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INTEGRATED INFORMATION

International Conference on Integrated Information

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CONTENTS

PREFACE: Proceedings of the International Conference on Integrated Information (IC-INFO 2011)	1
Georgios A. Giannakopoulos, Damianos P. Sakas	
Conference Details	3
Keynote Speaker	5
SYMPOSIUM ON INFORMATION AND KNOWLEDGE MANAGEMENT	6
Prof. Christos Skourlas	
Towards the Preservation and Availability of Historical Books and Manuscripts: A Case Study	8
Eleni Galiotou	
An Extensive Experimental Study on the Cluster-based Reference set Reduction for Speeding-up the k-nn Classifier	12
Stefanos Ougiaroglou, Georgios Evangelidis and Dimitris A. Dervos	
Exploiting the Search Culture Modulated by the Documentation Retrieval Applications	16
Nikitas N. Karanikolas and Christos Skourlas	
Information and Knowledge Organization: The Case of the TEI of Athens	22
Anastasios Tsolakidis, Manolis Chalaris and Ioannis Chalaris	
Providing Access to Students with Disabilities and Learning Difficulties in Higher Education through a Secure Wireless framework	26
Catherine Marinagi and Christos Skourlas	
Improving Query Efficiency in High Dimensional Point Indexes	30
Evangelos Outsios and Georgios Evangelidis	
Text Segmentation Using Named Entity Recognition and co-Reference Resolution in Greek Texts	34
Pavlina Fragkou	
KINISIS, a Graphical XQuery Language	42
Euclid Keramopoulos, Achilleas Pliakas, Konstantinos Tsekos and Ignatios Deligiannis	
Dimensionality Curse, Concentration Phenomenon and the KDB-tree	46
Nikolaos Kouiroukidis and Georgios Evangelidi	

Applying Balanced Scorecard Strategic Management in Higher Education	50
Manolis Chalaris, Anastasios Tsolakidis and Ioannis Chalaris	
A Web Portal Model for NGOs' Knowledge Management	54
Zuhal Tanrikulu	
The Digital Archives System and Application Optimized for the Tradition Knowledge Archives	58
Jeon Hong. Chan, In Deok. Hwang, Jae Hak. Park, Hyeok. Sim, U won. Gwon and Soon Cheol. Park	
A Semi-automatic Emerging Technology Trend Classifier Using SCOPUS and PATSTAT	62
Seonho Kim, Woondong Yeo, Byong-Youl Coh, Waqas Rasheed, Jaewoo Kang	
Presenting a Framework for Knowledge Management within a Web Enabled Living Lab	66
Lizette de Jager and Albertus AK Buitendag and Potjie (JS) van der Walt	
4TH SYMPOSIUM ON BUSINESS AND MANAGEMENT AND DYNAMIC SIMULATION MODELS SUPPORTING MANAGEMENT STRATEGIES	71
Dr. Damianos Sakas	
New Political Communication Practices: No Budget Events Management. The New Challenge	73
Evangelia N. Markaki, Damianios P. Sakas and Theodore Chadjipantelis	
Free Software – Open Source Software. A Powerful Tool for Developing Creativity in the Hands of the Student	78
Nasiopoulos K. Dimitrios, Damianos P. Sakas, Konstantinos Masselos	
Open Source Web Applications. How it Spread Through the Internet and their Contribution to Education.	82
Nasiopoulos K. Dimitrios, Damianos P. Sakas, Konstantinos Masselos	
Culture in Modern Times in the Frame of Luhmann's System Theory	85
Anastasia J. Chournazidis	
Managing Scientific Journals: A Cultural Viewpoint	87
Marina C. Terzi, Damianos P. Sakas, and Ioannis Seimenis	
A Conceptual Framework for Analyzing Knowledge-based Entrepreneurship	92
Nikos S. Kanellos	

SESSION ON INFORMATION HISTORY: PERSPECTIVES, METHODS AND CURRENT TOPICS	96
Prof. Laszlo Karvalics	
Emerging Research Fields in Information History	98
Laszlo Z. Karvalics	
Information Management through Elementary Data Clusters: New Observations on Pridianum-Type Roman Statistical Documents	102
Gergő Gellérfi	
Information and Secrecy on the Silk Road. Methods of Encryption of Legal Documents in Inner Asia (3th-4th century)	106
Szabolcs Felföldi	
The Role of Information and Disinformation in the Establishment of the Mongolian Empire: A Re-examination of the 13th century Mongolian History from the Viewpoint of Information History	110
Márton Gergő Vér	
Early Warning Systems and the Hospitallers in the Eastern Mediterranean	114
Zsolt Hunyadi	
Information Management as Establishment Dutch Navigational Knowledge on Japan, 1608-1641	118
Gabor Szommer	
Files Everywhere - Register and Training of Men for Military and Civil Purpose in Prussia in the early 18th century	123
Marton Holczer	
SYMPOSIUM ON INTEGRATED INFORMATION: THEORY, POLICIES, TOOLS	126
Prof. Georgios Giannakopoulos	
Approaching Information as an Integrated Field: Educating Information Professionals	128
Georgios Giannakopoulos, Daphne Kyriaki Manesi and Stryidon Zervos	
Special Libraries as Knowledge Management Centers	132
Eva Semertzaki	
Digital Libraries' Developers and their Suitability: A Case Study	136
Maria Monopoli	

