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Abstract:

Purpose - It has been more than two decades that LIS Education has been regarding information organizations (libraries, archives and museums) as an integrated field sharing a common basis of acquiring, handling and disseminating information independently of its source or substrate. In this respect LIS curriculum has treated resources at the basis of their descriptive, structural and administrative metadata; their semantic value; and the employment of technology as the means for creating a common platform for its organization, accessing and dissemination purposes.

Design/methodology/approach - Within this framework, LIS curriculum has expanded in order to meet the informational needs of cultural heritage institutions, such as museums and cultural centers. Furthermore, their requisites to create the fundamentals for their digital information management and digital presence in the web and their obligations to supply information and communicate with each other became also part of the curriculum. The latter introduced almost simultaneously the need to operate in common environment with archives and libraries that not only hold a significant amount of related information but also have common operational attributes. The latter has brought forward issues of interoperability, communication between metadata standards, the use of controlled vocabularies and semantic representation techniques.

All of the above, have established the notion in LIS Education that libraries, archives and museums are a global network of information organizations. At the same time, a series of cultural heritage projects, funded through the Horizon2020 [1] call were focusing on employing new technologies for staging cultural heritage content. The need for metadata and semantics had acquired the expertise of information professionals.

In this paper the case of the curriculum reform of the Department of Archives, Library and information Studies of the University of West Attica is presented and the specific interrelationship of the Horizon2020 Project "CrossCult" [2] in which the aforementioned Department participated, is viewed as a parameter for shaping a cluster of courses within its curriculum.

Index Terms **— LIS Studies, Culture Heritage, Information Management, Academic program.**

I. INTRODUCTION

Today's Library and Information Science (LIS) education includes the traditional studies of library, archives and museum at the basis of their information characteristics and the use of informatics as a medium in performing their functions, processes and provision of their services. The broader aspect of information management finds a most applicable domain within these organizations both as memory institutions as well as providers of information services to the community.

As a whole the allocation, organization, processing, preservation, retrieval and distribution of information are key elements of information organizations focusing on managing information itself, independently of the substrate that it is written or depicted upon.

In LIS education, this approach has shaped interdisciplinary curricula combining the above-mentioned domains including the management not only of information but of the organizations themselves, the relevant technologies and the continuous development of informational technical tools and media. Furthermore, the impact of technologies on the shaping of information infrastructure and media of dissemination along with the emerging socio-economic fabric is also considered. As a result, LIS curriculum is designed to meet scientific, cultural, managerial and business information. Our curriculum (Department of Archives, Library and information Studies of the University of West Attica[3]) at its undergraduate level comprises 6 interrelated modules. Three of them relate to the core subjects of **Library Science**, **Archival studies** and **Museum and Cultural Heritage studies** interconnected and supported by a central common subject, this being information science. In addition, two more subject areas are also supported, those of new technologies and humanities, to provide to our students' elements of digital humanities and a sense of the emerging cultural information management. To the latter, the department's participation

[2] CrossCult: "Empowering reuse of digital cultural heritage in context-aware crosscuts of European history", website: https://www.crosscult.eu/en/about/background/ (Horizon 2020).

[3] Department of Archives, Library and information Studies of the University of West Attica, see http://www.alis.uniwa.gr

in the European Union funded project "CrossCult" within the framework of Horizon2020, had a most interesting impact that led us to take several things into account, as it will be described further below.

The aim of the curriculum is to create professionals that will be able to respond to the market's demands and become competitive to the European and international information world. In the new digital environment, a LIS graduate should be able to act as an information professional, as a repository creator and manager, as an information systems expert, as an information advisor and as a high-tech business information executive.

