

A chronicle on the collaboration of computer and information scientists in a Library Science Department

Christos Papatheodorou* and Sarantos Kapidakis
Laboratory on Digital Libraries and Electronic Publishing,
Department of Archive and Library Sciences
Ionian University
Palaio Anaktoro, Eleftherias Sq. 49 100 Corfu, Greece
{papatheodor, sarantos}@ionio.gr

Abstract.

The relation between Information and Computer sciences was always interactive. The exponential growth of the information and communication technologies during the last decades was exploited by the information/memory organizations to develop reliable and useful information services and disseminate easily and user-friendly information to all over the world. This evolution empowered the relations of both scientific communities, which produce in common research results and recently decided to establish or merge computer and information science schools. This paper presents the activities of the Digital Library and Electronic Publishing Laboratory of the Department of Archive and Library Sciences, Ionian University, Greece and describes instances from the collaboration of computer and information scientists employed by a variety of organizations such as Libraries, Archives and Records Management services, Museums, etc. The development of powerful large-scale systems and services makes evident that the interaction of the laboratory with the Greek information science community is creative and fruitful.

Keywords: Digital Libraries, Information services, Information Science education, computer science, scholar communication.

1. Introduction

The value of information is indubitable especially in the current era. Human beings are characterized as informavore [13] since all the human activities are based on the valid and up to dated information. However the information owners or providers should develop services offering reliable, useful, complete and integrated information. The information that refers to an object or concept is useful when it is easily perceived by the users and relevant to their needs, reliable when it is the documented and proven true, while complete and integrated when the information is the result of a processing or correlation of data from different and heterogeneous sources.

The development of qualitative information services confronts many difficulties that have been already presented by many researchers. Some of the issues originate by the information overflow phenomenon, which depends on the technological development [1,12]. As the information and communications technology facilitates e-publishing and access procedures, the web augments exponentially including a plethora of heterogeneous and of ambiguous quality documents.

Therefore there is need for the development of qualitative, added value, personalized services, capable to help the users to their information seeking process. Indeed during the last decade the archives, libraries museums and in general the information organizations

* Corresponding author, tel:+30-26610-87419, fax: :+30-26610-87433

and centers exploit the power of new technologies and develop services aiming to provide valid, up to date, reliable and useful information to every citizen. This evolution has a recursive character: The technological evolution caused a generation of new user requirements for advanced services and the development of such services requires the cooperation of scientists who are educated to manage documents and information in any format.

The relation between information and computer sciences was always interactive [11]. In the past the role of computer science was supportive. Information scientists were developing standards for information encoding and exchange and services while computer scientists were offering efficient methods and tools for the implementation of databases, based on the established standards, and information retrieval mechanisms to support the services. Due to the close cooperation between the two scientific domains information providers develop services employing groups including professionals from the both disciplines.

Nowadays the relation is more qualitative. The technological progress caused the advent of digital libraries and the computer science introduced and offered new concepts (e.g. metadata, information architecture, etc.), functions and vision to information services (e.g. multimedia collections, news filtering, etc.). This interaction upgraded both the sciences, which produce in common research results and it is difficult to discriminate their borders. As a result the two scientific communities recently decided to establish computer and information sciences schools and faculties (e.g. University of Strathclyde, Glasgow, UK) fulfilling in practice the social and scientific demand for a common development.

In this international context the Greek information science community decided to incorporate computer scientists as faculty members in its university and higher education library schools. The Department of Archive and Library Sciences, Ionian University, Corfu, Greece, the unique university level information science school in Greece, incorporated in its faculty six computer scientists as members (more than the one third of the faculty!) planning to develop powerful cooperation in order to adapt its profile to the current scientific trend and fulfill the professional and social requirements.

In this paper, we present the activities of the Digital Library and Electronic Publishing Laboratory of the Department of Archive and Library Sciences, at the Ionian University and we explore the degree of cooperation with the library science staff as well as scientists from other cultural heritage domains such as Archives and Records Management, Museum Science, Art History, Musicology, etc. In the next section we present the environment in which the laboratory operates, i.e. the Department of Archive and Library Sciences. In section 3 we classify the educational and research activities of the laboratory, while in section 4 we present the existing collaborations with other institutions and we discuss the possibilities for extending them in the Greek and the international environment. Finally the paper concludes with the future directions that the information science community has to focus on.

