Work in Progress: European Education without Borders and the Challenges for Technology as Mediator

Fanny Klett [1], Maria Joao Martins[2], Peter Pharow[3]

Abstract - **The immediate future for European education, training and lifelong learning is intimately connected with the Bologna process. The main objectives of the Bologna process are to obtain convergence of European higher education systems, and to improve student and teaching staff mobility within Europe. Against this background, the European Association for Education in Electrical and Information Engineering takes part in several Thematic Network projects financially supported by the European Union (EU). These actions are also supported by several IEEE Education Society European Chapters.**
By encountering the difficulties and showing possible solutions, this currently performed work aims at providing overview of the specific orientation in the field of Electrical and Information Engineering Education in Europe. Using new technologies for new purposes is the core of its target.

Index Terms - Globalization, Human-centered design, Future technologies for e-learning, Trust, Security, and Privacy.

INTRODUCTION

Access, widening participation and lifelong learning have now been affirmed by governments in many countries as well as the European Commission (EC) to be key elements in fostering social inclusion and in building a competitive, knowledge-based society. This can be seen both from a human capital perspective as an indispensable ingredient for European competitiveness, and from a social policy view about the persistent social imbalance in higher education.

By signing the Bologna declaration in June 1999, 29 European ministers have omitted their governments to create a European Higher Education Area (EHEA) and to promote its attractiveness to make Europe "the most competitive and dynamic knowledge-based economy in the world". The main objectives of the Bologna process are to obtain convergence of the European higher education systems, and to improve student and teaching staff mobility within Europe until 2010. The use of European and international cross-sector co-operation is smoothing the transition from education to employment for students, teaching staff in charge of developing, coordinating, monitoring and evaluating educational programs in Electrical and Information Engineering (EIE) across Europe,

administrative bodies, accreditation boards, associations, life long learning institutions, research centers, and companies.

Several of the EC initiatives aim at the promotion of the richness of EHEA including its democratic values, diversities of culture and languages, and the diversity of the higher education systems. It encourages universities and research institutions to take full advantage of this diversity, so that citizens can effectively use their individual qualifications, competencies and skills throughout the EHEA.

EHEA HARMONIZATION ACTIVITIES

Against this background, the European Association for Education in EIE (EAEEIE) takes part in several thematic network projects with the financial support of the EU. These actions are also supported by several IEEE Education Society European Chapters (Germany, France, Austria, Slovenia, etc.).

In view of the numerous activities that have been carried out over the last years, a thorough view on the boundaries of Engineering Education disciplines in Europe has been gained. The thematic network THEIERE (Thematic Homogeneity in EIE Thanks to pre-Requisites and ECTS) laid first bricks of a reference point for EIE in Europe. The THEIERE project has been finished in 2004, and a specific THEIERE dissemination project has been approved by the EC as its extension towards dissemination of results. The observation on the harmonization achievements of current European EIE Education curricula and the implementation level of the Bologna process has resulted in two monographs. [1] and [2]

The successful realization of these thematic networks' outcomes led to the next innovative step, the thematic network EIE-Surveyor (Reference Point for EIE in Europe). In this project, 109 European partners, among them companies, the EAEEIE and IEEE Education Society European Chapters, are joining their efforts to apply a tuning methodology to EIE in Europe, to identify the required competences, to create an observatory on the European EIE degrees, to monitor the level of implementation of the Bologna-process in EIE, and to propose a methodology for accreditation, in order to enhance comparability and common certification procedures. Current project results [3] refer to contents vs. competences vs. industry needs, improving students' exchanges at the doctoral level, new pedagogical approaches, quality and accreditation.

[1] Fanny Klett, Fraunhofer Institute Digital Media Technology, Ilmenau, Germany, fanny.klett@idmt.fraunhofer.de
[2] Maria Joao Martins, Instituto Superior Tecnico, Lisboa, Portugal, pcjoaom@mail.ist.utl.pt
[3] Peter Pharow, eHealth Competence Center, University of Regensburg Medical Center, Regensburg, Germany, peter.pharow@klinik.uni-regensburg.de

In support of these developments, our further aim is to tackle the future technology challenges to education, training and lifelong learning, also according to reliability issues of learning systems, by putting the user with his/her physical and emotional diversity in the center of future research directions.