II. CONCEPTUAL FRAMEWORK – INTERNATIONAL STATUS

Library and Information Science today is the combination of different scientific approaches in knowledge organization and retrieval using new technologies and within the broader framework of the social sciences. In the European and North American spectrum, Library Science curricula can be found in different faculties, such as social sciences, humanities, informatics, communication studies, management etc. or as independent information faculties (such as the known "i-schools"). In 26 European countries there are 194 undergraduate library studies departments and 220 graduate LIS programs [1] (**Borrego, 2015**). Their North American counterparts – in the United States and Canada are the ones that have the longest tradition and today their curricula do manifest the common ground of information organizations (libraries, archives and museums) and incorporate relevant courses. Some of these curricula do identify streams within their programs acknowledging the informational interrelationship of the aforementioned organizations and emphasizing the common platform that new technologies are creating for the handling of their information.

European library schools have, in their majority, incorporated information science and the teaching of new technologies in library applications. Curricula such as those of City University of London[4] in the United Kingdom and the Royal School of Library and Information Science[5] in Denmark place an emphasis on computer applications and at the same time are retaining the social and cultural aspect of libraries with relevant courses from the social sciences and the humanities. The Department of Libraries, Archives and Museums of Uppsala University in Sweden regards all information organizations as an interwoven web of information independently of its format. Our curriculum integrates this latter approach, treating libraries, archives and museums within the information cycle and using technology as the vehicle for providing access, organizing and disseminating information.

Furthermore, it must be mentioned that other approaches to information science, either as a whole or to its components can be found within the European setting, depending on national traditions and historical derivations. Best example of this is the Department of Historical Information Science nested within the Faculty of History in Moscow Lomonosov University[6], fully attaching archives as part of the study of history and less within the concept of records management and the information world. Similarly, in France the Ecole National des Chartes (National School of Paleography and Archival Studies)[7] focuses on archives as a manifestation of the historical past and less as information organizations that need to be managed and play a role in the ever-evolving information world.

At the other side of the Atlantic, Library and Information Science schools of North America tend to treat information science as a central corpus within a common framework focusing on information and society, the impact of technology and the continuous changes brought about in information organizations. Specifically, both "i-schools" of Illinois University[8] and North Carolina University[9] offer streams on Library and Archival Studies based on a common base of courses on information science. Relative to that is the program offered by the University of Toronto[10] "i-school". It should be mentioned that the latter is offering a specialization degree in museum studies apart from the library studies and the information science one. Furthermore, the "i-school" of the University of British Columbia[11] offers one more specialization in Archival studies.

At the same time, looking at the international environment of research related to libraries, archives and museums, one can conclude that is focusing on semantics and their use in enhancing subject approach to information and content exploitation, also on the new trends and roles for libraries in an ever-changing environment and the emergence of museums as information organizations open to new technologies. The latter within the established

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[4] City University of London - https://www.city.ac.uk/department-library-information-science

[5] Royal School of Library and Information Science - http://iva.ku.dk/english/

[6] Dept of Historical Information Science - http://www.hist.msu.ru/English/departments/index.htm

[7] Ecole nationale des Chartes - http://www.portahistorica.eu/organisation/members/ecole-national-des-chartes

[8] School of Information Science- University of Illinois https://ischool.illinois.edu/degrees-programs

[9] University of North Carolina - https://www.unc.edu/school/information-library-science/

[10] University of Toronto - https://ischool.utoronto.ca/

[11] University of British Columbia, https://slais.ubc.ca/

approach that museums are now resuming a clearly educational and entertainment role, elements that have shaped funded and individual research. In addition, serious games, semantics and ontologies and the use of social media are but a few of the emerging areas of research and study.

Projects such as "CrossCult", EMOTIVE, INCEPTION, Wholodance, Archaide, GIFT, etc. have directed research in the area of technologies, the development of new high-tech tools for describing, organizing, using, re-using and promoting cultural content. If we look closely at the projects' focus areas, we can see the emerging needs of museums and their interconnection to information science along with a strong emphasis in the use of media technologies for modernizing and enhancing visitor experience. It is worth looking more closely to a couple of these projects leading research and shaping the future demands of cultural organizations.