2. The Department profile

This section does not aim to analyze in detail the curriculum of the department but to describe the context in which the interaction between the computer and information scientists. The Department of Archive and Library Sciences was founded in 1993 aiming to educate scientists able to generate, organize and manage archival, library and museum collections. The department focuses its research and education activities on the domains of book and information science, archives and records management as well as on museum science. The department curriculum includes close to 95 courses, classified in the following categories:

- Content management and processing. The department expertise spreads to all the material types (public and organizational records, archival collections, books, manuscripts, museum objects, etc.) and the educational process pivots on domains concerning the material processing principles, standards, policies and procedures, as well as the material and information sources organization and preservation.
- Information and knowledge management. The management of information of every format (printed, electronic, multimedia, etc.) is the other main axe of the department's activities and incorporates the domains of information and metadata production, databases and information systems development, information storage and retrieval, etc.
- Decision support. The management of information and cultural services pivots on a variety of domains such as information policies, information services management, rights management, and other general education courses that upgrade the students general knowledge and grow up their thinking, such as psychology, national and international political and state history, history of sciences, language and literature, etc.
- General Education. These courses give our students a background on many other areas, with more emphasis towards computers and communication technologies, as well as history and civilization.

The information and communications technologies are a major part of the department's curriculum consisting almost of the 15% of the offered courses. These courses aim to offer to the students the technical knowledge background capability for developing and managing large scale information services.

Four years ago the department started two MSc programs on Information Science. The first program focuses on the information services in the digital environment, while the second on information services management issues under the view of the information technologies bang. For the second program the department is cooperating with the department of Library and Information systems of the Technological Education Institution (TEI) of Athens, Greece. Of course this cooperation has many benefits for both the departments since there is the chance for the faculty staff to interact with each other and collaborate in educational and research issues.

The majority of the graduate students are librarians, holding their BSc from the three Library and Information Sciences departments of the country (the University level

Department of Archive and Library Sciences and the two Library and Information Systems departments of the Technological Education Institution of Athens and Thessaloniki correspondingly). However there exist a respectable number of graduate students that origins from a variety of scientific domains such as Electrical and Computer Engineering, Computer Science, Mathematics, Sociology, Economics, Business Administration, etc. Since both the programs focus on the impact of the new technologies to the information science, it is obvious that the role of the computer scientists is critical. Actually all the computer science faculty staff teaches graduate courses and supervises most of the MSc theses.

Finally the department has founded three research laboratories aiming to aggregate systematically and organize with flexibility and effectiveness the various research and development activities and projects that it carries out. In particular the laboratories are: The “Information Technologies” laboratory focusing on the information production, dissemination, management and exploitation technologies, the “cultural heritage documentation” laboratory focusing on the study and documentation of cultural objects and the “digital libraries and electronic publishing” laboratory focusing on several issues of digital library development as well as the study of the world wide web information.

To conclude, the environment in the department seems to be encouraging for the development of collaboration between the information and computer scientists. Further such collaboration is already planned and could provide significant research results and new information services to the Greek library community. However there are two main issues that pose barriers to the development of the desired collaboration. The first one is that the computer scientists are quite new to the department, the first of them appointed some years ago. Each faculty needs some time to be adapted to this new environment of the department and communicate efficiently with the other colleagues. The second is the lack of faculties on library and archive sciences. Being the computer scientists around the 35% (six out of sixteen) of the total faculty members and given that there exist one faculty member on museum science, two on library and information science and two on archive science, (the other faculties deal with history – including the book history domain – language and literature, paleography, etc.) it could be claimed that there is no a critical mass of information scientists able to open and maintain a qualitative and fruitful interaction between each other firstly and with computer scientists afterwards.

3. Integrating computer and information sciences

The organization and dissemination of digital information is desirable not only by the libraries and by the state archives, but also, by the majority of organisations such as ministries, governmental bodies, universities, scientific centres, publishers and firms that wish to promote their services via networks (e.g. tourist sector, agencies and industries) and bodies that would like to have their own separate network of information (e.g. hospitals that exchange medical information), which create and disseminate information, either for free or for profit or with access limitations.

The most difficult problem for the information seeker today is to locate and isolate the right information, even though it resides a few keystrokes away from his fingers. Therefore, the content creators should plan their efforts to make the information interoperable and easy located by the users. The achievement of this goal is difficult since users perceive information differently: different users may be looking for the same information in different ways, with different techniques and tools, with different knowledge of the field and using different languages. Interoperability is a significant parameter for the design of usable and functional information systems ensuring the integration and uniform access to heterogeneous and isolated sources. It helps information location without prior assumptions on where it resides or the usage of specialized retrieval systems for each information source. To this end, the laboratory of Digital Libraries and Electronic Publishing, and the Department of Archive and Library Sciences, make their best.