A Preliminary Study for the Creation of a Greek Citation index in the Humanities and the Social Sciences (GCI – H&SS)	140
Daphne Kyriaki-Manessi and Evi Sachini	
Archiving as an Information Science. Evidence from a Survey Carried out on a Sample of Greek Students	144
Georgios Giannakopoulos and Ioannis Koumantakis	
Transition Process of E-records Management and Archiving System in Universities: Ankara University	147
S. Özlem Bayram and Fahrettin Ozdemirci	
Government Information: Access and Greece's Efforts for Access	150
Aikaterini Yiannoukakou	
School Archives and their Potentials in Teaching: Aspects of Greek Reality	156
Sonia Geladaki and Panagiota Papadimitriou	
Research on School Libraries in Greece and Suggestions on its Further Development	160
Georgios D. Bikos	
Building Digital Collections for Archeological Sites: Metadata Requirements and CIDOC CRM Extension	164
Georgios S. Gkrous and Mara Nikolaidou	
Museological Claims to Autonomous Knowledge: Rethinking the Conceptual Mode of Display and its Claims to Knowledge	169
Assimina Kaniari and Georgios Giannakopoulos	
Use of Library Loan Records for Book Recommendation	172
Keita Tsuji, Erika Kuroo, Sho Sato, Ui Ikeuchi, Atsushi Ikeuchi, Fuyuki Yoshikane and Hiroshi Itsumura	
Developing a National Database on Librarianship and Information Science. The Case of E-VIVA, the Hellenic Fulltext Database	176
Filippos Ch. Tsimpoglou, Vasiliki V. Koukounidou and Eleni K. Sakka	
Integrated Access to Cultural Heritage Information Pieces in Iran Astan-Quds Razavi's Organization of Libraries, Museums and Documents Center: A Theory of Unionization Disparate Information Assets over Imam Reza's Zarih	181
Ms. Mitra Zarei and Ms. Maliheh Farrokhnia	
Attitudes of University Librarians and Information Scientists towards the Draft Code of	185

Library Ethics to Present a Model for Final Library Ethical Codes	
Mahsoomeh Latifi, Fatemeh Zandian and Hasan Siamian	
SESSION ON OPEN ACCESS REPOSITORIES: SELF-ARCHIVING, METADATA, CONTENT POLICIES, USAGE	188
Dr. Alexandros Koulouris	
Geographical Collections in Greek Academic Libraries: Current Situation and Perspectives	189
Ifigenia Vardakosta and Sarantos Kapidakis	
Information Seeking Behavior: Factors that Affect the Behavior of Greek Astronomers	194
Hara Brindesi and Sarantos Kapidakis	
Aggregating Metadata for Europeana: The Greek Paradigm	198
Alexandros Koulouris, Vangelis Banos and Emmanouel Garoufallou	
Integrating a Repository with Research Output and Publications: The Case of the National Technical University of Athens	202
Dionysis Kokkinos	
Implementation of Workflows as Finite State Machines in a National Doctoral Dissertations Archive	205
Nikos Houssos, Dimitris Zavaliadis, Kostas Stamatis and Panagiotis Stathopoulos	
Practices of “Local” Repositories of Legally Protected Immovable Monuments. A Global Scheme for ‘Designation – Significance’ Information	209
Michail Agathos and Sarantos Kapidakis	
Integration of Metadata in BWMETA-2.0.0 Format	213
Katarzyna Zamlynska, Jakub Jurkiewicz and Lukasz Bolikowski	
SESSION ON EVIDENCE-BASED INFORMATION IN CLINICAL PRACTICE	216
Dr. Evangelia Lappa	
Applicability of Data Mining Algorithms on Clinical Datasets	218
Wilfred, Bonney	
Changing Roles of Health Librarians with Open Access Repositories	221
Christine Urquhar and Assimina Vlachaki	
From Medical Records to Health Knowledge Management Systems: The Coding to Health Sector	225
Evangelia C. Lappa and Georgios A. Giannakopoulos	