The "CrossCult" project is an EU funded project aiming at creating a multi-level, cross-repository and cross-venue connections using new technologies for smart venues and cities. Personalized and context-aware experiences are part of "CrossCult's" objectives. This project main aim is to promote interpretation of historical events and invoke reflection of the past to present. Hence, four different pilots are implemented across European countries and cultural heritage venues. The pilots are realised under a common platform with the development of innovative tools and technologies that would realize the challenge of interpreting and reflecting on history.

Furthermore, EMOTIVE[12] is also an EU-funded heritage project that aims to use emotional storytelling to dramatically change how we experience heritage sites and it is chiefly addressed to cultural heritage information professionals. Along, the same lines INCEPTION[13] realizes innovation in 3D modelling of cultural heritage through an inclusive approach for time-dynamic 3D reconstruction of artefacts, built and social environments.

It is quite evident that research is drawing from both high-tech applications as well as digital humanities. For heritage professionals, this is not only the future but the means to present their holdings, to promote the wealth of information that they have and to interconnect with the other memory organizations, namely libraries and archives. It is also evident that research for the implementation of the aforementioned projects drew from metadata applications and information handling of the traditional library and information world.

In summarizing, it should be mentioned that curricula of library and information science departments, archival and museum studies departments along with current research

and trends were considered in shaping the curriculum of our department. The emerging role of libraries in relation to the new substrate of written and /or depicted information and the need to respond to the demands of the work environment along with the major factors shaping our job market have influenced the shaping of our LIS program. Digital libraries, digital archives and digital museums became a major element in our curriculum and information organizations were viewed within the emerging new digital environment?

III. NEW LIS CURRICULUM

This new curriculum has been in effect since September 2018. Two previous major reforms occurred in 2008 and 2015 accordingly and have prepared and formed the infrastructure for this latest reform. The new LIS curriculum aims at the formation of a contemporary profile, abiding to international standards and educational programs, while keeping up to date, with the latest scientific developments. The main objective of the program is to educate new graduates and offer them the necessary skills to manage information content, independent of the medium or the working environment context.

The upcoming sections provide useful insights about the structure, the philosophy and the aims of the new LIS curriculum, as well as details on how it integrates the skillset required for museum and cultural heritage information management in the educational process.

Curriculum structure

The new LIS curriculum structure is comprised of four main and two supportive course modules that aim to cover all library and information science topics focusing on both theoretical and practical aspects (see Figure 1). In particular, (i) the Information Management Common Courses (**IMC**) provide the ground base knowledge and act as the interconnecting layer for the three disciplines that the LIS curriculum offers, (ii) the Library Studies Courses (**LSC**), (iii) the Archival Studies Courses (**ASC**) and (iv) the Museum and Cultural Heritage Information Management Studies Courses (**MCHIMSC**). The total number of courses that these four main modules offer to the students is **33** and correspond to the **71%** of the total curriculum. Apart from the Information Science core topics, the new LIS curriculum provides two more course modules that aim to improve both undergraduate students' technology and social science skills. More specifically, (v) the Social Science and General Education Courses (**SSGEC**) contribute to the better understanding of the social framework within which information organizations operate, using a variety of methods and scientific approaches, in topics such as economics, management, history and political sciences. On the other hand (vi) the Information and Communication

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[12] **EMOTIVE**: "Emotive Virtual cultural Experiences through personalized storytelling", website: https://emotiveproject.eu/

[13] **INCEPTION**: Inclusive Cultural Heritage in Europe through 3D semantic modelling, website: https://www.inception-project.eu/en

