



Proceedings of the International Conference:
“Framing the digital curation curriculum”

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Editors:

Chiara Cirinnà, PhD

Kate Fernie

Maurizio Lunghi

Guest editor: Vittore Casarosa

Digital Curator Vocational Education Europe (DigCurV) project

www.digcur-education.org



Conference organisation

Fondazione Rinascimento Digitale

Programme committee:

Vittore Casarosa, chair

Chiara Cirinnà

Joy Davidson

Kate Fernie

Maria Guercio

Steve Knight

Maurizio Lunghi

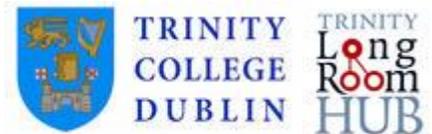
John McDonald

Nancy McGovern

Raivo Ruusalepp

Michael Seadle

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Creating a common vision for digital curation education: building alliances

Welcome!

The Digital Curator Vocational Education Europe (DigCurV) project, funded by the European Commission's Leonardo da Vinci programme, organised the "Framing the digital curation curriculum" International Conference in Florence, from the 6th to the 7th of May 2013. The Fondazione Rinascimento Digitale (FRD) was responsible for organising the event for the project.

The conference launched a Curriculum Framework for Digital Curation developed through a programme of work by the project partners and involving different sectors. This framework offers a means to identify, evaluate and plan training to meet the skill requirements of staff engaged in digital curation, both now and in the future. This conference was an opportunity to conclude a successful process of validation and begin the exploitation of the project's results: it is also worth mentioning the project's CURATE game, which has excited many digital curation practitioners.

For the DigCurV team's longer-term vision, the conference was a means of reaching the communities of national and international associations and organisations involved with vocational training in digital curation and of gathering them together around a table. We built relationships with related initiatives and advertised a very successful call for contributions attracting high quality paper contributions and a group of "supporters" who participated in the lively discussion at the final round table.

The participants came mainly from Europe and USA. The sectors covered were archives, libraries, museums, public administrations and research centres, but several private companies and students also joined the conference. The variety of organisations involved generated lively debate and enthusiastic discussion of the curriculum framework amongst the delegates.

The FRD is a non-profit foundation, established in 2005 by the Ente Cassa di Risparmio di Firenze, with a remit to investigate and apply information and communication technologies to the cultural heritage domain with special attention given to the long term preservation of digital objects and trusted digital repositories. The FRD would like to thank the Ente Cassa di Risparmio di Firenze for the venue in Palazzo Incontri that amazed our guests with its beautiful frescos. The success of the conference has been possible thanks to all the brilliant speakers, the Programme Committee members (John McDonald, Raivo Ruusalepp, Maria Guercio, Michael Seadle, Nancy McGovern, Steve Knight, Joy Davidson, Kate Fernie, Maurizio Lunghi and Chiara Cirinnà), the Programme Committee chair, Vittore Casarosa, the supporters of the conference and the participants, who enlivened and enriched the debate. A special thanks also to the DigCurV project partners for their precious support and to the FRD staff, always determined and motivated.

Despite the fact that this was the final project conference, we believe that training for digital curation practitioners in the library, archive, museum and cultural heritage sectors is a key subject that deserves continuous attention. For this reason we hope that this conference was the start of a discussion that will be carried forward, and that it was an excellent opportunity for future cooperation actions. The DigCurV project has a short, medium and long-term vision, and now it is the time to think how to best build on the results achieved so far.

Chiara Cirinnà, Maurizio Lunghi
Fondazione Rinascimento Digitale

Introduction to the DigCurV project

The DigCurV project began life in 2010 as a proposal to the European Commission's Education and Training agency for a project to address the gap in the education and training available to people working in cultural institutions and managing digital collections. We proposed to build a stakeholder network involving leading individuals and organisations in establishing a curriculum framework as the base from which programmes of vocational education and training could be developed in future. The project was funded by the Leonardo da Vinci programme and work got underway in January 2011 at a kick-off meeting in London where the members of the consortium - HATII, Fondazione Rinascimento Digitale, Goettingen State and University Library, Trinity College Dublin, Vilniaus Universiteto Biblioteka, MDR Partners and the University of Toronto – met to plan the project's activities.

In the thirty months since that meeting we have aimed to involve as many stakeholders with an interest in this field as possible. During the summer and autumn of 2011 we carried out surveys both of the existing training opportunities and to invite feedback from people working in cultural institutions on their training needs. The response was tremendous with more than 550 individuals taking the time to complete our online questionnaires – a figure which, as the survey was undertaken during the summer holiday season, in its own right makes a statement about the need for training and education in digital curation.

The information, which we collected through the surveys and via a series of focus group meetings and workshops, has directly helped to inform the Curriculum Framework that we are proud to launch at this conference. Along the way we developed the Curate! game as a means of stimulating discussion about digital curation and the surrounding education and training issues. Both the Curriculum Framework and the Curate! game have generated a lot of interest and discussion amongst the international network of people involved with Digital Curation Education.

This conference, which happens in the final months of the DigCurV project, is an excellent opportunity to bring together people who are actively involved in developing training and education for digital curators, to exchange ideas and to plan future developments. Our aim is to encourage people to make use of the tools which DigCurV has developed but ultimately our aim is to promote the emergence of new training opportunities in the field of digital curation.

I'd like to thank everyone who has helped to inform the Curriculum Framework by sharing their knowledge and experience, in particular all the members of the DigCurV project team who have worked with such enthusiasm and commitment.

Kate Fernie

DigCurV project coordinator

Invited lectures

Session 1 - Lifelong learning: a key to professional and personal development towards qualification and employment

A future with no history meets a history with no future: perspectives on how much we should know about digital preservation

William Kilbride
Digital Preservation Coalition
York, UK
William@dpconline.org

Digital preservation is a daunting challenge. It is a paradox that the cumulative effect of more than a decade of research and development in the topic seems to have made it impenetrable too. We started with predictions of data loss and since then our well-intentioned enthusiasm has produced great reams of blogroll, huge stacks of reports, endless screeds of code and toppling towers of power-point. The new projects, the new agencies, the acronyms, the jargon, the bluster and the debate constitute a discourse that would more likely discourage a novice than reassure them. Initially doom was our only colour scheme but in the last decade we seem to have settled for a literature in two forms: accessible, superficial doom-laden premonitions of imminent disaster; or deathless cryptic monotonous about partial solutions to infinitesimal problems. Both are prone to exaggeration: neither are very persuasive for terribly long. There are times I pity my students.

You could be mistaken in thinking that this was a problem: it is actually a diagnosis of health. In a rapidly developing field it is inevitable and useful that research should cover all sorts of ground. It's inevitable that some of it will appear impenetrable and some of it will get forgotten – what matters is that fragmented research congeals into a common understanding and a coherent set of practices. Novices need not be exposed to it all: teachers need a measured and thoughtful approach that makes sense of the whole and which engages them in the parts that really matter. It's the job of the teacher to interpret and keep abreast of the increasing specialisation, the ever-more recondite detail, the exhaustive scrutiny of tools and services, and to assemble from them a coherence that engages and enlightens. Perhaps it's my students that should pity me.

So we've come a great distance in a short time. The fact that we've managed to turn our initial fears about digital calamity into something that now seems pretty boring suggests we're on the road to taming them. But there are few commentators who would say that the problem is solved. Most imply that apparent solutions tend only to reveal ever more subtle problems. In any case, change is not a bug: it's a core feature and one of the principle benefits of IT. We've proven pretty conclusively that finding solutions is not a problem: we're almost too good at it. Translating research into practical executable guidance seems to give us problems. So two questions arise

for those who want to teach digital preservation: how much of this ever-thickening syllabus do we really need to hand on; and how, if we're not quite sure how to fix the problem ourselves, are we going to show others how to do it?

A partial answer to both questions can be perceived if we are allowed a brief remembrance of what makes digital preservation an issue. Digital preservation is not like preservation, at least insofar as there are very few natural processes which we need to confront. That's to say, while traditional conservators are busy fighting an eternal battle with bacteria, chemicals and grot, our enemies – obsolescence, representation and bit rot – are practically always of our own making. So is it possible that we could make obsolescence obsolete? The idea may seem far-fetched but it's not out of reach and it would transform what and how we teach digital preservation.

The point is not to take us down a blind alley with another research agenda and another work programme. The purpose is to ensure that skills remain current.

The same thought-experiment is possible with some of our familiar metaphors. For example, it's becoming increasingly clear that what we called a 'repository' in 2000 is less of a 'place', it's more of a 'process'. We talk of 'trusted digital repositories' when we actually mean the deployment of trusted services by trusted agents with trusted data and trusted processes. The repository, if it exists at all, is retail data storage for the AIPs. So when we talk about assessing whether something could be a 'Trusted Repository' what we actually need to assess are the services, the processes and the people. And in a service-oriented environment, with dependencies on a constellation of remote tools and operators, and where we call on 'Digital Preservation as a Service' we package trust along some very long supply chains. So why are we assessing and certifying repositories? Why isn't there a 'DP service seal of approval'? Perhaps instead of teaching students about the characteristics of a trusted archives we should teach them how to assess software dependency in a highly distributed environment?

Again the point is simply to observe that we work in a dynamic environment and that the curriculum needs to respond to this dynamic.

View from across the Pond:

Opportunities, Gaps, and Challenges in Digital Curation Lifelong Learning

Helen R. Tibbo

School of Information and Library Science
University of North Carolina at Chapel Hill
Chapel Hill, NC, USA
Tibbo@ils.unc.edu

Abstract—While some excellent lifelong learning programs in digital curation and preservation for cultural heritage information professionals exist in the US, most activities are sporadic and depend on temporary and shrinking grant funding. How best to provide continuing education on digital curation and preservation remains an open question. This paper will critique current programs, discuss key issues, and question the sustainability of existing efforts.

Keywords—component; digital curation; education; life-long education; digital preservation, continuing education

I. INTRODUCTION (HEADING 1)

Mechanisms are also needed to accelerate the transfer of new knowledge into practical working digital preservation systems to prevent further loss of valuable digital collections. There is a pressing requirement for education and training in new digital archiving methods, tools, and technologies [1].

The new discipline of digital preservation needs to be supported. This should include the provision of continual professional development for existing individuals with relevant skill sets, e.g., archivists, librarians and IT staff [2].

Curation of digital assets, whether cultural, educational, scientific, or economic, remains one of the central challenges of our time [1, 3-16]. While the last 20 years have witnessed extensive progress toward robust repository architectures, the development of numerous preservation tools and strategies, and standards for everything from metadata to trustworthy digital repositories, most repositories are no closer to sustainable, long-term preservation than they were when Margaret Hedstrom wrote that digital preservation was a “time bomb for digital libraries” in 1998 [16]. Grant-funded projects have provided a firm foundation for ongoing research and development but ten years after the “It’s About Time” report [1], and seven years after “Mind the Gap,” [2] the need for the dissemination of best practices, standards information, and especially training and support of digital preservation and curation professionals is more pressing than ever. Not only is the volume of digital data and heritage materials growing at an alarming rate but the expanding professional and research literatures often serve to confuse rather than clarify. The novice digital curator has much to learn and an increasingly complex pathway to learn it on his or her own.

Many information practitioners, regardless of their job titles, are conducting digital curation activities in a wide range of repositories and institutions today. Often these are new tasks and processes for which most current staff members have little training or experience, especially in small- to medium-sized cultural heritage institutions. Life-long education for scientific data curation is another area of pressing need. In light of mandates from funders such as the National Science Foundation (NSF) for data management plans (DMP), a growing number of institutional repository staff in academic libraries faces the challenges of advising researchers regarding data curation best practices and managing and preserving the data themselves. Few librarians or archivists in these settings currently have training in or experience with curating data and struggle to keep up with the literature.

In 2009, the Digital Curation Centre (DCC) and the Research Information Network (RIN) conducted a study to determine the roles and responsibilities needed for successful data management as well as the needed expertise of “data specialists” and pointed out the need for data curation education and training [17]. A limited number of graduate Information and Library Science (LIS) programs in the United States, most supported with Institute of Museum and Library Services (IMLS) funds, are now providing some sort of graduate instruction in digital or data curation (e.g., Simmons University, Syracuse University, the University of Arizona, the University of Illinois – Urbana-Champaign, the University of Maine, the University of Michigan, the University of North Carolina-Chapel Hill, and the University of North Texas), but continuing or life-long education for existing information professional is witnessing far less activity, little systemization of efforts, and few programs that are likely to be sustainable. There remains a strong need for more extensive, programmatic, and sustainable professional education for practicing librarians and archivists for digital preservation and curation.

II. .EXISTING CONTINUING EDUCATION PROGRAMS IN DIGITAL AND DATA CURATION IN THE UNITED STATES

Numerous small-scale and one-off education events focused on digital and data curation take place through webinars and face-to-face around the United States. Many of these events, much like the one you are attending today, are

designed to raise awareness around digital and data curation in general or for specific curation issues and are one-time deliverables from grant-funded projects. Few are developed over time into rigorous programs. It is hard to know the effectiveness of such events in the overall scheme of professional education and it is highly unlikely that most participants can piece these training courses into any sort of systematic or strategic whole. These stand-alone, one-hour to two-day events are unlikely to provide comprehensive or in-depth understanding of key curation activities, skills, or resources.

A few continuing education programs in digital preservation and curation stand out in the United States. I will highlight these programs before talking about the systematic challenges life-long education poses.

A. Digital Preservation Management Workshop (DMP)

One of the longest running programs is the Digital Preservation Management workshop [18]. This week-long workshop series started at Cornell University in 2003 under the direction of Anne Kenney and Nancy McGovern, moved to the Interuniversity Consortium for Political and Social Research at the University of Michigan during 2008-2012, and is now housed at MIT where Nancy McGovern is head for Curation and Preservation Services for MIT Libraries. These workshops incorporate “community standards and exemplars of good practice to provide practical guidance for developing effective digital preservation programs” and features lectures, exercises, and an online tutorial [19]. NEH partially funded the DPM workshops over the years but they are now self-sustaining. The DPM Workshop has travelled to several countries and serves as the basis for University of London Computer Centre’s Digital Preservation Training Programme (DPTP) [20].

The primary goal of the DPM workshops is to “promote practical and responsible stewardship of digital assets” [19]. More specifically,

The goals of the workshop are to foster critical thinking in a technological realm and provide the means for exercising practical and responsible stewardship of digital assets in an age of technological uncertainty. The workshop sessions are geared towards making a digital preservation program doable for any organization and all of the sessions include as many relevant examples as we can fit. [19]

The target audience for this series is managers who are or will be responsible for digital preservation programs in libraries, archives, and other cultural institutions. The workshops provide a management perspective, much the same as the Managers’ Lens does in the DigCurV Framework [21].

Key components of the program include 1) the three-legged stool model that articulates organizational infrastructure, technological infrastructure, and requisite resources necessary for successful digital preservation; 2) action plans to take away from the workshop for developing policies and practice at home institutions; 3) sessions focused

on technology trends and best practices in the digital preservation community; 4) a virtual field trip; and 5) readiness assessments and discussion of the five stages of institutional readiness for digital preservation programs [19]. The DPM workshop has contributed to several other digital preservation programs including DigCCurr [22], the e-science Institute [23], DPOE [24], and SAA’s DAS program [25] in the United States and the Digital Preservation Training Programme (DPTP) [20], Assessing Institutional Digital Assets (AIDA) [26], and the Collaborative Assessment of Research Data Infrastructure or (CARDIO) [27] in the United Kingdom.

B. Library of Congress’ Digital Preservation Outreach and Education (DPOE) Program.

In September 2011, Library of Congress’ (LOC) launched the first Digital Preservation Outreach and Education Program (DPOE) in Washington, DC [24]. Twenty-four trainers were drawn from across America to be trained in the fundamentals of digital preservation. LOC expanded the network to 45 trainers during the next year and the program continues to grow. DPOE has a mission to: “foster national outreach and education about digital preservation by building a collaborative network of instructors and partners to provide training to individuals and organizations seeking to preserve their digital content” [24]. The DPOE curriculum is built around six verbs and questions:

- Identify** - what digital content do you have?
- Select** - what portion of that content will be preserved?
- Store** - what issues are there for long term storage?
- Protect** - what steps are needed to protect your digital content?
- Manage** - what provisions are needed for long-term management?
- Provide** - what considerations are there for long-term access? [28]

DPOE is targeted at each layer of the information professional workforce as captured in this diagram [29]:



Figure. 1. DPOE Pyramid

DPOE divided the organizational pyramid so that outreach could be tailored to all levels of the workforce.

C. *DigCCurr I & II*

Preserving Access to Our Digital Future: Building an International Digital Curation Curriculum, (DigCCurr I; IMLS Grant # RE-05-06-0044) [22] was a collaboration of the School of Information & Library Science (SILS) at the University of North Carolina at Chapel Hill (UNC-CH) [30], and the U.S. National Archives & Records Administration (NARA) [31]. It ran from July 1, 2006 – December 31, 2009.

The overall goal of DigCCurr I was to prepare graduate students for digital curation positions with a wide variety of organizations, contexts and types of resources. This project had three main thrusts:

1. creation of a curriculum that involved a master's-level curricular framework, course modules, course development, experiential components, and international guest speakers;
2. two International Symposia - DigCCurr2007: April 18-20, 2007 [32] and DigCCurr2009: Practice, Promise and Prospects: April 1-3, 2009 [33]; and
3. the Carolina Digital Curation Fellowship program that funded five master's students for two years.

A key product from DigCCurr I is the DigCCurr Matrix of Digital Curation Knowledge & Competencies [34]. This is a tool for thinking about, planning for, identifying and organizing material to cover in a digital curation curriculum. Each unit of curriculum content can address one or more dimensions of the matrix. Articulating necessary skills and knowledge, the Matrix provides a framework to specify foundational and elective course content and customize course development for any educational setting or target audience.

The six dimensions of the Matrix are:

1. Mandates, values & principles.
2. Professional, disciplinary or institutional/organizational context.
3. Transition point in information continuum/lifecycle.
4. Type of resource.
5. Function or skill.
6. Prerequisite knowledge.

Although designed for graduate-level curricular and course design, the Matrix is also useful in creating professional education workshops and life-long learning programs.

The IMLS-funded DigCCurr II, "Extending an International Digital Curation Curriculum to Doctoral Students and Practitioners," [35] was a collaboration of the School of Information and Library Science (SILS) at the University of North Carolina at Chapel Hill (UNC-CH) [30], the U.S. National Archives and Records Administration (NARA) [31],

and the i-School at the University of Toronto [36]. It ran from August 1, 2008 through March 31, 2013.

Key DigCCurr II activities include:

- 6 PhD Fellowships
- Development of the Digital Curation Exchange (DCE) [37]
- The DigCCurr Profession Institute, 2009-2011
- Public Symposia, 2011-2013
- Ph.D. Seminar Series, 2012-2013

With initial funding from the Institute of Museum and Library Services (IMLS), UNC-Chapel Hill's School of Information and Library Science has offered the DigCCurr Professional Institute each May from 2009 to 2013. In June of 2012 the Danish Royal Library invited the DigCCurr Team to present the workshop to selected staff members. The Institute is comprised of week-long summer workshops for information practitioners with follow-up sessions held in early January [38]. The workshop is built off of the DigCCurr Matrix and is now self-sustaining.

D. *The Society of American Archivists' (SAA) Digital Archives Specialist Certificate (DAS)*

The Society of American Archivists' Digital Archives Specialist Curriculum and Certificate program [25] were conceptualized in 2011 while I was SAA President. Experts in the field of digital archives develop and refresh one-half to two-day courses on a continual basis and offer these in face-to-face workshops around the United States and via webinars.

DAS provides education and training to ensure that archivists adopt appropriate practices for appraising, capturing, preserving, and providing access to electronic records. It is also designed to provide archivists with the information and tools they need to manage the demands of born-digital records. Students can take individual courses or earn the Digital Archives Specialist Certificate after completing required coursework and passing both course and comprehensive examinations. [39]

Building from the DPOE Pyramid, DAS is structured in tiers of study for a range of archival audiences including administrators, managers, and practitioners. Descriptions for the tiers of study are found on the SAA website [40]:

- **Foundational Courses** focus on the essential skills that archivists need to manage digital archives. They focus primarily, but not exclusively, on the needs of practitioners—archivists who are or will be working directly with electronic records. These courses present information that an archivist might implement in the next year.
- **Tactical and Strategic Courses** focus on the skills that archivists need to make significant changes in their organizations so that they can develop a digital archive and work seriously on managing electronic records. They focus primarily, but not exclusively, on the needs of managers—those archivists who manage other professionals and who oversee programmatic operations.

These courses present information that an archivist might implement in the next five years.

- **Tools and Services Courses** focus on specific tools and services that archivists need to use for their work with digital archives. They are practical courses focused on specific software products and other tools and they focus primarily, but not exclusively, on the needs of practitioner archivists. These courses present information that an archivist could implement immediately.
- **Transformational Courses** focus on the skills that archivists need to change their working lives dramatically and transform their institutions into full-fledged digital archives. They focus primarily, but not exclusively, on the needs of administrators—those archivists with oversight over the entire archival enterprise of an institution. These courses present information that an archivist might implement over the course of the next ten years.

The DAS program is designed to address seven core competencies of Digital Archivist [39]:

1. Understand the nature of records in electronic form, including the functions of various storage media, the nature of system dependence, and the effect on integrity of records over time.
2. Communicate and define requirements, roles, and responsibilities related to digital archives to a variety of partners and audiences.
3. Formulate strategies and tactics for appraising, describing, managing, organizing, and preserving digital archives.
4. Integrate technologies, tools, software, and media within existing functions for appraising, capturing, preserving, and providing access to digital collections.
5. Plan for the integration of new tools or successive generations of emerging technologies, software, and media.
6. Curate, store, and retrieve original masters and access copies of digital archives.
7. Provide dependable organization and service to designated communities across networks.

III. CHALLENGES FOR PROFESSIONAL EDUCATION IN DIGITAL CURATION

There are many open questions for professional or vocational education in digital curation. These include:

- How long/extensive should training be?
- Where should training be held?
- How should training be supported/funded?
- How much should training cost?
- What types of credentialing are appropriate?
- Who should do the instruction?
- Should instruction be broad or specific?
- What should be the content?
- What prerequisite knowledge is necessary?

Currently, the landscape of professional education in digital curation involves a patchwork quilt of course offerings either in face-to-face or webinar modalities and that extend anywhere from one to two hours to week-long workshops. Several graduate schools of Information and Library Science are offering five to ten course post master's certificates and degrees [41-43]. Venues for these programs include colleges and universities wherein participants come to the teachers; "have workshop will travel" where the teacher comes to the pupil, often in conjunction with a conference; and one's computer (webinar). Workshops and courses may be part of a series held in one place or a series may be held in multiple places. Funding for professional education in digital curation includes grants, university continuing education programs, income streams for professional organizations, income streams for commercial firms, and non-profit groups that host events on a cost-recovery basis.

Whether aimed at administrators, managers, or practitioners, most of the existing programs are overviews and general in nature. Numerous gaps in this education landscape include:

- the need to integrate programs that address technical and professional knowledge and skills across the digital asset lifecycle;
- courses to support specialization in various curation functions.
- programs that address specific digital environments & resource types.

IV. PEDAGOGICAL ISSUES

What to Teach. Curriculum is just now being developed so there is no established canon at this time. Courses involve a blend of archival, information, business, and ethical principles along with cutting edge technical and process developments. Core content is, however, unclear as is the range of content and how instructional programs can best sequence course content for a variety of audiences and for participants who may not have taken courses in a strict sequence. Given the time and financial constraints of most workshop/course participants it is hard to fit in extensive core content to which all participants should be exposed as well as extended or specialized topics and maintain an audience. Overall there is uncertainty at all educational levels regarding what to teach to whom.

How to Teach. Given the expense of having working professionals travel to workshops, especially week-long courses, webinars have emerged as a significant training vehicle for digital preservation education in the United States. It is, however, unclear as to what is best taught in a face-to-face modality vs. by remote instruction. Regardless of venue, there are also questions concerning the best mix of lecture, discussion, and hands-on components in any instruction and especially how to provide practical experiences and exercises in remote instruction. There are also questions as to the proper role of field experiences/fellowships/internships/residency programs and how to integrate these components into larger instructional programs. Many of these internships programs

are currently funded through grant projects. It is unknown how these programs will continue without such funding sources.

Duration of Programs. In addition to how and what to teach, determining programmatic duration is a significant as well as practical challenge. Information professionals often have difficulty finding time for extensive continuing education yet there is much to learn; one should not expect to become a competent digital curator based on a few one-hour or even one-day workshops. How to get a core of information management and curation knowledge and skills to specialized audiences (such as administrators and funders) which have a limited attention span for learning about digital curation also needs to be addressed. Churning of material and sequencing instructional modules in appropriate order seem key to success.

V. SUSTAINABILITY

Each of the programs presented above provide participants with high-quality training but sustainability of these efforts is uncertain. Questions abound.

- Who is going to pay for all this?
- What is the business model for continuing education in digital curation?
- Who is going to claim this instructional domain and at what levels?
- How is the academy going to be rewarded for working in this arena beyond formal graduate and undergraduate education?
- How can we reach such a large audience (everyone needs to know something about digital curation!)?
- Can I-Schools provide the digital curation teaching capacity that the government, military, corporate, scientific, academic, and public sectors will require?

The Digital Preservation Management workshop and the DigCCurr Professional Institute were both started with grant funding but now are largely run with the efforts and energy of a few people and registration fees. The Library of Congress' Digital Preservation Outreach and Education program has a small amount of LOC funding for the organizing office but instructors are unpaid. How long any of these programs can run on personal commitment is in question. The Society of American Archivists' Digital Archives Specialist program may represent a more viable and sustainable model. DAS is not only a commitment to the progress of the archival profession; it is also a funding stream for SAA. This ensures that SAA will be diligent in making DAS a robust and long-lived program.

VI. CONCLUSION

At this point continuing education in digital curation and preservation is exploratory and experimental – even the formal looking concentrations and certificates in universities are just underway. The canon for the field of digital curation is only just emerging. Research and development is rapid but not easily translated into workflows of existing professionals. Those taking on the challenges of providing professional or

vocational education are working these issues out in real time but much remains speculative.

Digital curation educators need to work together, across national boundaries and across levels, scope, and instructional purpose. We need to share materials and discuss approaches and emerging good practice while ramping-up the educational workforce as well as educational efforts. We need to move from hand-crafted approaches to wide-spread and easily replicable solutions and be able to certify learning. Much work lies ahead.

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Balancing the Books

The Economics of Digital Curation Training

Neil Grindley

Digital Preservation & Curation Programme

Jisc

London, UK

n.grindley@jisc.ac.uk

Abstract - A great deal of work has been done to try and quantify the costs of digital curation and much of it has focused on assigning a cost value, either to various parts of the lifecycle of digital objects or to stages in the curation workflow. These models tend to assume that an organisational capability to curate is a given and have not tended to factor in the economic considerations associated with ensuring the relevant personnel have the skills and knowledge to do the work effectively. Training can also be understood as an investment and as such, organisations have to weigh the costs against the benefits to determine whether paying for training is worthwhile. From the perspective of standard economic theory, there may be disincentives to sponsoring training, which in turn may affect supply and demand issues and contribute to market failure in the training sector.

The skills and capabilities that personnel either develop or acquire via training are all part of the complex financial equation that institutions have to solve to ensure that their digital assets remain safe and accessible. This paper will look at some of the issues related to training through an economic lens to test whether new insights emerge. The ultimate purpose is to check whether these issues have relevance for other projects and initiatives, especially the newly commenced EC-funded 4C project that is looking to help a diversity of organisations understand the true nature of investment into all aspects of digital curation, primarily through the mechanism of costs, but also through related concepts such as sustainability, value and benefits.

Keywords – *digital curation, training, supply, demand, economics, costs, investment*

I. INTRODUCTION

One way of concisely explaining the benefits of digital curation is to call it an investment. This usefully sets out a few different expectations. The first is that unlike something that you might simply buy - and which therefore has a price - digital curation requires some thought, planning and strategy; and therefore the cost largely depends on the type of investment that is made. The second is the fact that investments tend to take time to mature and deliver returns, and the long-term nature of digital curation similarly does not generally pay sizeable and quick

dividends to impatient investors. Thirdly, it frames the activity in economic terms, and for the purposes of this paper, which is to consider digital curation training from an economic perspective, it indicates the sort of semantics that will be referenced.

There has been an array of projects and initiatives focusing on the costs and economics of digital curation in recent years[1] and further work to synthesise all of the existing information and to make sure that it is fit-for-purpose and as useable as possible is underway in the form of the 4C project [2]. This is a coordination action newly funded by the EC that will build on previous initiatives and reach out to diverse stakeholder groups. This will also need to include trainers and educators and those within institutions who are responsible for ensuring that the capacity and capability to curate is present within the organisation or procurable from without by cost-effective training and knowledge transfer.

One of the influential initiatives that the 4C project builds upon is a US/UK initiative that reported in 2010 called the Blue Ribbon Task Force on Sustainable Digital Preservation and Access[3]. This was the first significant attempt to frame digital preservation within the language of economics and to test assumptions using economic theories and methods. References to preservation as a ‘derived demand’ and digital objects as ‘depreciable durable assets’ may not be of tangible and immediate use to all practitioners, but for those with strategic responsibility for long-term planning in relation to such objects, and who need to have a deep understanding of what exactly constitutes an investment and what may remain a liability, the language of economics is surely appropriate. It is in this spirit that an enquiry into the economics of training and education has been tackled in this paper, using the commonplace framework of supply and demand (albeit in reverse).

II. INDIVIDUAL DEMAND

It is clear from recent studies, not least the DigCurV survey and its report on training needs [4], that the current general

situation is far from satisfactory in terms of an appropriate and relevant amount of training being supplied from one side to meet a steady and predictable flow of demand from trainees on the other. From a total of 454 responses, almost 19 out of every 20 individuals surveyed declared that their organisation either already had, or was going to have, responsibility for the long term care of digital assets.

Well over half of them (57.3%) said that their organisations did not intend to recruit new staff to deal with this issue. When asked about the likelihood of receiving training to learn how to do this job effectively, over a third (35.4%) of respondents said that training would be provided for staff who had no previous experience. Just under a third (31.4%) said that staff who already had some expertise would receive further training. The remaining proportion (35.1%) was either considering alternative approaches to training (learning by doing?) or had not yet decided how to tackle the issue (or perhaps didn't even think it was an issue). Given the not insignificant scale of the survey and the diversity of the types of organisations that feature, an extrapolation of these figures across the global workforce could be indicative of an imminent and prodigious requirement for training, even allowing for the third that were not at this stage interested in training issues.

Evidence from other sources corroborates this view of demand growing over the next few years. If not specifically in terms of requests for training then certainly in the overall importance that people anticipate that digital curation/preservation/archiving will assume within institutions. A recent survey asked UK university libraries what level of current priority e-journal archiving represented and what sort of priority it was likely to be in 3-5 years time. The results clearly pointed to an increased level of focus on the issue. See figure 1 below.

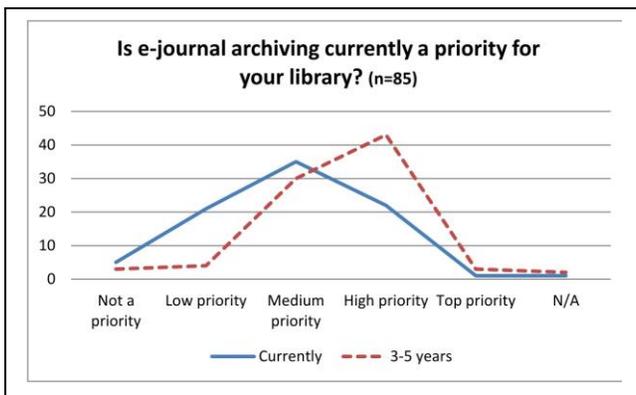


Figure 1 – Survey carried out for Jisc by Charles Beagrie Ltd. (2013)

In the course of two series of roadshow-type events organised by the UK Digital Preservation Coalition and the National Archives (UK), a total of around 700 participants from a wide range of organisations expressed the following opinions in formal and informal feedback [5].

- There is a great demand for training from staff already engaged in library and archive settings, and in particular for accessible introductory material.
- Participants at these two ‘road show’ series have consistently prioritized practical experience over theoretical knowledge, in particular through case studies and worked examples.
- Participants at these two ‘road show’ series have frequently requested practical exercises within training, learning through doing rather than passively listening to information.
- Participants at these two ‘road show’ series have shown willingness, even urgency, to make pragmatic progress in the preservation of digital collections. They favour small parcels of practical advice that is ‘good enough’ over comprehensive theoretical overviews and inaccessible research questions.

Not only does this reinforce the message that there is demand for training but usefully starts to articulate exactly what (some) people feel they would benefit from and therefore how (some) training might most efficiently be designed to meet their needs in the most cost-effective manner. The emphasis in this particular context was certainly on accessible and practical material that could be put to use relatively easily in an operational environment.

Returning to the DigCurV survey, the elicited information also indicates preferred modes of training: 75.3% said their preference was for small group work training (which was by far the most favoured mode). The most preferred occurrence of this type of training was on a one-off basis lasting between 1-2 days. The next preferred mode was for one-off training events lasting 3-5 days. Extended courses involving 1-4 hours of study per week were considered less popular and 1-2 week bloc courses in a repeated semester-style programme were less popular still – unsurprisingly, given the fact that this survey was chiefly aimed at addressing work-based vocational-style training rather than more academic approaches to learning.

An MIT study [6] from 2006 gauging the most effective of seven training delivery methods also rated “Classroom training with instructor” as by far the most popular and chosen in 30% more cases than the next highest option.

This picture of training needs is clearly important but what is difficult to discern is: the appetite for organisations to act upon these opinions; to make budget available to address these requirements; and how well-aligned the perceived requirements

of individuals are with the organisations they work for. To understand this requires very detailed knowledge about institutional concerns and some mapping of priorities between individuals and the organisations that they are employed by.

Organisations across different sectors are at very different levels of acceptance about the urgency and the importance of digital curation and this fact is understood and articulated by the five stage maturity model that emerged from the course developed at Cornell by Anne Kenney and Nancy McGovern[7].