TECHNOLOGY AS MEDIATOR AND IDENTIFIED PROBLEMS

We may assert from the outset that our work points out the need for balancing the top-down approach applied so far in the Bologna process, with the emerging bottom-up process in which higher education and research institutions are already playing, and must continue to play, a key role. Technological advances in line with the objectives of the Bologna process are not only emerging rapidly, but also represent challenges worthy of our full attention, as this paper hopes to prove.

Looking at learning systems from the personalization point of view, we will be able to make educational technology transparent and usable. [4] On the one hand, at the application layer the quality of information presentation (content transparency) and information access (accessibility) can be seen to vary significantly being one reason to acquire advanced research and development experience. Conversely, learning systems shortly fall in some other dimension as they provide just static human computer interfaces. There is a need to shift the emphasis on more cognitive and usability questions. This trend requires a new analysis of information and knowledge treatment in order to facilitate creating an active learning situation and to support exploratory activities. The timeline of this progress is determined by cost and regulatory factors: As education costs increase, learners' needs for beneficial courses, delivered in a human-centered way, with carefully designed responses will also increase.

The recent level of adaptation is limited usually to aspects of the user interfaces. In particular, contemporary systems:
- do not satisfactorily explore and use multi-sensory input;
- do not sufficiently recognize and adapt to the individual mental and/or physical needs of the learner;
- do not recognize and adapt to the emotional and physical state of the individual learner at various learning phases;
- lack the direct contact between the learner and the tutor;
- do not properly consider a trusted environment.

The scientific approach of future developments must be related to a broad interdisciplinary work driven by "learning pull" rather than "technology push". A methodical and dynamic infrastructure that concerns a learning system as a personalized role-based place being in the same time configurable according to individual and institutional needs, and regulatory requirements, is still missing. Thus, high-level adaptation requirements are rising. A new application based research approach [5] refers to an integrated system for education and training. This system adapts to the learners - their state, knowledge level, etc., by addressing the user as individual, human being and decision maker and systematically applying knowledge management concepts at the individual level (personal knowledge management), and the inter-personal and organizational level. Within the wider vision of e-learning as a contribution to knowledge management or knowledge development, learning materials could be seen as the outcomes of learning; the knowledge created, at all its different stages and in all its different forms. A common model for e-learning and e-knowledge architecture is useful for the users to purchase instant satisfaction and push the organization towards a forceful and comprehensive knowledge management system, in a step-wise approach.

FUTURE WORK

The further development concerns strategic directions. Addressing the user as a human being means giving due consideration to the importance of emotions for the learning activity. The interface design must be directed to provide the conditions for high personalized situations to enhance the learner's emotional involvement. Therefore, adding a vital signs-based interface to track the user's states and to detect biometric signals and speech in real-time will allow the integrated system to adequately respond to the user's state by influencing the adaptive provision of learning content, communication opportunities, and particular sequences.

Security, safety, privacy and ethics as well as cultural behavior play an important role for each type of information system. Especially systems that are designed to record, store, communicate, and process person-related data (including the category of data related to health status, user state, and emotions of persons) need to have an advanced level of security, trustworthiness, and reliability. So for these systems, security needs to be modeled as a basic part of the system right from the beginning along with a reality-prove policy definition part. Such an "user state-based" approach bases on the prediction that vital signs allow a kind of "measurement" of the user state in respect to his/her behavior and shape. The user state has obviously a huge impact on learning skills.

When fully completed the work is expected to result in scalable solutions for individual and organizational context and best practice recommendations on environments that work with tools to analyze and consider the user as individual, human being, and decision maker [5]. It will be evaluated and implemented according to the ambitious aims of EHEA.

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