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Advances in Computer-Supported Learning

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Advances in Computer-Supported Learning

Preface

Nowadays, computers are considered one of the most important instruments for supporting the learning process. This is mainly due to the fact that they allow the use of resources with various interaction modes, the friendly interface of many of their applications (most notably the so called Web-supported applications), the variety of multimedia resources supported by them, and their crescent acceptance and utilization worldwide. Moreover, thanks to the expansion of computer networks, such as the Internet, they are an important ally to eliminate geographical barriers. These barriers are characteristics of the face-to-face learning process and impede the transference of knowledge in a massive way. In summary, computers interconnected by worldwide networks provide the required support for alternative solutions in the educational area.

Computer-supported learning (CSL) was created mainly for anyone that, due to financial, social, or geographical reasons or due to physical incapacity, could not attend a formal school. Its main goal was to facilitate the access to education to people that did not have conditions of obtaining instruction by the conventional methods. However, CSL has evolved to a much broader role in the learning process.

The use of CSL to provide education allows more flexibility in the acquisition and in the knowledge transfer than the face-to-face learning. In the current knowledge economy, the knowledge required by people is daily updated. CSL allows adapting the training materials to the current needs of the students more easily than in the face-to-face learning approach. In the latter, training materials are quickly outdated, because they are usually prepared with great antecedence. CSL also offers the necessary structure for supporting, controlling, and addressing the knowledge to a target public. CSL can be used to promote coordination and cooperation among the students themselves, as well as among the students and the instructors. Due to all that, CSL is a research area that has great practical and theoretical importance, and has rapidly grown as an area of educational practice, in both academic and business training.

Challenges Faced by CSL

It is an enormous mistake to think that the implementation of this learning modality is easier than face-to-face learning and requires less work. Its implementation is indeed a complex task, involving many factors and variables. As examples of these factors, we can cite: the great diversity of both the target public and the training goals; the variety of learning environments available today; the distinct levels of familiarity of students and instructors with the employed technology, and so forth. CSL designers need to understand this complexity and carefully plan what to do, before designing their CSL solutions.

The successful implementation of CSL trainings requires a broad comprehension of the learning requirements that should be satisfied by the training, of the audience profile and, mainly, of the technology used. This technology involves both the technology supporting the learning environment as well as the technology being used by instructors and students for interacting among themselves and with the environment. Although technology is important for supporting the CSL environment, the use of a particular technology without a well developed educational plan is frequently not effective.

Contribution of This Book

This book has an overall objective to present new technologies, applications, and research in the CSL area. It intends to help the readers to obtain a larger understanding of both the potential of this learning modality and the trends that are being followed to make CSL as much or more effective than face-to-face learning.

As said before, the implementation of CSL is not a trivial task. The accumulated experience and know-how of the researchers in this area, who have invested time and effort in studying CSL problems, are, therefore, important success factors. This book shares this know-how with the readers. Our intent is to show the current trends, practices, and challenges faced by CSL designers. These include from theoretical assumptions and empirical researches to practical implementations and case studies.

CSL is a genuinely interdisciplinary area that strives for creating a better comprehension of the requirements of the learning process that is mediated by a diverse set of computer technologies. Therefore, this book is addressed to a wide audience, including scholars, academics, educators, researchers and professors working in (higher) education and corporate education, students, and CSL beginners and experts with interest in the CSL research area. Given its

depth and breadth of coverage, this book is also of interest to researchers in the fields of education and psychology, working in various disciplines, such as education, cognition, social, and educational psychology, didacticism, and, mainly, computer science applied to education. Besides, the book is helpful for industrial trainers and business professionals entrusted with the implementation of distance learning and CSL applications.

The major scholarly value of this book is to provide a general overview of research on CSL and its applications, as well as a notion of the recent progress in this area. This overview can support future academic research with the background provided by the experts that contributed to this book. Also, it indicates to the readers what they should do (best practices) and should not do (bad practices).

In relation to the contribution to information science, technology, and management literature, one important improvement, which is provided by this book, is the discussion on new methodologies, technologies, and approaches that are being used in CSL and their advantages and challenges. The topics covered, which include the current best practices in CSL, can also stimulate the implementation and the use of CSL in higher education and industrial trainings. In addition, this book serves to highlight some of the most important gaps in the development of CSL tools, patterns of interaction, online courses, and so forth.

Organization of This Book

The book is organized into 15 chapters that are divided into three sections with five chapters each. The first section, "New Approaches for Teaching and Learning Online," presents works on innovative approaches and methodologies for undertaking CSL. It covers subjects that span from CSL design models and desirable design elements for CSL systems, to peer review and learning management systems, including a thorough description of a major initiative of integrating CSL in a traditional distance course. In the following we give a brief description of each of the chapters that comprise this section.

Chapter I, by Inan and Lowther, does a comprehensive review of CSL design models with emphasis on the key dimensions and elements of effective teaching and learning within an online environment, such as learning activities, learning environments, and assessment of student learning. The chapter highlights the trend of creating online environments that are able to support student-centered constructivist learning.

