GUEST EDITORIAL: Special Collection on Software Engineering for e-Learning – Part I

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In the last decade, e-learning systems have become a standard tool for training both in academia (universities, schools, for example) and in business (employee training programs, lifelong learning, for example). This situation has generated an increasing demand for services and functionalities, resulting in highly complex systems, both from a technological point of view and from the point of view of design and development. This makes it necessary to extend and adapt the general methods of software engineering to this particular field in order to design, implement and maintain these applications.

Thus, the aim of this special collection is to deal with the different aspects of software development, but particularized to the field of e-learning, bringing together, in a single publication, results regarding all the aspects raised by the systematic conception, design, development, deployment, maintenance and exploitation of e-learning systems.

The 13 papers included in this collection were selected, after a rigorous peer-review process, from a total of 28 submissions. The process ran as follows:

- For each submission, we invited at least two external reviewers who are recognized experts in the submission's field.

- We asked reviewers to perform a first preliminary review in order to assess whether the submission was within the scope of the special collection. For this purpose, the paper should be primarily focused on the technical aspects of the design, development and maintenance processes of e-learning systems, instead of on the pedagogical aspects of concrete e-learning solutions and/or approaches. As a result, some good papers without a primary focus on technological and software development aspects were rejected at this first stage.

- Those submissions that passed the first scope assessment stage were exposed to a more conventional in-depth technical and scientific review stage, focused on assessing their actual contents, evaluating originality, scientific merit, readability, and overall quality, according to the JRPIT review policy. For most of the papers that were ultimately accepted, this stage ran through several review rounds, in which reviewers proposed changes and suggestions to the authors, who in turn got the chance to submit revised versions. Only those papers for which all the reviewers made final recommendations of acceptance were finally accepted for the collection.

As a result of this process, it is our pleasure to present a high-quality collection of papers representative of the several tendencies followed in the systematic development and exploitation of e-learning systems. The collection itself is structured in two volumes.

The first volume contains seven contributions, five of which are mainly concerned with architectural and technological issues in the development of e-learning systems:

- The paper "Access Control for Shared Remote Laboratories", by Mateos *et al*, addresses the problem of authentication and authorization concerns that arises when remote experiments, to be performed in remote virtual labs, are encapsulated as reusable learning objects, which can be deployed in different off-the-shelf learning platforms (e.g. Learning Management Systems).

- The paper "Moodbile: a Framework to Integrate M-Learning Applications with LMS", by Casany *et al*, describes an innovative solution to the integration of mobile devices and e-learning platforms (Moodle, in particular) using web services.

- In the work "Design of Flexible and Open Learning Management Systems using IMS specifications. The Game•Tel experience", by Caeiro *et al*, authors address the problem of integrating external tools and applications into e-learning platforms. For this purpose they propose to use IMS-based specifications (eg., IMS LTI, IMS LIS), and exemplify their approach with the case study of the integration of external tools and applications in the Game•Tel e-learning platform.

- The work "A Framework for Rapid Prototyping of Knowledge-Based Recommender Systems in the Learning Domain", by Ruiz-Iniesta *et al*, describes an object-oriented framework that allows for the rapid development of learning object recommender systems (i.e., systems able to recommend those learning objects best suited to the specific needs of learners facing huge repositories of learning resources encapsulated in the form of reusable learning objects).

- The work "An Architecture for Retrieving and Organizing Web Resources for Didactic Purposes", by Mayorga *et al*, describes the architecture of a system based on *formal concept analysis* that can be used to search learning resources in the web. The system is designed to facilitate its integration with external e-learning platforms and authoring tools.

The other two contributions are concerned, in turn, with process and methodological concerns:

- The paper "A Distributed Collaborative System for Flexible Learning Content Production and Management", by Pardo *et al*, addresses the central problem of content production in e-learning by describing a distributed and collaborative process model based on a single source approach and on production rules that specify how to orchestrate pre-existing tools during the production process. The model is supported by a system called Adagio, developed by the authors' team.

- Finally, the paper "Hierarchical Role-based Design of Web-based Educational Systems for Blended Learning in Higher Education", by Hornos *et al*, describes a role-based approach to education system development able to capture the particular requirements of collaborative educational systems in a suitable way, and exemplifies that approach with the development of a blended learning environment for higher education called Tutor.

We would like to thank all the contributors to this Special Collection for their valuable work and for their remarkable efforts in preparing the final manuscripts. Also, we would like to thank to all the reviewers for their effort during the review process. Finally, we would like to thank Rosemary Hay for her support during the preparation of this collection, as well as the Editor-in-Chief of

BIOGRAPHICAL NOTES

José-Luis Sierra is an associate professor at the UCM's Computer Science School, where he leads the ILSA (Implementation of Language-Driven Software and Applications) Research Group (http://ilsa.fdi.ucm.es). His research is focused on the development and practical uses of computer language description tools and on the language-oriented development of interactive and web applications in the fields of digital humanities and e-learning. Professor Sierra has led, and participated in, several research projects in the fields of digital humanities, e-learning and software language engineering, the results of which have been published in over 100 research papers in international journals, conferences and book chapters. He serves regularly as reviewer / PC Member for several reputed international journals and conferences.

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