- Acknowledge (Understanding that digital preservation is a local concern)
- Act (Initiating digital preservation projects)
- Consolidate (Segueing from projects to programs)
- Institutionalise (Incorporating the larger environment)
- Externalise (Embracing inter-institutional collaboration and dependencies)

It seems logical that those organisations that are less mature in their understanding of digital curation will be less open to the idea of training their staff to take on associated tasks. It's also tempting to characterise all staff within those organisations as sharing an overall view that trying to engage with the complexity of digital preservation will distract from core business. However, this begins to sound like an economist's theoretical conception of decision-making within the perfect marketplace, where all organisations act and think in a rational and coherent manner! An alternative depiction is the scenario where 'demand' often does not come either from the individual or from the organisation, but is the outcome of a conversation or a negotiation between the individual who would benefit from being trained, and another individual who has the authority and discretion to agree or to refuse to pay for that training.

III. ORGANISATIONAL DEMAND

This concept assumes that 'the organisation' takes a view on the tactical and strategic benefit of sponsoring training for an employee, which can be articulated in economic terms as a *human capital investment* decision. (In practice of course this is likely to be an individual or a small group of individuals attempting to act in the interests of the organisation as a whole). Standard economic theory [8] on this topic suggests that organisations will not invest in general training for their employees and will under-invest in specific training. The definitions are as follows:

- General Training - training that will make the employee equally useful to many different organisations.

- Specific Training - training that makes the employee useful within the sponsoring organisation and has no effect on the productivity of that person in alternative employment.

As seems often the case with economic theory, some further time is spent setting out what a 'perfect' model or market might consist of, which – for interest – is where there is full and open competition between organisations in their search for human capital; where all training is general; where all organisations train; all workers are trained; and everyone is purely motivated by financial gain. The admission in the literature that this perfect scenario is not ultimately realistic is acknowledged but not altogether accepted as logical.

“... a large body of empirical evidence obtained in laboratory experiments shows that a substantial fraction of subjects behave as if they are motivated by factors other than their own monetary payoffs.”[9]

The organisation that is a potential sponsor of training has a duty to think very carefully about the full cost and all the implications of training any particular individual. Training providers obviously believe that training is an unqualified good, just as those in the business of providing education believe that education, both for its own sake and for the development of the individual as an economic contributor to society makes a positive difference. From a purely economic point of view it might work against the interests of the organisation because:

- a) The cost is higher than might be apparent to the trainee
- b) It sets up expectations of future activity that the organisation might not be able to afford
- c) It exposes the trainee to disruptive ideas that the organisation might not be able to accommodate or react to effectively
- d) It enables the trainee to find employment elsewhere

The formal cost of the training might be anything from \$0 to \$1500 (see the discussion of *Supply* below) for vocational study or much more for educational opportunities. The productivity cost and the opportunity cost of releasing a valued and productive worker to attend training needs to be factored into the overall equation. If there are multiple training options to monitor, evaluate and coordinate, along with numbers of staff to deal with equitably - some allowance for choosing and arranging training on behalf of employees will need to be costed. If there is prior reading required and/or follow up in the form of reporting, this will also affect productivity.

The impact and effect of points b) and c) above are obviously very hard to anticipate and manage and address the insecurities of all organisations, many of whom might like to regard themselves as forward-thinking; tolerant of innovation; and strategic in their

approach to staff development – but may, in reality, be as anxious as the next organisation about a) and d).

The impact of d) is of particular concern to economists and provokes a great deal of theorising, particularly in relation to general and specific forms of training. As noted above, if the employee asks (at the company's expense) to be trained in a marketable skill or to have commercial knowledge bestowed upon them, the employer will need to think very carefully whether it is in their interests to support that individual to acquire those commodities. The unimaginative employer may prefer to maintain the status quo; support the productive employee in the role they are in; and not encourage aspirations about changing their status or designing their future.

IV.RECIPROCITY

It is likely that the scenario outlined above exaggerates and simplifies, firstly for effect, but also because the language and methods of economic analysis tend towards the formulaic. It is clear also that its relevance might be more or less applicable depending on the nature of the organisation, the most basic categorisation being whether decisions are required of a public or a private enterprise. It is clear that the drivers acting upon staff are very different in large and small and profit and non-profit organisations.

Whatever the level of relevance, it is logically true that the desires of the individual and the needs of the organisation are rarely exactly aligned. To alleviate this misalignment and to bridge the gap between the individual and the organisational views of human capital investment, Leuven et al suggest that the principle of *reciprocity* comes into play, which is a concise term for the good will that has to exist between the two parties in order for general training to be paid for by the organisation [10].

As mentioned above, standard economic theory deems general training to not be in the interests of the sponsoring organisation, and it therefore requires good will (and some trust) for the organisation to approve expenditure. Good will on the part of the employee is demonstrated by them behaving less opportunistically than standard theory assumes they will (i.e. immediately exploiting their new found skills to apply for a better paid role elsewhere).

Even with specific training, where the assumption is that the training received and the skills acquired are not transferable beyond the sponsoring organisation, some element of good will is still required because the standard tendency on the part of organisations is to under-invest. The problem in this case is not the loss of human capital investment (caused by turnover of valuable staff) but the likelihood of wage inflation in line with productivity gains following instances of training.

Leuven et al quote results from a survey undertaken in 2001 that, amongst other things, tried to ascertain employees' sensitivity to reciprocity. Having established which of those people amongst a representative sample of the Dutch population aged 16-64 had undertaken training in the previous 12 months (and associated details such as whether this was on work time, who paid for it, etc.), the survey finally asked, "if someone does something that is beneficial to you, would you be prepared to return a favour, even when this was not agreed on in advance?" The survey (1,393 people) prompted the following responses:

1. Not at all (1.0%)
2. No (3.3%)
3. Maybe (9.1%)
4. Yes (60.8%)
5. Certainly yes (25.8%)

This combined with other features of the survey led them to the following conclusions:

- Older respondents are less inclined to return a favour in response to someone doing something that is beneficial to them
- Younger employees are more reciprocal and participate more in training
- Those with more advanced levels of educational attainment are more reciprocal
- There is no systematic relation between respondents' reciprocal attitudes whether they are female, migrant, single or have children
- Women are less likely to participate in organisation-sponsored training than men, but are more likely to participate in training that the organisation does not support
- Employees are more likely to participate in sponsored training when the employer possesses its own training centre and when the organisation is larger
- Organisations learn quickly about the level of an employee's reciprocity
- Respondents with a high reciprocity rating were 15% more likely to receive training in a 12-month period than those declaring low reciprocity.

At a reductive level, some of the conclusions are self-evident. Young people implicitly lack knowledge and experience and therefore are more likely candidates for training; convenience will encourage uptake, etc. Perhaps the important figure is the last point which states the level of increased likelihood of securing sponsored training through the demonstration of a reciprocal attitude in the work place. Once again, however, it is open to question how practically useful economic theory is when

confronted with the real complexities of relationships and negotiations.

V. SUPPLY

The above account of demand tries to underpin some intuitively known barriers to sponsoring training with a dose of economic theory, to test (much like the Blue Ribbon Task Force did) whether such economic perspectives can offer new insights. Research and analysis relating to economic theories on the *supply* of training no doubt also exist, but were less immediately obvious. It is clear at a practical level though, both from the evidence emerging from the earlier cited DigCurV and APARSEN work, that the amount and type of training that is on offer is not perceived as sufficient to enable effective digital curation to occur in all the working contexts where it is required. The DigCurV study states: “Across the groups participants stated a lack of appropriate training offers.” It also states: “Some also noted that there are not enough skilled candidates on the labour market.”[11]

In the perfect competitive market (that has had time to establish itself), received wisdom dictates that if there is high demand then supply will automatically develop to meet that demand. Taking a purely economic view on this gap, one would have to conclude that training providers have not appeared because it is not financially viable to offer training on the topic of digital curation, which given the supposed level of demand is puzzling. The answer must be that the market is (as ever) imperfect and other factors are obscuring and blocking the expected machinations of the economy.

One possible explanation could be that developing training courses or materials for digital curation is disproportionately expensive or difficult. A Jisc-funded study from 2004[12] looked into this particular issue and asked a number of training providers how much it costs to develop and deliver a 5-day course.

Preparation	Type	Delivery	Total
34 days @£500 per day	Bespoke course	£10k	£27k
Minimal	Pulled together from existing sources	Internal to the organisation	£1.5k
Minimal - moderate	Some external speakers and some commissioned material	Internal to the organisation	£4.5k
20 days @ £500 per day + £5k for materials	??	£2.5k	£17.5k
£30k-£40k	Bespoke course	£4.5k	£34.5k - £44.5k

These cost estimates are nearly a decade old so may need updating, but even if they represent ball park figures, the high-end of £44.5k does not seem a formidable financial obstacle, considering that it should be possible, given the supposed demand, to run the course multiple times before more investment is required to update the course materials. The potential returns on such investment might be judged by the fees quoted for current courses:

- Digital Preservation Training Programme (DPTP) - £650 + VAT (£780) 3 day course
- MIT Libraries Digital Preservation Management Workshops – Intermediate for Management - \$1,500 (£978) – 5 day course

The second of these prices was found by consulting the Library of Congress list of digital preservation/curation training opportunities put together by Butch Lazorchak[13], which incidentally makes instructive reading about the range of courses and one-off sessions that are on offer, of different durations and at all prices, ranging from free to the \$1,500 quote above.

If capital investment is not the issue (and that is not to say that it isn't ... but only that it doesn't *feel* like the issue), then why aren't more suppliers of digital curation training not stepping forward with satisfactory products? The following statements might provide some starting points for discussion or some potential perspectives that may require more analysis and research:

- Digital Curation is too technically complex or niche a field and many providers are not yet in a position to assemble and deliver appropriate training
- The market for training is confusing and obscure for training providers and they don't understand who they would deliver products to
- There are no established products that address clear tasks that institutions require someone to tackle
- There is no obvious level of certified capability that confers credit on the trainer or the trainee

On the last question of certification, there are benefits and potential problems of attempting to make the capability of an organisation - and the identity of those with useful skills within it - more visible to the market. It is relatively straightforward for an organisation to attach wages to tasks but more difficult to attach wages to skills. This can be mitigated by the use of certification but the employer then runs an increased risk of having the employee poached by another organisation. This returns back to the problems of open and competitive markets referred to above and which has been a well rehearsed theme in the literature of labour market economics, going back at least as far as Arthur Cecil Pigou in 1912 and possibly further [14].

There is not space in this paper to delve further into these questions but the topic would bear further scrutiny and research to unravel the reasons behind the apparent shortfall between the stated demand and the perceived supply. It is of course conceivable that there are misconceptions at all three stages of that statement, namely that: the shortfall is apparent rather than genuine; the demand is stated but not actual; and the supply is wrongly perceived. Add in the complexity of trying to work out the precise relationship between supply and demand and which of the two is the more significant inhibitor of growth in the digital curation training sector and the questions become even more obscure.

VI. IMPLICATIONS

As stated in the introduction, one of the purposes of looking at this area was to examine what role and influence the economics of digital curation training and education might have on the work of the 4C project. It is clear that both the demand-side and the supply side of training are complex and are still at an immature stage in comparison with other areas of digital practice which have developed whole industries around the provision of training for specific skill sets (e.g. Cisco certification for networks, Microsoft certification, CAD skills, etc.).

What it also indicates is that the type and timing of investments that might be required on the part of institutions to ensure that they can acquire, maintain and retain the appropriate capability to undertake the curation of their digital assets is far from straightforward. This ultimately translates into a risk to the sustainability of digital assets and an obstacle to strategic planning. It is important therefore that these aspects are included in the work that the 4C Project is doing on risk identification. In the early part of the project this is principally relevant to the development of an economic sustainability reference model (for digital curation)[15].

Another emerging idea from this brief examination of economic perspectives on training is that if there is validity in the views referenced that organisations will automatically tend towards reluctance to train due to a concern about potentially losing human capital; and employees are all eagerly waiting to grasp the first more substantial salary that is offered to them, this paints a very gloomy picture of the entire community. It prompts the need for creative thinking about how to build more trust into organisations and how to design job roles and teams and conditions for working that provide much richer and more complex incentives than simple financial remuneration.

VII. CONCLUSION

The purpose of this paper was to introduce an economic perspective on issues around the provision and uptake of training. By referencing the apparent demand for training and the stated

lack of supply, it pointed out the economic anomaly that this represents and an example of market failure. Some possible factors and causes were suggested but the complexity of the problem requires further research. It was also recognized that problems and inefficiencies around training and skills acquisition represent a threat to the sustainability of digital assets and as such need to be tackled by relevant projects working in the field, such as the 4C project.

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Extending the Reach of Digital Preservation Practice: a program to teach practitioners in small institutions

Mary Molinaro

University of Kentucky Libraries
University of Kentucky
Lexington, Kentucky, USA
molinaro@uky.edu

Abstract— Many working in small libraries, museums, archives, and historical societies have been actively engaged in creating digital collections, but often these collections are not being digitized to standards, are presented to users via a web page and are not preserved in any meaningful manner. How do the people in these scenarios discover that there is a problem before they lose content and more importantly how do they learn what to do about it? The Library of Congress Digital Preservation Outreach and Education Program (DPOE) is taking a proactive approach to extending digital preservation education across the United States in a scalable way.

Keywords- *digital preservation; education; practitioners; training*

I. INTRODUCTION

Many working in small libraries, museums, archives, and historical societies have been actively engaged in creating digital collections, but often these collections are not being digitized to standards, are presented to users via a web page and are not preserved in any meaningful manner. How do the people in these scenarios discover that there is a problem before they lose content and more importantly how do they learn what to do about it? The Library of Congress Digital Preservation Outreach and Education Program (DPOE) is taking a proactive approach to extending digital preservation education across the country in a scalable way. This presentation will address these issues and describe how DPOE is meeting digital preservation education needs.

II. WHAT IS THE PROBLEM?

There is lots of information available about digital preservation. Presentations, conferences, webinars and articles abound. There are grants from various agencies available to institutions to have a digital preservation readiness survey done to assess where organizations are to start. Consultants can be hired. This only goes so far, however. While education about digital conversion, digital preservation and digital curation is readily available to those who seek the information, those who are affiliated with smaller independent organizations are not likely to have the information they need. They may realize that they don't know what to do, but for them to acquire the right information may be an

insurmountable obstacle. If they look at the standards that are published they may not understand the terms used or the technology involved. Do they have good content that would contribute to the record of our cultural heritage? Most certainly they do. Is the digital content at risk of being unable to be useful in the future? Unfortunately, the answer is also yes. Unfortunately many institutions are spending valuable resources and a great deal of effort to create digital objects that may prove to be a waste of time and money as the files become obsolete and the work is unsustainable.

III. A NOBLE EFFORT

In 2009 some key staff at the Library of Congress had some conversations with key individuals from around the United States on the pressing issues around preserving the digital content around the country. The primary issues they named were education and training. Concurrent with this, conversations were happening among many professionals in the digital preservation community about the need to train professionals in libraries, historical societies and other organizations who are responsible for creating and preserving digital representations of our cultural heritage. In a country as large as the United States how would this best be extended to those at "the end of the road"? How could a training program reach those who needed it the most?

Staff at the Library of Congress and others in the digital preservation community conceived of the Digital Preservation Outreach and Education (DPOE) program. From the beginning the DPOE team has been active in researching and developing a program that can meet the digital preservation education needs of individuals currently working in the field. This is not targeted at large institutions who are generally better prepared in this area, but rather is aimed at those small to medium institutions who are uncertain about which actions to take and who have limited funds for training.

In the summer and fall of 2010, a needs assessment survey [1] was conducted with 868 archivists, librarians, information officers, corporate executives, and similar professionals responding to the survey. The breakdown of respondents was as follows: 40% of the respondents were libraries, 34% were archives, 16% were museums, 4.5% were historical societies

and 0.9% were research groups. The majority of respondents (48.3%) were from academic organizations; 9.6% were from county or municipal government; 7.7% were from federal government; and 6.7% were from state government. 25.5 % responded as “Other” (many of these identified themselves as non-profit organizations). By regional breakdown 25.7% of respondents were from the Northeast region, 22.4% were from the Southeast region, 21.3% were from the Midwest region, 14.7% were from the Southwest region, 10.3% were from the South central region, and 5.3% were from the Northwest region.

The respondents were largely from smaller organizations, with 50.6% from organizations with fewer than 24 staff members. The survey revealed that the respondents preferred technical training (to assist practitioners in understanding and applying techniques) that was close at hand and with duration of a half day to a single day. Overall, nearly 50% indicated a preference for small workshop format.

During the winter of 2010 DPOE reviewed the curricula of five digital preservation training providers, including Cornell University-ICPSR Digital Preservation Management Workshops, Educopia Institute, MetaArchive Cooperative, LYRISIS, University of Arizona School of Information Resources and Library Science, Graduate Certificate in Digital Information Management program, and the DigCCurr (Digital Curation Curriculum) program at University of North Carolina. This review helped the DPOE team to craft a more targeted curriculum for working professionals.

Dr. Nancy McGovern (then at the Inter-University Consortium for Political and Social Research (ICPSR) and now at the Massachusetts Institute of Technology) was contracted to draft the basics of the DPOE program. She developed the train-the-trainer content and approach and developed the core principles that are the foundation of the program modules. These modules are intended to be foundational and support the training events that are offered to appropriate audiences by the trainers that are trained through the DPOE program. Dr. McGovern has deep experience with digital preservation training. In developing the DPOE modules she drew upon her experience derived from delivering more than 40 workshops in the very successful Digital Preservation Management Program that she developed with Anne Kenney when she was at Cornell University in 2003. Dr. McGovern states, “The objectives of DPOE were to raise awareness about digital preservation - to make awareness pervasive, to provide training in manageable chunks ... to build a base of trainers by giving really novice trainers an opportunity to learn how to be a trainer by presenting really basic information to a novice audience - then move on to mentor others and present more advanced content.”

The modules that were developed represent the fundamentals of digital preservation practice. They are intended to be accessible to novices and to be practical so that

people can easily put the concepts into practice as they handle their digital content. The modules were loosely modeled after concepts outlined in “A Framework of Guidance for Building Good Digital Collections” by the National Information Standards Organization (NISO). [2]

And thus, the Digital Preservation Outreach and Education program was established. The mission of DPOE is to foster national outreach and education about digital preservation by building a collaborative network of instructors and partners to provide training to individuals and organizations seeking to preserve their digital content. This is a train the trainer initiative. The DPOE National Trainer Network works to build relationships with organizations to make digital preservation training more widely available to working professionals. The National Trainer Network is made up of working professionals who attend a DPOE Train-the-Trainer workshop. DPOE Trainers provide digital preservation training to other working professionals in their communities.

The first Train-the-Trainer workshop was held in September 2011 at the Library of Congress where 21 participants from across the country were trained in the DPOE Baseline Curriculum and the fundamentals of managing workshops. The training was not aimed at teaching managers or administrators, but rather at novice practitioners. Following the weeklong workshop, the newly minted trainers committed to teaching one or more sessions in their region.

The second DPOE workshop was held in the summer of 2012 in Indianapolis at the Indiana State Library where another 23 participants were trained. Workshops are scheduled for the summer of 2013 in Illinois and Alaska where an additional 38 participants will be trained. Thus by the end of 2013 more than 80 trainers will have been trained to present the DPOE curriculum.

IV. THE IMPACT

Within six months of receiving the DPOE training, each group of newly minted trainers had done at least one training session with some of the trainers far exceeding their obligation. The sessions ranged from small one-time workshops to webinars offered in conjunction with the Association of Southeastern Research Libraries (ASERL), the largest regional library consortium in the United States. Over 1,500 people have participated in DPOE workshops in the first two years since the program was initiated.

In follow-up surveys participants of the workshops that the trainers held offered comments such as, “[the course] gave guidance and best practices with practical information on moving forward managing digital content.” and “The course content was very practical - I was immediately able to think of ways in which it applies to my current job. I got the feeling that people working in different environments could all take something of value from the course. I also appreciated that the course didn’t try to cover too much ground, rather it focused on small steps that can actually make a difference.”



The DPOE program is a scalable way to make a real difference to many curators, managers, librarians and archivists who are responsible for valuable content in places that are not able to readily participate in the larger digital preservation community. It is hoped that once the participants have the basic concepts mastered they will seek out more complex, higher level training. But until then, they are much better able to responsibly manage the content in their care.



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Invited lectures

Session 2 – Skills for the future

Skills for the Future:

Educational opportunities for digital curation professionals

Achim Osswald

Institute of Information Science
Cologne University of Applied Sciences
50968 Cologne, Germany
achim.osswald@fh-koeln.de

Abstract¹ - Several cultural heritage institutions all around the world have set up special services, trainings, courses or programs focusing on curation of digital material. Digital curation is a multifaceted task with a great variety of responsibilities, preconditions and objectives. For the first time in this field the DigCurV project offers a framework to locate competences and skills related to vocational education and training regarding digital curation processes. Referring to this framework should be a good starting point for differentiated educational activities focusing on special target groups, their educational background, the objectives of the digital curation process, and the material which has to be curated. Based on this, additional frameworks comprising these educational activities can be set up – still referring to the DigCurV framework partially or in total. This will offer the opportunity to compare educational activities regarding content and the results achieved.

Beside these efforts regarding content and concepts of digital curation education there is another ongoing challenge: getting people involved and making them eager to curate (their) digital material properly. The curation job is hardly glamorous or much admired. For the most part it is a service-oriented back office activity demanding functionality and perfection. For a long time, specialists will be needed – and will need qualified training – to meet these requirements. Increasing awareness of the need for digital curation by professionals and the public offers opportunities to get digital curation professionals and their skills involved even in everyone's working environment.

Keywords: component; education; training; vocational; personal archiving

I. INTRODUCTION

The title of this paper is deliberately left ambiguous: There are educational opportunities to be provided for and by digital curation professionals. The reason is quite easy to see: digital curation as a topic of educational activities is still in a stage far from maturity. Results from the DigCurV project have made obvious that there is a wide and still growing gap between the

various educational activities: On the one hand, there are still activities initiating and stimulating awareness of the digital curation challenge, on the other hand, there is a need for very specialized and sophisticated qualifications by those deeply involved in digital curation activities. Educational activities should and intent to serve both demands. Digital curation professionals and experts specialized in teaching and training are expected to work hand in hand to meet this challenge by vocational education and training. Results of the DigCurV project – especially the “Curriculum Framework for Digital Curation” – might be helpful points of reference during this effort.²

II. CHALLENGES OF EDUCATIONAL ACTIVITIES IN DIGITAL CURATION

A. The need for vocational education and training

The DigCurV surveys have documented and proofed what most of those involved in digital curation have seen as obvious: There is a very small group of institutions engaged in the management and long-term preservation of digital objects, nevertheless, they are growing in numbers. The more they immerse in the task the more specialization is required of their employees. Although training on the job is a very common way of qualifying employees the number of qualified persons is not sufficient. Exchange of experiences and ideas as well as specific, focused training in various tasks and competences are needed to reach the state of the art in digital curation. Furthermore, these specialists need to keep on improving their knowledge on methods and procedures. Until now, it seems that in the countries involved in and under focus by the DigCurV project this growing demand is served only partly. The situation varies from country to country but the overall picture seems that this specialized demand for qualification has not yet been met sufficiently.

While those already involved show a growing demand of qualification and training others seem to be far from being

¹ Paper presented at the international conference „Framing the digital curation curriculum” Florence, Italy 6 - 7 May 2013_with reference to the “Digital Curator Vocational Education Europe (DigCurV) Project” (<http://www.digcurv-education.org/eng/International-Conference>).

² DigCurV and the Curriculum Framework - see <http://www.digcurv.gla.ac.uk/> - itself is referring to a set of other concepts and analyses of qualification for digital curation issues, e.g. the Matrix of Digital Curation Knowledge and Competencies (June 17, 2009 (version 13), see <http://www.ils.unc.edu/digccurr/digccurr-matrix.html> or the findings of DPOE (Digital Preservation Outreach & Education, see <http://digitalpreservation.gov/education/>).

aware that they are supposed to get into the digital curation business at all. Some of them may feel disturbed when they think about the durability and accessibility of the digital material they have in their custody. But a lot of them really do not know how to start the digital curation task properly.

Therefore the need for digital curation professionals regarding vocational training activities stretches from seeding awareness up to high-end topics regarding the state of the art in digital curation activities.

The number of persons involved in education and training has not increased very much in recent years. In addition, the digital curation topic has become more and more differentiated by research results and objects to be curated. In this respect there are a lot of opportunities for digital curation professionals.

B. Looking back on educational activities in digital curation

About ten years ago when some of us started providing education and training in digital curation the situation was quite easier: It all was about raising awareness of the problem of digital curation (and it does not matter if we have called it digital curation, digital archiving, long-term preservation or if we have used other terms). We were pioneers in a field when the knowledge on the topic was less differentiated. Therefore, nearly everyone interested and participating in international discussions on the topic could get involved. Education and training was provided as a cooperative effort of experts with practical experience and teaching experts to which training events were a kind of vocational training as well.

Although there was wide involvement of digital curation experts in education and training the demand for digital curation qualification increased. This and some other factors have changed the situation: with research processes becoming more complex enthusiasm for side activities fades. And last but not least progress of research and the resulting huge number of publications in the field of digital curation make it difficult to keep pace with the developments. While some of us still give introductory courses, a few others are focusing on special areas such as special material, methods or processes. Altogether, there is just a core group of persons available for training events and vocational courses. Therefore, the number of colleagues to meet the demand for specialized courses is not sufficient. This is the picture in Germany and it seems to be alike in other countries – at least in those where English is not the first language.

Most vocational trainings are provided in national languages. Therefore, localizing the state-of-the-art knowledge has been a major task for some of us in recent years. Organizational structures and the involvement of major players vary from country to country. This has to be observed when concepts and ideas are going to be taught and implemented on a national or regional level. Localization is a time-consuming task and occupies especially those of us who are not from English-speaking countries. A German example of these activities is the “nestor-Handbuch” (“Eine kleine Enzyklopädie

der digitalen Langzeitarchivierung”³ [1], a cooperative state-of-the-art overview on basics and developments in the field of digital curation. The latest edition published on paper in 2009 is still a cash cow for the publisher although an updated online edition (2010; edition 2.3) is available open access under a CC license. Online access rates indicate (at least for Germany) that there is still demand for introductory information on the topic of digital curation in national languages. Most colleagues working in the heritage sector in libraries, archives and museums are reached by these activities in their first language.

Meanwhile there is a great variation of introductory material available regarding issues of curation and preservation of digital objects. Most of it is in English by which the largest audience is reached. Nearly everybody of us has seen and heard e.g. the adventures of “Team Digital Preservation” created by Digital Preservation Europe, a cooperative European Community financed network and project. At first sight this way of raising awareness of the challenges of digital curation seems to be much more attractive and convincing than videos of presentations at tutorials and workshops which are available online.⁴ Yet, these workshop recordings are helpful because they address another audience and provide much more insight into the relevant issues than those comic-like short videos of “Team Digital Preservation”.

Some of us have spent a lot of effort for many years – and still do – in creating online tutorials on various aspects of digital curation. The first and most famous one seems to be the “Digital Preservation Management: Implementing Short-term Strategies for Long-term Problems” tutorial realized by Cornell University 2003-2007. Available in three languages (English, Italian and Spanish) it has reached a large audience worldwide. We have used it within the courses of my university and at other occasions – until the nestor-based network of colleagues of German-speaking universities started in 2007 a moodle-based set of online tutorials.⁵ These tutorials are updated frequently and used by up to 300 students of different universities every year because some of us use them within the courses we teach. It is still under discussion whether this material can be made available to the public or should be kept accessible for a closed community only.

C. Updating and customizing teaching and training material

The teaching and training material available is adapted to special audiences and their needs and uses different didactic approaches and media channels. Because most of this material has been produced in a project context, it is rarely updated when projects have ended. Communication channels such as

³ The first digital version of the “nestor-Handbuch” was published in June 2008 under a CC licence. Its current edition 2.3 is available under urn:nbn:de:0008-2010071949. For details on the publishing history of the “nestor-Handbuch” see <http://nestor.sub.uni-goettingen.de/handbuch/artikel.php?id=0>.

⁴ See e.g. the DPE Digital preservation video training course from October 2013 at <http://www.digitalpreservationeurope.eu/video-training/prague-2008/?media=28>.

⁵ For more information see e.g. http://nestor.sub.uni-goettingen.de/education/nestor_e-Tutorials.pdf or [2] and [3].

wikis or blogs seem to offer fancy new opportunities of community-generated content. As a result new applications are popping up once for a while – and diminish. Over and above competition between universities and their educational activities sometimes at least complicates cooperative and collaborative activities in creating and updating course material.

However, students and participants of vocational trainings expect updated content in a state-of-the-art context. This requires ongoing efforts regarding content and its presentation for all of us in the education and training business – whether we offer introductory courses or not.

Sustainability and reusability of specialized course material seem to be another problem because there is so much research and other activities providing updated and new results. The more developed and advanced the topics are the more effort is needed to edit them for educational activities. Additionally, the pre-knowledge of the audience is often very varied and sometimes even unclear. This is one of the great challenges of vocational education and training especially in a small community like the digital curation scene. Nevertheless, most participants expect the presentation of customized material and solutions free of charge.

D. Differentiation and improvements

Participants of vocational education and trainings – like those of other educational activities – expect settled know-how and a good combination of theoretical/methodological knowledge and hands-on training. Projects like DigCurV and successional projects to be set up will offer not only a framework for this but can also stimulate agreements on specific content of educational activities. Beyond the basic framework provided and presented by DigCurV⁶ there is a need for qualification frameworks regarding the curation of specific objects like research data, databases, websites, multimedia objects, etc. Courses, school events and trainings on these topics already provided might be a good starting point for this. Such activities will continue to contribute to the development and a professional approach to the whole issue. In recent years some encouraging developments have been identified within the academic sector by setting up courses and Master curricula in the field of digital curation/preservation. With regard to vocational training, however, there is still a great lack of professional approaches. Therefore, ongoing efforts of developing baseline recommendations for special digital objects like DigCurV or the general topic are needed.

III. DIGITAL CURATION PROFESSIONALS AND THE LABOR MARKET

The professional approach might contribute to the basic issue of all these educational activities: It is still quite difficult to hire digital curation professionals because so far the numbers of digital curation professionals on the labor market is rather

small. There are only a few already specialized experts – most of them involved in project activities. The image of digital curation as a difficult and long term activity contributes to the problem. Indeed, the curation job is hardly a glamorous or admired one. For the most part it is a service-oriented back office activity with high requirements concerning functionality and perfection. The thrill of being part of a new challenge will get contained when these members of support staff do not get much appreciation. While most of the jobs are offered in the public sector, salaries are better in the private sector. In addition, IT-related careers in other contexts distract digital curation professionals to other jobs.

While general preconditions are not very appealing (at least for the public sector) we expect new colleagues to offer a great set of experiences and skills, e.g. in project management. They “need to keep up with emerging trends of digital scholarship, including electronic publishing, digital preservation, and data mining ...” [4]. Practical skills and technical skills combined with liaison and instruction skills are expected and should be related to “domain knowledge on the types of resources or data being managed.” [4] It seems that employers are looking for professional allrounders like a Swiss army knife – but are not willing or may not be able – to pay salaries which attract such professionals. It remains to be seen whether digital curation-related BA programs at universities will manage to qualify these additional experts. It is most likely that the labor market problem will not be solved in the near future. As a consequence, this will limit the further development of digital curation activities.

Yet, there is hope: If institutions realize how much they rely on services and know-how of digital curation professionals they might change their offers and perhaps will provide better career options. And if we as professionals can set up educational standards and develop adequate vocational trainings the reputation (and – hopefully little by little – salaries) of digital curation professionals will catch up as well. Frameworks like DigCurV and certified educational measures will support this development.

IV. AREAS OF EDUCATIONAL ACTIVITIES IN DIGITAL CURATION

Since librarians, archivists and colleagues from museums and the IT sector have been offering educational concepts on digital curation a differentiation in activities can be detected. There are at least three overlapping areas of action:

- At the beginning the topic was new to nearly everybody of us. We collected information regarding to whole scope of curation, preservation and archiving activities. During this phase activities on initiating and spreading out awareness were dominant. After defining areas of needs and actions introductory presentations, lessons and courses were set up mostly in cooperation with curation experts of memory organizations.
- In a second phase, another area of action emerged from projects focusing on digital curation education at universities. Digital curation became part of or the

⁶ See the presentations during the conference “Framing the digital curation curriculum” and the results made available at the DigCurV website <http://www.digcur-education.org>.

major topic of the content of university programs. Concepts like specialization within existing undergraduate programs, new BA programs integrating digital curation topics, or specialized post-graduate courses/programs by a single university or in cooperation with others have been set up.⁷

- Meanwhile, the third area of action becomes more and more relevant: vocational education and training of working professionals (of memory organizations and other organizations with needs in the digital curation business). These activities overlap with some of the others already mentioned. Nevertheless, it has always been clear that vocational education and training need a special didactic approach tailored to the pre-knowledge of the audiences. In the long run, vocational education and training could be the major educational opportunity by and for digital curation professionals.

Today we have set up different approaches for different audiences regarding content and teaching. We refer to a whole set of preconditions like different experiences, different knowledge and different learning styles. DigCurV shows that this is the road to success for vocational training whether it is designed as advanced training or curriculum-based further education. We need this success because vocational education and training will become increasingly relevant to our aging staff at heritage organizations. Setting up a European project like DigCurV and a conference discussing developments in this sector indicate the importance of both, the topic and the audience in relation to the topic.

V. POPULARIZATION OF DIGITAL CURATION KNOWLEDGE

Beyond all these qualification activities for staff members in the heritage sector there is an audience which we should keep in mind when we think about curation and preservation of digital objects: It is the population of our communities and states, our colleagues and family members and – last but not least – ourselves. We have to be aware that curation and preservation of the material we deal with in our professional working environment and especially in the heritage sector is only a small portion of the digital material out there.

