 User Interfaces: User-centered design, H.5.2 User Interfaces: Evaluation/methodology

General Terms
Design, Experimentation, Pervasive Learning, Workplace Learning.

Introduction
Companies have to adapt constantly to the evolution of technologies, business processes and competition. This adaptability is a competitiveness issue that relies on the

abilities and support of its employees. In this context, training is an accompanying measure to enhance their knowledge and skills.

Current company training dispositives whether face to face or in e-learning have the major drawback of creating a rupture in the work activity. It is indeed necessary to leave the work activity either to attend a face to face session or to access a computer in a remote place to browse e-learning modules. Furthermore, educational resources are designed for long term use because of cost and engineering constraints. This life time is not always compatible with the rapid evolution of knowledge and skills necessary to accomplish work activities. This obsolescence phenomenon brings a second type of rupture related to workers' needs. Daily business activities by themselves as well as observation and interaction with colleagues provide an informal learning vector that is equally important and that can alleviate some of the presented shortcomings [9].

The contributions of formal and informal workplace learning modes must be acknowledged and facilitated by the organisation [1]. Under the p-LearNet research project, we have considered the potential of Weiser's vision of a pervasive world to support integrated learning / working activities [12]. The rise of mobile and pervasive technologies provides the following properties for learning:

- the physical environment becomes a learning resource in itself [8] and enables the development of skills and knowledge in real or realistic setting [4]. The context then becomes a crucial element in providing the resources and relevant activities [3, 7];
- The extension of the interaction means within work settings (e.g., mobile devices, tactile surfaces...) offers the capability to access information on the spot but also to produce and disseminate it within the organisation more easily. This opens the possibility to support social and collaborative learning styles [5, 10, 13].

However, despite the obvious potential of pervasive computing for the various processes and learning situations, existing systems are still immature due to difficult access, lack of actual use or lack of relevance of services or learning dispositives. In the scope of the p-LearNet project, our partner had no significant deployment of mobile solutions for their business processes nor any strategic analysis of the potential of mobile and pervasive technologies for learning. Because of that, we decided to have a user-centered, participatory design approach and to go through a set of iterative deployment to assess the acceptability and usefulness of our proposals. In the next section, we will present our experimental setting and process. We will then present some aspects of the resulting prototypes. An analysis of the benefits and pitfalls identified during the project will then be presented in conclusion.

Experimental Setting

We are interested in supporting hypermarket sellers in their skills and knowledge evolution. Sellers are at the forefront of the relation with the clients and have multiple roles: seller, counsellor, taking care of the shelves... More and more they are confronted to clients that have already taken much information from the Internet before coming to the store and are sometimes more aware of the product features that the sellers. This is particularly true with the technology products (camera, GPS, television...) that we have considered during the project. Moreover this type of products have a rapid turnover and change every three months. For their work, the sellers have to integrate information such as the store and brands marketing strategies, distinctive technological

features, availability... to best respond to the client's demands.

Current training and learning practices
The brand's training centre offers both face to face and e-learning modes on business activities and processes as well as on products. E-learning resources are classical Flash based documents including subject matter information and quiz. E-learning is one to one without any collaborative features.

To have a better knowledge of the seller population and learning practices, 24 sellers passed a questionnaire. The average age is 37 years old and most of them (18/24) have more than 5 years experience in the store. Two third of them have been trained for vending either before or after recruitment. Considering their strategies to acquire information, they prefer direct interactions within their department (colleagues and department head). Otherwise, they would rely on product documentation or self experimentation and finally on Internet. Product providers that visit the store to present the new products and their evolution are also a great source of information. The main motivation for learning in this context is curiosity. Most of the sellers have followed at least one e-learning module per year. More than 50 percent of them is satisfied with these modules. However, further research showed that there was a lack for up to date information about new products and that sometimes a seller would arrive in a new department without any prior training. Above all 92 percent of the sellers identify lack of time as the principal limit to training.

Participatory design approach

We have followed a participatory design approach during the project [11]. This approach aims to involve all stakeholders in the design: scientists, direct (users) and indirect (prescribers) beneficiaries to facilitate adherence to the project and acceptability.

Since there was no initial experience to rely on, we used scenarios as a boot process describing typical business processes and incorporating pervasive and mobile support for them. Other intermediary artefacts such as Flash based animations corresponding to the scenarios have been produced to better convey the proposals to the different stakeholders. This has been completed by observation of the sellers' activities, informal discussions about their needs as well as post-it notes sessions to work on a prototype proposal.

Prototype proposal

From the scenarios and discussions with sellers and training department, we decided that the prototype would take the form of a seller digital assistant that would provide access to product information as well as training material (pedagogical resources, F.A.Q., best practices...).