The Survey of Skill, Attitude and Use of Computer and Internet among Faculty Members	229
Hasan Siamian, Azita Bala Ghafari, Kobra Aligolbandi, Mohammad Vahedi and Gholam Ali Golafshani Jooybari	
Trends in Scholarly Communication among Biomedical Scientists in Greece	232
Assimina Vlachaki and Christine Urquhart	
SESSION ON ELECTRONIC PUBLISHING: A DEVELOPING LANDSCAPE	236
Dr. Dimitris Kouis	
E-Journal and Open Access Journal Publishing in the Humanities: Preliminary Results from a Survey among Byzantine Studies Scholars	238
Victoria Tsoukala and Evi Sachini	
Preliminary Results on a Printed VS Electronic Text Books Assessment Through Questionnaire	242
Dimitrios A. Kouis and Kanella Pouli	
An Interpretation of Aristotelian Logic According to George Boole	246
Markos N. Dendrinis	
SESSION ON INFORMATION CONTENT PRESERVATION AS OUTCOME OF CONSERVATION OF CULTURAL HERITAGE: ETHICS, METHODOLOGY AND TOOLS	251
Prof. George Panagiaris and Dr. Spiros Zervos	
Intrinsic Data Obfuscation as the Result of Book and Paper Conservation Interventions	254
Spiros Zervos, Alexandros Koulouris and Georgios Giannakopoulos	
Mass Deacidification: Preserving More than Written Information	258
Michael Ramin, Evelyn Eisenhauer and Markus Reist	
Information Literacy of Library Users: A Case Study of Mazandaran Public Library Users, Iran	260
Hussein Mahdizadeh and Hasan Siamian	
The Narratives of Paper in The Archives of the New Independent Greek State (Mid 19th c.)	264
Ourania Kanakari and Maria Giannikou	
From Macro to Micro and from Micro to Nano: The Evolution of the Information Content Preservation of Biological Wet Specimen Collections	268
Nikolaos Maniatis and Georgios Panagiaris	

Digital images: A valuable scholar's tool or misleading material?	272
Patricia Engel	
Attitudes of University Librarians and Information Scientists Towards the Draft Code of Library Ethics to Present a Model for Final Library Ethical Codes	277
Mahsoomeh Latifi, Fatemeh Zandianand and Hasan Siamian	
Investigation of the Degradation Mechanisms of Organic Materials: From Accelerated Ageing to Chemometric Studies	280
Ekaterini Malea, Effie Papageorgiou and Georgios Panagiaris	
SESSION ON DIVERGENCE AND CONVERGENCE: INFORMATION WORK IN DIGITAL CULTURAL MEMORY INSTITUTIONS	285
Dr. Susan Myburgh	
Extending Convergence and Divergence in Cultural Memory Institutions: The Old Slave Lodge in the New South Africa	287
Archie L Dick	
The Transfer of Knowledge from Large Organizations to Small: Experiences from a Research Project on Digitization in Wales	289
Clare Wood-Fisher, Richard Gough, Sarah Higgins, Menna Morgan, Amy Staniforth and Lucy Tedd	
The Usage of Reference Management Software (Rms) in an Academic Environment : A Survey at Tallinn University	293
Enrico Francese	
Varialog : How to Locate Words in a French Renaissance Virtual Library	297
Marie-Hélène Lay	
The Urge to Merge: A Theoretical Approach	301
Susan Myburgh	
SYMPOSIUM ON ADVANCES INFORMATION FOR STRATEGIC MANAGEMENT	304
Professor Nikolaos Konstantopoulos	
Empowerment in the Tax Office of Greece	306
Antonios E. Giokas and Nikolaos P. Antonakas	
Building Absorptive Capacity Through Internal Corporate Venturing	310
Ioannis M. Sotiriou and Alexandros I. Alexandrakis	

The Monitoring Information System (M.I.S.) - An information and Management System for Projects Co-financed Under the National Strategic Reference Framework (NSRF) and the Community support framework (CSF)	314
Catherina G. Siampou, Eleni G. Fassou and Athanassios P. Panagiotopoulos	
Corruption in Tax Administration: The Entrepreneurs View Point	318
Nikolaos P. Antonakas, Antonios E. Giokas and Nikolaos Konstantopoulos	
Conflicts between the IT Manager and the Software House after the Strategic Choice of Outsourcing of the Information Processes in Maritime Companies.	322
Anthi Z. Vaxevanou, Nikolaos Konstantopoulos, Damianos P. Sakas	
Contemporary Forms of Ordering Between the Supply Department and Ship Chandler Companies in the Shipping Industry	325
Anthi Z. Vaxevanou, Nikolaos Konstantopoulos, Damianos P. Sakas	
Strategies Implemented and Sources Used for the Acquisition of Information on Foreign Markets	329
Myropi Garri, Nikolaos Konstantopoulos and Michail G. Bekiaris	
The Effect of High Performance Working Systems on Informative Technology in Enterprises after Organisation Changes such as Mergers & Acquisitions	333
Nikolaos Konstantopoulos and Yiannis Triantafyllopoulos	
Personnel's Absorptive Capacity as a Guiding Concept for Effective Performance in Informative Technology	337
Nikolaos Konstantopoulos and Yiannis Triantafyllopoulos	
SESSION ON CONTEMPORARY ISSUES IN MANAGEMENT: ORGANISATIONAL BEHAVIOUR, INFORMATION TECHNOLOG, EDUCATION & HOSPITAL LEADERSHIP	341
Dr. Panagiotis Trivellas	
Investigating the Importance of Sustainable Development for Hotel SMES	343
Panagiotis Reklitis and Anestis Fotiadis	
Strategic Alignment of ERP, CRM and E-business: A Value Creation	347
Catherine C. Marinagi and Christos K. Akrivos	
The Impact of Occupational Stress on Performance in Health Care	351
Panagiotis Trivellas Panagiotis Reklitis and Charalambos Platis	