Addressing our population and raising awareness of dealing with digital objects is a challenge which seems to go far beyond our staff capacities. Nevertheless, we should keep an eye on it because the so-called personal archiving will become an important part of digital curation. The personal archiving activities of the Library of Congress are an outstanding example of efforts in this field.⁸ Conferences like “Personal Digital Archiving 2013”⁹ indicate the dimensions of this topic. Until now, this topic has not received the attraction it deserves. It offers the chance for heritage institutions to renew and strengthen their position as social institutions. Public libraries might take this chance because they already have a very strong

impact on social life in our communities. However, the concept applies to academic libraries and their clients as well because there is a strong connection to curation and preservation of research data in humanities and sciences. As we all know, this is quite a hot topic in academics and the curation discussion these days.¹⁰

Commercial service providers and software companies already try to take their chances and offer features such as software and special services which help us to address and solve the archiving issue. It is most likely that cloud-based archiving services, some of which are already available on the market, will increase in numbers and scope very quickly. Yet, from a professional point of view these activities cover a small part of the curation and preservation needs only.

Therefore, it should be our mission to make people aware that there are several risks in leaving or perhaps sharing their personal or family-related records, pictures and other material with commercial archiving organizations. Nevertheless, for some people the issue of protecting their data privacy might have a different significance than for most of us. Whatever attitude to this topic people might have they will expect advice from us as digital curation professionals when there are discussions about solutions to the digital curation and archiving issue.

There is still hope that we will be able to contribute to a development where everybody is aware of the need to curate and where everybody will know how to curate and preserve objects from her/his digital environment properly. It is up to us as digital curation professionals to support this development. And we should not miss this chance. Massive Open Online Courses (MOOC) are an interesting option to provide such kind of information.

Vocational education and training regarding this task might be addressed in a future conference. From my point of view it is an educational opportunity for digital curation professionals to be put into focus.

VI. SUMMING UP

During the last ten years, education and training of digital curation professionals has improved quite a lot. Awareness programs have been realized and academic programs (graduate and postgraduate) have been set up or will start during the coming years. An extensive need for customized vocational education and training has been identified.

Until now, the skills of digital curation professionals demanded in job advertisements are extensive but not very much differentiated. This might change when the labor market improves and job advertisements will be more specific.

It is much likely that from the public sector’s point of view the gap in the labor market will grow in the years to come: It is most likely that the number of specialists graduating from

⁷ See e.g. <http://digitalcurationexchange.org/taxonomy/term/368>.

⁸ See <http://www.digitalpreservation.gov/personalarchiving/> for details.

⁹ See <http://mith.umd.edu/pda2013/schedule/> for details.

¹⁰ Clifford Lynch has addressed that issue lately. See [5], 577: “helping individuals preserve their own content and ultimately to contribute to the overall cultural record in new and different ways and roles.”

universities will not meet the demand of the labor market because graduates will take jobs outside the public sector due to better salaries and career options.

At least for some years the best way to get qualified staff for digital curation tasks especially in the public sector will be by vocational education and training. Digital curation professionals should take this educational opportunity as participants and teaching experts.

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DigCurV: next steps

Kate Fernie

MDR Partners (Consulting) Ltd.
London, UK
kate.fernie@mdrpartners.com

Ann Gow

HATII, University of Glasgow
Glasgow, UK
a.gow@hatii.arts.gla.ac.uk

Maurizio Lunghi

Fondazione Rinascimento Digitale,
Florence, Italy
lunghi@rinascimento-digitale.it

Abstract—This paper considers the next steps for the DigCurV project in working towards a sustainable future for vocational education and training in Digital Curation

Keywords-component; DigCurV; Digital Curator Vocational Education; Europe

I. INTRODUCTION

DigCurV was established with the aim of building a framework to address the needs for training in digital preservation resulting from the rapid growth in the digital economy in Europe and worldwide [1]. Since the project began in 2011, DigCurV has carried out surveys into the opportunities for training in digital curation and also the need. Based on these findings and knowledge, expertise and research from within the project and a series of international initiatives, DigCurV has developed a framework for curriculum development and has developed the Curate! Game and other products based on this framework [2, 3].

Over the last two years, international stakeholder network has built up including individuals and institutions with an interest in developing training and education in the field of digital curation. Now, during this international conference on ‘Framing the Digital Curation Curriculum’ is the time to think about the next steps and how best to build on the results we, and allied initiatives such as DigCCur, APARSEN, DPC, nestor, DPOE, EUDAT, IFLA, JISC, ANORC and others, have achieved so far.

II. IMMEDIATE GOALS

During this conference, an immediate goal for the project is to **promote the DigCurV curriculum framework** and the **Curate game** and to encourage you to explore them and to consider their uses

Our overall goal is to promote the development of training and education in digital curation. To that end, we are aiming to **build the network** and **develop alliances** with projects and institutions and individual educators who are developing digital curation curricula and training courses.

We would like to ask you to use the curriculum framework to **benchmark courses**¹ and to give us your feedback on how well it fits and whether you are considering exploiting it.

III. SHORT TERM GOALS

During the conference we are hoping to build alliances with the most important initiatives and to establish an agreement to work together and a **common reference model** whose benefits are clear to everyone.

After the conference DigCurV will continue to promote the adoption of the curriculum framework for benchmarking courses and encouraging people to play the game, and of course starting to think about the **future** and new developments.

Our survey of **training needs** amongst cultural institutions suggested a potential demand for short, modular courses. We would like to begin to explore the demand for **portable qualifications** and **accreditation of courses**; to evaluate ways of supporting **continuing professional development** of existing staff as well as student learners; and promoting the development of **training for trainers** based on the curriculum framework.

We need to begin to think about **sustainability** and how to continue the work of the stakeholder network around vocational education in Digital Curation.

IV. MEDIUM TERM GOALS

Our short to medium term goal is to find **evangelists** – or ambassadors who adopt the curriculum framework as a benchmark for courses themselves and promote its adoption by others. Our aim is to continue to **build consensus** around the curriculum framework and professional development in digital curation.

¹ We use the generic term courses to cover all training events from short courses to fully accredited degree level programmes.

Our vision is that in the medium term there will be **courses available** that are benchmarked to the curriculum framework, and products and tools which can be used to help support their delivery. We would like to continue the development of the Curate game to provide an innovative, collaborative learning environment, which is benchmarked to the curriculum framework and the various roles in digital curation.

V. LONGER TERM GOALS

In the longer term we envisage accreditation of courses by agencies as delivering portable qualifications benchmarked against the curriculum framework and which maintain or develop professional skills. We envisage that there will be a sustainable model in place for continued development of the framework and the network. This is clearly a long-term goal and will require considerable work in terms of theoretical and practical issues associated with accreditation.

VI. ACKNOWLEDGEMENT

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Report on the context of the DigCurV Curriculum Framework

Nathan Moles
Faculty of Information
University of Toronto
Toronto, Canada
n.moles@mail.utoronto.ca

Seamus Ross
Faculty of Information
University of Toronto
Toronto, Canada
seamus.ross@utoronto.ca

Abstract—This paper presents an overview of current or recently completed initiatives to create, structure, or help foster curricula for the on-going vocational training of information professionals with the aim of informing the implementation of DigCurV’s curriculum framework. The initiatives examined include the Digital Curation Centre, DaMSSI (Research Data Management Skills Support Initiative), DigCCurr (Carolina Digital Curation Curriculum Project), Closing the Digital Curation Gap, Digital Curation Exchange, International Digital Curation Education Action (IDEA) Working Group, Digital Preservation Coalition, Digital Preservation Training Programme, the Library of Congress’ Digital Preservation Outreach and Education, the Society of American Archivists’ Digital Archives Specialist (DAS) Curriculum and Certification and nestor, the German competence network.

Keywords - *DigCurV; Digital Curation curriculum*

I. INTRODUCTION

Digital curation is a complex and rapidly evolving field with an on-going requirement for continuous vocational training for those working in the field. The landscape of available training opportunities is equally complex, presenting challenges for both educators and working professionals trying to keep abreast of the increasingly diverse and sophisticated curation knowledge. One of the major products of the DigCurV project is a curriculum framework, which was produced with the intended purpose of providing structure and guidance to the development vocational education curricula for digital curators [1, 2]. Previous reports produced by this project have surveyed existing training opportunities, and defined the curriculum framework itself [3, 4, 5]. These outputs have focused on bridging the gap between the current state of skills in the workforce and those necessary for professional excellence.

This report shifts the focus by addressing the implementation and exploitation of the DigCurV curriculum framework within

the current training environment. To do so, it presents an overview of the major attempts to construct a portable and broadly applicable curation curriculum. The discussion of these initiatives does not attempt to be exhaustive or comprehensive, but instead illustrates the current state of digital curation curriculum development into which the DigCurV framework fits. In doing so, it draws attention to the weaknesses, limitations and gaps in these efforts. To maintain consistency with the overall orientation of DigCurV, initiatives that seek primarily to develop curricula to train digital object producers or users in curation rather than information professionals, have been excluded. The inclusion of producers and users in the definition of curation programmes is essential.

II. CURRICULUM INITIATIVES

This survey is not a catalogue of training opportunities. Instead it is an overview of current or recently completed attempts to create, structure, or help foster curricula for the on-going vocational training of information professionals. We have not included discussions of older initiatives such as ERPANET [6], DigitalPreservationEurope, or the series of summer schools run by the DELOS Digital Preservation Cluster [7]. These projects were selected because they attempt to move beyond an *ad hoc* approach to training. Some are included because they promote the development of useful tools or foster collaboration. Others are discussed because of the prominence they have achieved. Likewise, training programmes that provide instruction only in specific tools or as dissemination for otherwise targeted projects have been excluded. In some cases spin-off projects that directly relate to the objectives of the initial projects have been included.

A. Digital Curation Centre

The UK-based Digital Curation Centre (DCC) is involved in a number of projects related to education and training. These initiatives are generally focused on research data in a wide range of domains. The cornerstones of the DCC's training efforts are two workshop series: *Digital Curation 101*, which consists of workshops providing general introductory

instruction; and *Tools of the Trade*, that provides more detailed exploration of specific tools. Both series are offered at various venues throughout the UK as free half-day workshops targeted at curators and researchers. The DCC also plays a prominent role in many other collaborative training projects. Examples of these can be seen in the Incremental project led by the University of Cambridge¹², and the Sudamih project at the University of Oxford¹³. These focus on educating research data creators about the value of efficient data management, and providing the necessary skills to facilitate their work.

For the structure of their educational activities, the DCC has produced a tool around which they construct curriculum. The “Core Skills for Data Management”, is a visualization created as a follow up to the second DCC Research Data Management Forum in 2008 that identifies four roles in the management of research data: data creator, data scientist, data manager, and data librarian¹⁴. It associates competencies with these roles and identifies areas of overlap. One of the major strengths of this model is that it embraces a holistic approach to curation that traces data from creation to long-term storage and incorporates producers and users. Curation programmes undoubtedly benefit from the education of non-curatorial staff although broadening the audience in this way limits the depth at which material can be explored, detracting from the potential benefit to curators.

Similarities exist between these core skills and the attributes described for each role in DigCurV's curriculum framework. Several of the same concerns and areas of interest have been identified in both projects. These range from technical skills, such as those related to the use of metadata, to soft skills linked to managerial functions. In contrast to the curriculum framework, the roles outlined by the DCC reflect a horizontal delineation that mirrors stages in the lifecycle of data. The four roles all operate on a similar level in regards to the overall functional hierarchy of curation programmes and each role is associated with tasks that range from high-level planning to specific actions. However, the greater degree of abstraction presented by the core skills model hinders the delineation of responsibilities vertically and prohibits the concise statement of attributes that defines the DigCurV output. In this way, the core skills model reflects the DCC's interest in training curators as well as producers, and its narrow focus on a specific genre of digital objects, research data.

B. *DaMSSI (Research Data Management Skills Support Initiative)*

DaMSSI, a DCC-led project, co-funded by the Joint Information Systems Committee (JISC) and the Research Information Network (RIN), facilitates the use of Vitae's Researcher Development Framework (RDF) and the Society of

College, National and University Libraries (SCONUL) Seven Pillars of Information Literacy model, as frameworks for training programmes¹⁵. It was launched as a support project for the JISC-funded RDMTrain¹⁶. As part of a skills framework, this project produced a series of career profiles to conceptualize training needs. In keeping with the objectives and research data orientation of the DCC, these documents are designed to demonstrate how data management skills integrate and benefit professionals working in different domains. Career profiles have so far been established for conservators, social science researchers, archaeologists, clinical psychologists, and data managers. The last of these is the only profile that directly targets information professionals; the others integrate curation knowledge into other knowledge domains.

The DaMSSI conception of data managers is restricted to curators of research data and distinguishes them from other types of information professional. While this fits within the scope of curation, and could be mapped to roles in the DigCurV curriculum framework, the profile covers a wide range of responsibilities that cross the divide between practitioner and manager. This inclusiveness limits the usefulness of the profile in curriculum development, although it clearly demonstrates the importance of curation skills in the work of data managers. Despite this limitation, the skills framework is of considerable benefit in the context of curriculum development for training non-information professionals in the selected domains. Aside from demonstrating the relevance of data management training, the career profiles function as a tool for advocacy and link these curation abilities to the broader area of information literacy.

The second phase of this initiative, DaMSSI-ABC (Assessment, Benchmarking, and Classification)¹⁷, began in August 2012 and is scheduled for completion in August 2013. This phase builds on the previous work of DaMSSI; it classifies course offerings, identifies benchmarks, and makes training materials from RDMTrain projects available through the JORUM portal. With the project currently in progress, most of its outputs are not yet available. However, draft versions of a classification scheme as well as checklists for developing and evaluating information literacy training programmes have been made public. The classification scheme holds potential as a tool for aiding in curriculum development. The classification of courses allows for more informed selection by audiences, the planning of targeted training programmes, and provides boundaries for course instructors. At present, the classification scheme is in an underdeveloped state limiting its usefulness. The Checklists

¹² <http://www.lib.cam.ac.uk/preservation/incremental/>

¹³ <http://sudamih.oucs.ox.ac.uk/>

¹⁴ <http://www.dcc.ac.uk/sites/default/files/documents/RDMF/RDMF2/coreSkillsDiagram.gif>

¹⁵ <http://www.dcc.ac.uk/training/damssi>

¹⁶ Research data management training materials (RDMTrain) is a DCC-led initiative to train researchers in the management of their research data.

¹⁷ <http://www.dcc.ac.uk/training/damssi-abc>

have the potential to provide practitioners and others with effective metrics to assess skills.

C. *DigCCurr (Carolina Digital Curation Curriculum Project)*

DigCCurr consisted of two projects, DigCCurr I (2006-9) and DigCCurr II (2009-12), which aimed at developing a curriculum framework, course modules and experiential components for graduate and doctoral education¹⁸. Although it expanded its ambit in the second phase, the primary focus of DigCCurr is on formal academic education, in line with traditionally accredited master's and doctoral degrees. The project team for DigCCurr is based at the University of North Carolina-Chapel Hill School of Information and Library Science (SILS), but experts from Canada, the United States, New Zealand, Australia and Europe were represented on the advisory board, ensuring the project had an international perspective.

Of the products generated by DigCCurr I, the two most relevant here are the Matrix of Digital Curation Knowledge and Competencies¹⁹ and the High Level Categories of Digital Curation Functions²⁰. The DigCCurr matrix is a tool for identifying content for inclusion in curricula and structuring it for use. It contains six dimensions that provide space for both high-level concepts and the detailed specifics of curation actions. This allows individual skills and tasks to be linked to larger principles and functions. Situating technical and experiential components of education in the framework of an inclusive holistic perspective on curation bridges the gap created by teaching each in completely separate workshops. The matrix also benefits from linking skills to functions and from a less linear understanding of the information lifecycle. The high-level categories of digital curation functions document builds on the functions and skills component of the matrix. It consists of 24 functions and 4 meta-level functions that apply horizontally to the functions. Each function is defined and associated with particular curation activities. These categories are mapped to OAIIS, which in turn connects the skills and knowledge in the curriculum to a defined terminology and a model widely used in the preservation community.

The second DigCCurr project shifted the focus slightly to curriculum development for doctoral programs and the continuing education of working professionals. Building on the work of the first project, a series of professional institutes were organized. These training courses target digital curators and are taught by leaders in the field. Unlike most vocational training, they are structured around week-long initial sessions that include theoretical and technical components, followed by a two-day workshop after six months [8]. This format provides

more content than typical one-day or half-day workshops, while the follow-up sessions support the review of how the attendees apply the content within their organisation. Despite the efforts to broaden the initial objective to include ongoing vocational training, DigCCurr has not developed a modified framework for this new mode of education. Regardless of any limitations in adapting DigCCurr to vocational training, together these projects have made a significant contribution to curation education and the development of curricula.

The project has spawned a number of other initiatives under the DigCCurr banner; these include professional institutes, fellowships, conferences, symposia, and a number of other smaller collaborative projects. Three of these projects most relevant to curriculum development are profiled below.

D. *Closing the Digital Curation Gap (CDCG)*

Closing the Digital Curation Gap is a collaboration by SILS and the Institute for Museum and Library Services (IMLS), the DCC and JISC in the UK attempting to build consensus around a baseline of knowledge and best practices for core digital curation activities²¹. These activities cover a range of tasks from the management of intellectual property to monitoring storage environments and metadata creation. CDCG ran from October 2009 to March 2013 and, like DigCurV, was focused on continuing professional education within the cultural heritage sector.

The major output of this project is a series of Getting Started Guides²². These guides divide curation into six high-level functions modeled on stages in the information lifecycle and take an inclusive approach to the range of high-level and task-oriented activities within these functions. In doing so, they aim for flexibility and comprehensiveness in their use and designed to meet the educational needs of information professionals with only cursory knowledge of digital curation. As such, they include foundational concepts and principles, as well as the application of these in specific activities. The outputs of this project are available through Digital Curation Exchange.

E. *Digital Curation Exchange (DCE)*

Conceived as an online "town center", the Digital Curation Exchange (DCE) is an IMLS-funded project that grew out of DigCCurr II and CDCG. It functions as an extension of the objectives of these two projects fostering collaboration, networking and the dissemination of resources. As a web portal, DCE consists of an online discussion forum that contains news, events, job postings and teaching resources. The website further facilitates communication by providing both open and closed group spaces for members of active projects to collaborate. DCE does not generate original research. Its role in curriculum development is enabling communication between experts in a centralized area and providing a platform for projects to disseminate their results. A

¹⁸ <http://www.ils.unc.edu/digccurr/>

¹⁹ <http://www.ils.unc.edu/digccurr/digccurr-matrix.html>

²⁰ <http://www.ils.unc.edu/digccurr/digccurr-funct-categories.pdf>

²¹ <http://digitalcurationexchange.org/cdcg/>

²² <http://digitalcurationexchange.org/cdcg/?q=node/31>

central hub like this helps to further the discussions that build the consensus necessary for a baseline of curation skills. In the future, as its user base grows and the website becomes more established, it could function as a repository for course materials. In this capacity, it could help a vocational training curriculum to crystallize.

F. International Digital Curation Education Action (IDEA) Working Group

The IDEA Working Group was created as a forum for experts and educators to discuss issues of education and training. Initiated by the HATII (Humanities Advanced Technology Information Institute at the University of Glasgow), DCC, IMLS, SILS at UNC, and DigitalPreservationEurope (DPE), this group held a series of workshops and meetings to investigate opportunities for collaboration and consensus building. The first of these workshops in May 2008 sought to identify training opportunities, investigate collaborative approaches, identify roles and skills within curation, and discuss required curriculum elements [9]. Subsequent meetings built on these foundations with an emphasis on exploring collaboration and building consensus. These events have helped to foster dialogue and exchange about current training practices amongst a wide range of participants. In addition to the founding group involvement in the IDEA Working Group has included representatives from the University of Illinois at Urbana-Champaign Graduate School of Library and Information Science, the UK's National e-Science Centre (NeSC), the UK Data Archive, University of London Computer Centre and nestor amongst others.

G. Digital Preservation Coalition (DPC)

The Digital Preservation Coalition (DPC), a non-profit consortium and member of the DigCurV project, has workforce development as one of its core objectives. Amongst their efforts in this direction the DPC have initiated a series of Digital Preservation Roadshows that have toured the UK with presentations on issues, tools and organizations involved in digital curation. These have focused on practical solutions and raising awareness amongst information professionals. A second initiative, the DPC Leadership Programme, has provided grants for the staff of member organizations to attend continuing education courses. These efforts are primarily intended to support on-going vocational training and to build the necessary skill set in the workforce of their organizational members.

In July 2013, DPC are hosting the first Digital Preservation Advanced Practitioner Training course, which is organized by the Alliance for Permanent Access to the Records of Science in Europe Network (APARSEN) and involves collaboration with a number of other European curation projects. Unlike other training initiatives, this week-long event aims to build on existing skills and assumes a core of experience-based curation knowledge on the part of attendees. The focus will be on more

advanced topics and the exploration of curation processes in greater detail. The organizers anticipate this event will develop iteratively and become an annual offering²³. An addition to the training landscape, this programme holds the potential to address the specific needs of more skilled curators, while simultaneously acting as a conduit for new developments for digital curation professionals working on the front-line.

Together with the Fondazione Rinascimento Digitale (FRD), and as a part of APARSEN, the DPC published a report evaluating the needs and provisions for vocational curation training in Europe. The study focused on short courses intended for working information professionals with curation responsibilities. In their observations they noted a distinct lack of correlation between the topic of the course and the audience to which it was presented [10]. This indicates a lack of directed development and coherence in the range of course offerings as well as a failure of training providers to coordinate their activities. The study also recommended that curriculum be based on the latest research outputs as a means of remaining current and up to date with community expertise.

H. Digital Preservation Training Programme (DPTP)

The DPC was also instrumental in the initial launch of the award-winning Digital Preservation Training Programme (DPTP)²⁴, run by the University of London Computer Centre (ULCC). Designed for vocational training, this programme is structured around modular units that are taught in three-day workshops by recognized experts. The audience for these workshops can range from technical staff to traditionally trained archivists. With a broad audience, the programme introduces substantial amounts of foundation knowledge in its curriculum. Timetables from previous DPTP courses indicate a consistent pattern in which general knowledge is introduced and then followed by more in depth examinations of such issues as metadata, tools, and management issues. For workshop attendees with prior knowledge of curation or exposure to the topics being presented, many of these components of the curriculum may be redundant. In these cases, space within these courses could be better used for instruction on additional tools or more in-depth discussion.

The ULCC staff also offer courses that are specifically tailored to the needs of the client organization. These provide an opportunity to place emphasis where it is most needed and to provide instruction at the level that best suits the audience. The tools, methods and models that can be directly applied in daily practice can be situated at the core of the curriculum. Such a scenario will address immediate needs more effectively, but is unlikely to be a sustainable solution. Vocational training implies the on-going development of knowledge, skills and competencies. This is particularly important in a rapidly evolving field like digital curation. While the course packages

²³ <http://dpconline.org/events/details/62-APARSEN-Training-APJul13?xref=68>

²⁴ DPTP: <http://www.dptp.org/>

offered by DPTP have many strengths, the inclusive overview approach they take to curriculum means that the space available for new developments is limited and whatever new content can be included will be relatively small in comparison to material previously presented. This dissuades working professionals from taking courses on a topic more than once and undermines the sustainability of the programme.

I. Digital Preservation Outreach and Education (DPOE)

An initiative launched by the Library of Congress, Digital Preservation Outreach and Education (DPOE) is a program to foster vocational training nationally through networks of qualified trainers and course offerings. Based on a needs assessment and curricula review in 2010, the staff of the Library of Congress developed a curriculum specifically targeted at working professionals²⁵. The program is delivered through an evolving series of workshops, conferences, and web seminars taught by experts in regions across the country. These experts comprise a National Trainer Network that provides geographic coverage and extends the reach of the program. The scope of the program is further aided by a “train the trainer” approach that sees professionals from different regions trained as instructors by Library of Congress staff to then conduct seminars and workshops at their institution. This decentralized mode of dissemination is guided by the DPOE’s core training principles, which address the audience, content, instructors, and events of this network²⁶.

The heart of this initiative is the DPOE Baseline Digital Preservation Curriculum, which consists of six areas closely mapped to the core archival functions: identify, select, store, protect, manage, provide. The curriculum displays a heavily archival perspective. It situates the tools, concepts and models of digital curation inside the professional framework of archives. By doing so, it implies a *post hoc* approach to preservation, rather than pre-emptive curatorial involvement that addresses the full lifecycle in its approach to digital objects. In this sense, the program reflects a narrow view of *digital preservation*, rather than a holistic *digital curation* orientation. This subtle shift is in keeping with the Library of Congress’ role as a national cultural repository and its archival orientation.

An additional product of the 2010 Training Needs Assessment Survey was the DPOE Pyramid²⁷. The survey results indicated that there was benefit in parsing the training audience into three broad professional groups: executive, managerial, and

²⁵ <http://www.digitalpreservation.gov/education/>

²⁶ <http://www.digitalpreservation.gov/education/coreprinciples.html>

²⁷ http://www.digitalpreservation.gov/education/educationneeds.html#_utma=37760702.2113400002.1340813252.1340813252.1340813252.1&__utmb=37760702.5.9.1340813321399&__utmc=37760702&__utmz=&__utmz=37760702.1340813252.1.1.utmcsr=digitalpreservation.gov|utmccn=%28referral%29|utmcmd=referral|utmctt=/education/&__utmv=-&__utmk=195900526

practical. This visualization illustrates these groups along with likely roles and potentially effective training methods. This identification of audience groups and the recognition that each has unique training needs based on their different roles in digital curation programmes formed the basis for the distinct lenses in the DigCurV curriculum framework [1].

J. Digital Archives Specialist (DAS) Curriculum and Certification

The Digital Archives Specialist (DAS) Curriculum and Certification is a program, offered by the Society of American Archivists (SAA), for the continued vocational training of archivists who work with electronic records. The program uses a tiered curriculum that incorporates content hierarchically structured at four levels; foundational, tactical and strategic, tools and services, and transformational²⁸. The different levels are mapped to three primary audience groups; practitioners, managers and administrators, that correspond loosely with the categories of practitioners, managers and executives used by DigCurV. Specific courses are targeted at one or more of these groups, with each tier predominately geared to one or two audience groups.

The content is delivered through short workshops and online seminars. Audience members have the option of enrolling in single courses or completing a defined number of courses from each tier, after which they can apply to take a comprehensive examination and be awarded a certificate. The certificate itself is issued by the SAA and is valid for five years. A renewal procedure is being developed that will see certified professionals continue to take non-foundational courses as they are offered to retained their certification. The certificate is intended to reflect seven core competencies. These cut across audience groups, professional roles and repository functions.

Like DPOE, this program has a digital archives orientation, despite the shared content with more definitively curation-oriented programmes. This reflects the SAA’s role as a professional organization and the development of the programme to address needs of its members. Unfortunately, the perspective in the programme is narrower than other training alternatives as a result, for example a narrower range of digital objects are addressed. Repositories in the cultural heritage or scientific sectors manage a much wider range of objects than the electronic records that are the focus for DAS.

K. nestor

Nestor (Network of Expertise in long-term STORage of digital Resources in Germany) is a competence network and co-operative association for digital preservation in German-speaking countries. Amongst their concerns are the development and accessibility of training in digital curation. Current nestor training activities follow five streams: occasional seminars taught by experts, nestor schools modeled on early work by ERPANET, DPE and DELOS Preservation

²⁸ <http://www2.archivists.org/prof-education/das>

Cluster, the continuously evolving nestor handbook, the development of a co-operative curriculum, and the development of e-learning modules²⁹. The scope of these activities is broader than most vocational education and incorporates universities involved in undergraduate and graduate level programs in related fields. This reflects the co-operative orientation of nestor and its objective of facilitating the development of a digital curation curriculum by members, rather than controlling its own branded content [11].

The membership of nestor recognized as early as 2006 that there was a need for a systematic approach to training and that it could benefit from differentiating target groups. Like the DPOE pyramid, nestor separated practitioners and managers at different levels. In addition to working professionals, nestor added two groups of students in university programs. The final five target groups are upper management, middle management, staff (working professionals or practitioners), graduate-level students and undergraduate-level students. nestor also acknowledged that the scope and breadth of the field were too great for full coverage to be handled in any depth by any one organization[11]. The co-operative nature of nestor enables the co-ordination of contributions to a large comprehensive curriculum and the dissemination of that content through a range of means. The curriculum developed by members is reflected in the different training activities. This content is also captured in the nestor handbook, which has been published and maintained since March, 2007. Designed to be a cumulative and comprehensive reference, it is developed iteratively to reflect the latest knowledge in the field.

III. DIGCURV CURRICULUM FRAMEWORK

This brief survey of curriculum initiatives has demonstrated a number of features that limit the effectiveness of current training approaches. Most of the programmes covered by this survey follow a similarly structured curriculum that contains four components: introductory principles; concepts and models; tool and metadata; and management issues such as privacy, intellectual property and risk management. Regardless of the particular instantiation, the material is presented in a similar order, with each section building on and referencing the previous components. Together these topics form a strong curriculum that assumes a generic approach to digital curation and resembles a comprehensive introductory course.

The justification for this approach is understandable. Major surveys of curation training needs conducted by DigCurV [5] and DPOE³⁰ are consistent in indicating that a high priority is placed on virtually all aspects of digital curation. Unfortunately, while this approach does consider the areas of

need and is productive as introductory instruction, it is not an effective model for the on-going vocational training necessary to meet the changing needs of working professionals. By including content in all of these areas, curricula are limited in the depth at which they can examine any particular topic. Curators often have widely varying roles within their institutions and, while very few of them will need more than introductory instruction in all areas, most will need more in-depth training in some specific aspects of curation directly related to their daily activities. Placed in the categories of the DigCurV curriculum framework, current training methods are serving the needs of managers and executives more effectively than practitioners.

Variations on this pattern exist, but tend to result from the particular configuration of delivery such as short, targeted workshops or self-contained units within a longer period. Several of the programmes surveyed also offer more advanced instruction in the form of workshops on individual tools, techniques or methods, but the range of these workshops falls short of the spectrum needed. Likewise, a number of training providers are engaged in offering courses customized to institutional needs. Several benefits are gained from this degree of customization, including a more precise targeting of needs and more appropriate delivery methods. Unfortunately, many of the institutions that require training the most will be unable to exploit this opportunity for financial or other reasons. Those that can are unlikely to see it as a sustainable, or even repeatable, solution to their on-going training needs.

What these observations reveal is that there is a conflict at the heart of curation training between general and specific needs that is manifested on both the individual and organizational levels. At the International Curation Education (ICE) Forum in London, UK in 2011, one of the observations to emerge from the discussion was the existence of an unclear or poorly defined boundary between core curriculum content and specialized or extended content³¹. The unclear scope or range of the content to be included in curricula, pressures instructors to be more inclusive in their course designs, to the detriment of the skills, knowledge and competencies that are unique to each specific role. Unlike formal graduate degrees, vocational training is about providing a continuous update of skills that have relevance within the immediate context of professional employment. Given that context, vocational training programmes have little choice but to address specialized needs directly. The DPOE needs survey provides some evidence to support this. Amongst their survey questions, respondents were asked to rank their training needs. Analysis of the responses indicates that all identified areas from high-level

²⁹ <http://nestor.sub.uni-goettingen.de/education/index.php?lang=en..>

³⁰ http://digitalpreservation.gov/education/documents/DPOE2010Survey_CrossTabs.pdf

³¹ Tibbo, Helen R. "Educating the Curator: Digital Curation Education in the United States". London, UK, 2011.

strategic planning to management and technical skills out rank basic knowledge in importance by a considerable margin.

Within digital curation as a field, a similar question exists on a larger scale. It remains unclear if the features or characteristics that determine practices, task, strategies and programmes are entirely defined by the particulars of a situation or are subject to broader generalizations. At present this tension remains unresolved. The number of variables that need to be given consideration in the development and execution of curation programmes will inevitably vary widely even between similar circumstances. Unfortunately, that underlying tension creates a barrier that needs to be addressed to develop the replicable solutions that the modern digital environment demands.

The vocational training challenge facing the digital curation community is less about disseminating knowledge than it is about balancing competing needs. While there are no definitive solutions to the problem or methods for achieving this balance, the survey of initiatives above has indicated twelve characteristics that programmes should have if they are to achieve a broader set of objectives. The characteristics themselves are interrelated and not mutually exclusive:

- **Sustainability:** the field is in a constant state of development training will need to be a continuous process if professionals are to remain conversant with the latest advances.
- **Consistent Incremental Evolution;** programmes must provide a stream of new knowledge as it emerges as well as instruction in the accepted body of general or foundational knowledge.
- **Systematic:** a structured approach to training is necessary to ensure all relevant topics are included, content is appropriately targeted and redundancy is kept to a minimum. A major step would result from defining a canon of preservation and curation knowledge that professionals require and keeping that canon under review.
- **Tailored:** curricula must fit the needs of the professional community, match the professional roles of participants, and be complimentary to their daily activities.
- **Based on expert consensus:** curricula should be distinguishable from open research questions in order to prevent vocational training becoming little more than a weather vane to academic debates.
- **Operational:** the orientation of the course content should be towards practical results in real world scenarios. The material presented should be readily applicable in curation workflows.
- **Certification:** training programmes should be embedded in a certification structure to provide evidence that professionals have and are maintaining the relevant skill set Means should be in place for the maintenance of the certified status through continued training.
- **Portable:** while the training should be tailored to specific jobs, the skills, knowledge and competencies learned

should be applicable beyond the particular instance of employment.

- **Leverage existing knowledge:** the participants in vocational training are assumed to be highly educated information professionals who approach programmes with a well-developed skill set relevant to the curricula. These skills should be harnessed to maximize the effectiveness of the training.
- **Incorporate participant feedback:** a mechanism should be in place to systematically gather and evaluate feedback from the audience at every stage. This can be used to evaluate effectiveness and inform later iterations of the curriculum.
- **Address issues of all relevant digital object forms:** formats or file types that can reasonably be expected to exist within a repository cannot be ignored by training curricula.
- **Utilize appropriate dissemination methods:** vocational training has a much wider range of potential delivery methods than other forms of education. The full spectrum of these methods should be explored in order to provide the audience with learning opportunities that match their needs.

