On the Development of User Adapted E-learning Schemes for Teachers

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Abstract*:*
In this paper we present an innovative distance-learning scheme that employs dynamic user evaluation both content as well as behavior based in order to allow for dynamic training that is adapted to the user. Through content-based evaluation the appropriate learner profile is selected, influencing the level and the contents of the offered courses while behavioral evaluation affects the pace of training and the way information is presented to the user. Learner profiles are created and continuously updated through an e-survey tool that is integrated to the system. In its current form the presented system aims at increasing the familiarity with ICT of teachers working in the Special Education sector.

Keywords: *user adapted e-learning, e-surveys, e-evaluation, ICT level estimation*

INTRODUCTION

The impact of Information and Communication Technologies (ICT) is becoming increasingly evident in learning and teaching at all levels of education. E-learning, the Internet-enabled learning, is a revolutionary way to empower a workforce with the skills and knowledge it needs. It provides faster learning at reduced costs and increased access to learning information.

In this paper we present the method followed in the framework of SPERO project [1] for the estimation of the ICT level of the teachers, mainly of the field of special education, and the subsequent use of this information for creating a user-adapted distance-learning scheme that enables teachers to gracefully increase their ICT level of knowledge. For this purpose data concerning the ICT level of teachers have been collected through a pan-European survey. Analysis of these data , focusing on the impact of educational and social experiences of teachers, has been performed and the main conclusions have been included in the initial form of an e-questionnaire that forms the first step of teacher's ICT level estimation. Given that data are continuously collected and analyzed modifications to the questionnaires are

dynamically made to reflect to new situations on ICT knowledge level. Moreover, in the evaluation of teacher's ICT level personalization has been included to best identify any user peculiarities. Finally, a distant learning architecture has been designed and is currently under development, that employs both the ICT level of the teacher as well as the its behavior during training.

1. OVERALL ARCHITECTURE

The general architecture of the SPERO system is shown Figure 1 where all modules and subsystems are depicted. Three main subsystems can be identified:

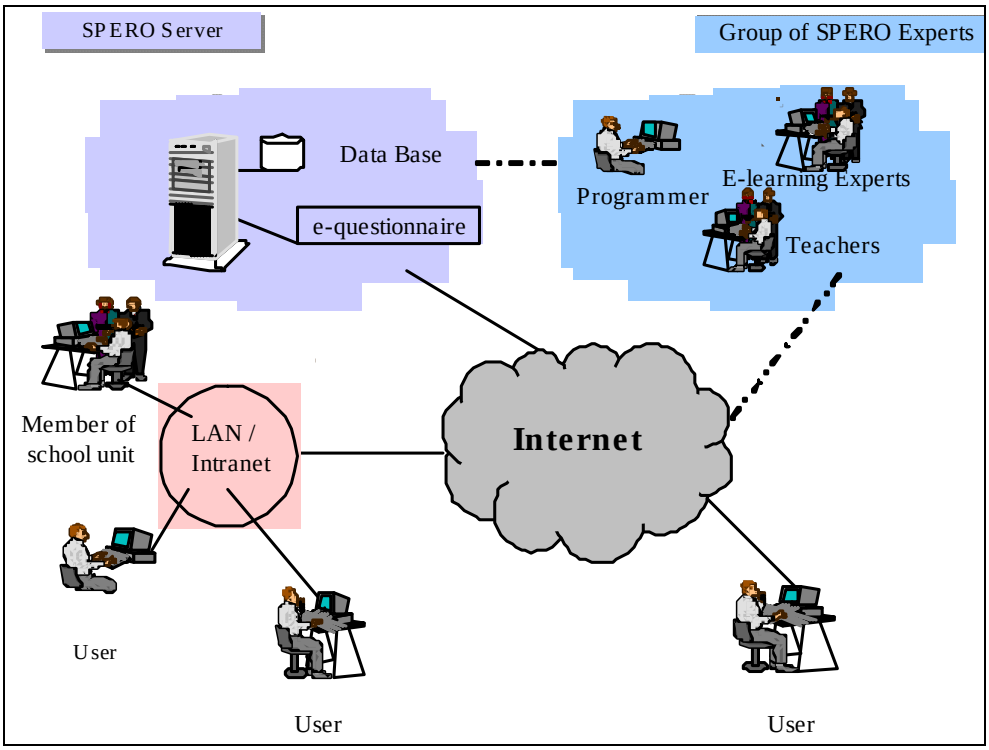

Figure 1: General Architecture of SPERO system

(a) Group of Users: includes members of School Units, users learning collaboratively, as well as users with different roles i.e. teachers, employers. These members can be connected with the other subsystems of the proposed schema through the Internet by using either a local area network or modem.
(b) Group of Experts: The Group of Experts includes a variety of people like teachers of the Special Education sector, experts in e-learning, data analysts, psychologists and software engineers. This group is responsible for designing e-questionnaires that allows for e-surveys to be conducted. Currently an e-questionnaire aiming at estimating the ICT level of knowledge of teachers working in the special education