Technology Courses (**ICTC**) are necessary for building skills that relate to computer science such as programming, data structures, database management and internet technologies. The number of courses that SSGEC and ICTC packs offer are **13** (**29%** of the total curriculum).
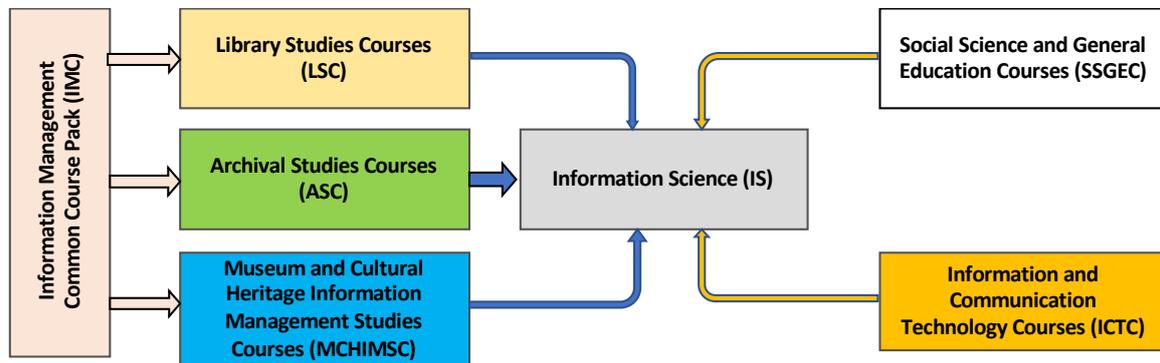

Figure 1. New LIS course packs

The new LIS curriculum sets as a prerequisite for the undergraduate students to follow an internship work experience course, at the final year of their studies, which lasts at least three months [2] (***Guidelines for Student Internships*, 2015**). Internship students work in information management related organizations, such as libraries, archives, museums or other governmental agencies, as well as in business sector locally or aboard [3] (**Južnič and Pymm, 2016**), resulting in an important learning opportunity, through their direct involvement at the work environment operations. At the end of the internship course, students ought to produce a report about their experiences demonstrating how they have addressed specific learning goals. Finally, students that attend the new LIS curriculum must complete an undergraduate thesis, under the supervision of a faculty member. The undergraduate thesis offers students the opportunity to perform research on a single subject, in greater depth than a simple course assignment.

Table 1 presents the details of the new LIS curriculum that was adopted after the last reform done by the Department of Archives, Library and information Studies of the University of West Attica in 2018. Specifically, the number of courses, the weekly hours for lectures and laboratory classes and the ECT[14] credits (European Credit Transfer and Accumulation System) per course module are given. It is evident that the work load for the undergraduate students is well balanced among the three main disciplines (Library studies, Archival studies and Museum and Cultural Management studies) of the new LIS curriculum, in terms of number of courses, total hours and ECTS (see also Figure 2). Also, the ratio between lectures and laboratory classes is 4 to 1 which is a positive feature as students always prefer the laboratory classes (active and hands-on learning) instead of lectures (passive learning).

Table 1. New LIS curriculum details: Number of courses, hours (lectures and laboratory part) and ECTS per courses pack

	Number	%	Hours (lectures)	%	Hours (Lab. part)	%	Hours (total)	%	ECTS	%
Social Science and General Education Courses (SSGEC)	7	15%	17	14%	0	0%	17	11%	31	13%
Information and Communication Technology Courses (ICTC)	6	13%	15	12%	12	38%	27	18%	37	15%
Archival Studies Courses (ASC)	7	15%	20	16%	4	13%	24	16%	37	15%
Library Studies Courses (LSC)	8	17%	20	16%	4	13%	24	16%	41	17%
Museum and Cultural Heritage Information Management Studies Courses (MCHIMSC)	7	15%	20	16%	0	0%	20	13%	36	15%

[14] ECTS is a credit system designed to make it easier for students to move between different countries. For more details see Education and Training at https://ec.europa.eu/education/resources-and-tools/european-credit-transfer-and-accumulation-system-ects_en