None of the programmes in this survey contain all of these characteristics. Each has its strengths and weaknesses. The contribution of the DigCurV curriculum framework to this context is that it is a tool to structure course content and develop comprehensive plans for on-going training. By separating curators into distinct groups, and identifying the skills, knowledge and competencies associated with each role, the framework helps trainers achieve the characteristics above. With this tool emphasis can be placed where it is most useful and the redundancy of current approaches can be corrected. The details provided by each of the lenses can be used to clarify boundaries for curriculum, while defining core and specialized content. It is unlikely that any single solution will ever exist to the problem of vocational training needs. However, what the DigCurV curriculum does do is equip trainers to tackle these challenges and ensure that curricula are as effective as possible.

IV. RECOMMENDATIONS

The DigCurV curriculum framework holds tremendous potential for the future of digital curation. Part of this potential resides in its on-going use and development. This report offers a series of recommendations in order to develop effective training curricula and maximize the impact of the framework on the current training landscape. The first recommendation is to map the curriculum framework to existing models of digital curation and preservation such as OAIS and the DCC Lifecycle Model³². Such mapping will promote adoption by

³² Students in Professor Seamus Ross' Introduction to Digital Preservation at the University of Toronto in the Winter of 2013 experiments with mapping DigCurV Frameworks to

demonstrating the skills, knowledge and competencies necessary to implement the models. It will also provide curators with the opportunity to position themselves in the models that guide curation programmes, and help to connect their daily activities to the larger functions of their institutions.

One of the most significant contributions the curriculum framework can make to digital curation vocational training is that it can be used as a basis to structure a formal certification program. Following the DAS example, internationally agreed certification will help to build consensus in the field by providing a common goal for trainers at different organizations. It can also help to disseminate emerging knowledge by including it in requirements for certification. This in turn will bridge the gap between research and practice, while demonstrating that certified professionals are acquainted with the latest developments in the field. The process of certification itself may benefit from the establishment of a multi-tiered system that distinguishes on-going vocational training from more formal graduate-level degrees or even between the different categories of professional identified by DigCurV or DAS.

The development of a fourth lens is recommended. This idea was discussed at the roundtable meeting in Florence, Italy, where the lens under consideration was targeted at personal record keeping [12]. This would extend the benefits of the framework beyond institutional curation programmes and the immediate purview of cultural heritage repositories. While there are advantages to this suggestion, a recommendation more in keeping with DigCurV's orientation would be for the creation of a lens for data creators. This new lens could focus on knowledge that would assist creators to produce reliable, well-documented and curatable digital objects. A lens of this kind would bridge the gap between DigCurV's focus and that of the DCC, making the curriculum framework of direct use in DCC's researcher training initiatives, while encouraging curation considerations to cover the full information lifecycle. The definition of research data used by the DCC is broad enough to encompass cultural heritage objects, and although focused on the heritage sector, the curriculum framework is versatile enough to be of use in other domains.

The final recommendation is to conduct case studies of the curriculum framework in use to develop, create and execute vocational training programmes. Studies of this kind would demonstrate the framework's effectiveness, identify areas that require further development, provide feedback into the development process and bring to light further use cases. The experience gained from use of the framework can reasonably be expected to lead to more thorough and grounded advice about its implementation. An optional worth exploring, is to use the framework to structure curricula to be taught through MOOC's (massive open online courses). The fragmentation of

OAIS and the DCC Curation Lifecycle demonstrated the efficacy of this idea.

roles into specific knowledge, skills and competencies by the lenses creates small easily learned and applied units to which MOOC instruction is naturally adept. A case study of digital curation vocational training through MOOC's would explore the viability of this format, potentially extending the range and audience of curricula.

ACKNOWLEDGMENT

The DigCurV project is funded by the Leonardo Da Vinci programme of the European Commission's Education, Audiovisual and Cultural Executive Agency.

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*A curriculum Framework for digital curators:
presentation of DigCurV results*

Digital Curator Vocational Education Europe:

overview of the DigCurV project

Kate Fernie

MDR Partners (Consulting) Ltd
London, UK

Kate.fernie@mdrpartners.com

Ann Gow and Laura Molloy

HATII, University of Glasgow
Glasgow, UK

a.gow@hatii.arts.gla.ac.uk

Abstract—This paper provides an overview of the EC-funded DigCurV project, its context, methods, main findings, and the project's initial framework for a digital curation curriculum and the Curate! game.

Keywords – DigCurV; digital curation; vocational training and education; curriculum development; Europe

I. INTRODUCTION

The Digital Curator Vocational Education Project (DigCurV) [1] is funded by the European Commission's Leonardo da Vinci programme [2]. The project began in January 2011 and runs until the end of June 2013. The main aim of the project has been to establish an initial curriculum framework from which vocational education and training in digital curation can be developed.

DigCurV brings together a network of partners [3] with a strong track record of international work in the field of digital preservation and digital curation to address the availability of education and training for staff working with digital collections in the library, archive, museum and cultural heritage sectors. The project has a particular focus on the training needed to develop the new skills and competences that are essential for the long-term management of digital content.

II. A STAKEHOLDER NETWORK

The DigCurV project consortium brings together partners from across Europe with two from Canada and the USA. The European partners include HATII (Scotland, UK), the Fondazione Rinascimento Digitale (Italy), Georg-August-Universität Göttingen (Germany), Trinity College Dublin (Ireland), Vliniaus Universiteto Biblioteka (Lithuania) and MDR Partners (England, UK). The Leonardo da Vinci programme allows for organisations from countries outside Europe to join project consortia which enabled the Faculty of Information at the University of Toronto (Canada) and the Institute of Museum and Library Studies (USA) to be affiliated with the project.

From the beginning DigCurV has aimed to build a network of stakeholder organisations with a strong interest in training and education in the field of digital curation. The founding members of the DigCurV network included the Digital Preservation Coalition (UK), the nestor qualification

consortium (Germany) and the Digital Curation Centre (UK) amongst other organisations from Austria, Belgium, the Czech Republic, Estonia, Germany, Ireland, Italy, Latvia, Lithuania, the Netherlands, Romania, Serbia, Sweden, the UK, Canada, the USA and a number of European Commission funded projects [4].

Membership of the network is open to organisations and individuals. Over the last two years, as the project has progressed membership has grown to include 44 organisations and 168 individuals. Membership is worldwide with members based in Argentina, Australia, Canada, Guatemala, Israel, New Zealand, South Africa and Uruguay, USA and twenty-one European countries. In addition to the registered members, the DigCurV network includes individuals who have registered to receive our newsletter or who are following the project on Twitter.

The membership of the DigCurV network demonstrates that there is a large community of interest in education and training in digital curation. As a project we are grateful to the members of this network for their willingness to contribute to the project's activities by taking part in surveys, focus groups, workshops and events.

III. MAIN ACTIVITIES

The main project activities have included:

- Identifying and analyzing existing training opportunities and the methodologies in use;
- Completing a survey and analysis of the need for vocational education and training amongst the staff of cultural institutions;
- Identifying the key roles, skills and competences of digital curation;
- Establishing an initial framework for a digital curation curriculum, working with the stakeholder network to evaluate and inform the framework as it has been developed via focus group meetings, workshops and other activities;
- Disseminating and promoting the project's activities and its results, with a specific aim of promoting the

IV. BACKGROUND

Europe's digital sector has seen strong growth in recent years in all sectors. Since 2005, the European Commission has been actively encouraged this growth, particularly in the digital infrastructure for the economy and ICT skills for jobs, initially through its i2010 strategy and currently through the 2020 initiative and the Digital Agenda for Europe [5]. There has been investment in digitizing and in making cultural content available online justified by the importance of the cultural heritage sector in the European economy.

Research carried out in 2009 by the Numeric project [6], estimated that there were more than 77,000 cultural institutions in Europe (national libraries, university libraries, public libraries, special libraries, museums, national archives and audio visual archives) with more than 82,000 staff. Many involved in digitization of analogue materials or in collecting born-digital materials.

The pace of development and change in information technology has been very rapid which presents particular challenges to institutions responsible for the management and long-term preservation of digital collections. For cultural heritage institutions the availability of staff with the skills and competences needed to care for the digital objects in their collections is an increasingly pressing issue. Traditionally the staff in libraries, museums, archives and galleries have qualified in the care of physical objects through well established professional and vocational courses. But as digital content becomes increasingly prevalent in the collections held by cultural institutions new skills and competences are required.

Surveys and informal research has been carried out in several countries, including the UK, Germany and the USA, which have found that both the recruitment of staff with the experience and qualifications needed for digital curation, and providing training for existing staff members are challenges faced by institutions. In 2004, work by the Digital Preservation Coalition for the JISC had already established the need for digital preservation skills and training in multiple sectors in the UK [7]. Research by DigitalPreservationEurope underlined the need for professionals to regularly refresh and update their skills as techniques in digital curation practice evolves [8]. A growing demand for the skills of digital archivists was recognized in the New York Times in 2009 [9]. In 2010, Gartner Research identified the new role of "digital archivist" as one which IT departments required to remain effective – this research estimated that 15% of all businesses would employ digital archivists by 2012 [10].

Yet, in spite of this background, when the DigCurV project began in 2011 there were only a small number of institutions offering digital curation as a part of professional courses in library and information management or archives management courses. In June 2011, the JISC organized an International Curation Education Forum (the ICE forum) at which fewer

than a dozen European institutions were registered as including digital curation training as part of their curriculums [11].

V. PROJECT RESULTS

DigCurV set out to build on the results of previous initiatives by surveying and analyzing the current situation.

A. Analysing existing training opportunities

At the beginning of April 2011, DigCurV launched a survey of existing training opportunities with the aim of:

- Identifying institutions, projects and individuals offering training in digital curation mainly in Europe but some responses were also obtained from North America;
- Analysing and mapping the training opportunities on offer to identify topics, skills, learning objectives, training methodologies and course formats, and methods of assessment;
- Establishing a registry of training opportunities [12] based on the findings of the survey and capable of accepting details of forthcoming courses from network members; and
- Developing an Evaluation Framework [13] intended to help inform the DigCurV curriculum framework.

B. Analysing training needs

In July and August 2011, DigCurV launched a survey of training needs in the cultural sector [14]. The survey collected information about:

- Institutional contexts including for example whether the institution was currently (or planning to) carry out digital preservation of its collections, had plans for recruiting new staff or for training existing staff members;
- The skills and competences being called for including both general skills and those specific to digital curation;
- Training preferences for example for the means of delivery (online, in person), the length of course, the type of assessment;
- The training needs being expressed for specific skills, competences, roles, access to training etc.

In addition to this survey, DigCurV collected job advertisements throughout 2011. This enabled it to obtain a snap-shot of the state of recruitment and the level of skills, competences, qualifications and experience being called for by employers.

C. Developing an initial Curriculum Framework

Throughout 2012-13 DigCurV has been building on the results of the surveys completed in 2011 and on experience within the consortium and from related initiatives to develop an initial Curriculum Framework [15]. The Framework indicates

the core digital curation skills and competences and pathways of progression through these. There are three main ‘lenses’ to reflect the roles of ‘practitioner’, ‘manager’ and ‘executive’ which indicate the skills and competences required in these roles.

During the summer and autumn of 2012, the DigCurV team ran a series of workshops and presented initial versions of Curriculum Framework at a number of events to invite feedback [16]. This series culminated in a workshop held in Florence in December 2012 [17]. The feedback from these workshops was invaluable in informing the development of the Curriculum Framework.

The Curriculum Framework was launched at the project’s final conference in Florence in May 2013. The framework has three main intended uses:

- To build or develop training courses
- To compare existing courses
- To plan professional development

D. Curate! The Digital Curator Game

DigCurV first developed the Curate! game for a workshop which was held at the DISH conference in Rotterdam in 2011. It was designed to provide a way for curators to explore their changing roles in creating, managing and curating digital content as they advance around the board.

Following the positive feedback received from players of the game at the first trial session, the Curate! game has been made available to registered members of the DigCurV network as a download package [18]. Curate! is currently being translated into several languages by members of the network. It has been played at conferences, workshops and staff development sessions worldwide.

VI. CONCLUSION

This paper provides a brief overview of the activities and results of DigCurV, separate papers in these proceedings describe the projects main activities and results in more detail.

DigCurV has been a highly participatory project. We set out aiming to involve both educationalists and culture sector professionals in our activities to inform the development of the Curriculum Framework. The international network that has grown up around DigCurV is open and we invite new members to join and to exploit the resources that project.

Ultimately, the project’s aim has been to stimulate an increase in the availability of vocational education and training opportunities for digital curators. We look forward to hearing news of the Curriculum Framework and the Curate! game being put to use and about new training courses being developed in future.

ACKNOWLEDGMENT

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A survey based analysis on training opportunities

Dr. Jūratė Kuprienė
Vilnius University Library
Vilnius, Lithuania
jurate.kupriene@mb.vu.lt

Abstract - This paper represents the results of a survey based analysis on training opportunities conducted under the DigCurV, a project funded by the European Commission's Leonardo da Vinci programme. The analysis of training opportunities was conducted at the start of the project with the aim to identify, document and analyze the training courses, curriculum, resources that are available for vocational training in digital curation at national and international levels.

Keywords - Training opportunities, digital curation, vocational training, DigCurV

II. INTRODUCTION

Digital Curator Vocational Education Europe Project – DigCurV, funded by the European Commission's Leonardo da Vinci programme, was started in the beginning of 2011 with the aim to establish a curriculum framework for vocational training in digital curation. In order to support and extend the vocational training for digital curators in the library, archives, museums and cultural activities sector for the first phase of the project it was important to learn what are the existing training initiatives and possibilities. A survey based analysis was conducted and the existing training courses, curriculum, resources, good practice instances that were available for vocational training in digital curation at national and international levels were identified, analysed, classified and profiled. The results of the survey were used to establish the main DigCurV product – a curriculum framework. This paper represents the main results of the survey based analysis.

III. METHODOLOGY

In April 2011 a survey on training opportunities in digital curation and long-term preservation project was distributed. The aim of a survey was to establish how many such opportunities were available for digital curators working in libraries, archives, museums and the cultural heritage sector during the preceding two years. A letter inviting participation in the survey was disseminated via email lists to various national and international institutions with interest and/or involvement in digital curation and preservation training activity as identified from the registry established in the Digital Preservation Europe project, funded by the European Commission within the Sixth Framework Programme, and other contacts. The deadline for returning completed questionnaires was the end of June 2011. In total sixty completed responses from sixteen countries were received. The highest numbers of respondents were located in the UK (11),

Germany (9), Italy (8), Netherlands (5), USA (5) and Spain (5). There were however a significant number of other European countries represented, namely Czech Republic, Lithuania, Estonia, Switzerland, Ireland, Austria, Belgium, Sweden, France and Turkey. There were no serious difficulties in getting a sufficient number of surveys completed by competence centers from Europe, but it was much more difficult to reach competence centers in the rest of the world. Only very few responses from the latter were received.

The survey included basic questions about the organisation but focused on issues related to training content, methodologies, delivery options, and assessment, certification and best practices for training and continuous professional development. The structure of the questionnaire:

- Information about institution;
- Information about trainings provided by the institution:
 - Type of training;
 - Target audience and their knowledge;
 - Key topics covered;
 - Training format;
 - Trainers;
 - Learning objectives and benefits of attending;
 - Assessment;
 - Certification;
 - Evaluation;
- Information about the future plans to organize such trainings.

IV. THE RESULTS OF THE ANALYSIS

A. Population of institutions providing training opportunities

To recognize the opportunities for training in this field in general and to gather information on the current status of training worldwide institutions were asked if they had organized courses for digital curators during the last two years. This time period was chosen to gather more recent information. Respondents could choose only one appropriate answer. Only

40% (24) of respondents replied that they had organized training for digital curators. Most of the respondents (59%) who had organized training had run between 2 and 7 training courses during two years. 7 respondents had only one and 4 respondents reported more than ten (France, UK, Germany and Belgium).

Institutions indicated many diverse reasons for not organizing training events, with more than half mentioning lack of funds (10) or lack of need (9) as the main issues. Six respondents did not consider this issue as currently important, stating they did not have enough time, concern or that it was not within institutional priority or mission. Four institutions noted that, as recently established organisations, they either hadn't yet had the time or were not yet ready to start organizing training.

The types of institutions participating in a survey were quite heterogeneous (Fig. 1). A large majority of the respondents were from libraries (17), universities (12), archives (8) and the business sector (7), as well as various competence centres (4), associations (3) and the following types of organisation: research institute (1), consortium (1), museum (1), data centre (1), state agency (1), nonprofit institution (1), advisory body (1), government (1) and project (1). The diversity of the institutions demonstrates that the topic is important not only to cultural organisations but also to academic, business and public sector organisations.

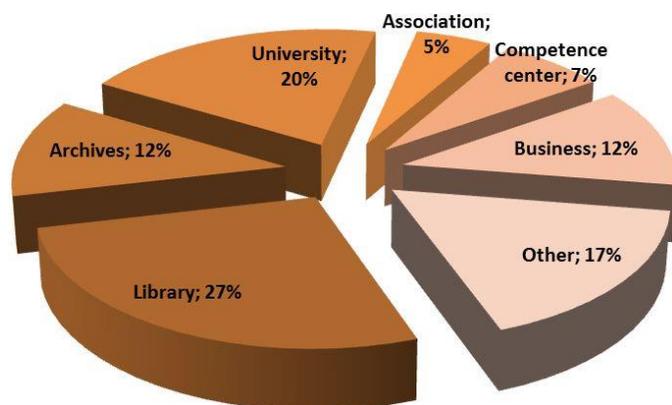


Figure 1. The population of institutions providing training opportunities

B. Trainings provided by the institutions

The next set of questions related to individual training events and key information about:

- **Accessibility of training.** This question was asked in order to find out how accessible training courses were to various types of audience. Most of the training events were open to all (29%) and to the professional community (45%) at national and international levels. Twenty-seven percent of training was only open to the host institution.
- **Target audience.** Most courses were aimed at several target audiences. The groups with the most opportunities to improve their knowledge in the digital curation field were practitioners (88%) and researchers (58%) from archives, libraries, museums or academic institutions. Forty-eight

percent of all training was also appropriate for developers employed by commercial vendors or institutional IT experts within the museums, libraries, archives, government and business sectors, who are responsible for digital curation. Finally 33% of events were targeted at students from various sectors.

- **Required experience.** Institutions were asked if their training required any experience or prior knowledge from their target audience(s). Most of the 48 training events required only basic understanding of digital curation issues (57%) or no pre-knowledge at all (36%) (Fig. 2). One respondent commented that they generally expect that there are curation activities happening at the organisation where the person works. The rest were more specific; two courses (4%) were aimed at experienced data curators and one (2%) required technical knowledge.

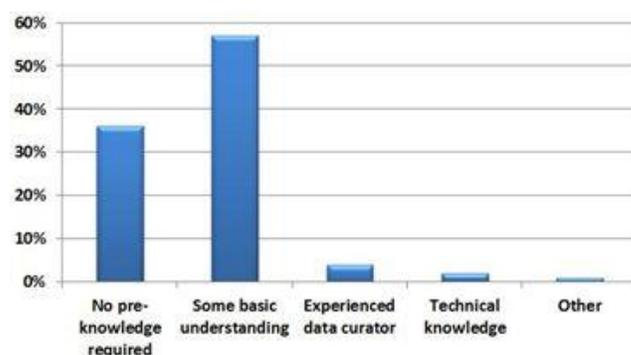


Figure 2. Prior experience or knowledge required by delegates

- **Key topics covered.** The survey results show that a variety of topics were covered in training courses (Fig. 3).

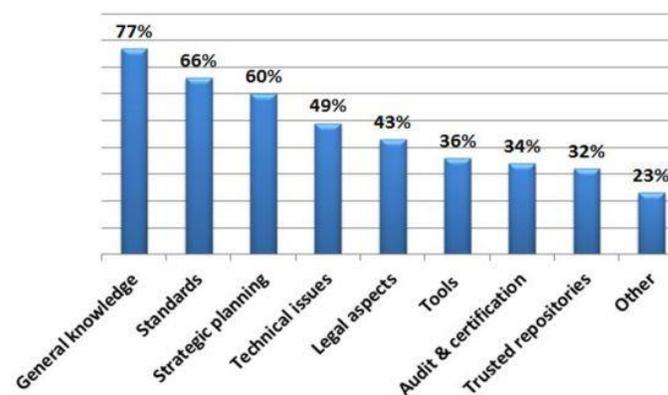


Figure 3. Key topics covered in training events

- **General knowledge** (77%) about key needs and challenges in this area, as well as digital curation standards (66%) and strategic planning (60%) were particularly popular topics, showing these topics are especially valuable and provide useful knowledge to take back to individual institutions. Other topics were also well-covered: technical issues were taught in twenty-three courses (49%), legal aspects in twenty courses (43%), digital curation and preservation tools

in seventeen (36%), digital repository audit and certification in sixteen (34%), and trusted repositories in fifteen (32%). Twenty-three percent of courses also proposed other topics, including file formats, risk assessment, terminology of digital curation, digital curation life cycle model and web archiving.

- **Training format.** The survey results showed that most digital curation courses were delivered in traditional format: large group workshops, a mixture of lectures and practical exercises (69%) and small group hands-on training, focused on practical activities (19%). Only three events (6%) were delivered in blended format, with one respondent explaining that it was a small group hands-on training together with online self-paced courses. One respondent also mentioned that they deliver a regular academic course, taught synchronously via an online system. Two others noted that they deliver a small group seminar, mixture of lectures and practical exercises and large group workshop.
- **Trainers.** Most trainers were practitioners – in-house (74%) or external (57%) subject specialists. Several courses were delivered by in-house (32%) or external (26%) training professionals and two respondents also mentioned online course developers (4%) and one an academic faculty (2%) (Fig. 4).

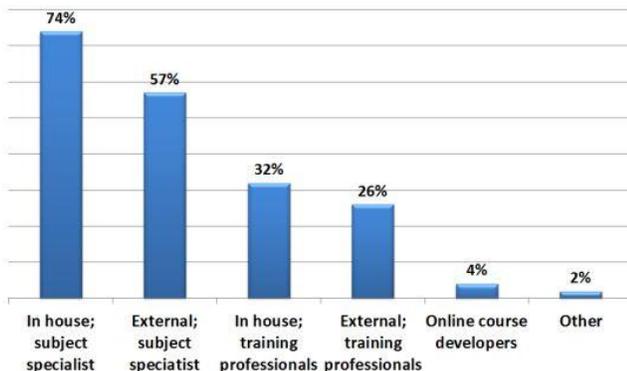


Figure 4. The trainers for the training events

- **Learning objectives.** Respondents were asked to list up to 5 objectives of the training course. For this question we received information about 38 training events out of a possible 48. The majority of objectives highlighted understanding of the main areas of digital curation: increasing awareness of the critical challenges and trends in the emerging data curation field; latest developments in managing digital information; and requirements for data curation in different organisational, technological, legal, cultural, and business environments. A significant number of respondents also mentioned policy and technical aspects as important objectives: ensuring capacity in developing internal policy for organisations involved in data curation; getting to know the standards applied; providing knowledge about some of the most up-to-date digital preservation methods and differences

between them; data management planning; and learning essentials on data repository systems, web archiving and file formats. Some organizers highlighted partnership with designated communities, broad knowledge of current networks, trends and projects and learning best practice for digital curation activities as important objectives.

- **Training materials.** Almost half (48%) of respondents noted that they provided pre-course supporting material. More than half (76%) provided training material after the course. Before the course, most organizers provided PowerPoint presentations, introductions to particular topics (OAIS, TDR, METS, DCC lifecycle model) and other course materials prepared by teaching experts. Respondents also mentioned biographies of trainers, lists of recommended readings, location information, schedules and lists of topics. Some organizers also delivered surveys to find out outcomes and expectations of delegates. The bulk of materials provided after the courses were arranged as PowerPoint presentations as well as other supporting material (literature, leaflets etc.). Supporting material was available on training or organizing institution websites, the Moodle course management system or internal wikis. Only fourteen respondents specified for whom training material was available, with 71% of them noting that it was accessible only for attendees of the course and 29% that it was accessible for all.
- **Benefits of attending.** The majority highlighted various competences and capacities which attendees will gain during the course: ability to make choices between short, medium and long-term digital preservation; becoming able to define strategy and planning in the field; understanding of the preservation planning process and its benefits to overall digital preservation strategies; acquiring competence on the main tools and standards; capacity to dynamically interpret rules and legislation; knowledge of the role and use of metadata and representation information needed for preservation; and knowledge of web archiving and implementation of existing software etc. A significant number of respondents also mentioned networking and the ability to exchange knowledge as an important benefit. Some respondents mentioned the opportunity to encounter experienced national and international experts as a good benefit of attending. Two respondents indicated the benefit of credits. One respondent noted the importance of training for dissemination of digital culture. The remaining answers included empowering delegates, for fun, to realise specific products, and encouraging thinking proactively instead of fixing things afterwards.
- **Assessment, certification, credits.** The majority of organizers (79%) didn't offer any assessment, 9% offered tests, and 6% exams (written exercises, oral questions or practical tasks). The results showed that 40% of all training provided attendees with certificates

as result of the course. Some courses (3) did not provide any certification even when there was student assessment. Some respondents specified the type of certification and results received show that 42% of those certificates were vocational and 32% academic. The results show that 34% (16) of all training provided credits. Three mentioned that they give two ECTS credits for attendance at their course, two respondents noted that they give four ECTS credits for attendance, and some respondents commented that it depends on university rules, work done and the time spent.

- **Evaluation.** Respondents were asked if they evaluated their own training events and if so, how. The results showed that most organizers (83%) use feedback questionnaires as their training evaluation method (Fig. 5). One organizer noted that they use feedback questionnaires at the end of the course and then follow-up questionnaires after several months. The other organizers use follow-up questionnaires (4%) or no evaluation at all (9%). One respondent reported that they obtain feedback by discussion with the students rather than by using a questionnaire.

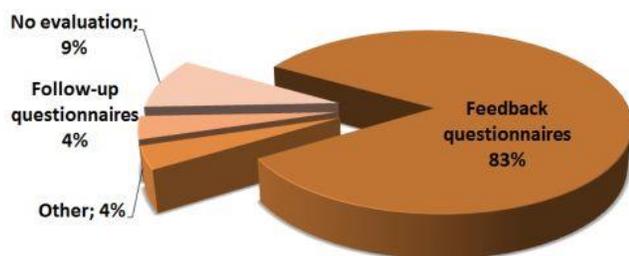


Figure 5. The evaluation methods of training events

C. Future plans of institutions providing training events

The last part of the questionnaire focused on future plans. The results showed that almost half (43%) of respondents were planning to organize such training events during next two years, 32% may organize and 25% were not planning to organize. All respondents who were planning to organize training events provided short descriptions on possible topics, learning outcomes and/or format. Respondents named very diverse topics, but several mentioned a general introduction to digital preservation (5). Others noted attributing metadata, evaluating the format of digital resources, checking an OAIS-compliant ingest plan, data archiving of scientific data sets and management of photo archives. With regards to learning outcomes, these included raising awareness about digital preservation and existing tools, learning about current developments in the field, understanding the risks associated with storing existing information for future access, and understanding the implication of business need in accessing older information.

Responses received show that most training events will be aimed at practitioners from the cultural heritage sector: museum professionals, library personnel and other digital

curators working with digital materials. A few respondents were planning to provide internal training that addresses specific in-house requirements. All the information received shows that training courses planned during the next two years are similar to those that are being organized now. They cover many of the same topics (general principles) and learning outcomes, are of a similar duration, and have the same target audiences. However some more specialised themes are starting to emerge, according to the needs of particular institutions, sectors or for a particular kind of data (scientific data, photo archives).

V. CONCLUSIONS FROM THE SURVEY

The results of the training opportunities survey illustrate various pertinent points.

The differing levels of awareness of the field of digital preservation are an important consideration for those engaged in curriculum design. Some institutions are just beginning to acknowledge their needs whilst others are already searching for specific solutions. Even more fundamentally, the concept of digital curation itself should be defined by training providers as some respondents appear to see no clear difference between digitization and digital preservation.

The variety of institutions should be taken into account:

- The results suggest that the future curriculum framework should correspond not only to the needs of the cultural sector but also of business or public sector organisations.
- The differentiation of the topics required by each of these sectors should be considered. While some organisations are still taking their first steps in this field, others are facing very specific challenges such as managing a particular kind of data.

Due to the dynamic rate of development of the digital preservation field, the content of each topic should be regularly revised, to ensure the material presented reflects the emerging research and practice in the field.

Training initiatives should aim to synthesize digital preservation knowledge, skills and practices into a coherent information management cycle covering the entire lifecycle of the digital object from ingest to access, use and re-use.

The selection of appropriate training formats as well as availability of training course materials before and/or after the course should also be kept in mind.

It is necessary to employ both parts of the content of the course or the entire curriculum and teaching methods to build certain competencies and capabilities that may vary depending on the digital curator profile of the intended audience, suggesting closer interaction between practice and theory. This can be developed through closer collaboration with practitioners and by learning more about the digital preservation labour market demands: using this knowledge will enhance development of understanding of the core skills of digital curation for the current labour market. These core skills

can be augmented by additional sector-specific skills. Again, however, this is an aspect of any curriculum which needs to be iteratively revised over time to ensure its currency.

In addition, training courses naturally need to equip attendees with the skills to meet digital curation challenges, but there is also a need to raise awareness of why successful digital curation action is important to undertake in the first place. Such flexibility in vocational training requires collaboration between organizers of relevant courses and the ongoing exchange of teaching ideas, methods and techniques. This aspect of training – the awareness-raising or outreach level – is less affected by emerging trends in digital curation practice and so materials

developed for this part of the curriculum are probably more durable, requiring less regular iterative revision.

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The DigCurV review of training needs in the field of digital preservation and curation

An overview of the main findings

Claudia Engelhardt

Göttingen State and University Library
Research and Development Department
Göttingen, Germany

claudia.engelhardt@sub.uni-goettingen.de

Abstract—This paper presents the results of the DigCurV review of training needs in the field of digital preservation and curation. The project carried out three research activities during 2011 and in early 2012: an online survey, a series of focus groups, and an analysis of job advertisements. The results indicate a severe lack of qualified staff as well as a lack of appropriate training options for digital preservation and curation. Staff working in this area need to have a broad spectrum of skills and competences. These comprise both generic and digital preservation-specific and technical skills and competences. An urgent need for training was stated in terms of digital preservation-specific and technical as well as with regard to generic skills. When asked to set priorities and indicate the areas where the need for training was most pressing, respondents clearly assigned these to the digital preservation-specific and technical skills.

Keywords: *digital preservation; digital curation; training; qualification; vocational education; needs assessment; survey; questionnaire; focus groups; job advertisements; cultural heritage institutions*

I. INTRODUCTION

As a basis for the development of the DigCurV Curriculum Framework for professional development in the field of digital curation and preservation, the EU funded project Digital Curator Vocational Education Europe (<http://www.digcur-education.org>) conducted research on both the existing training opportunities and the training needs with a focus on the cultural heritage sector. This paper is based on the “DigCurV Report and analysis of the survey of training needs” [1]. It presents the main findings of the DigCurV research on training needs which are described in more detail in the report [1]. The results of the survey on training opportunities are presented in a separate paper (see Kuprienė in this volume) or, in detail, in the respective report [2].

II. CONCEPTUAL DESIGN

The DigCurV review of training needs aimed at: (1) identifying the skills and competences needed in digital preservation and curation, and (2) identifying the need for training with regard to these skills and competences. It was

comprised of three research activities: an online survey, a series of focus groups, and an analysis of job advertisements. The survey formed the main part of our research. The focus groups and the analysis of job advertisements were conducted to gather additional information to counter-check and enrich the survey results.

A. Online Survey

The online survey was conducted during July and August 2011. It was targeted at staff members of cultural heritage organisations such as libraries, archives and museums, but also of institutions in the scientific and educational sector, such as universities. The survey was structured into four parts:

- 1) *Basic information about the respondents and their organisations:* The questions in this part referred to the location (country), type and size of the institutions as well as their involvement in digital curation/ preservation activities and the associated staff situation. It also asked about the respondents’ tasks with regard to digital preservation and curation.
- 2) *Training plans and preferences:* This part gathered information about the organisations’ plans for training in digital preservation / curation as well as preferences with regard to the methods and time frames for training.
- 3) *Skills and competences needed in digital preservation and curation:* This part concentrated on the skills and competences that are required of staff working in the field. The respondents were presented with two lists of tasks and skills (with each item representing a task and the skills or competences needed to fulfil this task) and asked to assess the importance of each task / skill in terms of the work of staff involved in digital curation on a four-point scale (essential, important, not important, and non-essential). One list contained general or generic tasks and skills, such as communication or management, while the other consisted of digital preservation-specific and technical tasks and skills.

- 4) *Training needs in digital preservation and curation:* The final part focused on the need for training with regard to a number of skills and competences required in digital preservation and curation. Again, the respondents were presented with two lists: one containing generic skills and competences, the other digital preservation-specific and technical skills and competences. They were asked to assess the need for training with regard to each item on a four-point scale (great need, moderate need, hardly any need, no need). In addition, the last question asked respondents to indicate up to three areas in which they considered the need for training to be most pressing.

B. Focus groups

To gather additional information from stakeholders, a series of nine focus groups – structured group discussions on the topic – were held in the DigCurV partner countries (Germany, Italy, Ireland, Lithuania and the UK) between September and November 2011. In the focus groups, participants first talked about the challenges with regard to digital preservation they perceived in their everyday work. Then they were asked to indicate the skills and competences that they considered necessary for staff working in the field. Because the tasks and roles of people involved in digital curation are manifold, participants were also asked to develop a number of different ideal job profiles as well as the relevant task and skill sets for each profile. Afterward, they were asked to assess the need for training with regard to these skills and competences. At the end, participants indicated suitable training formats and talked about the relevance of certification and accreditation.

C. Analysis of job advertisements

From February 2011 to January 2012, DigCurV collected 48 job advertisements for positions related to digital preservation and curation. These were examined with respect to the tasks associated with the advertised jobs as well as the qualifications, skills, and competences that were required of the prospective job holders.