The Impact of Emotional Intelligence on Job Outcomes and Turnover Intention in Health Care	356
Panagiotis Trivellas Vassilis Gerogiannis and Sofia Svarna	
SYMPOSIUM ON BUSINESS MANAGEMENT AND COMMUNICATION STRATEGIES SUPPORTING DECISION MAKING PROCESS IN TOURISM SECTOR	360
Dr. Panagiota Dionysopoulou	
The Human Factor as a Mediator to the Total Quality in the Tourism Companies. The impact of Employees' Motivation to Quality Improvements	362
Christos K. Akrivos and Panagiotis Reklitis	
Tourist Destination Marketing and Management Using Advanced ICTS Technologies	365
Anastasia Argyropoulou, Panagiota Dionyssopoulou, Georgios Miaoulis	
G.N.T.O. (Greek National Tourism Organization) Communication Strategy in Advertising Campaigns 1991-2006	370
George Stafylakis and Panagiota Dionyssopoulou	
GENERAL PAPERS	375
The role of Environmental Education within the Framework of the Environmental Policy of a Regional Municipality	376
Vassiliki Delitheou and Dimitra Thanasia	
Issues of Social Cohesion: A case study from the Greek Urban Scenery	380
Evgenia Tousi	
Merging Activity and Employee Performance: The Greek Banking System	384
Panagiotis Liargovas and Spyridon Repousis	
Sustainable Development and Corporate Social Responsibility in Higher Education: Some Evidence from Greece	387
Anastasios Sepetis and Fotios Rizos	
Exploring the Effects of Organizational Culture on Collaborative vs. Competitive Knowledge Sharing Behaviors	395
Hanan Abdulla Mohammed Al Mehairi and Norhayati Zakaria	

Preface: Proceedings of the International Conference on Integrated Information (IC-ININFO 2011)

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Aims and Scope of the Conference

The International Conference on Integrated Information 2011 took place in Kos Island, Greece, between September, 29 and October, 3, 2011. IC-ININFO is an international interdisciplinary conference covering research and development in the field of information management and integration.

The conference aims at creating a forum for further discussion for an Integrated Information Field incorporating a series of issues and/or related organizations that manage information in their everyday operations. Therefore, the call for papers is addressed to scholars and/ or professionals of the fields of Library and Archives Science (including digital libraries and electronic archives), Museum and Gallery Studies, Information Science, Documentation, Information Management, Records Management, Knowledge Management, Data management and Copyright experts the latter with an emphasis on Electronic Publications. Furthermore, papers focusing on issues of Cultural Heritage Management and Conservation Management are also be welcomed along with papers regarding the Management of Nonprofit Organizations such as libraries, archives and museums.

One of the primary objectives of the IC-ININFO will be the investigation of information-based managerial change in organizations. Driven by the fast-paced advances in the Information field, this change is characterized in terms of its impact on organizations that manage information in their everyday operations.

Grouping emerging technologies in the Information field together in a close examination of practices, problems and trends, IC-ININFO and its emphases on integration and management will present the state of the art in the field. Addressed jointly to the academic and practitioner, it will provide a forum for a number of perspectives based on either theoretical analyses or empirical case studies that will foster dialogue and exchange of ideas.

Topics of general Interest

Library Science, Archives Science, Museum and Gallery Studies, Information Science, Documentation, Digital Libraries, Electronic Archives, Information Management, Records / Document Management, Knowledge Management, Data Management, Copyright, Electronic Publications, Cultural Heritage Management, Conservation Management, Management of Nonprofit Organizations, History of Information, History of Collections, Health Information

Symposia

The Conference offered a number of sessions under its patronage, providing a concise overview of the most current issues and hands-on experience in information-related fields.

- Symposium on Integrated information: Theory, Policies, Tools
- 4th Symposium on Business and Management and Dynamic Simulation Models supporting management strategies

- Session on Open Access Repositories: Self-archiving, Metadata, Content policies, Usage
- Session on Evidence-Based Information in Clinical Practice
- Session on Business Management and Communication Strategies supporting Decision Making Process in Tourism Sector
- Session on Electronic Publishing: A Developing Landscape
- Session on Information and Knowledge Management
- Session on Information Content Preservation as Outcome of Conservation of Cultural Heritage: Ethics, Methodology and Tools
- Session on Advances Information for Strategic Management
- Session on Information History: Perspectives, Methods and Current Topics
- Session on Divergence and Convergence: Information Work in Digital Cultural Memory Institutions
- Session on Contemporary issues in Management: Organisational Behaviour, Information Technology, Education & Hospital leadership.

The wide range of aspects that the sessions covered, highlighted future trends in the Information Science.