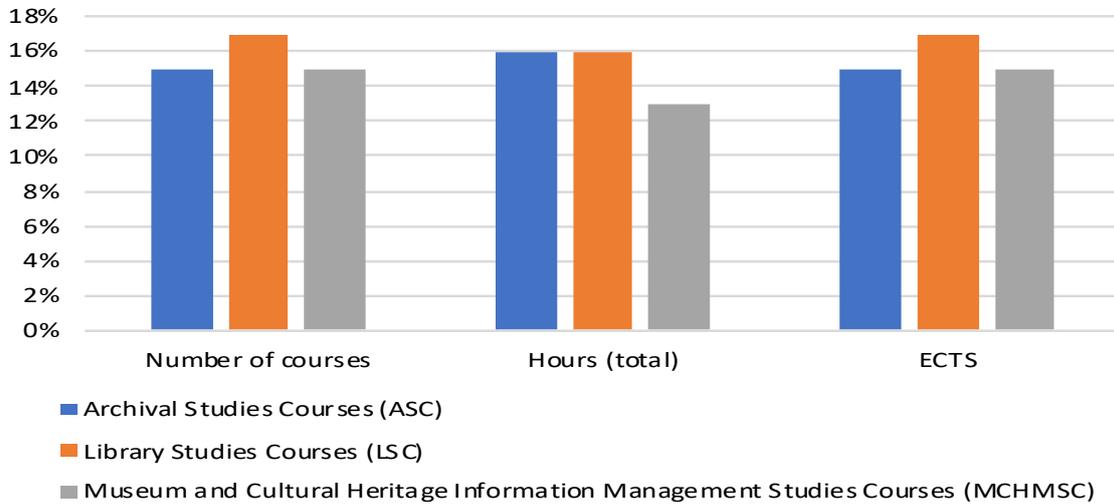|									
Information Management Common Courses (IMC)	11	24%	30	25%	12	38%	42	27%	62	25%
Total	46		122		32		154		244	

Figure 2. Comparison of new LIS curriculum three main disciplines (number of courses, hours, ECTS)

It must be mentioned that there has been a considerable shift towards museums and cultural information management courses over the latest reforms. In order to quantify this new LIS curriculum gradual shift towards museums and cultural heritage information management that took place after its latest reform, we provide Table 2. This was mainly done as a result to address the market and the research community demands for information professionals with skillsets among which most notably are metadata and semantics management in the related topics. Table 2 provides comparison data between the two previous reforms (2008-2014, 2015-2017) and the current version of undergraduate program (see end of the paper).

Table 2. New LIS curriculum vs LIS curriculum (2015-2017) vs LIS curriculum (2008-2014)

	New ILS Curriculum		Previous ILS Curriculum (2015)		Previous ILS Curriculum (2008)	
	Number	**%**	**Number**	**%**	**Number**	**%**
Social Science and General Education Courses (SSGEC)	7	15%	11	25%	14	32%
Information and Communication Technology Courses (ICTC)	6	13%	7	16%	7	16%
Archival Studies Courses (ASC)	7	15%	5	11%	5	11%
Library Studies Courses (LSC)	8	17%	6	14%	6	14%
Museum and Cultural Heritage Information Management Studies Courses (MCHIMSC)	7	15%	2	5%	0	0%
Information Management Common Courses (IMC)	11	24%	13	30%	12	27%
Total	46		44		44	

As expected, the number of courses that relate to the Museum and Cultural Heritage Information Management Studies was tripled (increased from 5% of the total number of courses to 15%) after the last curriculum reform. Note that the 2008 curriculum did not include any courses related to Museum and Cultural Heritage Information Management. However, in order to keep the students' workload balanced, a significant part of the Social Science and General Education courses were either eliminated or merged.

