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An « ethno-participative » Methodology for Designing E-Learning Environments : Experiment in Project Management Training

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Abstract This communication presents the “ethno-participative” design methodology proposed by D. Lecllet, and its scientific context. This methodology arises from her experience, and has allowed rationalizing a heuristics and pragmatics approach for Learning Management System created with Technology of Information and Communication in education. The methodology consists of five stages: the preparatory study of feasibility, the analysis and the modelling, the elaboration of the situations of learning and interactions, the incremental prototyping and the experiment in ecological environment. The context in which we applied this methodology to validate it, the project management training and the MAETIC project, are also explained in this communication.

Introduction

The "ethno-participative" design, proposed by Dominique Lecllet in (Lecllet 2004), arises from last ten research years and from her experience. This method allows rationalizing a heuristics and pragmatics approach used to design learning environment instrumented by the Information and Communication Technologies. The LMS (Learning Management System) so obtained were tested in varied educational contexts (distance, hybridising of distance and presence). We are also particularly interested in the learning of know-how, in vocational trainings of the higher education according to an active pedagogy.

Our first objective is to develop the “ethno-participative” design method, within the framework of the pedagogic engineering (Paquette 2002). Our second aim is to study and analyse the practices (teachers and learners) within the framework of training of know-how and to propose methods and models dedicated to these practices.

Indeed, force is to notice that the teachers have real difficulties to create educational scenarios instrumented by the CIT (Pernin & Lejeune 2004). Tools are often unsuitable for teachers who wish to organize this kind of training in their courses. For example, the platforms for opened training are too complex to be integrated by a teacher without any assistance. Furthermore, the lack of technical competence and sometimes of time also discourages teachers. All these reports are confirmed by our experience of practitioners. At first we are teachers, having for several years integrated the ICT into our courses. We are also researchers, who have analysed teachers' practices (Leclet 2004), (Trouillet & al. 2005). Moreover, on Web, numerous easy tools, like Weblog, exist and can be used in an educational context (BLOG AMUE 2006). Also, numerous research works propose tools dedicated to teachers who aim to help teachers to manage numerical courses (Paquette 2004). For example the NetUniversité portal (Trigano & Giacomini-Pecurar 2004) seems relevant to us to propose methods which allows setting up of easy learning environments with instrumentation of such simple and available tools.

In this research context, the method of "ethno-participative" design is tested on the research project MAETIC ("Méthode d'Apprentissage instrumEntée par les TIC" French Acronym which means Method of learning using Information and Communication Technologies). This research project takes place in a context of vocational trainings. These trainings integrate collective teaching scenarios to work according to a project mode. The training device supports the training of know-how, and more specifically the Projects Management training.

The aim of this communication is to present the "ethno-participative" design methodology and its theoretical context. We will then present the context on which we applied this methodology: the MAETIC project. Then, we will conclude on the perspectives of our work, and more particularly on the evolution of the design method.

An "ethno-participative" design methodology

We present, in this section, the methodology of "ethno-participative" design proposed in (Leclet 2004). At first, we will explain the sources of inspiration, which permit to elaborate this method. These sources are her know-how in extraction of knowledge due to her experience in Artificial Intelligence. Sources are also in her experience of researcher evolving in the educational context and in her "speciality" of teacher in the domain of Information Systems analysis and design. We present here the method of "ethno-participative" design.

A Framework

Two main sources of inspiration allowed to analyse and to formalize this design methodology. The first arises from design methods of the Software Engineering and from methods of project management. It also arises from LMS design methods (Deschryver & al. 2002), (Paquette 2004). These last ones put the user, his activities and his participation, in the centre of the design process (Mackay 2000). The second source of inspiration arises from approaches used in Education Sciences, especially the inquiries of ground (Weber 2001) and the cognitive engineering (Norman 1986).

We now present these different approaches. In Software Engineering and Project Management, the success of a project often depends on the good choice of the design and development methods. It permits to have a common language, a formalism that authorizes information representations and iterative progress in the analysis (Lemeunier 2000). The information system design is based on a development process, called life cycle, which resumes all the phases which permit to create the system.