III. SURVEY RESULTS

A. General information about the respondents and their organisations

- 1) *Basic information:* The survey received 454 responses from 44 countries. Most of the responses were from Europe (81%). 14% of responses were from North America and 5% from other countries all over the world. The majority of respondents worked in cultural heritage institutions, of which libraries and archives were most frequently mentioned. There was also a large proportion of participants employed at scientific and educational organisations. Moreover, a considerable number of respondents said they were affiliated with other institutions, e.g. public administration, broadcasters, or companies. The survey population comprised of institutions of all sizes: small (1-100 FTEs: 45%),

medium (101-500 FTEs: 30%) and large (> 500 FTEs: 25%). In their everyday work, respondents were involved in a variety of activities related to digital preservation and curation, including management, hands-on tasks and research as well as education and training, providing a strong input of expertise and knowledge from many relevant areas.

- 2) *Involvement in digital preservation and curation activities:* The vast majority (96%) of institutions in the survey face the challenge of digital preservation and curation. About 76% of them already store digital assets for long-term preservation, and another 18% were planning to do so in the future. However, when looking at the staff situation, there is a mismatch. 12% of the organisations that already store digital assets had no staff in place who were assigned to the associated tasks. This particularly applied to smaller institutions. Moreover, 57% of the 335 respondents who answered this question stated that their organisation had no plans to hire new staff for digital preservation tasks. Several participants commented on this question, pointing out that budget constraints were one of the main reasons for this situation. Another factor that was mentioned in this regard was the difficulty of finding adequately skilled candidates on the labour market. Since about 96% of respondents' organisations will have to deal with digital preservation, but many of them lack qualified staff to fulfil the associated tasks and also do not intend to hire new staff, presumably the existing staff will have to cope with these new duties, many of whom will need training to acquire the necessary skills and competences.

B. Training plans and preferences

Although there were a considerable number of organisations (35%) that did not plan training for their staff, about two thirds of them did. 35% of respondents said their organisation was planning training for staff without previous experience in digital preservation/curation, and 31% indicated that there were plans to train staff who already had previous experience. Fortunately, 26% of the institutions in our survey already provided training for their staff. In terms of the training method considered most suitable for their organisation, respondents clearly indicated small group workshops, mentioned by 75%, as their favourite option.³³ 39% chose blended learning, which is a combination of face-to-face instruction and online components. The other options were less popular: written manuals (22%), supervised one-to-one training by a senior staff member (20%), online training (18%), large group workshops (13%) and other (1%) (see Fig. 1).

Respondents also expressed clear preferences with regard to the time frames. They overwhelmingly favoured short events.

³³ Up to two answers were allowed for this and the following question.

55% stated one-time events of 1-2 days to be the most suitable time frame for their organisation, followed by one-time events of 3-5 days, which were chosen by 30%. The other options were selected far less frequently: a course of 1-4 hours a week for several semesters (19%), recurring block courses of one to two weeks for several semesters (14%), a course of 1-4 hours a week for two or more semesters (9%) and other (7%) (see Fig. 2). In their comments, several respondents explained their

preference for short term options, pointing out that many staff members had to cope with heavy workloads. This made it difficult for their institutions to release them for training for more than a couple of days. In terms of certification or accreditation for training, the opinions were divided. About half of the respondents stated that certification or accreditation of training is important, while the other half found it not absolutely necessary.

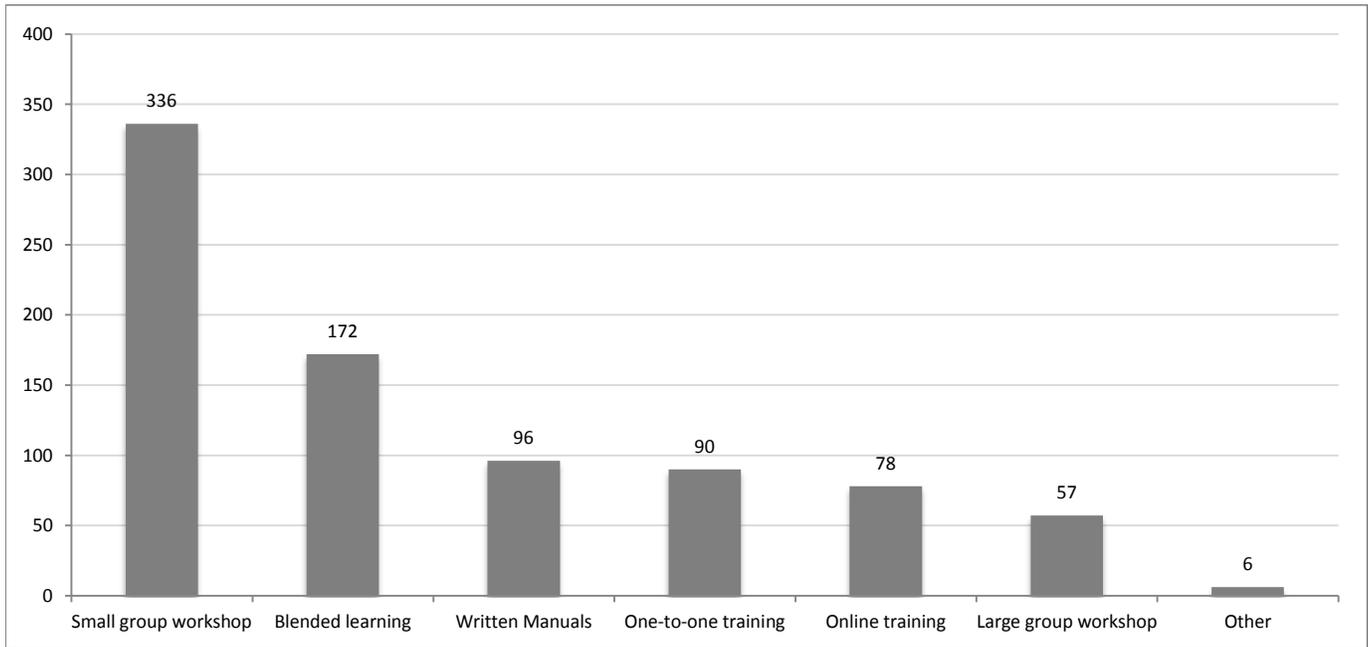


Figure 1. Training methods considered most suitable

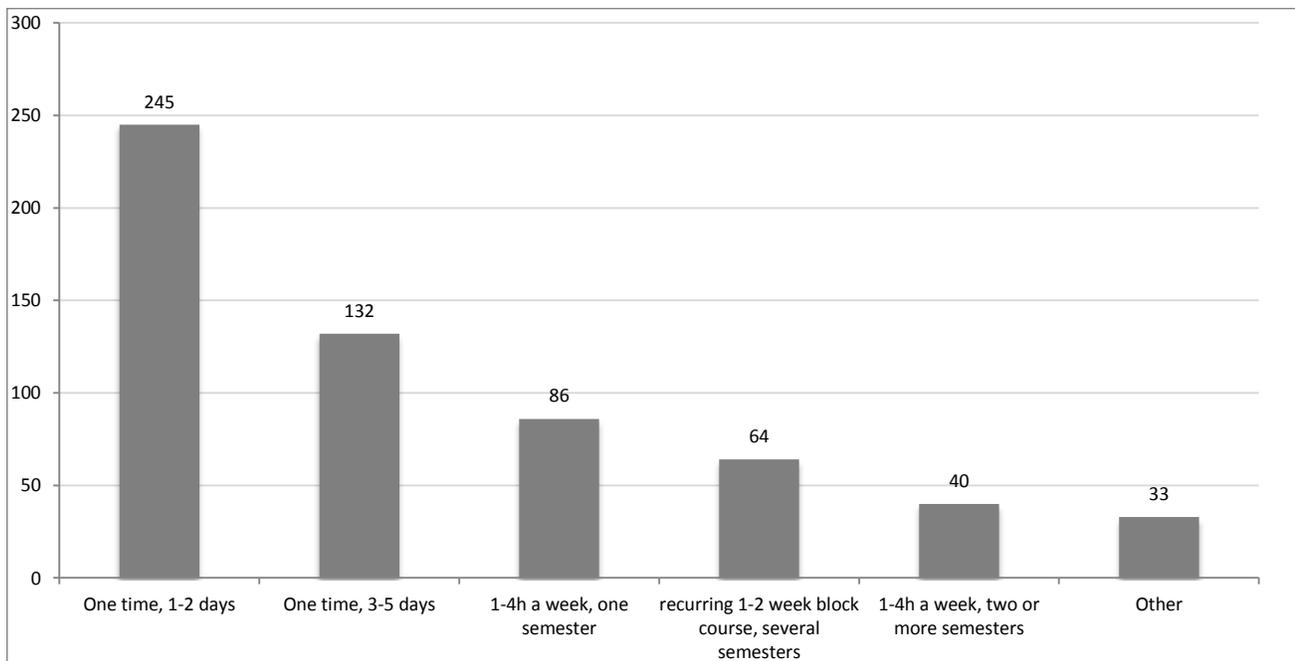


Figure 2. Time frames for training considered most suitable

C. Skills and competences needed in digital preservation and curation

Respondents were asked to assess the importance of a number of tasks and skills in terms of the work of staff involved in digital preservation and curation. These included general as well as digital preservation-specific and technical skills.

General or generic tasks and skills assessed were:

- Collaborating with others
- Communicating with others
- Affinity for technology
- Managing projects
- Training others
- Managing budgets
- Leading a department or team
- Organising conferences, workshops or other events

More than half of these were regarded as highly relevant. Collaborating with others, communicating with others, and affinity for technology were considered to be of particular importance. More than 95% of respondents indicated these to be either important or essential. For managing projects and training others, the proportions are also quite high: 84% and 77%, respectively. In terms of managing budgets, opinions

were divided. About half of the survey population (52%) perceived this item to be essential or important. Two skills – leading a department or team and organising conferences, workshops and other events – were seen as not as relevant. Nevertheless, the percentage of respondents considering them to be either essential or important were 41% and 35%, respectively (see Fig. 3).

The digital preservation-specific and technical skills assessed in the survey were:

- Preservation planning
- Ensuring access
- Managing data
- Evaluating and selecting data for long-term preservation
- Storing data
- Ingesting data
- Research, development and implementation of a digital preservation environment
- Administering the archive

The results show that, without exception, all of these skills were thought to be of extremely high relevance. Each of the given items was indicated to be either essential or important by more than 91% of respondents (see Fig. 4).

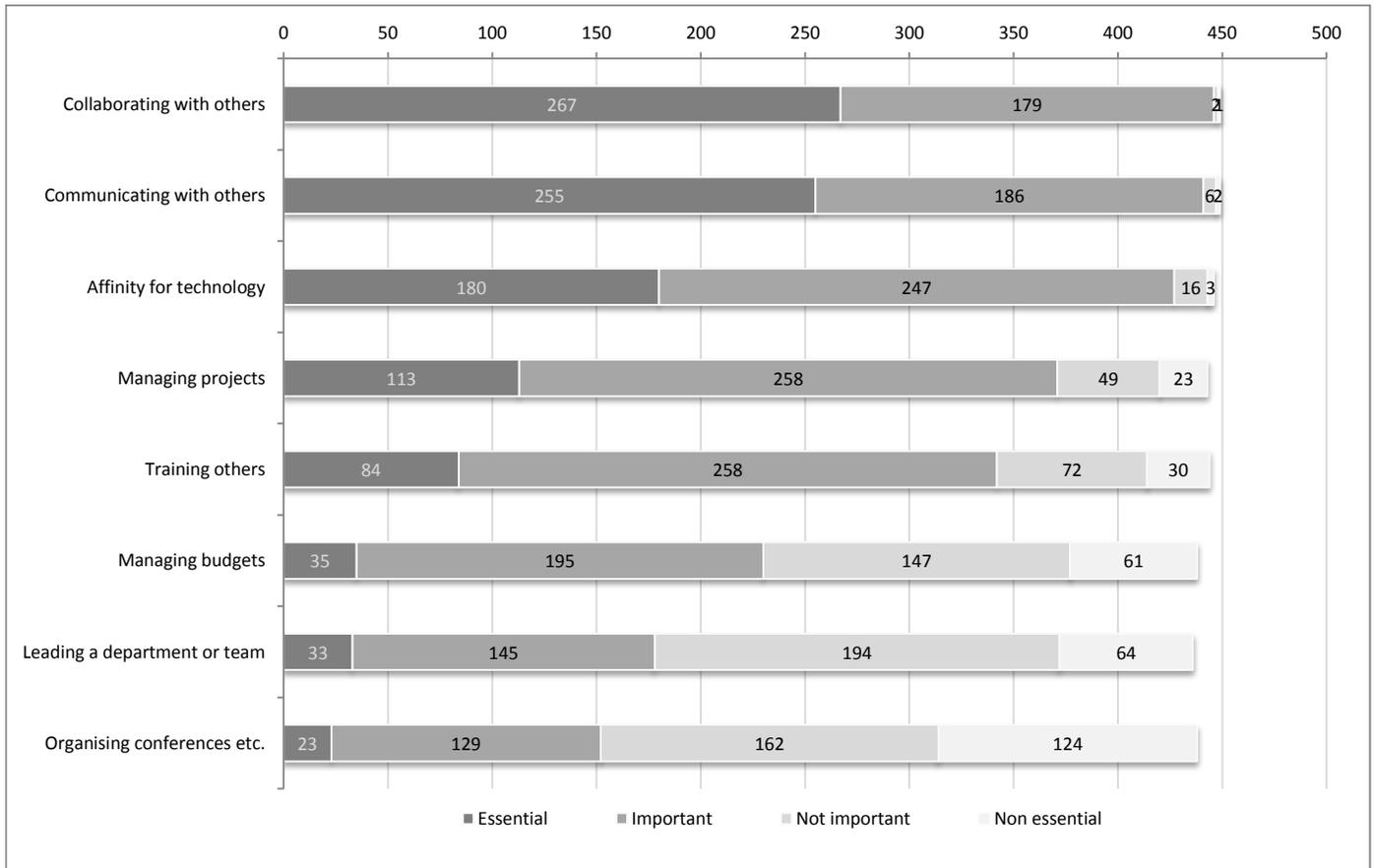


Figure 3. Importance of general tasks and skills

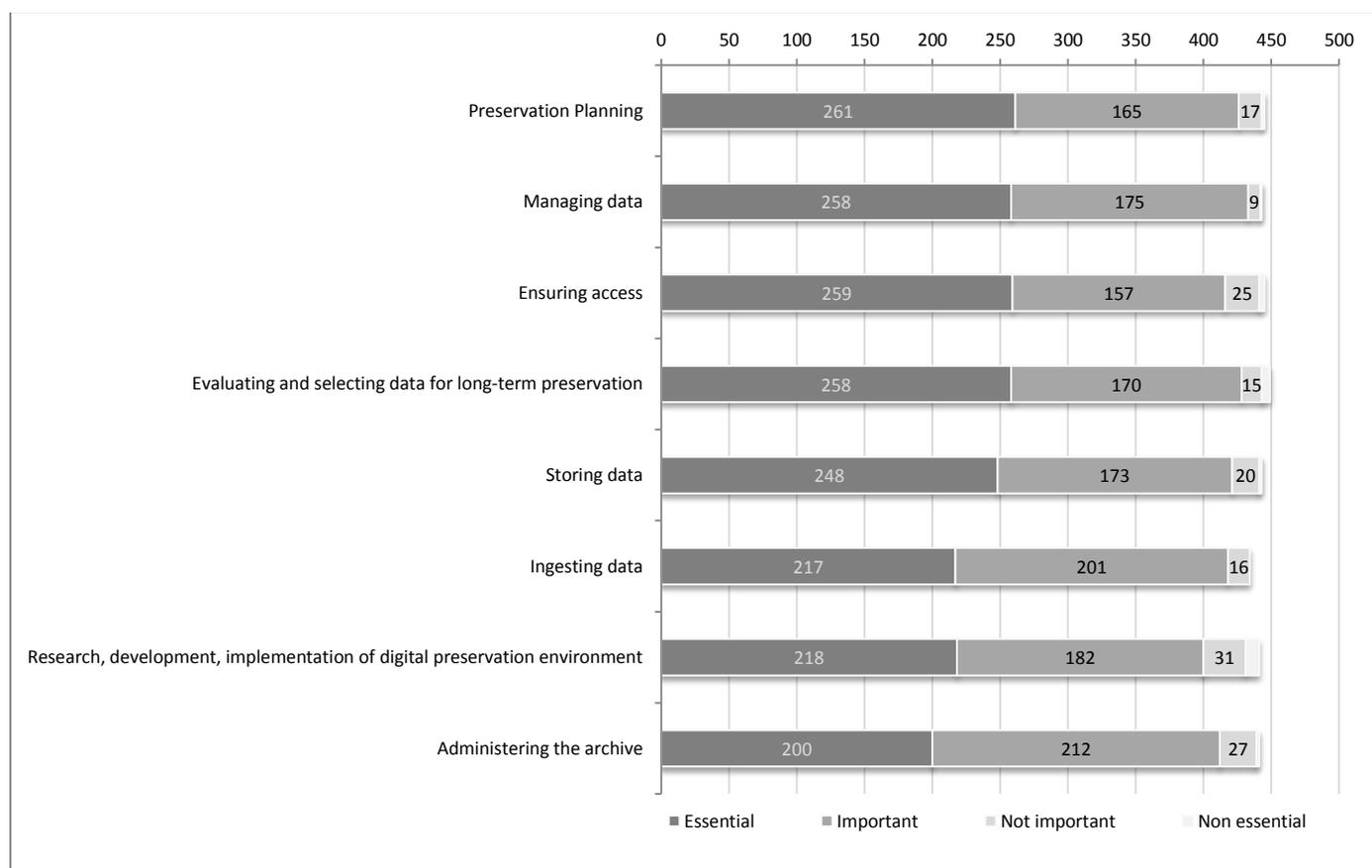


Figure 4. Importance of digital preservation-specific and technical tasks and skills

D. Training needs in digital preservation and curation

The survey results indicated a substantial need for training, both for general and digital preservation-specific and technical skills.

In terms of general skills and competences, the items assessed were:

- Liaising between customers and information technology experts
- Communication
- Project Management
- Networking with people
- Training others
- Administration and finances

For four of these, more than 80% of respondents indicated either a great need or a moderate need: liaising between customers and information technology experts (85%), communication (84%), project management (82%), and networking with people (81%). In terms of training others, the respective percentage was also quite high: 73%. For administration and finances, the proportion was somewhat lower, but still considerable: 61% (see Fig. 5).

With regard to digital preservation-specific and technical skills and competences, respondents were asked to assess the need for training for the following items:

- General / basic knowledge of digital preservation issues
- Preservation and data management planning
- Preservation tools
- Information modelling and metadata
- Trusted repositories
- Strategic planning and policies
- Technical systems
- Legal aspects

The results clearly show that the degree of need for training indicated is extraordinarily high for virtually all of these skills and competences. The proportions of respondents who stated either a great need or a moderate need for training ranged from 86% to 96% (see Fig. 6).

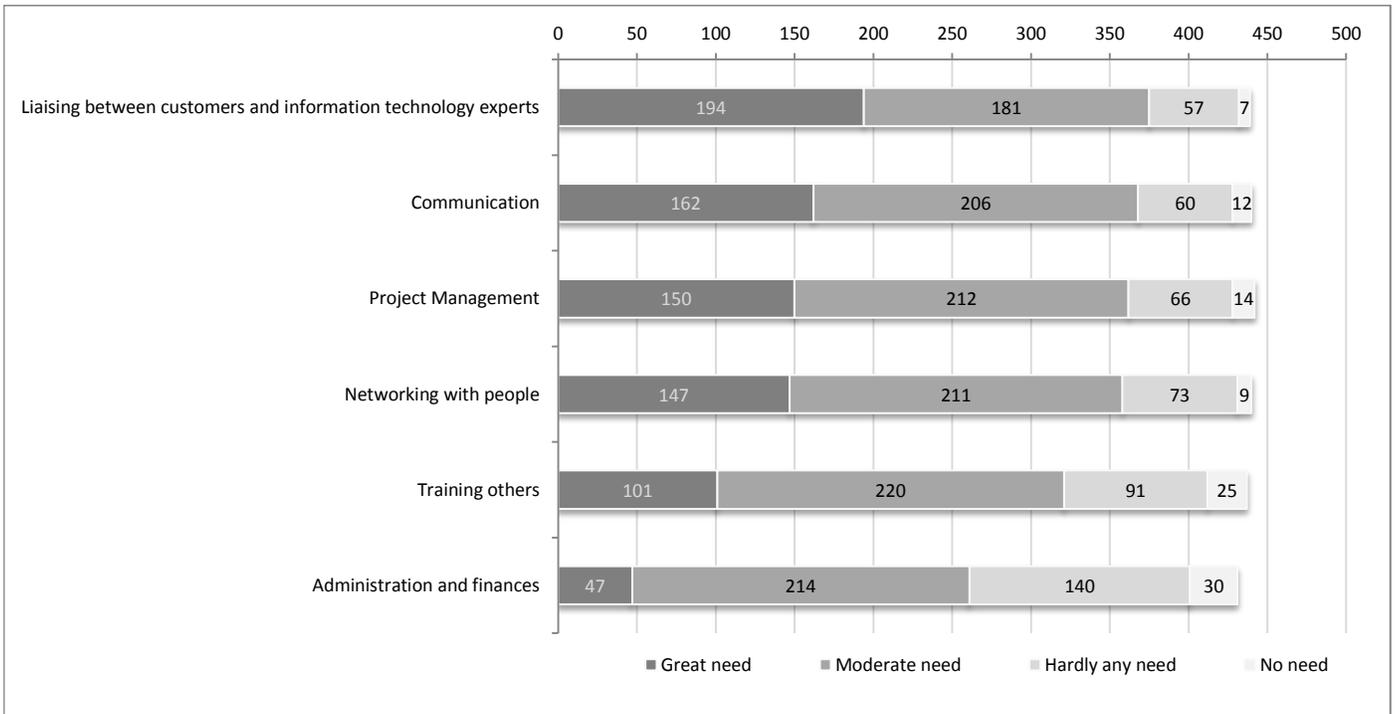


Figure 5. Training needs with regard to general skills and competences

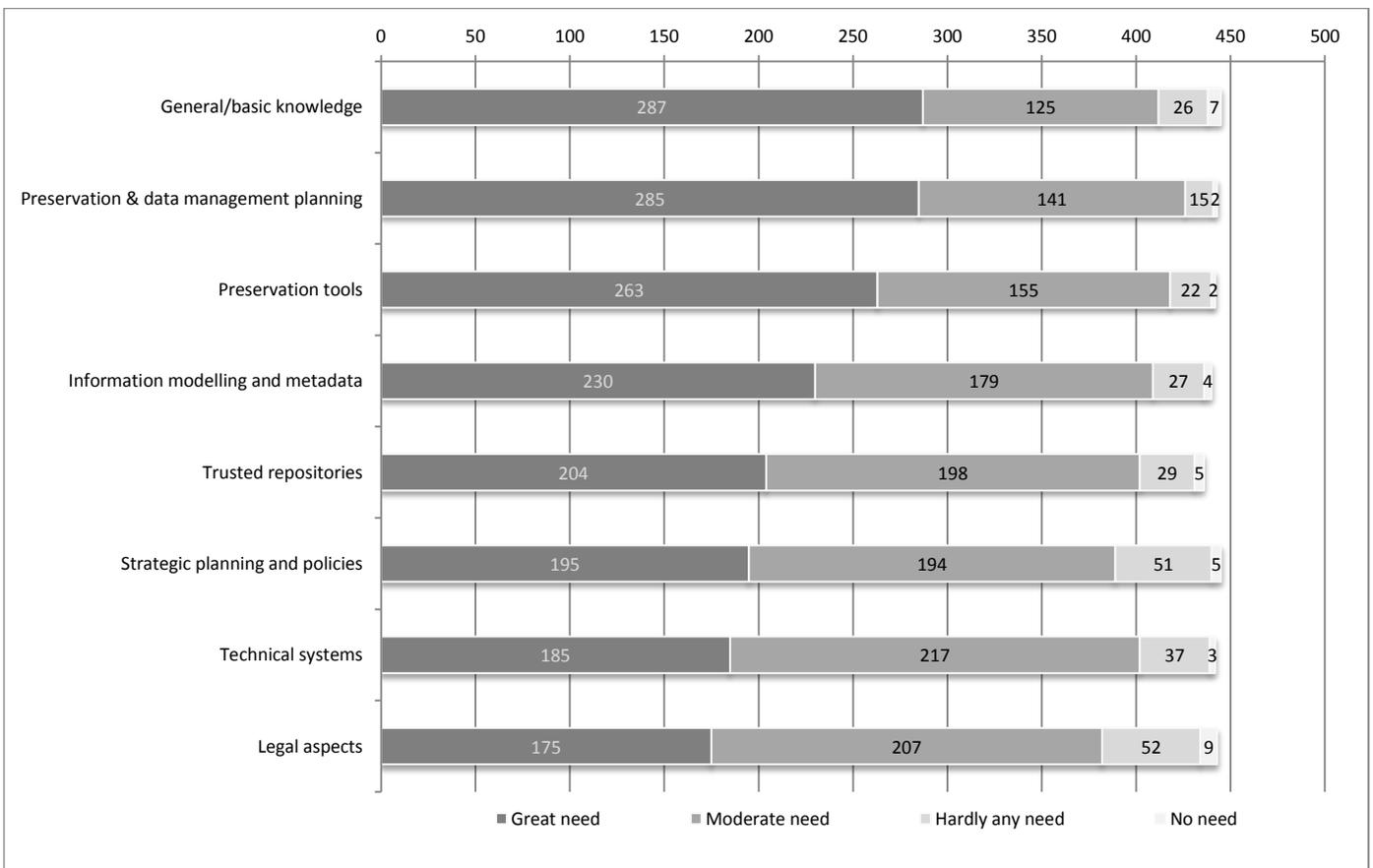


Figure 6. Training needs with regard to digital preservation-specific and technical skills

The last question of the needs assessment aimed at setting priorities by asking respondents to indicate up to three areas in which they believed the need for training to be most pressing. Here, the digital preservation-specific and technical skills clearly outnumber the general skills: all of them ranked

higher than any of the general skills and competences. The need was expressed to be most urgent for general / basic knowledge of digital preservation issues, preservation and data management planning (both 49%), as well as preservation tools (38%) (see Fig. 7).

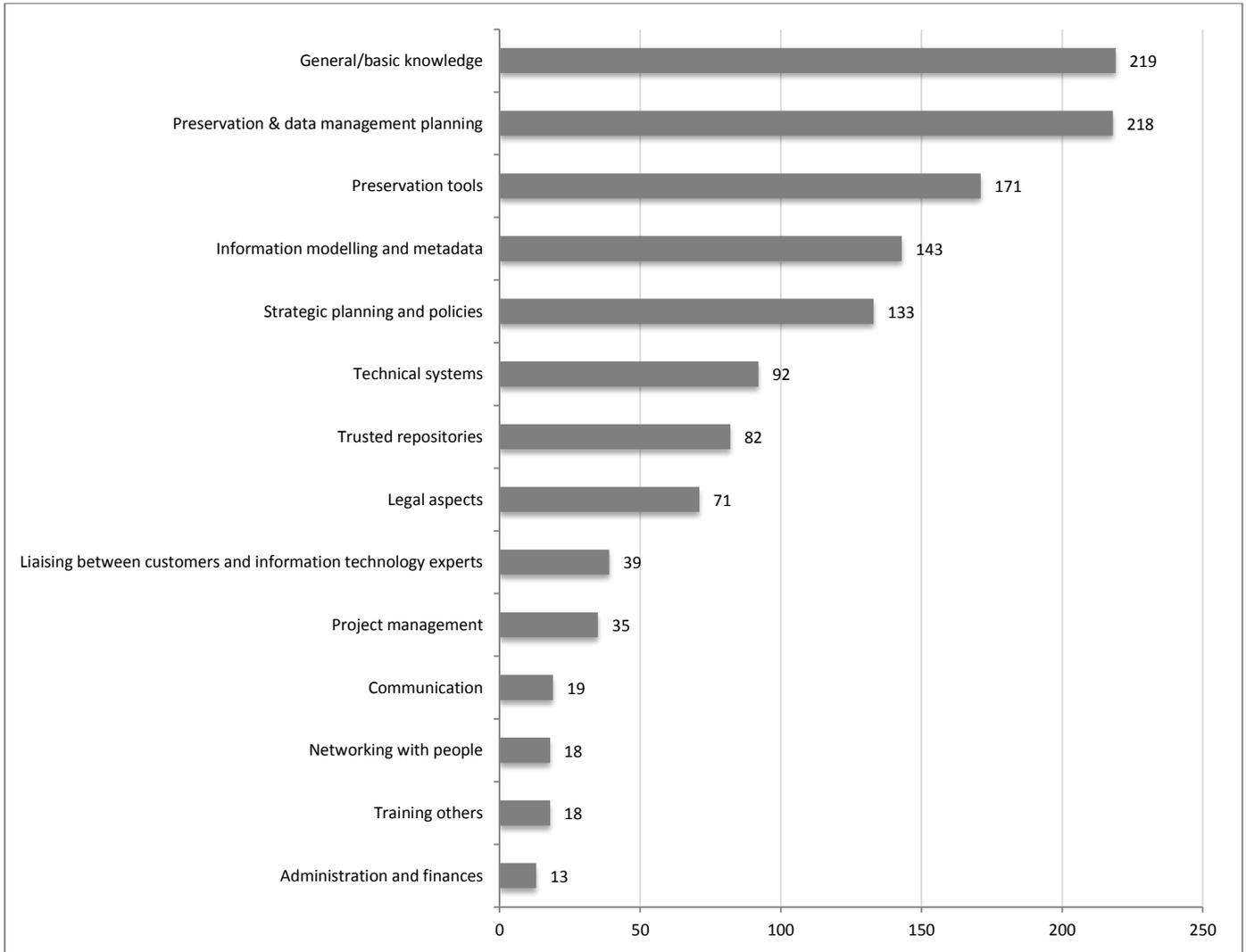


Figure 7. Most pressing needs

IV. FOCUS GROUP RESULTS

The results of the nine focus groups carried out in Germany, Ireland, Italy, Lithuania, and the UK in autumn 2011 underpinned the findings of the survey. One of the greatest challenges participants mentioned is the severe lack of professionals who are qualified for digital preservation and curation tasks. This refers to existing staff in the organisations as well as to potential staff on the labour market. The situation

is exacerbated by a lack of appropriate training offers. Furthermore, participants stated a general lack of awareness for the importance of digital preservation and curation among many institutions.

In terms of the skills and competences required of staff working in the field of digital preservation and curation, focus group participants covered a broad spectrum ranging from digital preservation-specific skills, IT knowledge and technical

expertise to knowledge of the subject domain as well as of library, archival and information science, to social skills, management skills, and knowledge of one's own organisation. Participants stated an urgent need for training, particularly in terms of technical skills and IT knowledge. Other areas in which a considerable need for training was stated were communication skills, management skills, and the ability to train others. Participants in Ireland and Lithuania also expressed a great need for introductory training.

With regard to the methods and time frames for training, the findings are similar to the ones of the survey. The training methods and time frames regarded most appropriate by focus group participants were blended learning, short term courses of a few days as well as courses of one to two weeks in length, such as summer schools. In terms of short events of a few days, some participants pointed out that they were suitable for very limited or specific topics, but not as much for training that has a wider scope. However, similar to comments in the survey, it was also noted that it is difficult for organisations to release staff for training for longer time periods.

V. ANALYSIS OF JOB ADVERTISEMENTS RESULTS

The 48 job advertisements for positions in the field of digital preservation and curation collected between February 2011 and January 2012 were analysed with respect to the task responsibilities as well as the required knowledge, skills, competences, and qualifications of the prospective job holders. The findings support the survey and focus group results.

The responsibilities of professionals comprise a broad spectrum of manifold tasks. They include digital preservation-specific and technical activities as well as general tasks. Among the general tasks, communication, outreach and liaison, project management, teaching and training as well as supervision and funding were frequently mentioned. The digital preservation-specific and technical tasks cover the whole digital lifecycle. Tasks often found were, for example, the development and establishment of workflows, data management, digital collection management, selection and appraisal, hands-on technical tasks, or the research, testing and implementation of digital preservation solutions in line with international standards and best practices.

Accordingly, the knowledge, skills and competences required of candidates are manifold as well. In terms of general skills, excellent communication skills were required or indicated as desirable in all but one job description. Collaboration and team work skills as well as project management skills were also frequently mentioned. The required digital preservation-specific and technical skills include areas such as digital archives and library collections management, data management, trusted repositories, metadata, information technology, programming, preservation tools as well as policies, standards and best practices. With respect to formal qualification, most job advertisements expressed a strong preference for an advanced degree (master's degree or equivalent) in the fields of Library and Information Science or Archival Studies or Science. However, many job descriptions

noted that a relevant academic field, e. g. Computer Science or in the Humanities, would also be acceptable.

VI. SUMMARY

During 2011, the DigCurV project carried out research on training needs in the field of digital preservation and curation. The main aims were to (1) identify the skills and competences that are required of staff working in the field, and (2) to assess the need for training with regard to these skills and competences. There were three research activities carried out: (1) an online survey, (2) a series of focus groups, and (3) an analysis of job advertisements. With 454 responses to the survey and nine focus groups with 6-10 stakeholders taking part, our research received strong input from the digital preservation and curation community, particularly from the cultural heritage, scientific and educational sectors.

The results of our research indicated a severe lack of professionals with the skills and competences necessary to deal with digital preservation tasks. This applies to existing staff in institutions as well as to potential staff on the labour market. The lack of qualified staff is accompanied by a lack of appropriate training options. Survey and focus group participants expressed clear preferences with regard to methods and time frames for training. With regard to the training methods considered most suitable, small group workshops stood out, followed by blended learning. The most preferred time frames were short options. The skills and competences needed for digital preservation and curation are manifold and comprise a broad spectrum ranging from digital preservation-specific skills, IT and technical skills to general skills as well as knowledge of the subject domain and information, library or archival science. There was a great need for training expressed for both general skills and digital preservation-specific and technical skills. The most pressing needs, however, were indicated in the area of the latter, with general / basic knowledge of digital preservation issues and research and data management planning being the most frequently mentioned.