In Chapter II, Coffey proposes a set of desirable design elements for a system targeted to support distance learning. The advocated elements range from the potential benefits of having an explicit realization of a viable pedagogical theory

as the underlying basis for the software, to the value of presenting a customizable interface, and the need for allowing the share and reuse of instructional resources. These principles are further developed in the context of a prototype system that is also presented.

Chapter III, by Kern et al., discusses the important issue of peer review in education. Although the subject is discussed from a computer science education point of view, the conclusions can be easily extrapolated to other areas. By reporting on the current practice of peer review in computer science education, the authors discuss the attained results, the tools available, as well as the different approaches in use. They end up by discussing the relevant issues of a methodological approach for a continued and regular large-scale adoption of peer review.

In Chapter IV, Watson et al. discuss Learning Management Systems (LMS) as an essential technology to fulfill the educational requirements of the information age. They advocate the use of LMSs as one way to effectively support the customized learning-oriented paradigm that we face nowadays. They also discuss the directions for further growth and development of LMSs.

Chapter V, by Aydin et al., concludes Section I with a thorough description of how the Anadolu University of Turkey has integrated CSL to its traditional distance courses. Building a CSL infrastructure for approximately 1 million students is a challenging endeavor. The experience reported by the authors will certainly be useful to whoever is involved with a similar task.

The second section of the book is titled "Main Issues and Trends in CSL." It presents some of the newest issues and future trends in the CSL area. It covers new areas such as the Semantic Web and technologies for sharing and reusing instructional material. It also discusses the implementation of CSL in the corporations. A brief description of each of the chapters of this section is presented next.

In recent years we have experienced a phenomenal increase in the number of e-learning initiatives put together by both the industrial and the academic sectors. Unfortunately, many of these initiatives have fallen short of their objectives. In Chapter VI, Ertl et al. postulate three theses aiming at overcoming the disillusionment and the problems that were encountered during the initial euphoric phase of e-learning. Together, these theses provide a framework that can be used to support the implementation of successful e-learning initiatives. The authors provide examples that further substantiate the applicability of their theses in the implementation of sustainable e-learning initiatives.

The next two chapters address applications of the semantic Web on CSL. In Chapter VII, Adán-Coello et al. discuss relevant applications of semantic Web technologies in the field of education. They argue that the possibility of describing resources via the use of metadata that are suitable for being autonomously processed by computers allows the creation of self-organizing networks that

can be the core of intelligent educational systems able to reuse information and integrate learners, authors, teachers, and educational institutions. Chapter VIII, by Branco Neto, discusses the problems that arise from the gap between the visions of two communities involved with Web-based learning initiatives, namely those that study the learning process and those that design and implement CSL technologies. After presenting some of the technologies proposed by both communities, the author proposes a way to put them together with the support of semantic Web technologies.

In Chapter IX Nascimento discusses the important issue of reusing and sharing information. This chapter introduces the SCORM standards for creating skills to support the conception and development of e-learning devices. The author shows that the use of SCORM in association with new technologies and techniques such as Metadata Harvesting, XML, RSS, and Feedreaders allows the understanding of the dissemination of Open Archives initiatives and Learning Objects Repositories in a variety of contexts. This, in turn, provides a better comprehension of how to design and develop CSL contents such that they can be more efficiently stored, distributed, shared, and reused.

Concluding the second section of the book, Chapter X, by Lee et al., deals with the issue of CSL in the corporations. They define CSL in a corporate setting as the delivery of lessons to employees via the Internet or the corporation's intranet. The chapter discusses the many challenges in providing CSL in such a setting and the possible solutions.

The final section, "Coordination, Collaboration, and Communication Technologies for CSL," presents a series of chapters illustrating the new ways of coordination, collaboration, and communication that can be implemented for improving CSL. This section starts with a discussion on the role of collaboration in online learning environments. Chapter XI, by Bonk et al., reviews the nature of online collaboration from several dimensions, including the task, social, and technological ones. They emphasize the importance of awareness support into each of these dimensions and suggest key knowledge elements in each type of awareness. The chapter is concluded with examples of awareness support for online collaboration.

Then, in Chapter XII, Lucena et al. introduce an approach to develop and analyze collaborative systems based on the 3C (communication, coordination, and cooperation) collaboration model. A case study based on the AulaNet learningware tool and on the material of an information technology course is used to support the discussion.

Chapter XIII, by Khine, describes the use of a tool that enables users to participate in discussions by attaching notes to video footage in a collaborative way. The use of this type of tool is relatively recent in the educational domain. The author also describes the results of the study and the way that this tool can be

used in order to improve the interaction among learners in other training settings in CSL environments.

In Chapter XIV, Furtado et al. describe EGA (educational geosimulation architecture), which is an architecture for the development of pedagogical tools for training in urban activities. The construction of this architecture was based on MABS (multi-agent based simulation), GIS (geographic information systems), and ITS (intelligent tutoring systems). The authors advocate the advantages of this architecture to fulfill the lack of efficient tools adequate to the use in trainings of urban activities with high risk and/or high cost.

Finally, Chapter XV, by Qiu, focuses on the design tradeoffs related to the project, deployment, and authoring of interactive learning environments. Qiu describes a combination of design choices in a software tool used for authoring and delivering learn-by-doing environments.

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