Furthermore, to better master the development process, it is important to respect the models of life cycle, allowing to take into account, besides the technical aspects, the organization and the human aspects. It is also important to clarify that a conception phase may lead to several activities, notably those of the global specification, the modelling activity and the validation. There are four development methodologies mainly used in Software Engineering (Norman 1986).

Among the conception methods used to develop Learning Management Systems, we find first of all, the technologic development in education methods (Nonnon 1993). The model allows to conceptualise, either a problem to be resolved, or an idea which seems interesting and unexplored. This model also follows the postulate according to which the theoretical confrontation can be led a posteriori of the starting up process with the aim of

confronting the idea or the problem so as to clarify it, improve it, modify it or reject it. So, this model doesn't make the end product dependent of the development process.

We also find methods so qualified of " incremental and iterative ", in the sense that they are based on a progressive refining of the product (Depover & al. 2000). The approaches proposed in the incremental and iterative methods imply the development of prototypes, which will be systematically validated to insure the equivalence between the requirements and the constraints of the environment. This approach allows to take into account in the dialogue, the exchanges among the various actors. This type of method also allows to wonder about the modalities of insertion (individual or collective, professional or school context, initial training, remediation) of the LMS.

Finally, we find the participative conception methods (Norman & al. 1986), (Mackay & al. 1997). The purpose of these methods is to do a collaborative work implying all the disciplines having to contribute to the development of the Computer System for Human Training. The principle is to bring down barriers between these various disciplines, to stimulate the creativity and to bring effective and innovative solutions. In this context, the users are not passive individuals submitted to the " good will " of the machine, but individuals that actively try to give a sense to this object by also trying to impose their perspective (Linard & al. 1995). The approach is then bi-directional, because the user is not only observed and interrogated, but is also considered in the process of conception.

Among the approaches used in Education Sciences, we find the investigation of ground. This term often giving to confusion, it seems to us necessary to clarify here our comment. The work of ground, called " field work " in the Anglo-Saxon tradition, is practised in the research on our own societies. It consists of a prolonged presence within a group, to get acquainted with this one and to collect documents, by means of what one calls the " inquiries of ground ". So, an inquiry of ground, also called " ethnographical inquiry " tries to understand the speeches and the practices by moving closer to the distant, by making familiar the strange (Weber 2001).

Finally, concerning the approaches bound to the cognitive engineering (Norman 1986), we interest briefly in the genesis of the notion of artificial intelligence. In the 70s, expert systems did not integrate, in their structures, the problems bound to the understanding of the cognitive mechanisms (Anderson 1983), and their translation in a system of symbols or in a knowledge base. At the beginning of the 80s, the problems of the knowledge modelling were encountered (Dreyfus 1984). A quite particular attention was carried in the construction of the knowledge base. The knowledge engineer (Vogel 1988) was so introduced to give a solution to this double inconsistency: that of the expert and that of the AI tools. The knowledge engineer should then have cognitive capacities and methodological and technological mastery. We are going to try to clarify the roles, the functions and the qualities of this expert in artificial intelligence. This one plays above all the role of an intermediary who should ensure two levels: the cognitive level (intermediary between the knowledge and its projection in a computer system) and the technological level (experimented designer of the knowledge bases systems and of the educational systems). Two techniques are then approached: interview and protocol of analysis (Aussenac & al. 1993).

The methodology proposed by D. Leclercq resumes the "in spiral" life cycle of a project design, because this one allows to take into account the needs of the users. So, these needs and their analyses are not motionless and become refined gradually according to the development cycles. The proposed methodology is also similar to the participative design. On one hand, this method takes place by the implementation of inquiries by conversations or by questionnaires. On the other hand, it proposes preparatory inquiries based on the observation of the users needs. This method is close to the incremental and iterative design. The method consists then in setting up ground inquiries by conversations or questionnaires and observation of the practices. Furthermore, from the point of view of the cognitive engineering, the methodology allows to practice three techniques: the interview and the analysis of protocol

Let us see now, in the following section, the formalization of this methodology.