The laboratory on Digital Libraries and Electronic Publishing (<http://dlib.ionio.gr>) was created on April 10 of 2003, and its activities are mostly related to teaching, research and development on the areas of interest to the department of Archive and Library Sciences. Its activities focus on current technological issues of information organization and dissemination – independently of their origination. In particular, the current fields of interest include digital information management, knowledge discovery and representation, interoperability, evaluation of knowledge and information management, dissemination systems, and personalized access to information sources. The role of the laboratory is to transfer to the department scientific principles, technologies and practices from several computer science domains. Transferring know-how and developing/using/teaching information management software tools, it contributes to the integration of computer science with the information science teaching, research and development activities held by the department.

The laboratory aims to participate actively to national and international scientific community and deals with the effective organization and dissemination of information via current technologies. Its main objective is the cooperation with other research bodies, in Greece and abroad, in the production of standards, protocols, technologies and applications that will address efficiently open research issues by:

- Studying and testing standards, protocols, technologies and applications in order to develop integrated and interconnected portals of information.
- Participating in the international efforts and initiatives of research and standardization that deal with issues related to the interests of the laboratory, and, at the same time, representing Greece and expressing the particularities of the Greek language.
- Offering services for requirements description, design and development of integrated solutions based on international standards and on the principle of interoperability.

Additionally the laboratory supports the information science educational process by organising and participating to seminars for new researchers and on site laboratory education. Specifically it supports the students and the teaching activities in infrastructure and tools, including specialized tools in beta version (e.g. EAD document development

tool) that are not yet available to the public. The students can use them for general practice, in their courses and in their (undergraduate or graduate) theses.

Up to now the laboratory employs three faculty members who supervise twelve PhD students, while almost twenty MSc dissertations have been finalized. The courses that are usually taught by the members of the laboratory are mostly related to the new technologies and include Information Retrieval, System Analysis and Design, Databases, Knowledge Management, Human-Computer Interaction, Electronic Publishing, Multimedia, Metadata, Information Systems, Data Encoding Standards, and Digital Libraries, on the undergraduate level, and Metadata, Information Systems, Knowledge Management, Electronic Publishing and Digital Libraries, on the graduate level.

3.1. Research

The laboratory research activities take place mainly through the elaboration of the PhD and MSc theses, while some of the activities are connected with international collaborations and research projects, such as the European Union DELOS network of excellence in digital libraries [4], in which the laboratory participates actively. Many research papers have been produced as the outcome of these activities, in journals and major international conferences such as IFLA, JCDL, ECDL, etc.

In general the main axes that the research activities focus on are digital library policies [10], interoperability as well as user-based digital library evaluation. Concerning the interoperability axe, the research involves information integration [6,14,15], e-Learning applications and metadata interoperability. Indicatively we refer to a cooperation with the Technical University of Crete that has been established for the creation of a learning ontology, as well as a semantic mapping between the metadata standard for learning objects IEEE-LOM and SCORM with the video standard MPEG-7, using the GraphOnto, an OWL authoring tool [2]. We studied and proposed a new model dealing effectively with the digital material in order to provide e-learning services to school, museum, archive, and library users. We developed an e-learning policy with particular emphasis on the value of using digital resources from libraries, archives and museums. In the same domain the role of CIDOC/CRM ontology have been considered as a mediating scheme for the integration of cultural heritage metadata. Mappings from EAD as well as DC-types to CIDOC/CRM have been generated [7,16]. Furthermore a CIDOC/CRM model for the description of an archaeological excavation, using the GraphOnto tool, has been generated.

Concerning the Digital Libraries Evaluation, the Interaction Triptych framework has been proposed [5,17] as a framework for evaluating digital libraries. The participation to DELOS Digital Libraries workgroup generated the obligation of the implementation and maintenance of a website for scientific communication, (<http://dlib.ionio.gr/wp7>). Additionally the laboratory participates to the DELOS joint research activity entitles “A Digital Library Testbed Framework for the Evaluation of Architectures, Services and Execution Dynamics”. During that involvement, we dealt with the definition of an experimental framework for the evaluation of Digital Libraries. We participated in

defining a logging schema able to represent and monitor the digital library users behaviour [8,9]. Furthermore we performed usability and usefulness evaluation experiments on the several digital libraries including the European Library. A new domain of interest is hybrid libraries, in which we explore the probability of the integration of physical and digital spaces providing a uniform user interaction through the usage of mobile devices. Currently we use evaluation techniques to test the acceptability of such devices by the hybrid libraries users.