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The DigCurV Curriculum Framework:

Structure, context and approach

Ann Gow

Humanities Advanced Technology
and Information Institute
University of Glasgow (HATII)
Glasgow, Scotland
Ann.Gow@glasgow.ac.uk

Laura Molloy

Humanities Advanced Technology
and Information Institute
University of Glasgow (HATII)
Glasgow, Scotland
Laura.Molloy@glasgow.ac.uk

Leo Konstantelos
University Library

University of Melbourne
Melbourne, Australia
leo.konstantelos@unimelb.edu.au

Abstract—This paper describes the development of the initial curriculum framework, focusing on the method and theory underpinning the content and structure within the context of the project.

Keywords - Training, education, skills, skills frameworks, vocational training, lifelong learning, curriculum development, digital curation, Europe.

I. THE CURRICULUM FRAMEWORK

The DigCurV Curriculum Framework draws on knowledge, expertise and research developed within DigCurV and related initiatives in order to synthesise a matrix of core digital curation skills and competences and, where appropriate, pathways of skills progression between one type of professional role and another. To this end, the Framework comprises three interrelated parts:

- a core Curriculum Framework model, which aims to provide in a cogent, relevant and approachable manner the constituents and interactions of different layers involved in digital curation training;
- three ‘lenses’, or views, one each for three broad types of professional role: Practitioner; Manager and Executive;
- a technical specification in the form of the current report, which outlines the groundwork for the Framework, defines the Framework’s terminology and identifies the interactions between the Framework and lenses.

II. OVERVIEW

The DigCurV Curriculum Framework aims to reflect a detailed yet coherent approach to curriculum design and evaluation, whilst remaining useable to those with or without specialist knowledge of curriculum development.

For clarity and in order to supplement understanding of the development process, a short list of definitions of terminology is provided here alongside a concept model (Figure 1) and a concept map (Figure 2). Whilst the list of

definitions may be useful to all users of the Curriculum Framework, the concept model and map are reproduced here to aid understanding of the development process and the relationship between concepts involved in the Framework development and need only be referred to by users where this is of interest.

At the core of our Framework lies the recognition that digital curation is a complex profession. For successful professional performance, staff must demonstrate domain-specific and technical competences, generic professional and project skills, and personal qualities in a blend appropriate to their particular professional context. We do not, however, expect an individual working within cultural heritage digital curation to possess every skill, ability or piece of knowledge enumerated within the Framework. Rather, the Framework is an *aspirational* model, providing a range of competences and qualities to which individual professionals can aspire in their pursuit of professional excellence. To address the full scope of digital curation activities, and to provide the necessary flexibility for relevance across diverse professional and institutional contexts, the DigCurV Curriculum Framework encompasses a wide range of skills. These skills are expressed as descriptors and arranged into a hierarchy of quadrants and subcategories in order that users may either examine the full scope of digital curation activities, or drill down into the skills associated with specific areas of interest.

To aid navigation across this range of skills, each individual descriptor in the DigCurV Curriculum Framework is assigned a unique alphanumeric identifier. These, however, are not reproduced in individual lenses. The lenses are intended to be a representation of the content of the framework at the highest possible level meaningful for a particular audience; the skill identifier code would add visual clutter and would not add to meaning in this context. The identifiers do, however, enhance usability in the overall framework by providing an additional means of identifying specific descriptors in the larger overall set of information.

Competence: the ability to do what is required [1].
Designated community: an identified group of potential consumers who should be able to understand a particular set of information. The designated community of each institution may be composed of multiple user communities.
Domain: the specific professional context of a cultural heritage institution or a subject area within arts and humanities disciplines.
Domain expertise: knowledge, experience and competence that have been acquired through a consistent track record of successful projects accomplished in various domain areas.
Knowledge: the body of facts, principles, theories and practices that is related to a field of work or study. This is identified in the Curriculum Framework as ‘understanding’.
Longitudinal Evaluation: reiterative review over time, resulting in ongoing improvement.
Skills: cognitive competences (involving the use of logical, intuitive and creative thinking) or practical competences (involving manual dexterity and the use of methods, materials, tools and instruments. These are identified in the Curriculum Framework as ‘abilities’.

IV. CONCEPT MODEL

In order to facilitate the understanding of the framework and the relationships between layers, a generic high-level concept model has been developed (see Figure 1). Each layer of the model is described in more detail below. For definitions and disambiguation of terminology, see section III above, ‘Definitions’.

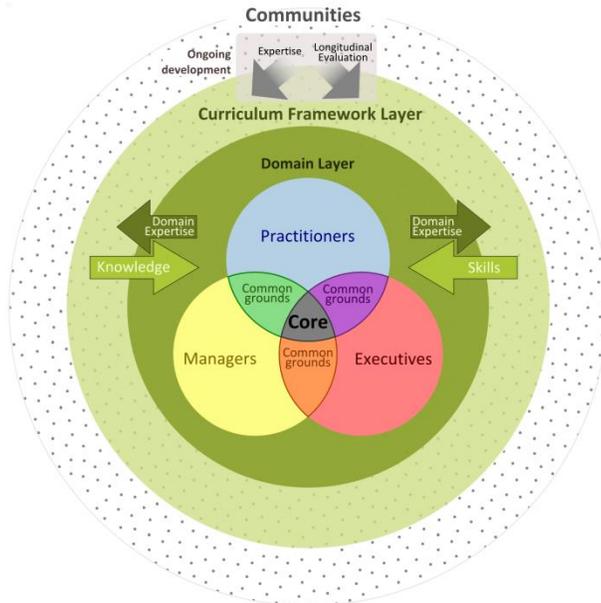
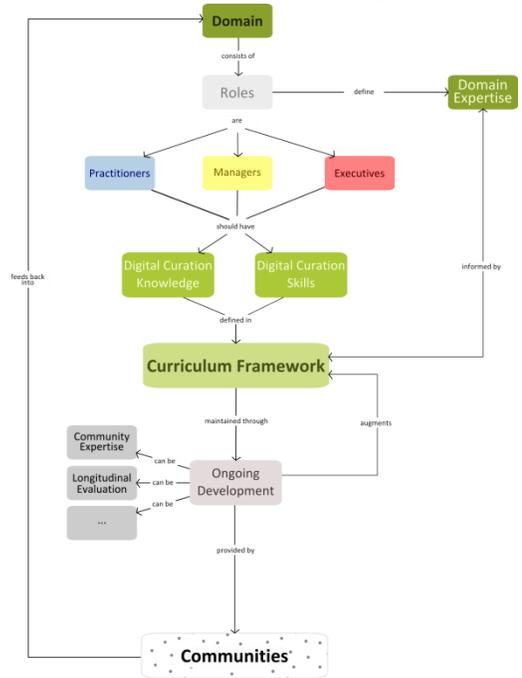


Figure 1: Concept model of the DigCurV Curriculum Framework

At the heart of the Curriculum Framework is a common set of descriptors, from which can be selected those specific to three distinct roles represented by the Curriculum

Framework lenses: Practitioner, Manager and Executive. In this instance, these roles are viewed as comprising the cultural heritage domain identified within the remit of DigCurV, specifically libraries, museums, galleries, archives and associated departments of higher education institutions. A domain can be an institution (e.g. the British Library) or a subject area within the Humanities and Information Sciences relevant to the cultural heritage sector. In this sense, the domain layer encapsulates an instantiation of a curriculum within the context of the specific domain. The areas of convergence between the lenses form common grounds. Further work could usefully define a set of core knowledge and skill elements that should be shared across all three lenses. The areas of convergence are described and connected on the page of the DigCurV website entitled, ‘Comparing Skill Requirements across Executives, Managers, and Practitioners’ [2]

Figure 2: Alternative concept map



The Curriculum Framework Layer: This layer represents the Curriculum Framework as presented in its current form in this document and any future iterations.

Interactions between Domain and Curriculum Framework Layers: Each lens should portray its ability to participate in digital curation curriculum activities through knowledge and skills components. These components form the core of the Curriculum Framework and feed into the generation of a domain curriculum.

In parallel, the roles within the domain lenses possess knowledge, experience and competences that have been acquired through continuing and consistent accomplishments within a domain. This domain expertise informs the Curriculum Framework, providing input in the

necessary knowledge and skills that a digital curation curriculum should include to be relevant to contemporary professional practice. This generates a corpus of knowledge within the Framework. Through the Framework's use, this knowledge is fed back into the domain through the curricula that are created.

Communities: Communities represent the extrapolation of the Curriculum Framework from the organisational/institutional layer (domain) to the collective/social layer. A digital curation curriculum required for the purposes of one organisation/institution in a domain becomes part of a wider network that comprises curricula from a range of organisations and domains. In addition to eliciting Framework content from communities, the collective memory and derivation of expertise from multiple/different uses of the Framework informs the ongoing development of the Framework. In the long term, the Curriculum Framework may combine a variety of sub-frameworks (hence pluralised) each satisfying the requirements of specific domains and/or uses.

Interactions between Curriculum Framework Layer and Communities:

By definition, the Curriculum Framework cannot be static, neither as a concept nor as a tool. Digital curation is a dynamic field, its methods and techniques changing as we gather more knowledge and experience. We therefore postulate that the framework requires ongoing development in order to be credible, usable and always relevant. This ongoing development is a result of a variety of methods, including – but not limited to – longitudinal evaluation and appraisal and exposure to community expertise.

V. CURRICULUM FRAMEWORK: LENSES

DigCurV created three views or 'lenses' onto the overall Curriculum Framework. The skills and competences specified in each lens were initially based on the findings of the RIN Information Literacy Taxonomy [3] built by RIN as an enhancement to the Vitae Researcher Development Framework [4].

These three lenses were developed in response to the findings of the DPOE initiative's work on classification of audiences for training [5]. DPOE found that if cultural heritage institution staff with digital curation responsibilities are divided, based on their role, into one of three broad staff groups, training methods which are more appropriate for each group can then be applied. Following this research, DigCurV developed one lens for each of these groups to maximise the accessibility of the overall Framework to each group.

The role of the lenses is to provide fine-grained information on the specific sets of key knowledge, skills and competences that are necessary for each of the target audiences to engage in successful digital curation practice. This provides a more closely-tailored model for the user to employ when attempting to establish, conduct and/or assess

successful digital curation curricula in their own particular context. These tailored skillsets are presented in a clear and accessible visualisation for each lens, which is intended to serve as an effective resource for curriculum development or evaluation and can be worked with in printed or digital form. Each lens binds together elements from the previous work with the RIN taxonomy, the results of research conducted by DigCurV survey work and the influences of the other relevant models listed above.

The lenses consider how practical, managerial and executive roles in digital curation map to each descriptor. These skills and competences encompass not just technical knowledge and duties but widen out to also encompass personal attributes and behaviours, further helping to define the approaches that a curriculum should encourage in individuals to shape them for success in digital curation professions. To ensure ease of use and to minimise barriers to comprehension, the language was attuned in response to feedback from the community, and skills and competences throughout were categorised into things that the individual 'understands', 'is able to' do and 'is aware of'.

Each lens aims to specify the knowledge, abilities and awareness that should be addressed by digital curation training for a specified level of staff in a cultural heritage institution.

The individual professional – the practitioner, manager or executive – is deliberately positioned at the centre of the lens. The skills and competences desirable for the role surround the individual and are divided into four quadrants. These in turn divide into three or four subcategories. Each subcategory has several descriptors. This structure is an attempt to provide an ontology of the skills and knowledge of each of three broad staff groups in digital curation in the cultural heritage sector, but also follows the legible approach of other successful skills models such as the Vitae Researcher Development Framework (which also influenced the use of term 'descriptor' in the framework) and the UK Society of College, National and University Libraries model, 'Seven Pillars of Information Literacy' [6].

The aim is to provide a user-friendly format that showcases information in a quickly digestible way.

VI. FUTURE DEVELOPMENT

The answer to the dilemma of whether all cultural heritage professionals should up-skill in digital curation, or whether it should be left to specialists, is not is not something that can be resolved by one 30-month project such as DigCurV. Pragmatically, then, in order to address as many futures in digital curation as possible, the project has worked with an open definition of lifelong learning and vocational training, acknowledging the relevance of all postgraduate and professional-level training available both to those intending to enter and also those already working in the field. This includes training types from short courses

on specific skills for existing professionals in the sector, to master's courses specifically training students in digital curation skills.

The international network established by the project – which includes and extends beyond the founding partners – has been involved in iterative development of the curriculum framework including detailed evaluation events in the second half of 2012. Further useful activity in this area may consider domain-specific curricula, extend community use – both as contributors and browsers – of the DigCurV training registry [7], undertake mapping to relevant larger European skills frameworks and consider the feasibility of accreditation of training offerings.

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The CURATE! Game

Its Development, Evaluation and Use

Karolina Badzmierowska
Trinity Long Room Hub
Trinity College Dublin
Dublin, Ireland
badzmiek@tcd.ie

Vicky Garnett
Trinity Long Room Hub
Trinity College Dublin,
Dublin, Ireland
vicky.garnett@tcd.ie

Susan Schreibman
School of English
Trinity College Dublin
Dublin, Ireland
susan.schreibman@tcd.ie

Abstract - The DigCurV CURATE! Game was developed by Katie McCadden, Prof. Susan Schreibman, and Dr. Jennifer Edmond at Trinity College Dublin (TCD), in conjunction with Carol Usher and Kate Fernie at MDR Partners in the UK. Developed as a means to highlight the importance of training in digital curation among practitioners and managers working in libraries, museums and cultural heritage institutes, the game has since expanded into a self-assessment tool, a team-building exercise and a training tool for early career students. A recent survey conducted by TCD and MDR Partners on behalf of DigCurV on the use and perceptions of the game has revealed new scope for further work

Keywords - digital curation; digital preservation; serious games; training; self-evaluation; role-play; experiential learning; game-based training

I. GAMEPLAY AS A TRAINING TOOL

Game or role-play has long been established in practical training situations - typically in high-risk situations (Ericsson, 2006). Aeroplane pilots are trained in simulators before they enter the cockpit; military training involves a significant amount of combat training before soldiers are shipped off to the battlefield (Smith 2006). Yet, experiential teaching practices, or 'Serious Games', as a training or coaching technique in less stressful/ high-risk environments have been steadily increasing in popularity (Ritterford, Cody and Vorderer, 2009), be they for training in marketing, strategy development or rehabilitation. Team-building workshops and exercises have also been proven effective, particularly in an online environment (Hirsch 2001; Pantazis, 2002; Grzeda, Haq and LeBrasseur, 2008).

II. THE EARLY GAME

The objective of the Digital Curation Vocational Education Europe project (DigCurV) is to provide a Curriculum Framework for training in digital curation. The CURATE! game began as an unplanned output of the project, which had already defined its objectives and deliverables at the beginning of the project. The key deliverable, the Curriculum Framework, was designed to be used by students and early-stage researchers, practitioners in the field, and managers and

executives of cultural heritage institutions. The idea for the CURATE! game was devised following two influences. The first was the focus groups that were carried out as part of the required work for DigCurV, where it became apparent that a 'hypothetical scenario' worked best in eliciting responses from the participants on their experiences of digital curation, typically within their institutions. The second came from a poster that was presented by Dr. Jennifer Edmond of the CENDARI project, Dr. Owen Conlan of the cultura project, and Katie McCadden who was working on the DigCurV project. The poster, entitled 'Digital Cultural Heritage and Social Participation' was presented at the Intel European Research and Innovation Conference (ERIC) in 2011 (see Figure 1).



Figure 1: "Digital cultural heritage and social participation" poster, as presented by Dr. Owen Conlan, Dr. Jennifer Edmond, and Katie McCadden at Intel Eric 2011

The intention behind the poster was to bring these three cultural heritage projects (CENDARI, cultura and DigCurV) based within Trinity College Dublin together to present an overview of the ways in which the intersection between technology and cultural heritage could contribute to social cohesion (J. Edmond, personal communication, May 2013). Taking the idea of a game to present a scenario to people in a way that would get them to discuss such issues was then applied to the problem of enabling those engaged in Digital Curation to actively discuss their experiences of working with digital objects. The early version of the game was entitled ‘Game of the Digital Curation Lifecycle’. Following its inception, Katie McCadden and Susan Schreibman at Trinity College Dublin (TCD) developed the game in conjunction with DigCurV colleagues Carol Usher and Kate Fernie at MDR Partners in the UK. The game was developed to include a suite of questions relating specifically to obstacles or achievements typically found within digital curation projects. Answer sheets were also developed and included to allow players to keep a record of their answers. These answer sheets were then either collected by DigCurV and used to provide an insight into the way in which digital curators deal with certain situations, or they remained with the players for them to use as a reference tool. The title of the game was changed to ‘CURATE!’

takes place, and the inner board, which indicates the players’ progress in the ‘Digital Curation LifeCycle’.

The outer board is divided into an equal number of squares on each side, each of which has a scenario or instruction that directs the player as to their next move. In some cases, they are instructed to select a card from one of three categories; “CAUTION!”, “DANGER!” or “DigCurV”. The centre of the board features a second element of play, the lifecycle of the Digital Curation Project. This is represented as a circle that is divided into three key sections, “1. Develop, 2. Educate, 3. Manage“. Players move their ‘token’ pieces around this circle as they complete one full cycle of the main game board.

The game was tested with colleagues and feedback was gathered. The game was then produced as an online download from the DigCurV website³⁴ once the feedback had been taken into consideration.

IV. WHERE IS THE GAME BEING PLAYED, AND WHO IS PLAYING IT?

Two years on from the development of the game, a survey was carried out by TCD and MDR Partners on the uses of the game, and the reception the game has received. This survey was designed for completion online, and was made available from April 2013. The survey has, by and large, reinforced anecdotal comments made to the game developers. The results so far indicate that the game has been played across Europe, as we already knew from conversations with players, as well as in the USA and Australia. In Europe, the game has been played in Belgium, Germany, Ireland, Italy, The Netherlands, Spain and the UK. In the United States, we found an instance of the game being played in New Hampshire, and in Australia we received feedback to the survey from Canberra (see **Error! Reference source not found.**). The game received exceptionally good feedback online, especially among Twitter users.



Figure 2. The CURATE! gameboard

III. DEVELOPING AND TESTING THE GAME

The game was envisaged as a board game, much in the tradition of non-electronic games, such as Monopoly and the ‘Game of Life’. The game board was designed with two key play ‘areas’; the outer board on which the majority of play



Figure 3. CURATE! game play around the world

³⁴ <http://www.digcur-education.org>

To date the game has been mentioned in more than 50 tweets from all over the world.³⁵

Conferences

The game is played most frequently at conferences, usually during a coffee break or poster session. In many cases the game is introduced to the conference participants by a DigCurV partner who either co-organises the conference, or who brought the game as a part of their poster presentation. For example, the game was played at the Digital Strategies for Heritage Conference (DISH 2011) in Rotterdam during the "Digital Curation Training: Mind The Gap!" workshop which was co-organised by DigCurV partners Kate Fernie and Katie McCadden.³⁶ Trinity College Dublin demonstrated the game at the Digital Repository of Ireland's 'Realising the Opportunities of Digital Humanities' conference³⁷ in November 2012 in Dublin, and at the COIMBRA group workshop 'Digitising University Collections' at the University of Edinburgh in May 2013. The game was played by attendees at the DigCurV 'Framing the Digital Curation Curriculum' Workshop in Florence in December 2012 and consequently at the final DigCurV conference in May 2013. The game was also played at LATINA Post-it in Vilnius, Lithuania at the end of May 2013, which comprised a seminar and workshops organised by the Mykolas Romeris University, Lithuania and the Oslo and Akershus University College, Norway.³⁸

The game has also been included in conference programmes through more organic means, where an individual who is not a DigCurV partner has played the game elsewhere, and has included it in their conference. The most recent organic example of including the game in a seminar/training course is the Ina EXPERT event "FRAME 2013: Future for Restoration of Audiovisual Memory in Europe" which will be dedicated to 12 European professionals in the media industry and will take place in Paris in June 2013³⁹. This is, of course, the most encouraging use of the game.

CURATE! in the classroom

Teaching is the second most popular situation in which the game is played. Respondents to the survey indicated that they have used the game as part of a university programme. Students of DigCurV partner HATII (Humanities, Advanced Technology and Information Institute), University of Glasgow played the game in their final week of the MSc. Information

³⁵ <http://storify.com/karolinabadz/digcurvcurategame>

³⁶ <http://digitaalduurzaam.blogspot.com.au/2011/12/playing-digital-lifecycle-game-dish2011.html>

³⁷ <http://www.dri.ie/realising-opportunities-digital-humanities>

³⁸ http://akkordio.net/postit/?page_id=7678

³⁹ <http://www3.ebu.ch/files/live/sites/ebu/files/events/Academy/2013/DOCS/1.%20FRAME%20programme%20Draft%202013%20session%201%2026022013.pdf>

Management and Preservation course.⁴⁰ Trinity College Dublin has included a session of the game as part of its delivery of the MPhil. in Digital Humanities and Culture. DigCurV partners at the University of Göttingen also included the game as part of their 'nestor/DigCurV School 2012' in October 2012.

CURATE! as a Team Building exercise

Playing the game is also very popular in team-building exercises, the third most popular use of the game. For example, a pre-Christmas party for students studying Digital Humanities, as well as those interested in digital curation was held in December 2012 at TCD. The game was also played at a data management meeting in Utrecht in 2012.⁴¹ Further examples of team-building include Dartmouth College Preservation Service in New Hampshire⁴², who sat down to a game during a coffee-break. In a similar setting the game was played by the staff members of the Academic Commons online repository at the Columbia University, New York.⁴³

Improvised use of the game

We have also received responses that indicate that users are improvising in their use of the game. One lecturer decided to dispense with the game board altogether, and simply used the game-cards as prompts for discussion and for testing student knowledge.

V. RESULTS OF THE SURVEY

In evaluating the game, respondents to the survey were asked to rate elements of the game, for example the questions, the board layout, and its complexity, while giving reasons for their answers.

Interaction/Discussion/Education

The discursive and interactive elements of the game were considered strong for the most part. Criticism was mostly geared towards occasions when the game was played with players who possessed very different levels of knowledge in digital curation. The mixed experience of the players on these occasions might indicate that different levels of knowledge might be barriers for some players to engage in discussion. Knowing this, however, might be turned into a strength rather than be viewed as a barrier. One of the purposes of the game is to educate. By creating a situation in which players with less experience can discuss digital curation issues with their more experienced colleagues, they are given the opportunity to learn and develop their own knowledge base.

⁴⁰ <http://blogs.arts.gla.ac.uk/hatii/msc-imp-mcpdm-best-blog-awards-results-are-coming/>

⁴¹ <https://twitter.com/leandervdspek/status/185475787611320323>

⁴² <http://dartmouthpreservation.blogspot.ie/2012/07/winning-game-of-digital-curation.html>

⁴³ <https://twitter.com/ResearchAtCU/status/193406095505625088/photo/1>
<https://twitter.com/ResearchAtCU/status/193405223610499074/photo/1>

Respondents to the survey recognised this:

"depends very much on the people in your team. You can talk about the issues on different levels."

"The more experienced the players are, the more interesting is the outcome."

Equally, players at a reasonably similar level of expertise in the field as collaborators in a digital curation project will have a different background and experience, therefore the game play and resulting discussions are a learning curve for all.

Many respondents to the survey felt that the game's 'fun factor' creates a friendly and creative environment where players can openly discuss the topics and self-evaluate. Similarly, the game creates a 'safe' environment in which players can put forward suggestions on hypothetical situations without feeling like they might make a mistake. There will inevitably be some in the group who disagree with an answer given, but this only leads to discussion, as indicated by these respondents:

"The interactive nature of the game - the questions lead to more and more discussion as the game goes on."

"I think the idea of raising awareness by a game is great."

"A nice way to bring up discussions about digitalization issues."

The Game Questions

The questions and scenarios on the DigCurV and CAUTION cards range from positive points (DigCurV cards) for discussion, e.g. "You receive funding for a Digital Preservation project; what's the first thing you do?", to quite serious problems (CAUTION! cards) that can potentially arise during the lifecycle of a project, e.g. "There has been a technical failure. Your metadata from the first 3 months of the project is gone and it was not backed up. How will you handle this?" The questions also represent different levels of complexity of problems and issues that can arise. The issue of expertise among players, however, was once again seen as a weakness by respondents when it comes to the questions in the game. Some respondents felt that the quality of answer given by a less experienced player would hamper the learning capacity within a game session of players with mixed experience.

"The questions are formulated in such a way that players with little knowledge can give very general answers and get away with it."

"Some questions are too general and can provoke very general and superficial answers. Especially when played with players with little knowledge about digitisation projects."

"Some questions are not very inspiring and formulated too broad."

Those with a basic knowledge, the respondents claimed, tended to give very general and broad answers to some of the more complex questions, whereas those with a higher level of expertise in the field found many of the questions to be too broad in scope in any case, and therefore not challenging.

Some felt that the topics of the questions did not cover the entire digital curation experience sufficiently. One criticism came from someone who believed that the questions focused "too much on the side of costs, funding, etc. Not enough discussion of risks that would result from strategy selection, etc". The survey specifically asked if players felt other topic areas should be included, and the majority of results indicated a need for more questions relating to project planning for the project, issues surrounding the act of digitalization, establishing and maintaining standards in digital curation and a knowledge of software. Interestingly, the same number of people also indicated they felt there should be more questions on funding (see Table 1). However, the most common issue raised was the small amount of cards provided with the game. This had an impact on the game overall, as in many cases the lack of cards / questions caused many to abort the game before completing it, as indicated by these comments:

"Could not be finished. Not enough questions."

"Before finishing the first round there were no questions left."

Question topics	Less	Just right	More
Project Management	2	3	3
Training	0	5	4
Software	1	2	6
Work plan	0	0	8
Digitalisation	0	3	6
Budget planning	1	1	4
Staff	1	4	2
Standards	0	1	6
Feedback	0	1	5
Documentation	0	3	4
Resources	0	3	3
Funding	1	0	6
Outcomes	0	2	3
Technologies	0	3	5
Preservation	0	3	6
Other topics	0	1	2

Table 1 -Survey responses "Which topics/subjects would you like to feature more or less

Structure and Design of the game

The game is designed in the familiar format of a gameboard, on which boxes or ‘spaces’ are organized in a linear structure for players to move around the board on the throw of a dice. This is a common format for board games and makes game play instant and accessible to players. The three ‘Digital Curation Lifecycle’ stages in the centre were not considered clear enough for players, who could not understand their purpose:

"It is absolutely not clear what the function is of these stages and how they relate to the questions."

A suggestion was made as to how to better make use of these stages:

"Give different questions for different stages."

The game-flow received a mixed response. The majority considered the board structure to be ‘ok’, with further equal responses indicating that the structure was either ‘easy’ or ‘difficult’ (see Table 2). The deliberate ‘stumbling blocks’ on the ‘DANGER!’ cards was seen by some as a positive aspect, whereas it frustrated others:

"No 'lose next turn' card, or other things that slows down the game."

"We decided to sometimes ignore 'lose next turn' because it slows down the playing rhythm..."

One respondent commented that they strongly disliked “being stuck in the same place too often (on the board)”.

Rate the board structure (play, moving around)	
very easy	0
easy	2
ok	6
difficult	2
very difficult	0

Table 2 DigCurV Survey Responses "Rate the board"

The relationship between the questions and the game-board was brought into question by one or two respondents, one of whom described the journey around the board as ‘kind of mechanic’. They also took issue with what they described as a ‘luck’ component that meant that the quality of answers given to the questions had no bearing on a player’s progress around the board. The size or format of the game-board itself proved difficult for those playing in groups larger than 5:

"The idea of having a game for digital curation is great. However, the way it is designed now (a board game) it is a bit difficult to play it in a group bigger than 5-6."

We have already seen how one teacher dispensed with the board altogether and focused on simply using the cards. This indicates that the link between the board and the questions is perhaps tenuous in its current form. It also suggests different directions in which the game could be developed. The imagery and graphics of the board have been designed to match the DigCurV branding of dark blue, orange and white. However, there were some criticisms regarding the size of the text on either the gameboard or the questions cards, which some felt was too small.

Access to the Game

The main strength for the game in terms of access is the ability to download it directly from the DigCurV website. However, there were still some problems encountered with the download, such as this respondent whose colleague spent too much time on printing:

"Printing all the game cards took quite some time, my colleague told me."

VI. FURTHER DEVELOPMENT FOR THE CURATE! GAME

Taking the feedback from the survey into consideration, and coupling this with anecdotal feedback we have received through our own game sessions, DigCurV is currently developing a plan for improvements to the game that should address many of the issues highlighted. Many of the improvements are possible within the short term for the game, and are considered possible before the end of the DigCurV project. However, some others require much more extensive development, and have been proposed as a major part of a new funding application.

Short term developments

- The quantity, quality and range of the cards within the game was the first issue addressed, and was completed with 41 new cards trialled during a game session at the DigCurV Final Conference (May 2013).
- Clearer instructions will be developed in various media, including a YouTube instruction video.
- To tackle the issue of the different levels of experience of players, it is proposed that two sets of cards be developed to allow for a ‘genius’ version of the game for those with more experience or those who want a challenge, and a ‘standard’ game for those who are starting out, or for mixed ability groups. Of course, we would not wish to be prescriptive as to who should play which set in particular, and it should also be possible for players to combine the two sets of cards if they feel it would make the game more interesting.

The increased number of play cards is also hoped to amend the issue that some felt the progress of the game was hampered by too many ‘lose a turn’ or ‘go back one space’ cards. However, that said, there was further anecdotal feedback that indicated that the element of risk, or obstacles to

the game made it closer to the ‘real-world’ scenarios and frustrations associated with a digital curation or preservation project. Nonetheless, the ‘DANGER!’ category received the fewest new cards.

Continued additions to the cards are feasible before the end of the project, and it is hoped that further development will be able to link the topics on the cards to the three ‘lifecycle’ stages on the gameboard.

Medium-term developments

Further developments are desired, but may require additional funding in order to complete. For example, re-formatting the layout of the gameboard to include more squares would be feasible within a 6-month timeframe, but are perhaps not possible within the remaining month of the project.

Long-term developments

Ultimately, it is the aim of DigCurV to produce an online digital version of the game. Much of the feedback indicated that this would be favourable and this would certainly increase access and improve the interactive components of the game. Options could include the ability for players to customize the game to their needs, developing a version that could be used for assessment purposes in training, or creating some manner of multi-player set up that could allow colleagues at different institutions to play a game. The online version could play a role of an open forum where the participants can ask questions, discuss issues, network and learn from each other outside of their regular working environment and comfort zone. This could also help to populate the card questions database based on the players’ own experience, expertise and concerns around digital curation and preservation.

The game has the potential to be widely included in a number of training programmes across relevant institutions and training providers, e.g. higher education courses, digital curation and preservation courses, libraries, repositories, museums, archives, galleries. In order to proceed with this long term development a carefully approached outreach plan, promotion and development strategies need to be created and disseminated.

Unfortunately, this is beyond the scope of the current project. In order to achieve this particular goal would require extensive development over a significant period of time.

VII. OVERVIEW

The CURATE! game has been extremely well received since its development two years ago. So far it has been used mostly in the classroom and at conferences, which has introduced the game to many people. The results of the survey have revealed several strengths of the game that were perhaps unexpected (flexibility of use in training environments by using the cards only), and revealed weaknesses of the game that can be addressed through recognizing the variety of

experience of the players. Both the strengths and weaknesses revealed will be taken into consideration for the continued development of the game. While many changes can be made in the short-term before the end of the project, the main changes to ensure greater flexibility would require a greater investment of time and money.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the inspiration of Katie McCadden, Dr. Owen Conlan and Dr. Jennifer Edmond, who first developed a game-play poster which in turn, fostered the developed the CURATE! game; and in particular Katie McCadden who took the lead in game development in conjunction with Susan Schreiber, Carol Usher and Kate Fernie of DigCurV.

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Contributed Papers Sessions

Introduction to the sessions

With the increase of digital content in the broad areas of Institutional and domain specific Repositories, Libraries, Archives and Museums, digital curation is becoming a central activity and a challenge. The need for skilled professionals to manage digital collections is evident in Europe and internationally, yet there are limited numbers of institutions currently offering professional training and education programmes to prepare individuals to work in the field. One of the main objectives of the DigCurV project was to address the availability of educational curricula and vocational training for digital curators in the library, archive, museum and cultural heritage sectors needed to develop new skills that are essential for the long-term management of digital collections.

In line with those general objectives, it was felt that the inclusion of some Contributed Papers Sessions in the final conference of the DigCurV project would have added value to the project and interest to the conference. The objectives of the conference were to promote discussion and sharing of experience among the participants, and to start building some consensus among the main stakeholders for what concerns the criteria and requirements needed to develop training courses for professionals in digital curation. The presentation of results from projects and initiatives actively involved in education, training and professional development in the field of digital curation and digital preservation was therefore mostly welcomed.

A Call for Papers was issued, soliciting contributions on concrete examples of training initiatives and educational programmes in digital curation, illustrating approaches, methodologies and success stories of training addressed to an increasingly qualified workforce of the library, archive, museum and cultural heritage sectors. A number of topics of interest were suggested, from lifelong learning in digital curation to opportunities and challenges in developing training curricula, from training the trainers to sustainability of training initiatives. The complete Call for Papers can be seen at the DigCurV web site:

<http://www.digcur-education.org/eng/International-Conference/Call-for-Contributions-Closed>.

The call was quite successful, and the Program Committee in the end selected sixteen papers and twelve posters (of which only four were presented at the Conference, due to budget restrictions at the submitting organizations). The accepted papers were divided into 4 sessions, broadly based on the main topics dealt with within the paper, but this classification is rather coarse, as many papers could belong to more than one session, so we encourage the reader interested in browsing through the papers to look more at the abstract of a paper rather than at the title of the session.

By looking at all the accepted papers, an interesting consideration that can be done is that many of them are dealing with the curation and preservation of “research data”, despite the fact that this topic was not specifically mentioned in the Call for Papers. Today practically all the research activities are based on digital sources, and therefore a particular aspect of Digital Curation is the storage, management and preservation of digital research data. Digital research data can take many different aspects, such as previous publications, images, video, audio, data bases, email, web sites, etc., and most of the time those data are specific to the research field. The term Data Curator is more and more used to indicate the person/organization responsible for all the activities connected with the management (curation) of research data. However, it is not (yet) clear which of the existing professional roles are best suited for this activity. Should there be a Data Librarian, or a Data Archivist, or a Data Museum curator ? Or is this a new role to be invented from scratch ? Or should the responsibility of curating research data be given to the “data producers”, i.e. the researchers themselves ? As previously stated, it is interesting to note the different approaches and solutions to these topics that are presented in many of the papers.