Being in a controlled environment (the department store), we provided a true pervasive environment using a middleware we have developed. This middleware enables the discovery and use of local services from the digital assistant. This provides the capability to overcome the limits of the mobile device by taking control of remote interaction means. Figure 1 shows the mobile assistant with some information displayed on a local TV by the user. The information presented on the mobile device and the screen can be different to keep private data on the mobile for instance.

Figure 1: Extended interaction with a personal assistant.

Since it was clear that the device would not be used if it did not have a business added value, we also proposed a product comparison tool that on one hand enable the seller to get an idea of the product differences and on the other hand can support the seller argumentation in front of the client. In the later case, the product comparison can be displayed on local TV to support discussion with the client. The first prototype was developed on a Samsung Q1 mobile windows PC. The second experiment used a Villiv computer which was a little smaller and lighter.

Experimentation

For the initial deployment, we have done a laboratory experiment first then we deployed in the store. Later deployments were done directly in the store.

Laboratory experiment

Prior to the field experiment, a laboratory experiment has been scheduled for two days to check technical problems and application ergonomics. We have reproduced a department store in this controlled environment with video cameras. A set of scripts corresponding to specific tasks has been prepared to test the different functionalities of the prototype. The laboratory experiment lasted two days. People were introduced to the prototype. Then, they had to perform the scripts as sellers alone or with a fake client (see figure 2).

Figure 2: Laboratory experiment.

The first evaluation day was more an expert evaluation with people from the project team as well as people from the company business units (training, information system, domain expert for the selected goods (camera...). The second day was dedicated to real sellers from the store where the field deployment was planned. Each test was followed by an

interview so as to get their impressions of the system and how they foresee its use in a real situation.

The laboratory experiment has enable the correction of some bugs as well as ergonomic improvements before the scheduled field trial. It has also provided hints for further developments. Some of the issues are related to the business context (e.g., organisation of information). Other issues are more related to the impact of introducing a pervasive system in business environment and activities. In particular the department store needs to be designed to support the new capabilities (e.g., position of the screens). Moreover, the relation between the seller and his/her client is changed by the mediation of the system and an adaptation is necessary.

Field experiment

The prototype has been deployed for one month within the "nomad" department store (cameras, GPS…) of a local hypermarket. The target products were high end numeric cameras and GPS devices. The former was chosen because of their high technicality and number of characteristics as well as the necessary knowledge of photography. The latter resulted from a demand of the sellers because it was a new element in their department store and they felt a need for further training and information.

Figure 3 shows a typical use of the prototype in store where the seller will select some products based on his discussion with the client. Then he can display the product comparison tool on an external screen for discussion with the client. The product features can be used as entry points towards resources either on the mobile device for the seller or on the shared screen to the benefit of the client.

Again, we have observed that the work environment has a great impact on the deployment of a mobile solution. The organisation of the department store, the capabilities of the mobile device (form factor, autonomy) are important to facilitate the uptake of the solution. The other issue was the availability of pertinent resources. Sellers are very demanding. They need timely product information and market oriented overviews of the product range to support their argumentation in front of the client.

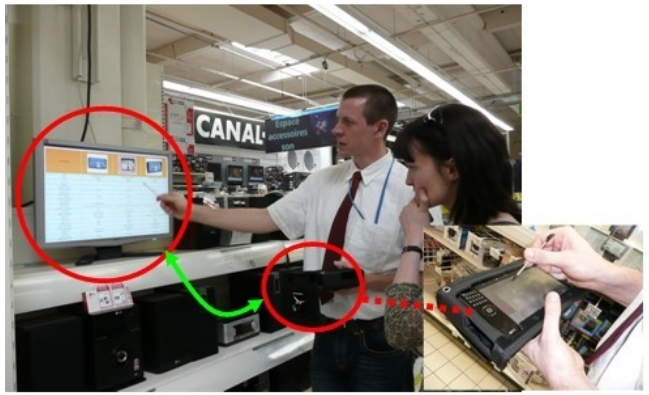

Figure 3: In store prototype use.

Conclusion

Following the first experiment in 2008, we spent almost one year on the resource issue to elaborate a new engineering that would better support our needs. We have also integrated Twitter feeds in the prototype to enable the sellers to get information directly from products vendors and specialists. In this latter case, the training department is more in a role of editor of a list of information sources around the sellers interests. The user-centered design and involvement of the sellers was well received and participates to the acceptance of the solution. This has been verified with the last experiment involving three stores. One of the stores did not participate in the project beforehand and the solution was just deployed

“classically”. People did not take the effort to appropriate the prototype and we had to stop the experiment.