The above research is conducted in the framework of MSc theses and PhDs. In this way the research is in touch with the educational process. The new knowledge is disseminated in the undergraduate students through seminars and/or presentations in the framework of undergraduate practice courses, or undergraduate theses as well as course essays.

3.2. Development

The development activities take place mainly through the participation to national digitization projects. For such projects many undergraduate theses are elaborated, offering significant experience to the students and at the same time useful outcome for the Greek community of, mostly, archivists and librarians. All such theses, as well as course essays, are freely available on the web site of the laboratory.

During these activities we develop and evaluate innovative software tools and applications for specific cases such as online museum collections, musical collections, applications with extensive configuration of the digital library Greenstone, library communication applications with weblogs, educational and multimedia content, Dublin Core application profiles for libraries, digital libraries for manuscripts, etc. Another application domain is web portals and ontology – based information retrieval. Up to now, we have developed subject gateways for the archive and library sciences, and also for digital libraries and electronic publishing. Thus, we make publicly available to all interested users information that is difficult to collect. Finally we use software tools to describe digital collections that record existing Greek content, applying new and modern standards such as TEI and EAD.

Additionally, we implement studies for common problems that are of interest to many people who organize, digitize or create of digital collections, such as on: technologies for intellectual property, standards for describing multimedia, classification of digital content, methods for evaluation of digital libraries, creation of electronic archives, preservation metadata, comparisons of various standards or systems, etc. We also make studies that produce guidelines that are related to the digitization of content, and are of immediate interest to all libraries and archives that are involved to digitization projects: digitization of sound archives, digitization of different types of paper, criteria for material selection for digitization, digitization technologies, etc.

Finally, some of our development activities have the goal to create Greek reference content, such as official guidelines or documents about standards, most of them coming from translations of well established international documents. We have translated the

documents of the MARCXML, MODS, MADS, Dublin Core, ISAAR, etc standards, and the UNESCO guide for electronic theses, etc. We also studied and analyzed the classification of the web pages of the Greek Universities; we create demo collections with unusual kinds of digital material, where new technologies and ideas can be demonstrated; and we recorded the terminology that is used in the Information Science in Greece and its mappings to the English terminology, (<http://dlib.ionio.gr/standards/bibterms.xls>). We always welcome suggestions for more appropriate translations of any terms.

To conclude, activities of the laboratory are mostly related to assisting the teaching activities of the department of Archive and Library Sciences, to promoting the research in the areas of Digital Libraries and Electronic Publishing and aiding the development of Greek digital content, of the related Greek infrastructure and of the corresponding Greek community.

4. Collaborations - New possibilities

Most of the above mentioned activities are the result of collaborations with other institutions. Firstly we have to refer to the collaborations with other research units inside the Ionian University. There are particular laboratories and working groups from the same or other departments (mainly from the History and Music Studies Departments), which provide content (such as music manuscripts), or equipment, or know-how (such as multimedia digitization equipment or techniques for managing banking records). Such cooperation enhances mainly the educational process and the relations among the University departments. Our laboratory personnel contribute to the advancement of these relations by teaching to master programs of other departments, supervising master theses and participating to national and European projects.

Our master programs are the first to take place in Greece in Information Science, and the one that our department provides in cooperation with the Department of Library and Information Systems of the Technological Education Institute (TEI) of Athens, is very popular to librarians who have many years of working experience in big libraries, and cannot leave Athens, but want to attend a master program. For our laboratory personnel, this cooperation is fruitful because it caused new relations with the TEI faculty staff, which resulted to collaborations in teaching and research.

In general the laboratory collaborates with both content and technology providers being either from Greece, and especially the Ionian University, or abroad. The cooperation with technology providers concern mainly research activities and results to publications. As mentioned, the strategy of the laboratory is (a) to acquire know-how on the domains that it is interested in and to produce new knowledge and (b) to transfer technology and educate the new archivists and librarians. Concerning the first goal, the results obtained in a cooperation basis are encouraging. Many PhD students produce new knowledge and publish papers participating in national and European funded research projects, while many MSc theses have been completed producing innovative deliverables.