Curriculum philosophy and aims
The philosophy behind the reform of our LIS curriculum is to ensure high quality educational services which are up to

date, with the latest scientific developments and aligned to the job market demands. Curriculum reforms are considered to be an important academic process and may result in useful discussions among not only academics but also market representatives and experts. During curriculum change, aspects such as *'political (the culture of a university), philosophical (the nature of the discipline), and educational (professional practice)'* should be considered [4] (**Pegg, 2014**). From our perspective, the following requirements were set before the reform process started:

- Undergraduate students and their education are in the spotlight.
- The reform should keep continuity and be linked to previous curriculum versions and should retain the complementarity between the disciplines of LIS studies.
- The curriculum should be compatible with the rest of LIS programs in Europe and North America.

- New Information Professionals (**NIPs**) [5, 6] (**Jantz, 2016; Myburgh, 2005**) that follow the new LIS curriculum should be able to meet workforce competences and job market requirements at national and international level.
- The curriculum should reinforce its interdisciplinarity, Information Technology (IT) constituents and be up to date with the contemporary research topics.
- The structure and the content formation should be compatible with national and international standards and requirements that will assure accreditation.

Table 3 presents an indicative list of skills that undergraduate students develop during their studies, following the new LIS curriculum, and skills that will utilize as New Information Professionals [6,7,8] (**Nonthacumjane, 2011; Missingham, 2006; Elings, Choi and Zhang, 2014**).

Table 3. New Information Professionals skills that the new LIS curriculum put emphasis on

Generic skills [Social Science and General Education Courses (SSGEC) Information and Communication Technology Courses (ICTC)]	
Personal skills	Analytical, creative, flexible, adaptable, self-motivated, critical thinking, problem solving, leadership
Outreach skills	Information literacy, communication, teamwork, ethical and social responsibility, marketing, presentation, social media management
Management skills	Project management, people management, planning and evaluation, bids and proposals, strategic management, financial skills, service development, copyright law, academic and research ethics, etc.
IT skills	information systems design, application design, user support, database management, digital libraries, coding/programming, data visualization, information retrieval systems, mobile applications, digital preservation etc.
Information Science skills and per discipline specific skills	
Information Science studies	information architecture – organization – management – representation – access – seeking – integrated services, knowledge management,
Library studies	documentation, classification, subject expertise, metadata, collection management, education and research processes support (information literacy education), Library Service Platforms, Scholarly Communication, Scholarly Publishing, Open Access, Research Data Management etc.
Archival studies	archival metadata formats, record management, archive collection management, organizational structure analysis, Archival Information Systems
Museum and Cultural Heritage Information Management studies	cultural institutions collections, resource management, digital curation, museum and cultural collections metadata, museum collection management, history of art, history and theory of cultural heritage institutions etc.

As it can be seen from the above set of skills, supported by the new LIS curriculum, the Museum and Cultural Heritage Information Management topic is present and well balanced in relation to the other two major disciplines (Library and Archive studies). In addressing the new educational requirements, imposed by research and market shift towards cultural heritage information management, the new curriculum offers courses in special collections and archives management, preservation (both

analog and digital), art and museum librarianship etc. All of the above are in addition to the core Information Science courses.

IV. CROSSCULT PROJECT IMPACT ON THE NEW LIS CURRICULUM

As already has been mentioned, a curriculum is not built in vacuum but rather it is a result of the emergence of scientific developments, research trends, market demands,

technology developments etc. The Departments participation in the project CrossCult was one of the factors that have shaped the curriculum. The projects demands have in many ways indicated the areas that our graduates were most likely to participate in research and/or acquire new jobs.

The objectives and aims of the European project "CrossCult" were set to be the following: (a) to develop pilot experiences gaining insight into the research question: "*How the same facts may be interpreted differently from different social realities and by individuals with different cognitive/emotional profiles (meta-history)?*" (focus on the interpretation of information, its accessibility and content elements), (b) to create a semantic knowledge base that interrelates an unrestricted set of (existing and future) digital cultural heritage resources and venues across different repositories, on the grounds of common properties or crosscutting, transversal concepts (metadata focus, ontologies and semantics of information), (c) to assess the impact of state-of-the-art technologies of geolocalization, micro-augmentations of reality, social networking, content adaptation and personalization in mobile edutainment apps for smart cities and smart venues, (uses of personalized information, geospatial information, cultural heritage information, database structures) (d) to automate the generation of narratives and the composition of digital cultural heritage resources in order to deliver meaningful interactive experiences to individuals and groups, taking into account their cognitive/emotional profiles, as well as temporal, spatial and miscellaneous features of context (user studies and user profiles, information handling and information dissemination) and (e) to design business models and plans for the exploitation of the project results in collaboration with a new network of researchers, scholars, ICT professionals and specialists of digital heritage (information exploitation, information organizations).