We thank the readers for their interest in Digital Curation, and we hope that this set of papers can stimulate further thoughts, discussions and cooperation. Enjoy your reading !

Vittore Casarosa, Program Chair,
and the whole Program Committee



Session 1 – Digital Curation Education

Data-Intelligence Training for Library Staff

Ellen Verbakel (*Author*)

3TU.Datacentrum
TU Delft Library
Delft, The Netherlands
p.m.verbakel@tudelft.nl

Marina Noordegraaf
www.verbeeldingskr8.nl

Madeleine de Smaele (*Author*)

3TU.Datacentrum
TU Delft Library
Delft, The Netherlands

Nicole Potters
TU Delft Library,
Delft, The Netherlands

Abstract - The course Data Intelligence 4 Librarians was developed by 3TU.Datacentrum at the end of 2011 to provide online resources and training for digital preservation practitioners, specifically for library staff. The course is intended to overcome the insecurity and perceived lack of knowledge about data management which prevents library staff from proactively providing support to research staff with the management, storage and sharing of their research data. The course objectives are: 1) to transfer and exchange knowledge about data management, and 2) to provide participants with the skills required to advise researchers or research groups on efficient and effective ways of adding value to their data. The course is an additional service provided by 3TU.Datacentrum⁴⁴ a digital repository for research data set up by the research libraries of the three Dutch Universities of Technology (3TU): Delft University of Technology, Eindhoven University of Technology, and the University of Twente. The paper describes the process of creating the course, the methodology, and the results of the two courses in 2012. There were three phases to creating the course: 1) an investigation of the training needs, 2) the design of the course and 3) the development of the training materials. The training needs could be divided into hard skills (such as data management basics, data citation and knowledge of the data browser interface) and soft skills (such as acquisition skills, advisory skills and a reflective attitude towards their profession). This has led to a course with a competency-based modular design, consisting of four modules. The project team consisted of 3TU.Datacentrum staff. The team designed a blended learning course, composed of a didactical mix of group meetings, online study and homework assignments, including the website Data Intelligence⁴⁵ that provides online reference material. By using a modern collaboration environment and social media, the course meets the needs of the modern scientific community. The training methodology proved effective in creating a solid base for digital preservation and a network of starting data librarians.

In the first half of 2012, 14 librarians participated in the pilot course and provided feedback. The feedback has been used to improve the next cycle of the course, which started in September 2012. In February 2013 the third cycle starts.

This paper demonstrates the choices made during the design process. Finally, future plans are discussed. They include expanding the course to make the materials also suitable to researchers and other data repositories in cooperation with organisations from The Netherlands.

Keywords:- *DataIntelligence; 3TU.Datacentrum; Verbeeldingskr8*

I. INTRODUCTION

Attention for research data management (RDM) from funders, high level management of universities and research institutes as well as some data producers is increasing. To bridge the gaps and support eager researchers with RDM, well-trained support staff are urgently required.

In literature, emphasis lies on training researchers themselves in RDM (Lyon, 2007; Grim, Van der Heijden, De Smaele & Verbakel, 2011). To our knowledge, Data Intelligence 4 Librarians is the first course to specifically focus on support staff, particularly librarians. The mission of the course was formulated as follows: *Data Intelligence 4 Librarians wants to contribute to the professionalization and positioning of support staff as a trusted partner in the support of data-intensive science.*

II. PROCESS

There were three phases to designing and delivering the course Data Intelligence 4 Librarians: 1) an investigation of the training needs, 2) the design of the course, and 3) the development of the training materials.

A. Investigation of the training needs

The course Data Intelligence 4 Librarians was primarily intended for library staff from the three Universities of Technology in The Netherlands (3TU): Delft University of Technology, Eindhoven University of Technology, and the University of Twente. A recent white paper stressed the urgency of the development of RDM trainings for support staff and researchers (Grim, Van der Heijden, De Smaele & Verbakel, 2011).. The white paper describes the results of a literature search on curation education and no examples existed

⁴⁴ 3TU.Datacentrum: <http://datacentrum.3tu.nl>

⁴⁵ Data intelligence: <http://dataintelligence.3tu.nl>

which could be transferred to the current situation in The Netherlands.

Sessions were organised with the information specialists or reference librarians of the 3TU universities. During break-out sessions training needs were identified. A Twitter account @datalibrarians⁴⁶ was set up to proactively look out for the latest developments in the field. To get in touch with relevant parties in The Netherlands the Onderzoeksdataforum [Research Data Forum], now the Special Interest Group Research Data⁴⁷ was visited, and in June 2011 a visit was paid to the ICE-forum⁴⁸. Our pragmatic approach received confirmation: get the course running as soon as possible and let participants evaluate its content to improve it. Open Educational Resources on the subject were not yet available at that time.

B. Design of the course

During the investigation of the training needs, librarians expressed a great need for more knowledge and ICT-skills before they would feel capable of establishing data services. Our course is designed and built as a competence-based modular course, combining online and face-to-face tuition (blended learning). From the inventory of learning goals, seven core competencies were defined for a data librarian:

Table Head	Table Column Head
Skilfully handles ICT	<ul style="list-style-type: none"> • Uses the available Information Technology in an effective and efficient way. • Can use the 3TU.Databrowser to upload a dataset and make it available for (re)use
Has specific library knowledge	<ul style="list-style-type: none"> • Knows how to acquire specific knowledge about metadata standards. • Can explain how minting a DOI (Digital Object Identifier) and UUID (Universally Unique Identifier) enhances the visibility (citability) of a dataset.
Develops entrepreneurship	<ul style="list-style-type: none"> • Is committed to improve data services in response to changing needs in the field. • Keeps an eye on trends in the profession, knows where new knowledge may be found (networks) and spreads relevant information to key persons in the organisation. • Investigates needs in the field by means of questionnaires, interviews and so-called focus groups. • Actively contributes to developments in the field by visiting conferences and enrolling in courses and training.
Develops a systemic view	<ul style="list-style-type: none"> • Acknowledges that data are just one part of the scientific research cycle and is aware of the significance of data within that cycle. • Sees the library and its data and information services as part of a larger decision-making system.
Develops advisory skills	<ul style="list-style-type: none"> • Can advise researchers on RDM topics, like sustainable data formats, data models, intellectual property and the demands of research funders. • Knows when certain aspects of RDM do not fit his/her expertise and is able to refer questions to corresponding knowledge experts.

⁴⁶ 3TU.Datacentrum on Twitter: <http://www.twitter.com/datalibrarians>

⁴⁷ Special Interest Group Research Data: <https://www.surfspace.nl/sig/28-research-data/29-over-de-sig/>

⁴⁸ International Curation Education Forum: <http://www.jisc.ac.uk/whatwedo/programmes/preservation/iceforum.aspx>

Table Head	Table Column Head
	<ul style="list-style-type: none"> • Supports researchers in setting up a data management plan (DMP). • Can hold a so-called data interview and is aware of the possible use of data curation profiles (DCP) as a possible interview instrument. • Can connect to a researcher's perception on data management and data sharing. • Asks for feedback on his/her advisory skills and adjusts his/her behaviour accordingly.
Develops collaboration skills	<ul style="list-style-type: none"> • Investigates how collaborating with other employees, institutions, data centers and researchers may lead to a better provision of services. • Acknowledges the need for a forum of data professionals who may join forces in important data issues like copyright and (inter)national information infrastructure. • Takes responsibility for his/her role in partnerships.
Develops training materials	<ul style="list-style-type: none"> • Develops RDM training materials for end users. • Is able to translate the knowledge and skills acquired in the Data Intelligence 4 Librarians training into RDM training material for different target audiences.

Using these competencies, a modular course was designed which consists of the following modules:

1. Current topics
2. Data management
3. Technical skills
4. Advisory skills

For the Current topics module, the homework assignment requires the students to use relevant (online) tools and sources for about a month to form an opinion on the current state of affairs in the field of data curation (services). In a short elevator pitch they then share their findings with their fellow students.

The premise of the course is that supporting researchers in data curation is teamwork. Therefore strong emphasis is placed on enabling networking within the student group.

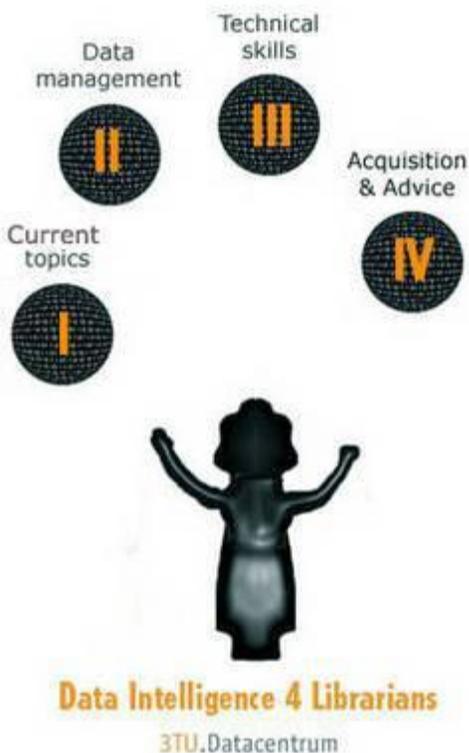


Figure 1. A graphic overview of the course: a data librarian juggling four balls. Retrieved from: <http://dataintelligence.3tu.nl/>

In the second module, students learn about research data management in general, such as formats, metadata, copyright, policy etc.

The third module is technical in nature. It explains what digital objects are, how data are to be cited, how research data are transformed to different formats during different phases in its lifecycle, how to search for data (depending on the data model used) and how to enhance publications. Students practice with searching for existing datasets and describing and uploading a dataset.

For the fourth module, students write an acquisition plan. They present their plan to fellow students and give feedback on each other's' plans, they try their advisory skills in role plays and, finally, put their acquisition plan into practice by actually carrying out the first steps described in their own plans. In this final module theory, skills and attitude come together.

C. Development of training material

Once the training design was finished, the actual development of the course started. For each module a team of three to four experts on the topic came together for two to four iterating sessions of one or two hours. The content was written in between sessions. The design was fine-tuned with the feedback of the knowledge experts, texts were reviewed by the

experts and rewritten. The experts agreed on the final text on the course website and on the homework assignments. The whole process of developing the training material for all four modules took no more than three months. Even though the course was initially designed for Dutch participants, the course website was translated into English, in order to provide a possible source of inspiration for universities or other institutions abroad. The course material was illustrated with images.

Two coaches were selected for their didactical skills, following the belief that being an inspiring coach requires different skills than being a knowledge expert. The design of the course places much emphasis on learning by trying things yourself, without putting too much trust in an expert. Everyone is an expert in a certain area and data curation is teamwork where everyone should be valued for their specific contribution.

The coaches were provided with a global scenario for each training day, homework assignments, and some PowerPoint presentations not included in the course website.

III. FINDINGS

Some important issues put forward by participants and coaches were:

Participants enjoyed and appreciated their discussions resulting from the homework assignments, seen as the most valuable element of the course.

Four days of face-to-face tuition were seen as a considerable time investment, but useful because of the relevant discussions and networking possibilities.

Participants were interested to hear from researchers themselves how they deal with data management issues, and about differences between disciplines.

Participants missed the opportunity to practice writing an actual Data Management Plan.

Participants urgently needed practical information about setting up a front office for data management services.

The participants appreciated the images included in the course material on the website, which they thought were a memorable way to clarify concepts.

In view of the evaluation results a collaboration with DANS (Data Archiving and Networked Services - archive of humanities, archaeology, geospatial sciences and behavioural and social sciences in The Netherlands) was set up. The course expanded to include information about non-technical disciplines as well as services provided by DANS. DANS also provided one of the coaches for the second cycle of the course, making it a truly joint undertaking. The course website is now providing reference materials from 3TU.Datacentrum as well as from DANS.

The first course was a pilot with mainly participants from the 3 technical universities. They know each other from various meetings, projects, seminars and so on. They still work together in 3TU.Datacentrum. The networking component of the course was less apparent than intended. The second cycle of the course took place between September and December 2012 with 16 participants from universities and research organisations throughout The Netherlands. In the evaluation Google+/Drive was more appreciated than in the first round. The networking component was highly ranked, all students came from different institutions, they learned from each other. The DigCurV game CURATE: The Digital Curator Game was played and provoked discussions. Most of the students went home with lots of plans to work on data management in their institutions. The technical module was too shallow for some students, too detailed for others. Their opinion is related to their prior knowledge and expectations about the course.

As information about the course *Data Intelligence 4 Librarians* has spread within and even outside The Netherlands, several parties have asked to share our experience and knowledge in other projects like RDMRose⁴⁹ and in exchanging experience and work with UK partners like DCC and JISC. Our course has also served as an inspiring example to developing the Liaison Librarian Training by EDINA & Data Library, University of Edinburgh (Macdonald, S., Donnelly, A., & Rice, R., 2012).

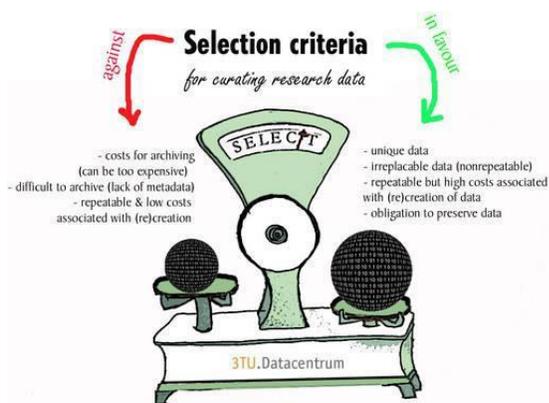


Figure 2. One of the illustrations used on the course website.
 Retrieved from <http://dataintelligence.3tu.nl/>

Participants in the course have expressed appreciation for the visual content on the course website, and adding more audio-visual content will greatly enhance the learning experience.

The development of the course *Data Intelligence 4 Librarians* was a leap into the unknown. No courses on this topic existed in The Netherlands and no easily reusable

courses on this topic existed abroad. But the need to get such a course running was obvious.

IV. FUTURE PLANS

A project just started for the design of a new, flexible and dynamic learning environment to make the course even more interactive and make collaboration easier. Simultaneously, an RDM training for researchers will be developed, initially for use at the three Universities of Technology in The Netherlands (3TU). The Data intelligence website will than cover the reference materials for the training for Support staff and the training for researchers.

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⁴⁹ The University of Sheffield Information School:
<http://www.sheffield.ac.uk/is/research/projects>

An Applied Approach to Data Curation Training at the Inter-university Consortium for Political and Social Research (ICPSR)

Jared Lyle, Mary Vardigan
ICPSR, University of Michigan
Ann Arbor, MI, U.S.A.
{lyle, [vardigan](mailto:vardigan@umich.edu)}@umich.edu

Jacob Carlson
Purdue University
West Lafayette, IN, U.S.A.
jakecarlson@purdue.edu

Ron Nakao
Stanford University
Stanford, CA, U.S.A.
ronbo@stanford.edu

Abstract—ICPSR recently developed two new training initiatives in digital curation: a week-long applied data curation workshop where participants learn the theories and methods of data curation using the ICPSR “processing pipeline” as framework, and an ongoing virtual working group of data librarians that discusses similar core data curation topics while giving participants independent access to curate their own data using ICPSR’s processing environment and tools. This paper discusses the background, structure, and lessons learned from these new training initiatives.

Keywords—*Digital curation, data curation, training, curriculum.*

I. OVERVIEW

The Inter-university Consortium for Political and Social Research (ICPSR), a research center in the Institute for Social Research at the University of Michigan and the world’s largest archive of social science data, recently developed two new training initiatives in digital curation. The first initiative is a week-long applied data curation workshop offered as part of the ICPSR Summer Program in Quantitative Methods, where participants learn the theories and methods of data curation using the ICPSR “processing pipeline” as framework. The second initiative is an ongoing virtual working group of data librarians that discusses similar core data curation topics while giving participants independent access to curate their own data using ICPSR’s processing environment and tools. This paper discusses the background, structure, and lessons learned from these new training initiatives.

II. DATA CURATION WORKSHOP

As data multiply in sheer quantity and become increasingly important in the research process, the demand for data curation knowledge rises. What are the best practices for curating research data? How does one apply them to daily practice? What tools

can assist in curation efforts? In 2011, ICPSR began planning a data curation workshop to address these questions.

A. Background

The workshop was intended for individuals interested or actively engaged in the management and curation of research data, particularly data scientists, data managers and analysts, librarians, archivists, and data stewards and curators. The initial goal of the workshop was to “raise awareness about the benefits of life cycle principles for data management, including how to create, comply with, and evaluate required data management plans, how to encourage and trace re-use, and how to manage data from its inception through archiving and beyond.”

We believed, and continue to feel, that ICPSR is uniquely positioned to offer a course on data curation. First, ICPSR plays a central role in many social science data curation standards and activities, including serving as the home office for the Data Documentation Initiative (DDI) and as a founding member of the Data Preservation Alliance for the Social Sciences (Data-PASS). DDI has become an international standard for metadata in the social sciences. ICPSR and many other data archives use the DDI XML to document information about the data in our repositories; the ICPSR online catalog is also built on DDI metadata, allowing structured searching across the entire repository at the variable- and even the value-level. Data-PASS is a voluntary partnership of organizations created to archive, catalog, and preserve data used for social science research. The Data-PASS partners collaborate on best practices for data archiving and have a shared digital preservation strategy.

Second, ICPSR has established workflows for curating, preserving, and providing access to data. These workflows, described as the “ICPSR Pipeline Process” (Fig. 1), have been developed and refined over 50 years of archiving more than 8,000 research collections from across all social science

disciplines, and are informed by the Reference Model for an Open Archival Information System (OAIS) for the preservation of digital objects as well as other community-based best

practices. The workflow segments, which are broken into digestible portions, make it easier for students to follow and learn curation processes.

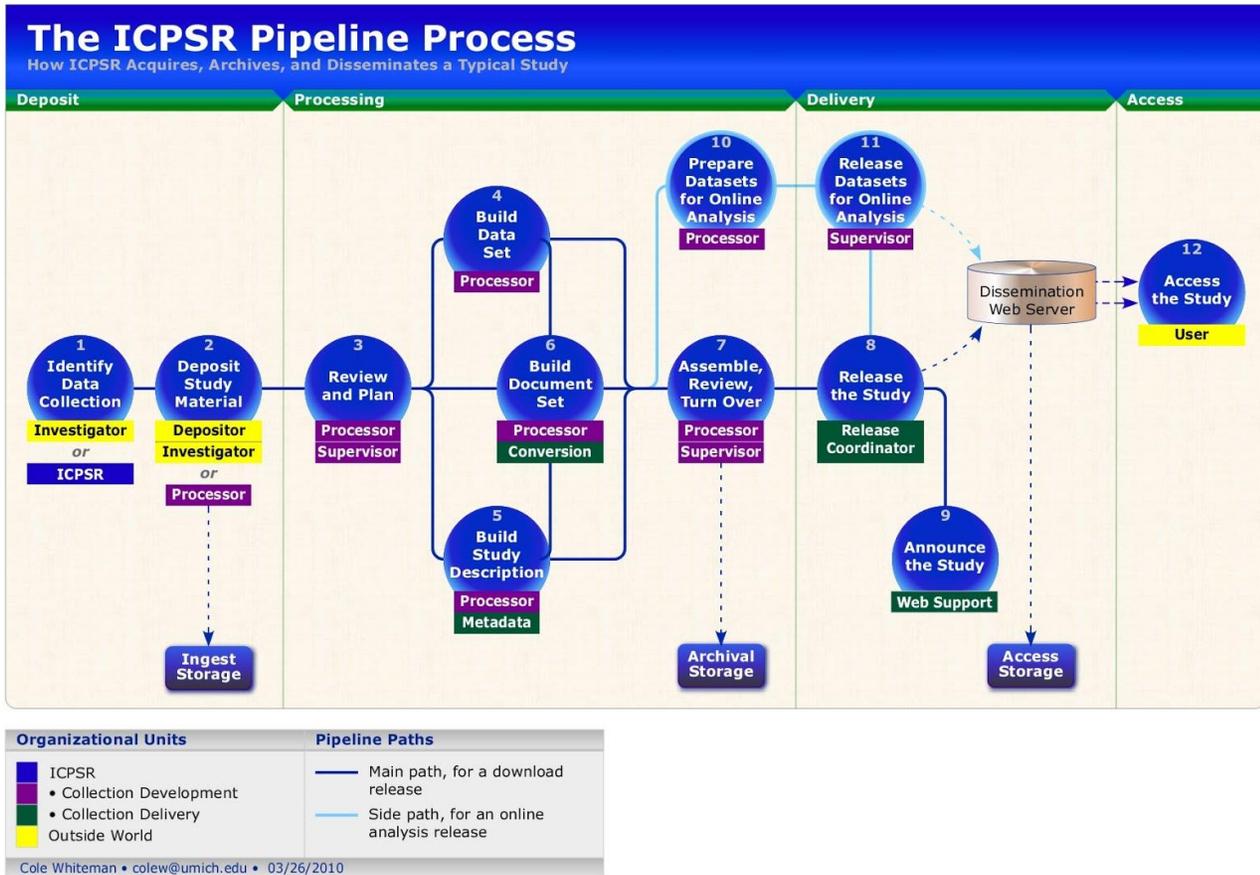


Figure 1. ICPSR Pipeline Process.

Third, ICPSR has an established Summer Program in Quantitative Methods that offers more than 70 courses every summer. The program provides an instructional infrastructure readily accessible for curation instruction. For the past several years, for instance, we have offered a course for data librarians called “Providing Social Science Data Services: Strategies for Design and Operation.” More recently, a course on confidential data, “Assessment and Mitigation of Disclosure Risk in Data: Essentials for Social Science,” was offered.

Finally, ICPSR is committed to global leadership in the area of digital curation, especially through instruction. Direction 1 of the ICPSR Strategic Plan reads: “Through global leadership and strong partnerships, set standards for excellence in data curation and in the ethics of data access and protection for the social sciences and related disciplines.” The ICPSR Council, which is

elected by the Consortium membership and provides overall guidance, strongly encourages our participation in initiatives to promote digital curation. We are eager to share our experience and knowledge. We also recognize and appreciate the benefits from the course: increased connection with front-line curators, improved understanding of the needs and workflows of the community, and new opportunities to influence the curation of data further upstream in the data lifecycle (i.e., closer to the original production of the data).

B. Structure

The workshop, titled “Applied Data Science: Managing Research Data for Re-Use,” was held July 23-27, 2012 in Ann Arbor, Michigan. ICPSR teamed with the University of Michigan School of Information to host the workshop. The core instructors were Mary Vardigan and Jared Lyle from ICPSR,

Kathleen Fear from the UM School of Information, and Jake Carlson from Purdue University.

Twenty-five participants attended, representing diverse institutions from the United States and Canada, as well as a range of disciplines, including engineering, chemistry, physics, the physical sciences, and the social sciences. Participants came to the workshop with a wide variety of interests. Many participants were interested in broad-based training. Others were establishing or expanding their own repositories and needed “shovel ready” plans for curating data. Still others came with very specific questions in mind, such as how to manage confidential data or how to address copyright questions.

The workshop was grouped into five themed days that followed an ICPSR dataset across the data life cycle through creation, deposit, data processing, dissemination, preservation, and reuse [1]. Day 1 provided an overview of the research life cycle stages and data curation. Day 2 covered data management planning and acquisitions. Day 3 highlighted metadata. Day 4 covered data processing, confidential data management, and repository requirements. Day 5 addressed dissemination, preservation, and tracking reuse.

Throughout the workshop, guest speakers provided insight on a wide variety of curation topics, such as managing video data, geospatial data, provenance, and repository assessment. Case studies and hands-on curation activities designed to help participants apply the material presented were woven throughout the workshop. Examples of hands-on activities included creating study- and variable-level metadata, reviewing unprocessed data within Google Refine, and checking a dataset for confidentiality issues.

C. Lessons Learned

Overall, the participants had very positive comments about the workshop. Most rated it as “exceptional” or “above average” when compared to other graduate level courses they have taken.

Expertise, breadth of subject material, and applicability were main strong points mentioned in the course evaluations. “This workshop provided an insider’s view of the data curation process,” wrote one participant, adding that “having presenters that specialize in key parts of the process was very valuable.” Another participant noted, “The ‘pipeline’ served as an excellent framework.” Yet another appreciated “the hands-on aspects of the course and the various print-based handouts.”

As this was the first time this workshop was offered, we were particularly active in gathering feedback. We surveyed the participants at the end of each day of the course and applied the feedback we received to adjust the course pace and content for the subsequent days. At the end of the course, the Summer Program also conducted an official, proctored evaluation. This

feedback now informs our future development. Some of the shortcomings of the workshop that were identified, along with plans to address them, include:

1) *Covering Too Much Content*: While many participants enjoyed the broad range of curation topics discussed, we also heard comments like “Almost too much material...difficult to digest in short space of time” and “Too many briefings that tried to cover too much material in a short presentation.” We intend to remedy this by discussing fewer topics but diving more deeply. Instead of discussing, for instance, the many possible data types in detail, leaving small chunks of time to each, we intend to provide a quick but broad overview of the subject and then spend quite a bit of time discussing the specifics of one or two examples with hands-on activities.

2) *More Discussion and Collaboration*: A few of our days were especially long on lectures and short on discussion. We wanted to impart as much of our knowledge as possible, along with that of our invited experts. What the participants really wanted was a mixture of learning from experts and discussion among their peers. “Would have liked more opportunity to share challenges/solutions with participants,” wrote one attendee. Another said, “A forum for discussing individual situations, problem-solving suggestions for next steps, etc. would be helpful.” As a solution, we are building more discussion time into the schedule, including structured thirty-minute blocks each morning and afternoon and a longer lunch break. We are exploring building peer-to-peer collaboration into the exercises as well. We intend to better capitalize on the expertise and knowledge that many workshop participants bring with them.

3) *Applied, Applied, Applied*: Though we tried to pair applied examples and exercises with each lecture, workshop participants wanted more. Many participants mentioned there are quite a few opportunities to learn about curation, but few chances for hands-on active learning and interaction. While we feel applied interaction is one of the strengths of our workshop, we are looking to fine-tune the exercises that worked well and add others.

4) *More Science in the Curriculum*: As a social science data archive, the curation material that we discussed naturally emphasized methods and content from just one slice of the research data spectrum. Our participants recognized the applicability of social science data curation to all types and formats of data, and we did include some examples from the ‘hard sciences.’ That said, the participants wanted to “cover a wider array of data types and the unique management issues for each.” While we will continue to highlight our own data and methods from the social sciences, we can attempt to better

diversify the types of data covered in the exercises and discussions. One option, for example, would be to offer participants a choice of the types of data to work with during exercises.

III. DATA CURATION WORKING GROUP

Shortly before the start of the summer data curation workshop, ICPSR discussed with Ron Nakao, Stanford University, some possible mechanisms to provide more hands-on, localized data curation training to librarians, especially the Official Representatives at member institutions who assist faculty, staff, and students with ICPSR resources. Many librarians have limited experience with data management and curation. In addition, as budgets are increasingly tightening, librarians may not have the chance to travel for week-long training. Even the more experienced data librarians do not have the tools or resources that ICPSR can provide. Although multiple venues exist to meet and discuss data curation topics -- from listservs to conferences -- few opportunities arise for data curators to engage in personalized but collaborative hands-on work using the tools of an established domain repository.

A. Background

We proposed a virtual data curation working group where participants would apply curation theories to practice through actual data processing, interact with and ask questions of other data specialists within a working environment, and gain first-hand experience using ICPSR's internal tools and procedures for curation. The course would last approximately four months, with one virtual meeting of 1 ½ hours approximately every other week.

ICPSR would benefit from the group as well. By opening our processing environment and tools to outsiders, we would learn more about the tools and services data librarians want and need, and the suitability of expanding the use of ICPSR's own curation tools to a broader community. This interest coincides with our work in an IMLS National Leadership Grant (LG-05-09-0084-09) to investigate tools and services to assist librarians with specialized tasks in the archiving and dissemination of social science data. Another benefit of the working group would be that more data would be curated and archived, benefiting the ICPSR membership and the entire social science community.

B. Structure

The working group first met -- virtually -- in September 2012. Participants hailed from Emory, Duke, UCLA, and UC Berkeley, along with Jared Lyle from ICPSR as facilitator and Ron Nakao as the chair. Participants received access to the ICPSR secure processing environment and brought their own data to curate. Bi-weekly discussions focused on topics similar to those found in

the summer data curation workshop: acquisition (gathering information from the data producer, legal agreements, and appraisal), review (quality and disclosure review), processing (data cleaning, insuring data integrity, and quality checking), metadata (standards, and variable- and study-level metadata), dissemination (final packaging, delivery mechanisms), and preservation (policies and actions).

At this time, the working group is still active. Participants have access to the ICPSR secure data processing environment through September 2013.

C. Lessons Learned

As in the workshop, participants were generally excited to be learning about and practicing data curation. "This was a fantastic opportunity," wrote one participant. "The most useful/informative aspect has been applying the ICPSR's workflows and practices to an actual data collection and seeing what's involved in getting the data in sync with those workflows and practices."

Since the group is ongoing, and since group members are still processing and curating their data, we anticipate learning more about the successes and challenges of this training format. In the meantime, we offer a few in-progress lessons learned.

5) *Bring Your Own Data:* All working group participants brought their own data to process and curate. As a result, the participants were highly invested and motivated; the questions and discussions raised were timely and relevant rather than purely theoretical.

6) *Hands-on Activities Were Key:* Similar to bringing their own data, hands-on activities using ICPSR's processing environment and tools helped the group members understand and experience the core work of curation instead of just talking through what can seem like generalized concepts. As one participant mentioned, "...The real work was with going through the data and documentation and seeing things like discrepancies in variable names and the need to flesh out citations to make them more informative. That was both interesting in its own right and illuminating to provide a sense of what data curation actually consists of in practice."

7) *Scheduling Issues:* Virtual meetings have distinct benefits, including saving time and money, and allowing participants to practice methods and tools in between group discussions. However, many in our group experienced one big drawback: scheduling conflicts. As one member lamented, "I guess the only real 'problem' with the group was that scheduling/timing issues were such that we had to do a lot of the work during the semester, when other demands on my time made it hard to focus on the project in a sustained manner." Another member

expressed similar frustration. “Unfortunately, my schedule shifted pretty dramatically this semester, and it was often difficult to fit in the call and prep work needed to make the call most useful.” By not leaving their physical job work environments, it was increasingly challenging for participants to carve curation time away from the everyday job demands and expectations.

IV.SUMMARY

As part of ICPSR’s commitment to global leadership in the area of digital curation, especially through instruction, we will offer the data curation summer workshop again in July 2013. Likewise, the data curation working group is running through September 2013.

We see continued demand by professionals to learn about curation, especially through applied learning, and feel we can play a role in helping educate the research and digital curation community through teaching and discussing the curation experiences and processes that have shaped our 50 years as a data archive. As we do this, we recognize and appreciate the benefits: increased connection with front-line curators, improved

understanding of the needs and workflows of the community, and new opportunities to influence the curation of data further upstream in the data lifecycle.

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A Tale of Two Countries

Digital Curation Education in Malta and New Zealand

Milena Dobрева

Library Information and Archive Sciences Dept
University of Malta
Msida, Malta
milena.dobрева@um.edu.mt

Gillian Oliver

School of Information Management
Victoria University of Wellington
Wellington, New Zealand
gillian.oliver@vuw.ac.nz

Abstract—This paper looks into the current tertiary and vocational offering in the domain of digital curation in two small countries, Malta and New Zealand. It illustrates how the specifics of local memory institutions and digital media sector influence the existing course, and identifies areas which can be improved. Particular emphasis in both countries needs to be placed on the vocational education and in-service training; in addition in Malta there is a need to develop a framework for the validation of the non-formal and informal learning in the domain of digital curation.

Keywords—Higher education, in-service training, validation of non-formal and informal learning.

I. INTRODUCTION

Small countries face particular challenges in attempting to deliver digital curation training and education. Resources and expertise are likely to be very limited, with perhaps just one or two individuals with the specialist skills required to teach in this area. Nevertheless, the need for learning opportunities are just as great as elsewhere in the world, and there is likely to be considerable interest and enthusiasm for training and education, both from new entrants to information management professions and established practitioners. If there are no local programmes prospective students may have no option but to try to gain their education overseas but this will only be feasible for very few. At the same time, when specialist digital curation positions become available employers may prefer to recruit from overseas, thus further denying development opportunities for the local workforce. From the training/education provider's perspectives the numbers of potential students, and potential job opportunities simply may not seem to justify the provision of specialist programmes. This paper reports on experiences in two small countries, Malta and New Zealand, to show approaches that have been successfully developed despite considerable resourcing constraints.

II. CURRENT PROVISION AND NEEDS IN DIGITAL CURATION EDUCATION IN MALTA AND NEW ZEALAND

The selection of the countries presented in this paper followed the natural interest and previous cooperation of the authors who work in the countries discussed. However, the choice of the cases is not only a matter of serendipity. Both countries are small and this signals the key problem, how countries with limited human resources respond to needs and new developments in digital curation. Do their memory institutions and other stakeholders taking care of digital data have the awareness in digital curation? Do they have the potential to develop solutions which match their needs? How is education responding to local needs—both in the cases of tertiary education, and vocational training? Which are the areas where most urgent action is needed and how much of it can be locally developed, and what would be better suited to happen in some form of international cooperation or eInfrastructure?

A. Malta

The population of Malta is about 400.000 people. It has a well-developed system of memory institutions. The Archives Act of 2005 [1] provided the necessary legislative framework for the Archives and records management in the country; however in particular the requirements to have qualified records managers in all governmental bodies are still not applied in real life practice.

This characterizes a situation where even the most basic records management is not implemented in places and this will have a further negative impact on the holdings of the National Archives when they receive records which are not prepared up to high professional standards.

Most specialists with a master's degree in archives and records management received their training abroad, with UK courses being most popular. The only University in Malta addresses the need in specialists in archives and records management on the lower higher education levels.