Paper Peer Review

More than 300 papers had been submitted for consideration in IC-ININFO 2011. From them, 91 were selected for presentation, after peer review in a double blind review process. The accepted papers were presented at IC-ININFO 2011.

Thanks

We would like to thank all members that participated in any way in the IC-ININFO 2011 Conference and especially:

- The famous publishing house Emerald for its communication sponsorship.
- The co-organizing Universities and Institutes for their support and development of a high-quality Conference scientific level and profile.
- The members of the Scientific Committee that honored the Conference with their presence and provided a significant contribution to the review of papers as well as for their indications for the improvement of the Conference.
- All members of the Organizing Committee for their help, support and spirit participation before, during and after the Conference.
- The Session Organizers for their willing to organize sessions of high importance and for their editorial work, contributing in the development of valued services to the Conference.
- PhDC Marina Terzi for her excellent editorial work, contributing in the production of the Conference proceedings.

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KEYNOTE SPEAKER



Professor Amanda Spink

Professor Amanda Spink has published over 340 scholarly journal articles, refereed conference papers and book chapters, and 6 books. Many of her journal articles are published in the Journal of the American Society for Information Science and Technology, Information Processing and Management, and the Journal of Documentation. She is Editor of the Emerald journal Aslib Proceedings. Amanda's research has been published at many conferences including ASIST, IEEE ITCC, CAIS, Internet Computing, ACM SIGIR, and ISIC Conferences. Her recent books include Information Behavior: An Evolutionary Instinct and Web Search: Multidisciplinary Perspectives, both published by Springer. Amanda's research focuses on theoretical and empirical studies of information behavior, including the evolutionary and developmental foundations. The National Science Foundation, the American Library Association, Andrew R. Mellon Foundation, Amazon.com, Vivisimo. Com, Infospace.com, NEC, IBM, Excite.com, AlltheWeb.com, AltaVista.com, FAST, and Lockheed Martin have sponsored her research. In 2008 Professor Spink had the second highest H-index citation score in her field from 1998 to 2008 [Norris, M. (2008)]. Ranking Fellow Scholars and their H-Index: Preliminary Survey Results. Loughborough University, Dept of Information Science Report].

Providing Access to Students with Disabilities and Learning Difficulties in Higher Education through a Secure Wireless Framework

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Abstract: *In this paper we focus on the design and implementation of adaptive learning environments in Higher Education, accessible by students with disabilities and learning difficulties. Assistive technology, and especially mobile learning, is used for the establishment of the communication between learner and teacher, mainly, in the mainstream class. We discuss the establishment and operation of parallel “assistive” classes for specific topics and specific groups of students and needs. The architecture of Secure Wireless Infrastructures and Personalized Educational Learning Environments (SWI_PELE) is also presented and the collaboration of such environments is discussed. This architecture includes a scheme of servers and incorporates wireless infrastructure, and personalized, multimedia based educational course material. Mobile devices and PDA’s are integrated in educational scenarios to support various activities, such as giving lectures in the mainstream class, attending classes, working in the laboratory and participating in assessments and exams.*

Keywords: *Adaptive learning, Personalized learning, Architecture for educational technology systems.*

I. INTRODUCTION

In Higher Education, students with disabilities and learning difficulties need personalized education in adaptive learning environments. In the e-learning and mobile learning (m-learning) context, the term Assistive Technology (AT) refer to devices, assistive computer programs and computer-based services that help students with disabilities to perform tasks and activities. Therefore, various types and levels of AT for students can include: 1) devices such as Personal Digital Assistants (PDAs) for supporting m-learning, 2) assistive computer programs, such as Text-To-Speech programs reading aloud documents that blind people have typed or dyslexic students retrieved into their computers, 3) Web-based Database Systems and Information Retrieval Systems, such as portals storing lessons, multimedia educational material, bibliography, legislation related to disabilities, news, links to other sources, as well as offering accommodative user interface, personalized access of information, visualization of results, and 4) communication services, such as mobile telephone services that allow a disabled person to communicate with teachers.

In the past the use of AT based services was restricted by the location of use. Lately, PDAs, smart phones and hand held PCs provide a new heterogeneous use of services that includes the whole territory of campus, the town square, etc. (Burzagli *et al.*, 2009).

Wireless technology including ad-hoc networks, mobile and ubiquitous environments, offers enhanced, cheap and reliable assistive technology for the Deaf and Hard of Hearing (D-HH) persons. Assistive computer programs can be executed on PDAs; ad-hoc networks of PDAs can offer access to databases of interest; PDAs can ensure communication between users through e-mail, chat, etc. The new networking paradigm that emerged with the appearance of wireless computing can boost the performance of systems in which they get applied. (Belsis *et al.*, 2008).