During the project, we had the same process with two other stakeholders : a postal service and in the medical domain. Mobile prototypes were developed following the same approach and tested in the field [5][2]. Figure 4 presents a synthesis of the different points to which we have been confronted in the three domains:

- **resources** have to be adapted for mobile use (e.g., granularity) but also to be in line with the evolving needs of the workers;
- **learning activities** should be strongly associated to the business processes and application for an easy switch between the two and informal learning modes should be enabled;
- the **environment** including mobile devices should be suitable for the tasks to performs to avoid rejection because of constraints to the business tasks.
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Moreover the links between these elements underline three processes that have to be considered for successful adoption of the mobile and pervasive workplace learning:

- mobile and pervasive learning are not a replacement for other learning modes. It is necessary to design a global learning dispositive including face to face, e-learning and mobile learning modes;
- the engineering process of the resources has to be adapted accordingly both for the production of resources that fit mobile consumption but also to enable more rapid resources production in line with the workplace and market actuality;
- the adaptation of the activities and environment to support a mobile and pervasive solution requires an organisational support from different business units and from the local hierarchy to promote learning and knowledge sharing

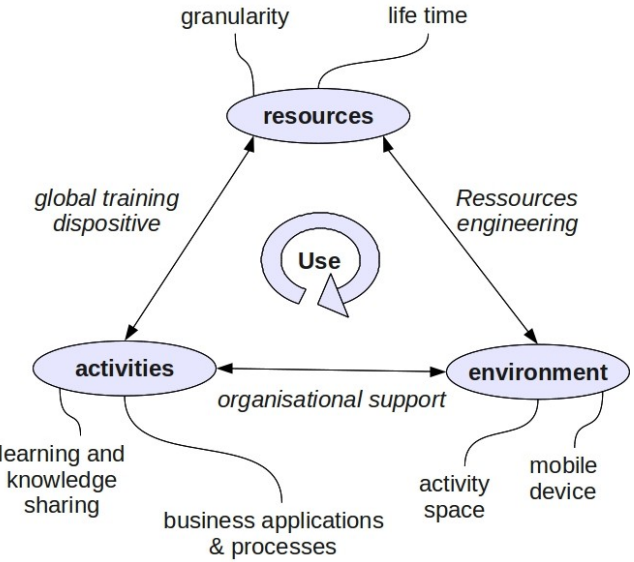

Figure 4: Mobile workplace learning key elements.

References

1. Billett, S. (2002). Critiquing workplace learning discourses: participation and continuity at work, Studies in the Education of Adults, 34:1, pp. 56-67.

2. Bricon-Souf, N., Przewozny, E. (2010) How to Transform Personal Knowledge into Collaborative Knowledge with a Wiki Dedicated to Microlearning, International Conference on Intelligent Computing and Cognitive Informatics, pp.376-379.

3. Derntl, M., & Hummel, K. A. (2005). Modeling context-aware e-learning scenarios. Pervasive Computing and Communications, PerCom 2005 Workshops, pp. 337-342.

4. Hundebol, J., Helms, N. H. (2006). Pervasive e-Learning - In Situ Learning in Changing Contexts. Conference on Informal Learning and Digital Media (DREAM 2006), Odense, Denmark, 2006.

5. Kaddouci, S., Peter, Y., Vantroys, T. (2009) Designing learning support for mobile workers, Proceedings IEEE International Conference on Advanced Learning Technologies (ICALT'09), pp. 258-260.

6. Koole, M. L. (2009). A Model for Framing Mobile Learning. In M. Ally (Ed.), Mobile Learning: Transforming the Delivery of Education and Training, pp. 25-44.

7. Kurti, A., Milrad, M., Alserin, F., & Gustafsson, J. (2006). Designing and implementing ubiquitous learning activities supported by mobile and positioning technologies. Ninth IASTED International Conference Computers and Advanced Technology in Education, pp. 193-199

8. Laine, T. H., Joy, M. (2008). Survey on Context-Aware Pervasive Learning Environments. Proceedings World Conference on Mobile and Contextual Learning (mLearn 2008), University of Wolverhampton, School of Computing and IT, pp. 192-199.

9. Moati, P. (2001) Les stratégies d'adaptation des entreprises : éléments d'analyse. Cahier de recherche n°160, Crédoc

10. Sharples, M, Taylor, J.,Vavoula, G. (2007). A Theory of Learning for the Mobile Age. In: Andrews, Richard and Haythornthwaite, Caroline eds. The Sage Handbook of E-learning Research. London, UK: Sage, pp. 221–247.

11. Schuler, D. and A. Namioka (1993). Participatory Design: Principles and Practices. Mahwah, NJ, Lawrence Erlbaum Associates, Inc.

12. Weiser, M. (1999). The computer for the 21st century. ACM SIGMOBILE Mobile Computing and Communications Review, 3(3), 3-11

13. Wenger, E. (1998) Communities of practice: learning, meanings, and identity. Cambridge University Press. ISBN 0-521-66363-6