Integrating Digital Curation in a Digital Library Curriculum:

the International Master DILL Case Study

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***Abstract*—The paper describes the design and delivery of the curriculum of the International Master DILL and the methodology used to integrate the digital curation module and its specific learning objectives.**

Keywords— Digital Library Education, Digital curation

I. Introduction and definitions

DILL (Digital Library Learning) is an international Master for the education of digital librarians, selected and financed from the Erasmus Mundus Program and started in 2006. It is a joint course, taught in English, and delivered by a Consortium of Universities coordinated by Oslo Akershus University (Norway), together with the Tallinn University (Estonia) and the University of Parma (Italy). The students come from all areas of the world and spend the first semester in Oslo, the second in Tallinn and the third in Parma, completing their thesis where they choose their supervisor. Defining the role of the digital librarian, the DILL Consortium partners defined it as:

1) a bridge between digital resources and users (the traditional role of the literature mediator, but done remotely);
2) an agent of innovation, of citizenship, of information literacy etc. (the concept for the digital librarian as a facilitator of learning, a mentor, as a friend of the user, as a personal trainer who guides the user);
3) communication skills are important for the social role of the librarian which is still prominent, and even more so in a digital environment (the concept of a social role, for active citizenship and social inclusion in the Learning Society, also the collaboration needed with stakeholders);
4) pedagogical skills are enforced in a digital environment (the role of educator, teaching digital librarian) – the concept of the digital library as a virtual classroom.

The facilitator and the educator roles of the digital librarian in cultural institutions have been especially stressed, in relation to cultural heritage institutions., starting a debate about Convergence and Identity of different professionals in the sector.

Exactly what a digital library is, and what its societal role may be, remains undecided and debated, with two different approaches taken by the Computer science community on one hand and the Library and Information Science (LIS) community on the other (Borgman 1999). In 2003 a first definition by the Digital Library Federation suggested that:

Digital libraries are organisations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works (Digital Library Federation 2003).

The emphasis here appears to be on the production and organisation of digital documents in order to increase access to a more distributed community, and to preserve these documents in particular ways. A second definition by the DELOS Network of Excellence on Digital Libraries envisions a Digital Library as a tool at the center of intellectual activity having no logical, conceptual, physical, temporal, or personal borders or barriers to information. (dl.org, 2010, online).

The DILL Consortium decided that experts from the two communities should offer their views in the challenges that face digital libraries managers and researchers now and in the next decades. From this multifaceted perspective it appears that Digital Libraries continue to be a new topic in existing research fields, and education has to take into account this interdisciplinary and multidisciplinary aspect.

We reflect here on our experiences of the participatory nature of Digital Library curriculum design and discuss how, as a team

with different backgrounds, we developed a common understanding using a "workshop model" which has been run and iteratively refined at five major international conferences, involving over 200 participants. The DILL Consortium met in Florence in 2004 (Tammaro 2007) and according to the participants' opinions, the competences, skills and roles of the digital librarian vary, and were recognised as dependent on the specific type of the library or information center in which the digital librarian works and on his/her level of qualifications and responsibility. The qualification level of the digital librarian envisioned by the Consortium partners is that of the Managerial level.

The cooperation with the Computer science community started with a workshop held in 2005 in Parma with the title "Information Technologies Profiles and Curricula for libraries", jointly organized by the DELOS Network of Excellence, the European Library Automation Group (ELAG) and the University of Parma International Master in Information Studies (Tammaro 2006). After this, in a seminar held in Parma in November, 2010, and in Berlin during the TPDL Conference in 2011, and at LIDA in Zadar in June 2012, the Consortium partners of the Master in Digital Library Learning met with the team at dl.org (formerly DELOS), and have begun a process of knowledge sharing and collaboration for research (Casarosa et al. 2011). This group acknowledges the multidisciplinary nature of their work, and states that Digital Libraries represent the meeting point of many disciplines and fields, including data management, information retrieval, library sciences, document management, information systems, the web, image processing, artificial intelligence, human–computer interaction, and digital curation. What emerged from these first events was the identification of three main profiles at the operational, managerial and strategic level of a library. Two of them, called the digital librarian and the system librarian, were identified as higher level qualifications.

The third one, which could be called the "end-user librarian", is a profile with a deep knowledge of the information needs and applications of the selected user community, allowing her to provide input to the digital librarian on one side and to assist the library users on the other, by providing reference services (possibly using web search engines) and assistance in the use of the new functionality made available by the digital library, such as annotations and co-laboratories.

The Consortium partners thought that a new approach should view curriculum development intellectually at the unit level (what topics and learning objectives/competencies are common across related disciplines) and how best to facilitate this development for professional graduates. At the very least, such approaches could use research findings about interdisciplinary learning to improve the problem solving and competencies of graduates.