Methodology Formalization

The suggested methodology is iterative. It is made of a succession of stages, by gradually refining the specifications, by estimating the remaining solutions, then by realizing and by integrating the modifications until obtaining of a satisfying product. It is also an incremental method that allows the progressive adaptation of a system to the met situations. One begins by developing a core of the system, and adds then supplementary functions.

The method consists of five stages: the preparatory study of feasibility, the analysis and the modelling, the elaboration of the situations of learning and interactions, the incremental prototyping and the experiment in ecological environment.

- *The stage 1 "preparatory study of feasibility"*. The objective of this stage is to express users requirements, then to study them and to analyse them in order to encircle the outlines of the learning system. This stage allows to define the problem (analysis of the manners, general problem), the context of use, the aimed know-how and the practices of learning, and finally, the underlying theories. In this stage, one finds the techniques used in Human sciences, notably the "ethnographical" inquiries. At the end of this stage, we find a document called "feasibility study", the definition of the problem, the specifications concerning the context of use and the aimed know-how, the choice of one or several practice (s) of learning as well as the choice of the theory.
- *The stage 2 "analysis and modelling"*. The objective of this stage is to establish the educational structure of the system. At first, it allows the analysis and the modelling of the information (contents, knowledge) and it enables to establish a formal representation of it, under the shape of a knowledge base (the data of the system). In a second time, it ends in the educational analysis of the knowledge base, which describes "step by step" the practice (the treatments of the system). It is in this stage, that are used the AI methods (conversations and knowledge modelling).
- *The stage 3 "elaboration of educational situations and interaction"*. The objective of this stage is to describe the situations of learning and the interactions of the system. We use the description of a "scenario" under a paper form or a simulation of PowerPoint type. This scenario defines the educational situations and the interactions such as they will be presented to the learner. This version allows to formalize the interactions. The realization of a semi-computer model (of flash type) illustrates the interface representing the situations of learning. It is in this stage, that are used the participative techniques, notably the conversations and questionnaires.
- *The stage 4 "incremental prototyping"*. The objective of this stage is to prototype the learning system, to realize the interface, and to proceed by progressive adjustment of the interface and the ergonomics. It is at this moment that the designer makes the choices of the most suited communication languages for the educational situations, which he wants to develop. During this stage, developing the incremental prototyping and spiral method, one comes and goes continuously between the conception of the educational situations and their "computer" shaping.
- *The stage 5 "experiment in ecological environment"*. The objective of this last stage is to test in real condition, the use of the learning system to obtain information on the manners. We also find here participative techniques.

A recent evaluation of this "ethno-participative" design methodology was made within the framework of a research project dedicated to know-how project-based trainings, for vocational training and using ICT. This method of learning forms part of the MAETIC research project. The evaluation of this methodology is presented in the following section.

An evaluation of the Methodology

It is important to underline, that one of our first objectives, before going further in the proposition of a design method, was the validation of the five stages of the methodology. Let us present now, the context of evaluation of the methodology realized in a project management course.

Evaluation Context

The elaborated project management course is inspired of learning method called MEPULCO (Talon & al. 2006). It consists of a student product and of a teacher product. The student product aims to form students with the project management through a collective creation of a "product". The teacher product aims to suggest to teachers a guide allowing them to "coach" teams of students.

The course has been organised for two target populations: MASTER I MIAGE (Computing Methods dedicated to companies management) and MASTER II IFA (Engineering for Adults Training). So the student product has been adapted and instrumented by D. Leclerc through easy to use tools. The first one was NetUniversité portal (Giacomini-Pecurari 2005). This portal has notably the advantage, besides its usability, to implement the 3 IMS-LD's levels (Giacomini-Pecurari 2005). Associated to this Web portal, the Weblog technology was also introduced, allowing to the students to hold a activities' log of the project and to communicate work to the teacher and to the other members of their team. So, the content of the student product is the following one:

- A tool: Teacher' Weblog which references the blogs of the students projects teams.
- An educational NetUniversité resource composed by:
 - A homepage, which presents the working context, the aimed educational objective.
 - A graphic charter.
 - A methodological guide for the students (to download).
 - Four " pilot files " and models of documents (to download).