For the second purpose several students test and evaluate a variety of software tools developed to cover different needs. For example, the collaboration with the National Documentation Centre, Greece has as result the donation of a powerful editor for the EAD standard used by the students to generate several archival finding aids. Additionally, the collaboration with the Duisburg University, Germany in the framework of DELOS network of excellence on digital libraries [4] has as result (a) the translation of Daffodil [3] – a collaboration tool testbed including a digital library hosting a variety of collections, mainly on Computer Science – interface in Greek by a PhD student and (b) the usefulness - usability experimentation of its services by a number of MSc students, who deal with information services evaluation.

Furthermore the laboratory collaborates with a variety of content providers such as libraries (mainly academic as well public), archives (the national archives as well record management services of organizations, e.g. the learning resources – printed and audiovisual – of the National Public Administration School, banking archives, etc.) and museums (e.g. the National Gallery, etc.), which possess, process and disseminate content in various formats, such as text or musical manuscripts, printed material, learning resources, physical objects, etc. As mentioned, such collaborations are developed in the framework of national or European funded research and development projects or of MSc and PhD dissertations. Moreover some organizations request, independently of funded projects, consultation on metadata schemas as well the design of their databases, the collections digitization and the implementation or evaluation of information systems carrying out user studies.

Two members of the laboratory have been appointed as members of the steering committee of the General State Archives. For the future, the laboratory seeks partnerships with audiovisual stakeholders and content providers. For many years digital libraries were preserving mainly paperback material (text -manuscripts or printed- still images, maps, etc.), but nowadays the technology permits the management and dissemination of huge volumes of multimedia information. The laboratory has invested in know-how about the metadata crosswalks and management of audiovisual material, while it has already made cooperation with technology partners who deal with multimedia metadata and information retrieval, in the framework of DELOS network of excellence on digital libraries.

Concluding, the lessons learned and the experiences gained by the collaborations are significant for the laboratory. It should be mentioned that the most crucial experiences were gained during the close cooperation with computer and information scientists. In such cooperation both communities find a common language to interact and express their demands and interests in order to produce useful and usable information services for the citizens' benefit. Based on this experience the next aim for the laboratory, except the collaboration with content providers, is the exploitation of programs that encourage the mobility of researchers and teachers from Information Science departments all over the world.

5. Conclusions

A few years ago, not much content was available digitally. Today, many large collection of interesting information, addressing different types of audience, are available: news (such as newspapers or weblogs), scientific information (such as journals and other publications), scientific collections (such as data or pictures from space or flowers), and many others, of interest to the average user, (such as historical or tourist information). As the number and the size of the collections increase, improved content management techniques are needed. Such techniques, that take advantage of the new technology achievements, are developed with the goal to be scalable. Thus these techniques require much more content than before to be applied and tested. As these better techniques make the content more functional and usable than before, they encourage more usage and development of new content. And this loop never ends: we continuously expect even more content and better techniques to be developed and made widely available in the future.

The need to combine Computer Science with Information Science content management techniques is well recognized into all content providing organizations. To achieve this, we need scientists that are familiar quite well with both areas: (a) Computer scientists that have developed applications that manage content and posses significant experience through their interaction with information scientists, and (b) Information scientists that are well educated in computer science technologies, locating the technology benefits and can describe their technological requirements clearly. The cooperation of the two scientific communities ensures the improvement of the existing information infrastructure and services, making available to the public vast amounts of information with efficient, painless and friendly ways.

Nowadays the introduction and adoption of the new technologies by the Greek libraries is significant. It should be mentioned that the libraries in Greece step further from implementing valuable services, to research performing a variety of projects and studies. This development is highly related with the improvement of librarians' education. All the Library and Information Science departments have improved their curricula and new faculty members have been appointed.

The laboratory of Digital Libraries and Electronic Publishing was the first organized research group in the Greek Universities dealing with the integration of Computer and Information Sciences. Although most of its faculty staff origins from the Computer Science there are many Archive and Library Science students and researchers who develop technologies and exploring a variety of issues of Information Science. Moreover the laboratory cooperates with information scientists and collection curators who work in Libraries, Archives and Museums, either offering educational and consulting services, or developing innovative systems and services. This cooperation offered to the laboratory the chance to confront real user needs and to participate to the development and evaluation of large-scale information systems.

The general impression from the cooperation with information scientists is positive and encouraging. This interaction is very fruitful, since it reveals particular issues that cannot

be resolved without the common effort of both the scientific communities. Moreover new knowledge was acquired, generated and exploited, aiming to the benefit of the end-users. The international and Greek experiences prove that the existence of a group of computer scientists strengthens the educational process as well the scientific results of the Information Science departments and therefore is desirable and feasible.

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