II. Digital Curation and Digital Library

Digital curation is a term closely linked to the Digital Library concept. Using the definition of the Digital Curation Centre, digital curation is:

The term digital curation is used [to describe] the actions needed to maintain digital research data and other digital materials over their entire life-cycle and over time for current and future generations of users. Implicit in this definition are the processes of digital archiving and preservation but it also includes all the processes needed for good data creation and management, and the capacity to add value to data to generate new sources of information and knowledge' (UK Digital Curation Centre, 2008, online).

This concept includes some of the functions of digital libraries: the selection, the organisation and subsequent preservation of documents or cultural objects, although the term is often applied to the preservation of digital "data" (such as might be collected during a research project), or perhaps to the bit streams which constitute the digital format, rather than documents (for example, the research report). Such digitally recorded collections are kept in digital repositories, which are different from digital libraries in several noteworthy ways. Most importantly, they serve a different purpose: the data in the digital repositories can be mined or processed using different techniques in order to answer different sets of research questions, and thus digital repositories constitute a vital part of a country's cyber infrastructure. Digital repositories are sometimes also called digital archives but archives contain a particular type of documents, arranged and stored in explicit ways, often for legal requirements. Furthermore, most of what might be the technical and practical side of digital curation is handled by software engineers.

In the first intake of the international Masters DILL, topics related to digital preservation were taught in the modules Access to Digital Libraries. After a first evaluation of the program, with different possibilities for access and different models for preservation, it was decided that it may be desirable to ensure knowledge and skills about digital curation, which should not be ignored.

III. Methodology used for DILL digital curation module design

What will be the role of established institutions for knowledge sharing and knowledge mediation (such as libraries, museums and archives) in this new digital context? The

traditional role of such institutions has been to acquire, organize, secure access to and mediate printed material. Digitization is extending the role of these institutions and professionals who can help people find their way in an increasingly complex informational world where information overload might be a result just as probable as increased and efficient access to relevant information. The curator is often a specialist in the field and through his competence enriches the collection in a variety of ways. First of all the curator is an expert in the activities of selecting the collection, in which the whole is considered greater than the single parts. The services evidence above all the value added of the curator who has an educational and of personalizing role of the service, the curator is able to interpret the significance of the collection and communicate it to users. The curator also has more technical competences such as the activities of indexing and documentation, which enrich the single objects of information in their descriptive and historical context.

In "A Study of Digital Curator Competences: A survey of experts", the DILL student Madrid (2011) defined and validated competence statements for the Libraries Archives Museum (LAM) digital curators through a Delphi research technique. The researcher intended to get equal number of participants from the Library, Archives and Museum sectors, but no reply was received from emailed-anticipated participants from the Museum sector. However, the major respondents of this study were university professors or researchers concerned with digital curation and preservation in LAM sector which is now considered an interconnected profession. Using a modified Delphi method with three rounds of questionnaires interspersed with controlled feedback and space for comments and/or suggestions were sent to panel members. A five point Likert scale was employed in the questionnaire.

The definition of Digital Curator which has been agreed upon by the experts participating to the Delphi study and later adopted by the International Master DILL is:

"Digital curators are individuals capable of managing digital objects and collections for long-term access, preservation, sharing, integrity, authenticity and reuse. In addition, they have a range of managerial and operating skills, including domain or subject expertise and good IT skills"

The list of the 20 statements is divided into Operational and Managerial competences for maintaining the structure of DILL learning objectives, but the statements are the result of a holistic approach.

A. Technical competences

Knowledge of the digital infrastructure is important since digital curators should be well informed about how infrastructure decisions can impact their hands-on data endeavors. From the Delphi study, the ten technical competences of digital curator are:

1) Selects and appraises digital documents for long-term preservation.
2) Has an expert knowledge on the purpose of each kind of digital entities used within the designated community and its impact on preservation.
3) Knows data structure of different digital objects and determines the appropriate support it needs.
4) Understands storage and preservation policies, procedures and practices that ensure the continuing trustworthiness and accessibility of digital objects.
5) Is aware of the requirements for an information infrastructure in order to ensure proper access, storage and data recovery.
6) Diagnoses and resolves problems to ensure continuous accessibility of digital objects, in collaboration with IT professionals.
7) Monitors the obsolescence of file formats, hardware and software and the development of new ones (e.g. using such tools as PRONOM registry)
8) Ensures the use of methods and tools that support interoperability of different applications and preservation technologies among users in different locations.
9) Verifies the provenance of the data to be preserved and ensures that it is properly documented.
10) Has the knowledge to assess the digital objects' authenticity, integrity and accuracy over time.