sector has been designed. Conclusions of this e-survey as well as the use of the e-questionnaire itself are fed back to the e-questionnaire by modifying its form either in the contents or in the user interface level. Moreover, the e-questionnaire is used to estimate the ICT level of individual users, especially teachers that need to improve their familiarity with ICT. The experts group is responsible for suggesting appropriate e-courses for this purpose. E-courses themselves need to be dynamic; i.e., enabling adaptation of their form based on the answers that the individual user has given in the e-questionnaire.

(c) Server System: Includes all the hardware and software that enables a Web-Server to be active and efficient. It contains the web applications (E-Questionnaire, Automatic Data Analysis for conducting E-Surveys and links to E-Courses) and an RDBMS system in which information collected through the web applications or through data analysis are stored and can be retrieved. Moreover, manual insertion of information collected through other means (hardcopy questionnaires, prior experience of the experts group, etc.) is also supported.

2. E- QUESTIONNAIRE

As already mentioned the current e-questionnaire (a) aims at conducting an e-survey on the ICT level of knowledge of teachers of special education, and (b) provides the means for estimating the ICT level of individual users (teachers) in order to propose them appropriate e-courses that will help them increase their ICT knowledge. The overall aim is to promote the wide use of ICT which offer new possibilities and solutions in the teaching-training profession. ICT, on one hand, enable teachers-trainers to increase their opportunities for continual learning and for improving their professional accreditations so as not to be excluded from the labor market themselves. On the other hand, they may prevent exclusion of high-risk learners-trainees from society and labor market by the use of computers and Internet.

The initial form of the e-questionnaire has been designed by a group of experts, coming from eight European countries, and consists of: (a) Scientists of the field of Special Education that have great experience in supervising teachers in Special Education Units, (b) Teachers of the Special Education sector, (c) Policy maker officials, (d) Data Analysts, (e) Survey designers, (f) Psychologists, (g) Software designers and (h) Distance-learning scientists. In the design of the e-questionnaire priority was given to the ability of teachers to express their attitude towards the use of ICT which is fast influencing their former status, to allow important issues to emerge through capability or inability of using ICT tools, to help them clarify their new tasks and to encourage them to use the powerful tools that ICT offers in meeting special educational needs. In particular the e-questionnaire includes sections that aim at identifying the:

- ICT level of knowledge of teachers
- Attitude of teachers with regard to the use of innovative methods and 'tools', i.e., computers, Internet and software in teaching.

- Awareness of teachers with regard to self-evaluation, self-training and life long learning possibilities.
- Identity of Organizations providing teacher training programs
- Identity and role of the teacher with respect to the increasing needs of the modern multicultural learning environment.
- Needs of special education either in mainstream or in special school units.

The proposed e-questionnaire is available on-line and can be found at http://www.image.ntua.gr/spero, *Questionnaire tab*.

3. DISTANCE LEARNING ARCHITECTURE

The e-questionnaire described in the previous section is used for ICT level estimation in the framework of the distance-learning architecture that is shown in Figure 2. This architecture is based on the *IEEE Reference Model (WG) of the Learning Technology Standards Committee* [2]. The components of the proposed e-learning architecture are categorized as follows:
Processes: learners, evaluation, e-teacher, delivery, e-survey, profile adaptation.
Store: learner records, learning resources, e-questionnaire Database, Profile Database.
Flows: learning preferences, behaviours, assessment information, performance and preference information, query, catalogue info, locators, learning content, multimedia, interaction context, statistics, update.

Learners fill in the e-questionnaire coming from the delivery process; their answers are stored as a record in the e-questionnaire database. E-questionnaire records along with learners' records enable statistics to be extracted and e-surveys to be conducted on a variety of subjects regarding e-learning, ICT familiarity and training procedures validation. At the same time the answers of the questionnaire are used to select the profile of a new user by finding the existing learner profile that best matches the current user's ICT level of knowledge and peculiarities. A new learner profile can be created or existing ones can be adapted based on the statistics of the e-questionnaire database. New learner profiles or adapted versions of them are then stored in the Profile Database. Whenever an already registered learner accesses the systems its profile is restored from the Database Profile. Change of the profile of a learner is performed based on the progress of its training.