Among other activities, CrossCult project has developed four (4) innovative pilots (see Table 4), to acquire proofs on the methodological approach credibility and to validate the outcomes putting the aforementioned objectives into real life activities and testing applications and methods along with knowledge demands and skills. This has helped the LIS team to evaluate curriculum needs in practice and assess the demands for skillsets and real-life implementations. Table 4 is indicative of those requirements, venues involved and their informational nature along with their use in the digital information world that shapes today's memory institutions.

Table 4. CrossCult flagship pilots

Pilot category	Implementation details
Pilot 1 - Large multi-thematic venue	The broad collection of the **National Gallery**, London (**UK**), is used to illustrate the **connections** among **people**, **places** and **events** across European history.
Pilot 2 - Many small venues	**Spanish**, **Portuguese**, **Italian** and **Greek small venues**, respectively the Roman healing spas of Lugo and Chaves, the Archaeological site of Aquae Tauri and the ancient theatre of Epidaurus are connected in the pilot. It will highlight the inherently cross-border nature of History by engaging people of multiple nationalities in the discovery of connections between their respective bodies of cultural heritage.
Pilot 3 - One venue, non-typical transversal connections	In the **Archaeological Museum** of Tripolis in **Greece**, visitors will go beyond the typical level of history presentation (e.g. type of a statue, or its construction date), into deeper levels of reflection, over social aspects of life in antiquity, power structures, etc.
Pilot 4 - Multiple cities, "Past & Present" interplay	Outdoors in **Luxembourg** and **Malta**, more precisely in Luxembourg City and Valetta, this pilot challenges the visitors' **current perceptions on migration** as a contemporary emotive topic and engages people in exploring the past to understand the present.

Pilots were implemented around sites with significant cultural importance, across the continent of Europe, where, participants faced different types of questions, looked at past and present societies with a critical mind, and evaluated major events and characters on the grounds of economic, political, cultural and environmental realities. To achieve these have used information deriving across from artefacts, archival resources and bibliographic information, geographic resources, current web information, newly produced experiential information, stories and games.