The NetUniversité resource was divided into four chapters: the aimed educational Objective, the context, the student guide and different files. In the chapter " aimed objective ", we explain what is a project and a pedagogy in a project mode. In the chapter "context", we present the working context, the progress of the projects and the educational approach. Finally, both last chapters are intended for the downloading of the various documents.

Let us note that the student product joins in an educational scenario which aims to set up a project-based pedagogy. So, the progress of the educational activities of the students was defined during the first working session, in room. A planning of the sessions was also proposed to the students.

The detail of this instrumentation is explained in another article accepted in this same conference. Let us see now how was made a first validation of the stages of the "ethno-participative" design methodology.

A first validation

Let us come back on the stages of the methodology and let us see how they were tested.

- *The stage 1 " preparatory study of feasibility "*. This feasibility study took place during year 2004. During this period, "ethnographical" inquiries were established. The analysis of these inquiries allowed then to elaborate the document "feasibility study" in which is defined the nature of the problem, the specifications concerning the context of use (vocational training of MASTER type), the aimed know-how (project management) and the choice of the learning practice (project-based active pedagogy). It is during this stage, that we chose a "hybrid" mode of training. The alternation of sessions on site and autonomous working sessions allowed us to get closer to real conditions of the progress of a project: collective and individual sessions while favouring the communication between the members of the project.
- *The stage 2 " analysis and modelling "*. The knowledge modelling and the educational analysis was not really made. Indeed, at present the educational modelling does not cover the personalization of the student' course, nor the event side (level 2 and 3 of IMS-LD). Only the level 1 of the educational modelling was made.
- *The stage 3 " elaboration of the educational situations and interaction "*. This stage took place from the starting up of the project. So, the situation of learning and the interactions instrumented with NetUniversité were defined. An educational paper scenario such as it was presented to the students in real condition, was also conceived.
- *The stage 4 " incremental prototyping "*. The incremental prototyping was made continuously. It took place between the conception of the learning situations and its development under the NetUniversité portal. It is in this stage that one implemented the educational resources and elaborated documents to be downloaded.
- *The stage 5 " experiment in ecological environment "*. From October 2005, the course was then experimented in an ecological environment. The target population was the following one : a population MASTER I MIAGE (63 students) divided into two groups among which a witness group and a population of MASTER II IFA (19 students). The experiment protocol consists of a participating observation of the teachers in sessions, the collection of activity reports of sessions sent at the conclusion of every session, of a collection of the " posts " of students' Weblog, by a questionnaire filled by every student, at the end of the module after the exam, and by semi-directive conversations with group of students (one month later). Concerning the questionnaire, the following eight thematic were retained: the meetings, the external sources, documents, the collaborative work, the roles within the team, the role of the teacher. The Weblog and the NetUniversité platform. In the current day,

52 questionnaires on 63 were returned for Masters I MIAGE, 19 questionnaires on 19 for Masters II IFA. The semi-directive conversations were made. The handle of questionnaires under SPYNHX is foreseen in April and the analysis is foreseen until summer. The experiment results will allow to make a return on use which will allow the development of a new version of the prototype.

Conclusions

In this communication, we have presented a methodology for the design of training environments instrumented by Communication and Information Technologies. This "ethno-participative" design methodology, resulting from practices of ground, proposes a process in 5 stages, which goes from the preparatory study of feasibility to the experimentation in ecological environment. Methodology could be tested during the design of a training method of know-how of the type "project management course". The "ethno-participative" design proved to be effective in this context. It enables us to plan an evolution of the training method, after analysing use. Following this positive experiment, we plan to make evolve the design methodology towards a design method in the sense of the definition suggested by (Rumbaugh 1995) namely by defining a set of modelling concepts as well as sights and notations to present these concepts. The development process has already been defined. It will have however to be refined, in order to detail the activities to be carried out along the various stages, as well as the associated techniques.

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