The integration of multimedia features in the teaching content and the application of multimedia enhanced teaching methodologies arise as an interesting challenge (Belsis *et al.*, 2005). Combining efficient learner’s requirements elicitation with personalization techniques throughout the design and delivery of the instructional material is an extremely important aspect for providing adaptation to the needs and interests of individual learning groups (Belsis *et al.*, 2008). Learners with the cognitive disability of dyslexia, and Deaf and Hard-of-Hearing (D-HH) students constitute learning groups which can be greatly benefited by Information and Communication Technologies (ICT). Research on adaptive learning indicated that learner’s interests, ability, and cognitive characteristics greatly influence learning effectiveness (Kalyuga, 2007).

Accommodative Learning Environments offer various possibilities of assistance. They, usually, generate the appropriate user profiles, and adapt provision of services and presentations according to these profiles. They combine pedagogical and technological efforts, and use semantics and knowledge to monitor the context of learning (Skourlas *et al.*, 2009). AGENT-DYSL programme (Project Agent-DYSL, 2006) aims to support inclusive learning in the mainstream class using text-to-speech programs, spell-checkers and controller, structured presentation of reading, etc. (Schmidt and Schneider, 2007).

This work reports on the design and implementation of a wireless learning system in Higher Education for including students with disabilities and learning difficulties to mainstream class. We present the architecture of Secure Wireless Infrastructures and Personalized Educational Learning Environments

(SWI_PELE) and discuss the collaboration of such environments. Previous work that has been reported includes a brief description of the architecture of Personalized Educational Learning Environments (PELE) (Marinagi *et al.*, 2010a) and some experimental results from a first evaluation of the system (Marinagi *et al.*, 2010b).

The remainder of this paper is organized as follows: In Section II we firstly present the requirements of system architecture. Then we present various system utilization scenarios, where special emphasis is given to security issues related to the intercommunication between different learning domains and units. In the following we describe the architecture of secure wireless infrastructures for personalized educational learning environments and we explain the role of the servers that were implemented for educational services. Section III presents some conclusions and future perspectives.

II. A FRAMEWORK FOR SWI_PELE

Educational information is highly sensitive in the case of examinations and assessments using PDAs, enrolments, accessing grades, etc.; thus, we have to design our applications in order to demand less processing and network bandwidth resources, without though decreasing our privacy requirements (Skourlas *et al.*, 2009; Vassis *et al.*, 2009).

A. System architecture requirements

The main requirements for Secure Wireless Infrastructures and Personalized Educational Learning Environments (SWI_PELE) are the following:

1) Sensitive educational information and data include answers to specific assignments and exams tests, marks, assessments (and self-assessments) and evaluation (of lectures, students, teachers, and learning cases). Therefore, systems' architecture can provide authorized access and privacy preservation. In order to transmit sensitive data wirelessly a shared key encryption approach must be used so as to achieve a lightweight implementation (Skourlas *et al.*, 2009).

2) Pervasive infrastructures are characterized by Network topology instability due to two factors: node mobility and node failure. System architecture must support and provide constant connectivity for as long as possible. Decentralization of processing and communication tasks are used. This can be done using advanced algorithms which allow the nodes in the network to act collectively as a distributed server (Maltras *et al.*, 2005).

3) For specific sensitive activities, e.g. examinations in the laboratory, administrative services, access control management seems to be important. In order to apply access control, we have also conducted experiments adopting the simple and widely acceptable security standard Role Based Access Control Model (RBAC). This is a standardised model which allows the assignment of permissions to resources according to the role that the user is granted to. For example all students

are granted similar permissions (Access specific resources).

4) Integration of the IT infrastructures between learning domains or units and improvement of the collaboration of the learning environment with other ones.

B. Utilization Scenarios and Security issues

Fig. 1 illustrates a scalable, distributed architecture, which can support various learning environments and domains. It consists of a wireless network which spans along the campus, and in specific consists of different subnets which communicate, each with its local policy enforcement and authentication module. For access control enforcement and authorization in distributed environments the architecture uses a standardized policy model based on the Role Based Access Control Model (RBAC).

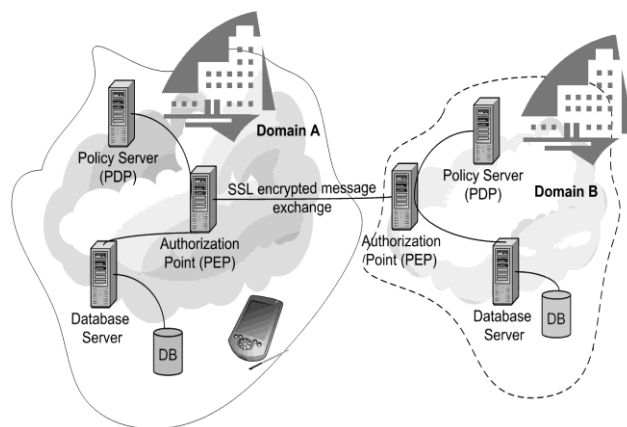


Figure 1. Overview of the secure multi-domain framework of learning environments and infrastructures.