Based on the above description, the figure that follows indicates certain key concepts of CrossCult project (blue circles) and how the new LIS curriculum (red circles) corresponds to prepare **NIPs** who are ready to participate in research activities/projects (e.g. CrossCult) and to implement new cultural heritage information management services in related organizations.
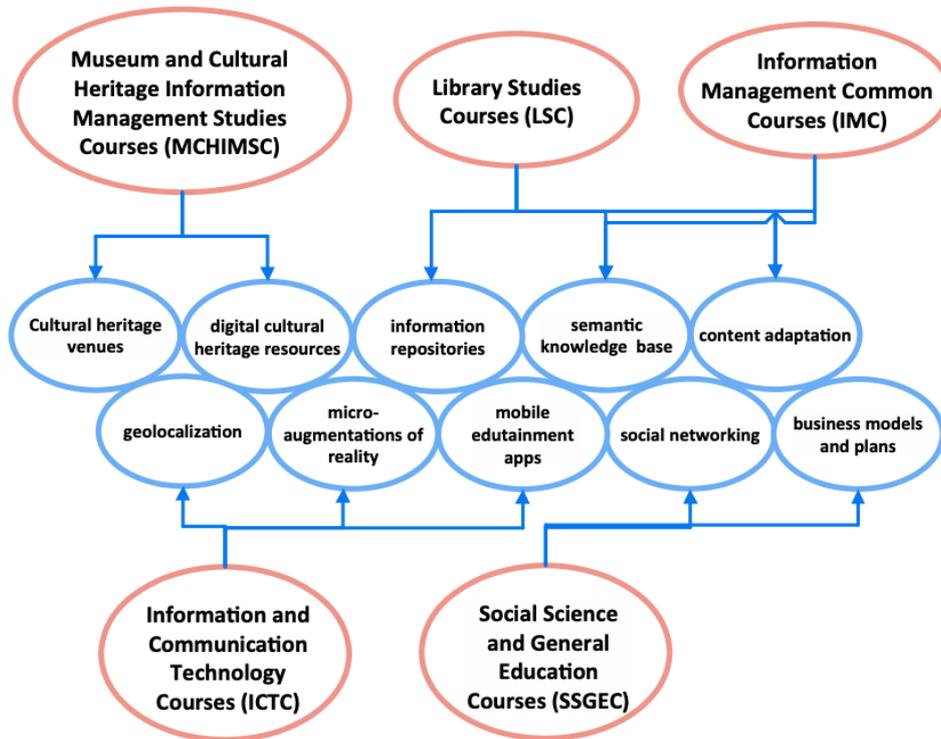
Figure 3. CrossCult project – New LIS curriculum interconnections

V. DISCUSSION - CONCLUSIONS

Today's LIS Curriculum is a cross disciplinary curriculum. It incorporates the traditional library, archives and museum courses based on the common platform of information technologies and their informational character. Dealing with the emerging of new media technologies and the new substrate of digital information that is transforming rapidly all memory institutions is looking at the future of these organizations within the new environment and is acquiring new areas of expansion. To our curriculum, memory-information organizations are an interrelated web of human knowledge and are treated equally as such. This is regaining the wholeness of information independently of its origin or place of storage. It focuses on its organization and semantic value and the technologies used to acquire, disseminating and handling it, rather than creating sets of courses and rules within specific library environments. New trends of research in the areas of the use and re-use of information within the social settings and needs of cross-cultural populations, new socio-economic conditions that demand re-interpretation of history and the flexible use of information outside of sets and rules are reflected in the curriculum.

The emerging new market for information professionals is also a major element in shaping the curriculum. The demand for independent information professionals that can both create the settings of information handling as well as the actual processes and the dissemination of information has well indicated the required skills and knowledge of applications within the European and international market. Our new graduates- information professionals are competent enough to provide services within any kind of information organization and can merge and incorporate information as a whole. Whilst, in previous curriculum reforms library, archival work, records management and business information were mostly present, we have come to the point to incorporate museum and artefact information within the socio-economic setting of today's digital world.

Specifically, the latest curriculum reform, among other benefits, achieves to fully incorporate the cultural heritage information management special requirements through a complete set of courses, compared to the 2015 studies program (**Giannakopoulos, Manesi and Zervos; 2011**). The driving force behind the reform process was the department's active participation at national and European research projects, such as the "CrossCult". The intense research activities and the experience gained by the interaction with international information management organizations was the catalyst that led to a rapid and in-depth curriculum restructuring. As a result, our department adequately responded to the necessity to reinforce the LIS program transdisciplinary and its Information Technology (IT) constituents according to the needs of modern information organizations, by emphasizing the cultural heritage information management. The further development of the areas of use and re-use of information and the actual production of information within the

traditional library profession is among our future areas of expansion.

Finally, our next goal is to develop curricular tracks and specializations in an attempt to offer information science studies as an integrated interdisciplinary set of fields and in a sense of the evolution of the traditional fields of library science, archives and museum studies.

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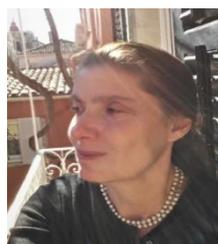
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