Learning preferences are, in general, negotiated between the learner and the e-teacher. Learning preferences' negotiation has much in common with cultural adaptation and accessibility for people with physical and cognitive limitations. In the latter case an external authority can also specify learning preferences, allowing for the learning process to conform to corresponding standards.

The behaviour of the learner system component and the answers of e-questionnaire feed the evaluation process component. The first provides "raw" information about the learner's activity. It is recorded in real time and serves as an additional channel in the evaluation of courses perception. The evaluation process is

framed in the appropriate context in the basis of the information that is provided by the delivery process. The outcome of the evaluation process is assessment information (e.g., learner ICT level or grades of his e-courses) that is directed to the e-teacher, and performance information that is stored in the learner's record. Learners' records store also performance information given by the e-teacher in the form of certifications. Performance information may refer to the past (e.g., historical performance), to the present (e.g., current assessments for suspending and resuming sessions) or to the future (e.g., pedagogy, learner, or employer objectives).

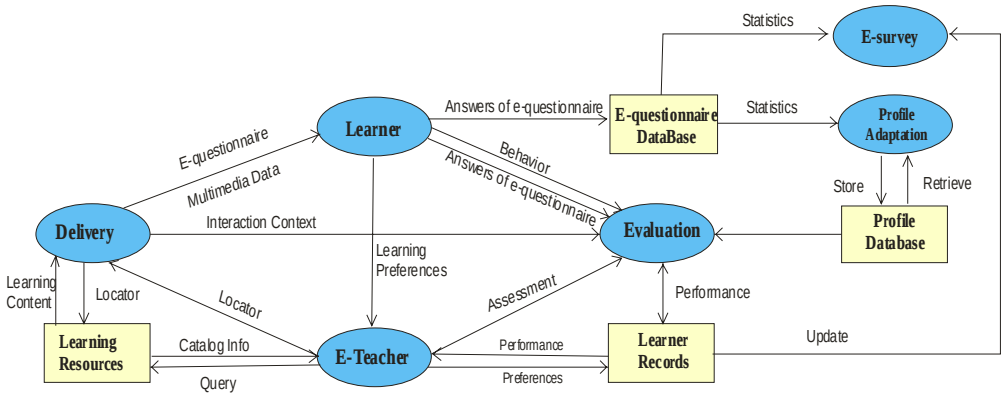

Figure 2: e-Learning System's Architecture

The e-teacher receives the current assessment information from the evaluation process and as well as performance information from learners' record to support the decision-making process for choosing future learning experiences. Based on the current assessment information and historical performance information, the e-teacher sends queries to the learning resources to search for learning content that is appropriate for the learner.

The learning resources store representations of knowledge, presentations, tutorials, tutors, tools, experiments, laboratories, and other learning materials that are used for learning experiences. The learning resources could be searched by queries. The matching information is returned as catalogue info. The locators are extracted from the catalogue info. The delivery process in order to retrieve learning content uses the locators.

The learning content data flow is a coded representation of materials that help suggesting and delivering the learning experience. The learning content is identified by the locator, retrieved by the learning resources, and transformed by the delivery system into an interactive multimedia learning experience.

The delivery process transforms information obtained via learning content into a presentation, which is then transferred to the learner in a multimedia context (presentation and questions, an intelligent tutoring system). The presentation can be

static, interactive, collaborative or involve experiments and discovery. The delivery process will receive locators from the e-teacher and will retrieve learning content from the learning resources. The delivery process will transform the learning content into an e-questionnaire or e-courses for the learner. Within an actual system implementation, the delivery process will be combined with the evaluation process to achieve the tight coupling necessary for responsive, interactive learning experiences.

The interaction context is a data flow from the delivery component to the evaluation component that could provide information (a framework) necessary for interpreting the "raw" information supplied by the behaviour data flow. The multimedia data flow is the simultaneous delivery of several types of media, such as video, audio, and graphics from the delivery process to the learner. The delivery system will transform the learning content into an interactive multimedia presentation to the learner entity.

4. CONCLUSION

In the era of Information Society surveys should not only used to record information about a particular subject in particular time instances. Their main conclusions need to be usable in a dynamic manner. In this paper we have presented how an e-questionnaire, designed for conducting a survey about the ICT level of knowledge of teachers working in the special education sector, can be used in the framework of a dynamic distance learning scheme so as to achieve user adapted learning facilities.

REFERENCES

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