We can present and discuss various System Utilization Scenarios (use cases). A simple, representative one is given:

A D-HH student within the class s/he attends or in her/his place wants to access some basic notes regarding the teacher's presentation or a previous learning unit stored in the multimedia database. The student sends a request from her/his PDA to retrieve the data from the database. Since the requested resource is not a critical one, only the permissions of the requester are evaluated against the local policy and no encryption is used.

In the case of examinations or assignments, when a request is sent to the server, in order to authorize or not the request, the server needs to identify the learner's identity as well as to evaluate the permissions which have been granted to the learner for the specific activity. First it requests a validation of the learner's id.

This can be implemented using public key encryption techniques. Using the learner's public key and the server's private key, the two parties may authenticate each other and they can exchange a (shared) session key which will be used to encrypt all further communications. If private key encryption

techniques were used for the transmission of all messages a lot more computational resources would be demanded.

The learner's device is able to identify its location with the aid of a beacon that sends signed messages identifiable by the learner's device when compared to a number of stored signed messages. Thus, we prevent unauthorized transmission or reception from the device, when it resides outside the pre-settled space boundaries.

After authentication has been performed and the session key has been exchanged, all communication can be encrypted end to end from the database to the learner's device using the Secure Sockets Layer (SSL) protocol. When a new request is sent to the database, the policy module is invoked to examine the request, the requester's role and the privileges which have been recorded in the policy. This procedure is supported by most of modern devices, which handle effectively at least 128-bit encryption.

C. System architecture description

The mainstream class in Fig. 2 illustrates the use of the wireless infrastructure offered to D-HH and dyslexic students. You can see two important actors: teacher and teacher assistant. Teachers' multimedia presentations are appeared on the interactive whiteboard and everything written on it can be saved. Assistant can play a key role because s/he communicates (chat based communication) with D-HH students for question-answering, during the lecture. We must mention that the assistant does not know Sign Language (SL).

Another interesting actor is a hearing (volunteer) notes' taker. This role is complementary and s/he takes notes apart from the existence of the interactive whiteboard, which saves presentations and text written by the teacher. You must also notice that between students there are D-HH and dyslexic ones. In order to see presentations, the D-HH students use PDAs or PCs and the dyslexic students use PCs. Dyslexic students have the possibility to adapt user interface according to their preferences and needs. Both students have the option to access more information and multimedia material locally or access other servers out of the classroom. It is assumed that, in the initial stage, they fill forms with personal details (if they want to participate), and documents for the personalized access to the multimedia information and for the adaptation of the interface according to their needs. Privacy of all these personal details is ensured (see Fig. 1).

In Fig. 2, a parallel, "assistive" class is also illustrated. A major difference is that, there is an interpreter in the classroom, which plays a key role. In the parallel class there is neither teaching assistant, nor notes' taker. Hearing volunteers and hearing students are included. Another interesting point is that the presentations and related discussion are recorded for later study. In this case, teaching is based on bilingual presentations. We have also carried out successful experiments to establish communication between the

mainstream class and parallel classes, and communication between two parallel classes where there is only one interpreter. The organizational scheme depicted in Fig. 2 can support bilingual teaching, synchronous e-learning and m-learning, and communication. Fig. 2 also illustrates the establishment of a scalable environment including three servers (personalization server, communication server, and database server) and multimedia database of lessons, documents, bibliography. Therefore, the scheme enables asynchronous distance learning and personalized access to distributed databases of educational documents and information. Teacher can exploit this possibility to add material: documents, assignments, small projects, examination tests, results, etc. Personalized services to students are supported through the personalized server and the whole scheme ensures the privacy of the personal details. Data related to the usage of the system (the personalized service) are used to dynamically change user models (profiles).

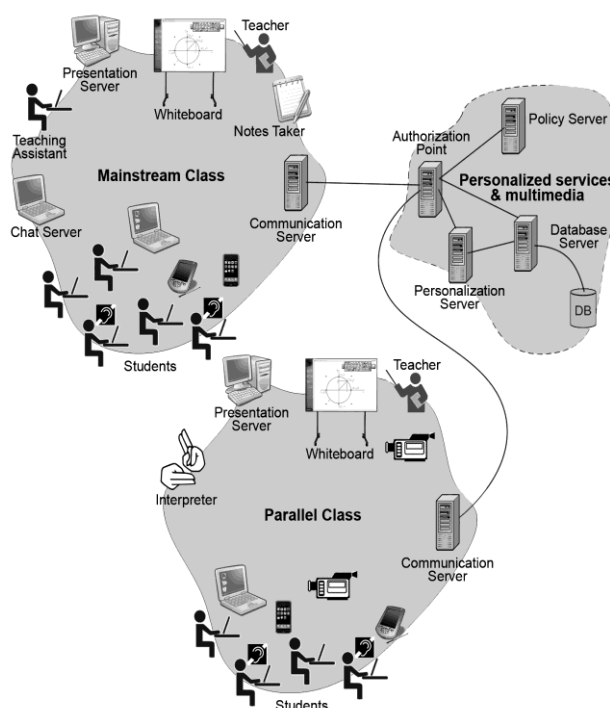


Figure 2. Organizational scheme for supporting teaching and personalized services.