B. Managerial competences

The ten competences of the digital curator evidenced by the Delphi study are:

1) Plans, implements, and monitors digital curation projects.
2) Understands and communicates the economic value of digital curation to existing and potential stakeholders, including administrators, legislators, and funding organizations.
3) Formulates digital curation policies, procedures, practices, and services and understands their impact on the creators and (re)users of digital objects.
4) Establishes and maintains collaborative relationships with various stakeholders (e.g., IT specialist, information professionals inside and outside the institution, data creators, (re) users and other stakeholders like vendors, memory institutions and international partners) to facilitate the accomplishment of digital curation objectives

5) Organizes personnel education, training and other support for the adoption of new developments in digital curation.
6) Is aware of the need to keep current with international developments in digital curation and understands the professional networks that enable this.
7) Understands and is able to communicate the risk of information loss or corruption of digital entities.
8) Organizes and manages the use of metadata standards, access controls and authentication procedures.
9) Is aware of relevant quality assurance standards and makes a well considered choice whether to employ them or not.
10) Observes and adheres to all applicable legislation and regulations when making decisions about preservation, use and reuse of digital objects in collaboration with legal practitioners

IV. DILL DIGITAL CURATION KNOWLEDGE AND COMPETENCES

Three skill areas of the five stages of the data life cycle, are traditionally regarded as pure data curation, and they build on the traditional library and information science skills of data collection, data management, and data archiving/preservation.

The other areas of the above mentioned competences, are the areas of domain knowledge, infrastructure and project management. Based on our understanding of the notion of digital library, and that the role of the digital librarian is socially validated, but at the same time arguing that the use of digital technologies provide an opportunity for a re-conceptualisation and re-articulation of purpose, we decided that the following topics should be included in our curriculum for digital curation. DILL Students at the end of the module should be able to:

- know how the curation of digital resources differs from that of traditional materials and how to deal with them;
- understand what the implications are –in technical, institutional, economic and legal terms—of assuming the responsibility for long-term digital curation
- manage projects and organise digital collection in order to guarantee that digital materials remain accessible and usable for as long as needed by their user communities.

The topics traditionally regarding digital curation are to be covered in the more technical modules of the International Master DILL: Digital document (1st Semester) and Access to Digital Libraries (3rd Semester), together with the Unit Collection Development inside the module Users and Usage (3rd Semester). The other areas of competences are the same of the digital librarians and spread in the all curriculum.

In particular, the content of the International Master DILL includes:

Digital document: Representation and preservation of digital, multimedial content. Methods, evaluation of open-source or other software for the purpose.

Digital repositories: Prerequisites and functionality for deposit of digital material in institutional repositories. Access to Scientific Repositories for e-Science and e-Learning, & Knowledge extraction.

Making the digital library work for users: The students examine how digital libraries are valued by their users and explore ways of permitting the allocation of resources to areas of user-identified needs. Pertinent models from marketing, economics and library assessment and evaluation are reviewed.

The module will illustrate methodologies for analysing different communities of practice, learning needs and behaviour.

Digital collection development: Planning the digital project, Selection and appraisal; Negotiating licences; Digitisation workflow; Metadata consideration: access, storage, preservation and rights management; Standards issues: metadata and content standards; Preservation and archiving. Institutional repositories: metadata – concepts – models – hardware&software.

Digital library services: Integration of access – interoperability – metasearching - usability. Digital reference. Digital publishing. Personalisation - Cooperative and communication asset

Digital library values: Users behaviour, typologies of users. Digital libraries evaluation and users studies. Digital humanities. Scholarly communication in the 21st Century. E-government strategies.

Economic and legal issues of the digital library Copyright - Privacy and legal issues. Business plan for the digital library – sustainability – cost issues. Staffing

DILL students follow a Laboratory for digital curation and prepare a Group work. At the end of the Parma modules they participte to an internship period in a digital library institution, completing a project work about a digital library issue of their choice. Students are involved in the development of the course, preparing a Digital Library as final task of the Parma modules and are given the possibility of evaluating their achievements of learning objectives, preparing a portfolio collecting their results during the individual, Group work and Internship assignments.

V. Conclusion

For the DILL Consortium, Digital libraries are technological systems and can be studied as such. But they are also organizations that can be researched in that respect, they are arenas for information seeking behavior and for social processes such as learning and knowledge sharing, they are collections of content that need curation (collection, description, preservation, retrieval, etc.) and they are social institutions with a social mandate that are affected by social, demographic and legal developments. These different dimensions of digital libraries are interdependent. There are, for example, interdependencies between technological solutions and the role of libraries and archives as memory institutions and their role as arenas for knowledge sharing processes that should be researched from disciplinary and interdisciplinary point of view. When developing solutions for digital access for a given professional field, one need researchers with domain knowledge from the professional field in question as well as researchers with expertise in traditional core subjects in library and information science such as indexing, retrieval and information seeking behaviour.

It is the opinion of the DILL Consortium that digital libraries with a potential of covering the needs referred to above have to be based on an integrated and holistic, interdisciplinary knowledge base.

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