D. The role of servers

In Fig. 2 various servers of multimedia information and data are depicted. These servers were implemented as a part of our research for educational services for dyslexic and D-HH students and support teaching, learning, and personalized access to multimedia information, lessons and documents:

- 1) Servers of Multimedia Educational and Learning material

A distributed multimedia database of lessons, assignments, small projects, selected bibliography and bibliographic data, grey bibliography and educational material is hosted. Videos in Greek SL are also given.

2) Servers for supporting the inclusion of dyslexic and D-HH students in the mainstream class

During the lecture, dyslexic and D-HH students can access the slides of the teacher's presentation in their PC or PDA, see teacher's notes and also previous slides of the ongoing presentation. D-HH students can watch related video in Greek SL in the case that there is not any interpreter available in the class. Dyslexic students can use earphone to hear the content of the slides and they can modify the user interface according to their preferences and needs.

3) Personalization server

Our experiments mainly include individual users (learners) models. These models are dynamically adaptive to the use of the system. User (learner) models contain personal information about the users, as provided during the registration and information related to their preferences of sources and categories.

III. CONCLUSIONS

In this paper we concerned with the design of adaptive learning environments that enable accessibility for students with disabilities and learning difficulties. We presented the architecture of Secure Wireless Infrastructures and Personalized Educational Learning Environments (SWI_PELE) and the collaboration of these environments. The issue of security is crucial in case of examinations and assignments. Thus, we proposed a secure multi-domain framework which can support various learning environments and infrastructures. Moreover, we described an implemented scheme of servers for educational services. We proposed both the use of blended learning and personalized learning based on parallel classes and servers of multimedia lessons.

In conclusion, wireless networks and PDAs form an attractive and helpful framework for supporting students with disabilities, especially Deaf and Hard of Hearing (D-HH) students, as well as students with learning difficulties, such as dyslexic students.

Of primary interest, for the future, is the further experimentation with stereotypes of Dyslexic, D-HH students for the mainstream class and for accessing educational information and material. Research on various aspects of the user communities of learners is also planned for accessing educational information, material and bibliography.

REFERENCES

[Belsis, P., G. Pantziou, C. Skourlas and J. Varnas, "Supporting Academic Courses through Multimedia Enhanced Content Deployment," *Proc. International Conference on Multimedia, Image Processing and Computer Vision, IADIS, Madrid, Spain.* \(2005\).](#)

[Belsis, P., C. Sgouropoulou, K. Sfikas, G. Pantziou, C. Skourlas, J. Varnas, T. Alevizos and V. Tsoukalas, "Exploiting Distance Learning Methods and Multimedia-enhanced instructional content to support IT Curricula in Greek Technological Educational Institutes," *Proc. 6th International Networked Learning Conference \(NLC08\), Thessaloniki, Greece* \(2008\).](#)

[Burzagli, L., P.L. Emiliani and F. Gabbanini, "Design for All in action: An example of analysis and implementation," *Expert Systems with Applications* **36**, 985-994 \(2009\).](#)

[Kalyuga, S., "Expertise reversal effect and its implications for learner-tailored instruction," *Educational Psychology Review*, **19/4**, 509-539 \(2007\).](#)

[Malatras, A., G. Pavlou, P. Belsis, S. Gritzalis, C. Skourlas and J. Chalaris, "Secure and Distributed Knowledge Management in Pervasive Environments," *IEEE International Conference on Pervasive Services*. V. Kalogeraki \(Ed.\), IEEE, 79-87, \(2005\).](#)

[Marinagi C.C., P. Belsis, and C. Skourlas, "Designing a wireless learning system for including students with disabilities to mainstream class," *Proc. 6th National & International HSSS Conference "Systemic Approaches in Social Structures"*, June 23-26, Mytilene, Greece \(2010a\).](#)

[Marinagi C.C., F. Sarinopoulou and C. Skourlas, "A learning system for the adaptive evaluation of Deaf and Hard-of-Hearing students," *Proc. 5th International Scientific Conference eRA-5*, September 15-18, Athens, Greece, 540-545 \(2010b\).](#)

[Schmidt, A. and M. Schneider, "Adaptive Reading Assistance for Dyslexic Students: Closing the Loop," *Proc. 15th workshop on adaptivity and user modelling in interactive systems*, Halle \(2007\).](#)

[Skourlas, C., P. Belsis, F. Sarinopoulou, T. Tzolakidis, D. Vassis and C. Marinagi, "A Wireless Distributed Framework for Supporting Assistive Learning Environments," *Proc. Workshop Assistive Healthcare & Educational Technologies for special target groups*. ACM Press, Corfu, Greece \(2009\).](#)

[Vassis, D., P. Belsis, C. Skourlas and S. Gritzalis, "End to end secure communication in ad-hoc assistive medical environments using secure paths," *Proc. 1st Workshop on Privacy and Security in Pervasive e-Health and Assistive Environments*. ACM Press, Corfu, Greece \(2009\).](#)