1) *Higher education: curation in infancy*

The tertiary education in the country addresses the need to increase professional skills in the domains of archives and records management in general. The University of Malta has offered courses on archives and records management (a diploma in archives and records management and a Bachelor in Library, Archives and Information Studies since 2007 [2] which had been discontinued in the last years and is now being restored. The decision to stop the course reflected a restructuring in the area of Library Information and Archive sciences—when the former division established in 1992-3 became a department in 2011. Since 2012 the departments also started offering for the first time in Malta a Master by research in Library Information and Archive Studies; this is a useful programme for motivated professionals but not particularly suited for the area of digital curation where practical skills are largely still to be introduced in Malta.

The Diploma in Archives and Records Management is currently undergoing a revision and will be re-launched in 2013-14. Among the discussion on the introduction of new subjects such as Records management, Audio-visual archiving, Personal archiving, one area which is considered for inclusion is digital curation. Having a module on digital curation within the archival and records management context would definitely need to address the specific needs of these institutions. The department has one staff member with expertise in digital preservation and curation – and contributed in 2012 to a highly acclaimed summer school on Access to Digital Archives (July 2012, Summer University at Central European University, Budapest) which is the basis for a specialised edited collection on issues around access to digital archives [3].

The local situation in Malta requires the promotion of awareness and basic knowledge in this domain. Currently most efforts of memory institutions are still concentrated on digitisation and digital asset management systems with preservation and curation not in focus.

Given this context, the digital curation course aims to establish the understanding of digital curation as an essential component from the digital objects' lifecycle, and to offer basic knowledge on preservation strategies, major standards, preservation functional entities and illustration of popular curation tools and services.

Examples from the EC-funded projects will be used widely during this new course, in order to provide also the necessary EC context, which is essential in the case of Malta.

2) *Specific curation needs*

One heritage area in Malta which attracts substantial attention not only in the memory institutions, but also through projects

implemented by non-governmental organisations and based on crowdsourcing [4], is the Maltese musical heritage. There are several initiatives which aim to gather and preserve historical musical records (M3P project as described by Toni Sant [4], and the work of A. Alamango on 'The Lost Voices' project [5].

Although these initiatives emphasize the need for preservation, it is understood merely as sustaining our access to historical records through digital surrogates. The sustainability of the digital objects still needs to be considered properly. The interest to this domain is illustrated by the fact that one of the first three Master by research students in Library Information and Archive studies is working on user engagement in the case of musical historical heritage and will touch upon the preservation issues.

Furthermore, the Department of Library Information and Archive Sciences also joined as an associated partner EUScreenXL, the continuation of the EUScreen project [6] funded by the European Commission as an associate member—a step which hopefully will increase the local expertise in the presentation and preservation of video and audio heritage.

Unfortunately, Malta is not part of eInfrastructure projects which could improve the local knowledge and competences, such as DARIAH or DCH-RP. One possible way to improve the current situation is to be more proactive towards such opportunities to be informed and to apply newly developed tools and services.

Another area which needs urgent attention is the one of data curation. While it emerges as a domain of training in its own right [7], it is still not addressed in either higher education or in-service training in Malta. Currently curation needs in Malta are dominated by the work done within memory institutions, but this definitely will need to be addressed in the near future.

3) *In greatest need: in-service training and validation of non-formal and informal learning in the area of curation*

While the higher education in Malta addressed the needs in proper introduction of curation content, aligned to the level of current needs in the country, the offers for in-service training and professional courses in the country are completely missing at the moment.

The Maltese Library and Information Association (MaLIA) offers talks and also short courses, but this domain is currently completely untouched. This illustrates that other domains of library and archive and record management practice are given priority and considered to be in need of urgent attention, part of them concern digital skills. However a systematic effort needs to

be made to also improve local awareness and skills related to curation.

This is also linked to an area which is only emerging in Malta, validation of non-formal and informal learning. It makes sense when developing programmes for in-service training to link them to subsequent validation of staff. This will help to consolidate efforts of different bodies—memory institutions and those which are authorized to validate skills and expertise.

B. New Zealand

New Zealand's relatively small population of about four million, coupled with its geographic isolation in the South Pacific are significant factors impacting on the provision of education. Numbers of potential students for specialist courses are low, and in today's economic climate courses that do not promise at least a return on investment are unlikely to come to fruition. This environment however encourages the development of innovative solutions to problems, and where there is a need as is the case of digital curation skills, there is the will to find ways to make things happen.

New Zealand has just one provider of information management education at postgraduate level, including archives and records management, the School of Information Management (SIM) at Victoria University of Wellington [8]. A course on managing digital collections which focused on digitization activities had been developed some years earlier. The existing masters qualification provided the opportunity for the development of a single 15 point unit of study on digital curation, which was offered for the first time in the third trimester of 2011. There was a keen interest from students in this new course, and importantly there was also a lot of enthusiasm from the New Zealand digital preservation community in Wellington. This community support was instrumental in the very successful initial offering.

New Zealand's capital city of Wellington is the centre for much of the ongoing digital curation activity in the country, not only taking place at the national library, archives and museum but also at other government departments such as the national statistics agency. Practitioners in these organisations were very keen to be involved in the new course, and their contributions ensured that the course content was very relevant to workplace concerns.

Delivery of the course was challenging as it had been decided at a much earlier stage to offer it as a condensed six-week course. A further complicating factor was that there were insufficient enrolments for the daytime face-to-face class, but over 30 students wanting to study at a distance, online. Online courses at SIM generally have an evening synchronous component, using

voice over Internet protocol, in conjunction with a supporting asynchronous learning management system (Blackboard).

These two factors meant that the course was delivered in double lecture sessions on six concurrent Monday evenings in the pre-Christmas period leading up to the Southern Hemisphere summer break – a difficult time to study and concentrate. So a key requirement was to make sure the content was engaging and stimulating.

The course was structured as follows:

- Session One: Issues and challenges; digital preservation strategies
- Session Two: International research projects; OAIS
- Session Three: Ingest and Storage
- Session Four: Administration, Data management and Access
- Session Five: Preservation planning and Evaluation
- Session Six: Alternatives to OAIS

For sessions one to five, one or more practitioners volunteered their time as guest speakers, talking about their experiences with the issues and challenges associated with the topic for that evening. Using the OAIS terminology provided the common language necessary to ensure that the practitioner guest speakers could easily focus on the areas required. At the same time, more practitioners were involved in the Blackboard environment. As such limited time was available, with no immediate possibilities apparent to offer further courses, it was important to make sure the problems associated with specialist areas were at least signalled. Consequently there were online discussion forums for questions and answers about the curation of digital audio-visual information and data, providing the opportunity for students to 'talk' directly to specialist digital archivists working in those areas.

The course was very successful indeed. Student feedback was extremely enthusiastic, with many positive and appreciative comments made about the involvement of practitioners. This community involvement had significant benefits. Firstly, students were exposed to a depth and breadth of specialist digital curation knowledge and experience that could not have been provided by a single instructor. Secondly, students and potential employers had the opportunity for relationship and network building across New Zealand. Thirdly, although offered in the context of a formal masters qualification, the course content was very firmly grounded in vocational realities.

III. DISCUSSION AND RECOMMENDATIONS

The presentation of the situation in both countries is summarized in the table below.

Criterion	Malta	New Zealand
Current offering of higher education courses	Yes, one module on Digital Curation within the DipARM course; one on-going Master by research project. Curation module is under development.	Yes, one course in the Masters of Information Studies, plus one pre-existing course on managing digital collections.
Type of provision in higher education courses featuring curation	Reactive, curation is currently introduced as a module in the DipARM course.	Proactive, aiming to capitalize on local strategies and expertise.
Current offering of in-service training	No	A 100 hour work placement is an option, but not specifically developed for digital curation.
Clear criteria for validation of non-formal and informal learning	No	Partly - New Zealand's library association has an accreditation programme for members.
Areas where interest exists but there is lack of expertise	Digitised musical heritage.	Audio-Visual archiving.
Areas completely unaddressed	Data curation.	Big data archiving.

TABLE I. COMPARISON BETWEEN DIGITAL CURATION EDUCATION PROVISION AND NEEDS IN MALTA AND NEW ZEALAND

One issue which needs to be addressed seriously in Malta is the need to make a step over the current 'reactive' type of offering to a more proactive scenario which is not only addressing local realities, but actively introduces existing best practices and technological solutions. Domain-wise, in Malta there is a clear need to do more about the education on data curation, which currently is *terra incognita* in both higher and in-service education.

On the basis of these two examples, we also looked into the possible priorities for future development and summarized it in a Roadmap (see Table II). We should note that Malta and New Zealand could tap into different external collaborations in order to develop further digital curation education. In the case of Malta the European Commission and projects implemented within it are

naturally to be considered; in the case of New Zealand the focus should be outwards, with the aim of attracting international students from the Asia Pacific region.

Timeframe	Malta	New Zealand
Short-term (1-2 years)	<ul style="list-style-type: none"> Join relevant EC eInfrastructures. Stabilise curation course in higher education. Introduce components of curation knowledge within in-service and vocational training programmes. 	<ul style="list-style-type: none"> Rationalise content coverage in 'digital' courses, and develop certificate programme. Market certificate to practitioners as post-experience programme. Develop work placement opportunities for students.
Medium-term (3-5 years)	<ul style="list-style-type: none"> Introduce validation of non-formal and informal training. Address needs in training on data curation. 	<ul style="list-style-type: none"> Continue to actively involve local digital curation community in provision of learning & identification of training needs.
Long-term (10 years)	<ul style="list-style-type: none"> Achieve a solid level of curation in institutions which currently work on digitisation of and access to cultural heritage. 	<ul style="list-style-type: none"> Develop a suite of courses which address a range of specialist requirements, and make available internationally.

TABLE II. ROADMAP FOR THE FUTURE DEVELOPMENT

It would be very helpful to compare to what extent the emerging priorities in digital curation training in Malta and New Zealand correspond to those in other countries, and how small teams can join forces to offer high quality training. For both countries a useful strategy will be to undertake a gap analysis of current training provision with the DigCurV Evaluation Framework [9]. This will be particularly useful in terms of assessing the extent to which the training needs of different potential audiences are being fulfilled.

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Session 2 – Frameworks and lessons learned

Digital Curation in Architecture Curricula and vocational training for Architects

The DEDICATE Framework in Architectural CAD Courses Design

Dr Ian Anderson and Dr Ruggero Lancia

HATII (Humanities Advanced Technology and Information Institute)
University of Glasgow
Glasgow, UK

Ian.G.Anderson@glasgow.ac.uk and Ruggero.Lancia@glasgow.ac.uk

Abstract—As the design processes in architectural practices switch toward entirely digital workflows, architects are gradually required, because of their legal and commercial liability, to provide for both a relatively long-term curation of their own digital products and the deposit of authoritative data. But, despite being the sole curation actors for their data, architects receive little education or training in either pertinent competences nor agreed and established procedures to comply with these duties.

In this paper, the DEDICATE project, an AHRC funded project hosted by the HATII of the University of Glasgow, will be discussed to explain its role in the design of Digital Curation courses within architectural CAD education and architects' vocational training.

Keywords—Digital Curation, CAD, CAM, Architectural CAD Education.

I. CAD/CAM IN PROFESSIONAL PRACTICES AND ARCHITECTURAL EDUCATION

Early computer aided drafting systems started being adopted in Architecture design as soon as the 1970s within large companies and public bodies [1] At the beginning of the 1980s, both the diffusion of personal computing and the releases of CAD software running on microcomputers permitted this phenomenon to expand across smaller businesses. These first systems were generally developed as substitute of the conventional drawing board and aimed at augmenting the efficiency of the traditional design process cutting the drafting costs. More elaborated idiosyncratic systems with integrated analytical functions started being developed in the same period within research institutions and large corporations especially to manage statutory requirements of design, such as the energy codes.

In the first two decades of CAD application to Architecture Design, the scarce integration of automated methods in the building industry, the limited diffusion of computer assisted

procedures in the day-to-day operations of architects and the still high costs of the CAD procedures management, delayed the development of a specific CAD education in Architecture curricula. Interestingly, in 1980, a review conducted by Patrick Purcell on the CAD syllabuses offered by the architectural schools of the British Isles and other prominent international institutions explained the difficulty of inserting a formal CAD syllabus in the Architecture curriculum, emphasising the lack of architectural competences and research interests among CAD educators, in most of cases coming then from engineering and computer sciences [2].

Between the end of the 1980s and the beginning of the 1990s, CAD applications triggered a switch in the traditional design process introducing 3D modelling and visualisation functions, parametric modifications and semantic modelling with simplified analysis features.

Since the 90s, CAD training has been regularly offered in the majority of the Architecture courses in Developed Countries, more often than not within other disciplines syllabuses and usually without either formal assessments nor graded progression. Because of both this persistent informal approach to CAD education and the diffusion of professional CAD packages running on personal computers, vocational and technical schools CAD courses started acquiring popularity resulting in a new class of specialised draughtsmen lacking any design background [3].

Despite the lack of formal education in these years, the design processes in architectural practices grew predominantly digital, the availability of integrated procedures for the design and production of building elements, such as CNC (Computer Numerical Control) manufacturing, has accelerated practices' switch toward entirely digital workflows often concurrent with other related digital design workflows, such as Engineering Design. Major architecture schools have interpreted and supported this change offering training and post-grad specialist

qualifications in advanced CAD scripting, generative and parametric design.

Despite the thorough understanding of both the processes applied on and the characteristics of digital design data required by these technologies, there are neither Architecture curricula including Digital Curation training nor vocational training for architects on this subject to support the rising need for management of digital data.

Data management constituted a topic of the CAD education at the beginning of the 1980s in the MIT Master of Science course in Computer-aided design and at the Carnegie-Mellon University, in a four-week module in the professional architectural programme [2]. As idiosyncratic CAD systems development was superseded by commercial package solutions, the interest on this topic was exhausted and, to date, there are no evidences of other CAD courses held in Architecture Schools addressing the management of design data.

II. ARCHITECTS' COMMERCIAL AND LEGAL RESPONSIBILITIES FOR DIGITAL CURATION

There is evidence that statutory project documentation is mainly adapted to be printed and kept in paper archives by architectural practices [4]. But, the request for producing and depositing authoritative digital data is an emerging phenomenon across many international Building Control authorities and Public Investors that are urging architectural practices to implement consistent data management procedures.

For example, in Netherlands, since November 2011, the Rgd BIM Norm obliges design contractors involved in public building projects to produce and deliver their products in Building Information Modelling formats following the policies of the Rgd BIM standard [5]. In the same year, the United Kingdom Cabinet Office announced in the Government's new Construction Strategy that will require on all public works BIM documentation by 2016 [6].

Further, where workflows are entirely digital, the commercial liability of architects extends these requirements for the consistent management of digital data, introducing the need for relatively long periods of reliable data retention. Such as for example, in United Kingdom, the architects' professional liability period amounts to 12 years [7].

Borrowing from the definition of Digital Curation by Neil Beagrie as "the actions needed to maintain digital research data and other digital materials over their entire life-cycle and over time" [8] and combining these data management requirements, it is evident that architects are being given Digital Curation responsibilities over their digital data. In addition, because of the key role of public commissions in the growth of commercially successful practices, a progressive extension of these

responsibilities will likely take place as a result of both the technological adaptation of competitors companies aspiring to public clients and the strategic request of public bodies for an increased control over the Built Environment.

So far, the heterogeneity and complexity of architectural digital data, as well as the prevailing role of major repositories in establishing preservation and curation policies, has neglected policies, agreed standards and feasible procedures to be implemented by design professionals.

The workflow ramifications and the still limited legal pressure on architecture practices for both implementing consistent data retention procedures and depositing authoritative data, actually prevent both Digital Curation professional from approaching this field and architects from appealing to their services. As a result, most practices resort to commercial services for data management that do not solve crucial curatorial issues, such as long-term data accessibility and authoritativeness.

III. THE DEDICATE PROJECT

The Design's Digital Curation for Architecture (DEDICATE) project is funded by the Arts and Humanities Research Council (with the ref. AH/J008265/1) and is hosted by the Humanities Advanced Technology and Information Institute (HATII) of the University of Glasgow.

This project is aimed at delivering the policies, requirements and procedures to build a sustainable curatorial framework for CAD/CAM assets minimising their loss risks and maximising their reusability and interoperability within their stakeholder community.

In more detail, DEDICATE is aimed at answering these research questions related to the different curatorial stages of CAD/CAM data, as they are categorised by the high-level abstraction of the DCC curation lifecycle model [9]:

1) *[Data Pre-production stage] Which capture methods should be preferred for ingesting authoritative data relating to Built Environment? Which modelling tools might be preferred in order to obtain products apt to enter the curation workflow, that is released in durable formats and with a metadata set suitable to record their production process? Which data formats should be adopted to enhance the persistence and the reusability of information? What information should be kept in metadata at this stage and through which technique?*

2) *[Data Creation stage] How to record the actual use, that is the set of events determining either a modification or the employment, of the digital objects before their ingestion in the repositories?*

3) [Data Appraisal stage] *What policies should be defined to implement an evaluation method for the appraisal and selection of the digital objects to be collected in repositories? How might be involved actively the stakeholders' expertise in this process?*

4) [Data Ingestion stage] *Which ingestion processes could be assessed culturally and economically sustainable in this context? Which policies should be adopted to integrate automated procedures and the self-submission of the assets? Which information should be retained at this stage for curation and preservation purposes, and how?*

5) [Data Preservation and Storage stage] *Which digital asset management architecture should be adopted and how should it be implemented to fit the policies and processes of the researched repository system?*

6) [Data Access stage] *Which kind of interoperability model should guarantee access to the information? How many of the original functionalities of the digital object should be granted to their users and adopting which methods? How to deal with the intellectual property management of these digital objects considering as well the possibility of deriving new data from those?*

7) [Data Transformation stage] *Which kind of transformations could affect the original data in the repositories and following which policies? How to manage the data migration for preservation purposes in order to retain perpetually its contextual functions? Data derived from stored assets might be considered either transformations of the original digital objects or new items, and which metadata set should record these kind of relationships between assets? Which model of rights management would enable the control of diverse typologies of intellectual property?*

In this investigation, the actors of Built Environment modification and management are considered the major and more vulnerable stakeholders of these digital products. Thus, this study is particularly concentrated on architectural practices, engineering consultancies and Building Control bodies.

Given the different results this research aims at accomplishing, a multiplicity of methods is needed to fulfil the tasks that each investigation stage is intended to carry out.

In order to identify the functions and the current use of the CAD/CAM assets as well as the events that modify their consistency and to assess the curatorial management of the digital objects emphasising their correlated risks, this project makes extensive use of audits on project partners, from the selected categories of stakeholders, drawing on the models and

tools developed by three outstanding Digital Curation initiatives focusing on specific aspects of digital assets' life-cycle:

1) DAFD (*Data Audit Framework Development*) which provides an audit methodology and online tools to support and facilitate organisations to establish an overview of their data holdings, policies and practices against best practices and new risks (<http://www.data-audit.eu>);

2) similarly, DRAMBORA (*Digital Repository Audit Method Based on Risk Assessment*) which offers an audit methodology, complemented by a computer-aided audit software, addressing the assessment of risks implied by the policies adopted by the repositories;

3) and finally, Planets (*Preservation and Long-term Access through Networked Services*) which offers a testbed to experiment the effects of curatorial actions on digital assets.

To complement the audits' information with statistical results, scripted analyses are run on the partners' data repositories to characterise digital products, that is to record important data characteristics, and measure their distribution.

Thus, the audits consist of both experimental investigation activities resulting in metric findings assessing the digital curation actions held by stakeholders and, on the other, unstructured interviews and reports of unobtrusive observations describing the digital assets, the processes taking place in the data repositories and their agents.

The curatorial framework for CAD/CAM data will result from both the analysis of the context recorded by the audits and the study of the specific digital workflows involved by common procedures within the stakeholder's community against the agreed and general technical and administrative requirements for a consistent data management across the entire digital products lifecycle.

Eventually, the feasibility of this framework will be evaluated by applying the testbeds developed in Planets and CASPAR (*Cultural, Artistic and Scientific knowledge for Preservation, Access and Retrieval*), specialised in data preservation and in perpetual accessibility of the digital objects and their contextual environment. In doing so, borrowing from the Information Studies both the quantitative and qualitative approach to services evaluation, the audits will triangulate metrics, ethnographic observations and unstructured interviews to assess the implementation of the proposed policies and recommended procedures.

IV. DIGITAL CURATION IN ARCHITECTURAL CAD EDUCATION – THE DEDICATE FRAMEWORK CONTRIBUTION

The scope of the CAD/CAM data curation involves a wide stakeholder community spanning across different communities of practice and often bears the responsibility for the preservation of information of public interest although not benefiting from statutory archival retention. The three categories of Built Environment actors which have been selected as context for the researched framework constitute a coherent group of stakeholders both cemented by the mutual need for information and data exchange, and sharing responsibilities over their digital assets.

In such context, post-hoc data curation procedures are neither feasible nor effective, instead, as Alistair Miles proposed for the project ImageStore, a DCC SCARP section, curatorial attention when integrated in the very workflows defining the data lifecycle enhances the quality of data and their preservation viability in informal retention contexts [10]. Therefore, the researched framework of the DEDICATE project, delivering the policies and procedures to build a sustainable curatorial framework for CAD/CAM assets, is expected to be highly integrated with architectural design procedures and, as a result, tending to substitute the professional digital curators' interventions on this repertory with a competent management by the stakeholders themselves.

From this standpoint, the DEDICATE framework will offer also the knowledge to design specific Digital Curation training for Architecture education and architects' vocational training by contributing technical and managerial competences pertinent to the entire design data lifecycle.

In particular, the managerial tasks that architects are expected to be able to carry out are:

- 1) to plan and implement consistent curatorial procedures along the digital design workflows;*
- 2) to formulate data appraisal and selection criteria against a set of economical and professional objectives to formalise information disposal procedures;*
- 3) to manage the ingestion of digital assets according to agreed curatorial policies to ensure data authoritativeness persistence and accessibility;*
- 4) to establish preservation policies according to professional and legal needs to implement preservation procedures on the assets held in the repository;*
- 5) to manage the persistent feasibility of data storage;*

6) to monitor and restrict privileges for data access and reuse according to professional and legal requirements;

7) to plan and implement procedures to track the data reuse and transformation according to good practices in IPR management.

The corresponding technical competences expected from the addressees of the course are:

- 1) expert knowledge of formats, data structure and digital design computing procedures;*
- 2) advanced knowledge of metadata standards and data quality assessment;*
- 3) thorough knowledge of both the purpose and the originating digital work flow of data;*
- 4) understanding of preservation routines function and strategies;*
- 5) knowledge of repository architectures options;*
- 6) understanding of the techniques and procedures for privileges based data access;*
- 7) knowledge of data watermarking, cryptographic techniques options and format migration issues.*

Trained architects should be able to understand and promote curatorial framework updates as the technologies and the tools for both curation and design evolve.

Moreover, the dissemination of curatorial competences to students and architects through the CAD training would support the evolution of the architect profession and corroborate the control over the commercial exploitation of digital design products.

The traditional rationale for introducing computer education in architectural schools has predominantly regarded the professional relevance of the presented techniques [2]. With the affirmation of professional software packages, this attitude has determined a simplification of CAD education contents, often reduced to specific packages employment instructions, promoting a substantial loss of control over the digital design process. The integration of Digital Curation competences into CAD education will fit the latest digital design techniques that demand for computing awareness and coding competences.

Further, the affirmation of the digital cultural market and the integration of digital design techniques with manufacturing facilities are urging the redefinition of the role of the architect as a content provider. This renewed scope on the professional services expected from architects demand from them the necessary competences to legally and persistently manage the intellectual property rights (IPR) associated to the design digital products. The Digital Curation module of a CAD training would

offer architects the opportunity to integrate consistent IPR management in the very workflows of the digital design processes and in so doing facilitating the commercial exploitation of their products.

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Introducing the Information Culture Framework as a Component of the Digital Curator's Toolkit

Fiorella Foscarini
Faculty of Information
University of Toronto
Toronto, Canada

Fiorella.foscarini@utoronto.ca

Gillian Oliver

School of Information Management
Victoria University of Wellington
Wellington, New Zealand

gillian.oliver@vuw.ac.nz

Abstract—The purpose of this paper is to promote the notion of “information culture” as an integral component of the education for digital curation professionals. Understanding the context in which digital artefacts are created and used is essential for their meaning to be knowable, communicable, and preservable over time. Human beings’ attitudes towards information and the values they attach to it are an unexplored aspect of such context. The Information Culture Framework (ICF) that is presented here has been developed to help organizations assess the ‘soft’ factors that enable and constrain their information-related practices. By applying the ICF, digital curators will be able to shed light on the information culture underlying the objects under their purview, to explain how and why such objects are as they are, and to enhance understanding of what they meant to their creators and users.

Keywords: *information culture; human activity system; digital curation; education*

I. INTRODUCTION

Capturing the context in which information objects are created and used, that is, understanding why those objects look as they look, what their purpose was and how they have been used in specific circumstances, is of paramount importance to information professionals. The archival and records management discipline has traditionally been concerned with identifying and maintaining trace not just of individual records but also of the relationships among them and between each recorded piece of information and the activity generating it. Today, preserving contextual information has become a top priority more than ever before, as digital objects, being “physically fragmented and only kept together by a logical boundary” [1], would simply be inaccessible and meaningless without appropriate sets of metadata attached to them.

The models, methods and strategies that have been devised by national and international bodies and research projects interested in the survival of our individual and collective memories in digital form have primarily focused on widely applicable conceptual frameworks (e.g., Open Archival Information System (OAIS) Model [2]), domain-agnostic

standards (e.g., Dublin Core Metadata Initiative (DCMI) [3]), high-level system development methodologies (e.g., Design and Implementation of Recordkeeping Systems (DIRKS) [4]), and rule-based representations of the life of information objects (e.g., the InterPARES 2 Chain of Preservation Model and Business-driven Recordkeeping Model [5]; MoReq2010 [6]). All these initiatives have enriched our understanding of the digital domain and have provided ‘solutions’ that are in turn used to define requirements for specific applications (e.g., electronic document and records management systems (EDRMS)).

However, due to their abstract and prescriptive nature, these ‘solutions’ have also contributed to remove us from the ‘problem,’ the actual situation that our optimal models only partly and distantly portray. The notably missing piece of the puzzle is the ‘human’ component of every *human activity system*, where people carry out their purposeful activities through the information they create [7]. People, processes, and structures are all part of human activity systems, and are inextricably linked one another. However, the first element is often ignored or misrepresented in the literature we have referred to, as well as in the education provided to information specialists, despite the recognition of the centrality of the human factor in recent studies [8].

Our research set out exactly to tackle the *people problem*. This paper outlines the characteristics of the Information Culture Framework (ICF), an assessment tool that enables the analysis of the main influences on the ways individuals and groups in organizations behave and the assumptions they make in relation to the information they create and manage in the course of their daily activities. Being aware of such influences and how they affect the features of information objects and systems is a crucial step towards a concrete and situated understanding of the context in which those objects and systems are embedded. Before discussing the ICF in detail and the benefits that digital curators may derive from it, we will review the background ideas and preparatory work that led to its development.

One of the most successful research projects in the area of digital preservation, the International Research on Permanent Authentic Records in Electronic Systems (InterPARES) project, identified five contexts as instrumental in establishing the meaning and properties of every record (including its reliability and authenticity). These contexts are: the juridical-administrative framework in which the record was created; the record's provenance (i.e., its origin from a specific creator); the procedure or business process involved in its creation; the documentary context the record belongs to (i.e., its relationship with any other records constituting the whole archives of a single creator, and the structure itself of such archives and of every individual aggregation within it); and the technology that was used to create the record (specifically the hardware, software and operating systems involved) [5]. This description is certainly helpful when it comes to breaking down the complexity of the environment surrounding information objects that must be preserved as evidence of activities.

However, in the light of the limitations of existing models discussed earlier, this archival representation of the context is insufficient to grasp what actually happened in any specific instantiations of record making and keeping. Was the legal framework understood and applied by the users of the records system? Can we be sure that the 'official file' contains all of the records used to carry out any given transaction? How was the available technology used (or not used) by concerned individuals? Additionally, by considering each of the contexts as a distinct factor and by keeping them separate from the actual objects, processes and human beings involved, the InterPARES model fails to account for the interactions and mutual influences existing among those elements.

As argued elsewhere [9], 'hard' approaches to information management, that is, approaches that focus on simplified notions of the 'problem situation' because their primary objective is to achieve sustainable, replicable 'solution' rather than an understanding of what the actual 'problem' is, have contributed to build an interpretive framework that excludes or idealizes the human agents that are responsible for constructing our social and organizational worlds. When socio-cultural aspects emerge in those studies, they are usually seen as a barrier to the implementation of the envisaged solution (whether it is a classification tool or a digital recordkeeping system). How to eliminate or mitigate the effects of human participation in information-related endeavours seems to be an explicit or implicit goal of much research in this area.

We believe that it is time to start delving into the messy and complex reality that shapes and is shaped by our information objects and systems. The concepts of organizational culture and information culture can assist us explore the tacit assumptions, espoused values and material artefacts and practices that reveal who we are as culturally and historically situated human beings

collectively engaged in the creation and dissemination of knowledge.

III. ORGANIZATIONAL CULTURE AND INFORMATION CULTURE

By drawing on management and organization theory [10, 11], IS research [12, 13] knowledge management and information management [14] and genre theory [15], our study began with an investigation of the characteristics of organizational culture and its relationship with other, interrelated supra- and sub-cultures that may be found in organizations (e.g., supranational, national, professional or occupational, and group cultural layers, as identified by Karahanna and colleagues [16]). One of the most cited definitions of organizational or corporate culture is the one provided by Schein [17], that is: "A pattern of shared basic assumptions invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration, that have worked well enough to be considered valid and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems."

Although interpretations of culture vary, most authors agree that values and practices are two critical components of it. Typically, values are acquired early on in life through the family and neighbourhood, and later through education. They provide us with fundamental assumptions about how things are. Practices are developed through acting together in social contexts (e.g., the workplace) and ideally reflect our values. Values and practices are intertwined and tend to affect each other. Both are continuously evolving, although values, especially those acquired during the formative years, are hard to change. Culture at the national and supranational level (the latter involving language, religious, ethnic, and regional factors) is mostly influenced by interiorized value systems, while organizational, occupational and group cultures appear to be primarily based on shared practices.

Ideas about cultural influences on information-related practices in organizations have been discussed and explored since the 1980s (see, for instance, 18, 19). Interpretations of information culture are at least as varied as those of organizational culture. Some authors look at it as 'culture of information' and suggest that organizations that have an information culture are more likely to achieve success in their business performance [20]. We maintain there is no organization without an information culture, whether the latter is perceived as being effective or not.

Following Oliver's [21] definition of information culture (i.e., "the manifestations of organizational culture that portray values and attitudes to information in organizations"), we embarked on a research project to identify its components. The first stages of the project, which involved an analysis of the websites of multinational organizations and the design of a global survey, are described in some detail in a recent contribution by these authors

and collaborators [22]. The ICF builds on the outcomes of such preliminary research and on observations of information and records management practices conducted by the authors in different organizations. Subsequent stages of the project will involve fieldwork studies with the aim of refining initial findings by means of qualitative, ethnographic methods.

IV. THE INFORMATION CULTURE FRAMEWORK

The ICF takes into consideration all possible factors that appear to affect the attitudes towards information and the values accorded to it in relation to the various cultural layers one may distinguish within an organization (i.e., from supranational and national characteristics to manifestations of culture at the corporate, occupational and group levels).

Some components of information culture are more amenable to change than others. This is an important insight, as organizations often try to (and need to) influence people's behaviour with regard to the way they share information, how they use existing systems and technologies, and other information-related practices. By applying the ICF as an assessment tool, organizations will realize what factors impinge on the achievement of their objectives, and might eventually be able to come up with more appropriate and effective policies and strategies, targeted at specific aspects of their local information culture(s).

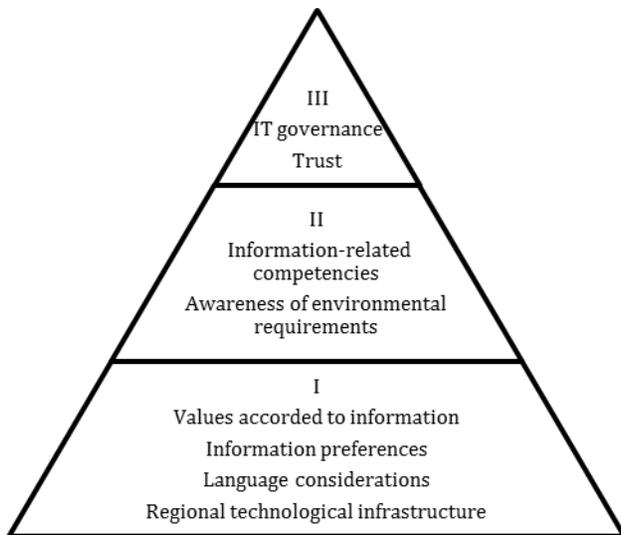


Figure 1 Information Culture Framework

In the ICF, the factors involved in the information culture construct are categorized into three levels according to their degree of malleability:

I. Fundamental influences – It is the bottom layer of the pyramid in Fig. 1 and represents those factors which are so deeply rooted in human beings and their social institutions that they are extremely hard to change. Supranational (e.g.,

regional, ethnic, religious, linguistic), national and corporate cultural influences are especially involved. Level one factors have been identified as follows:

- Values accorded to information. In relation to organizational functions that involve public accountability, awareness of the need to manage certain information as evidence will for instance manifest in several forms of respect for the records and the recordkeeping policies and systems in place. This critical feature can be further extended as appropriate (for example, awareness of the need to actively manage research data).
- Information preferences. This factor accounts for variations in relation to preferences for explicit or implicit forms of communication (words vs. pictures), synchronous or asynchronous media, formal or informal sources of information. It also refers to information sharing behaviours and relevant levels of granularity (e.g., with colleagues in the same workgroup) and perceptions of information ownership.
- Language considerations. The terminology used by different groups to name their artefacts and to talk about their activities determines the way they see the world; and the way the world appears to them shapes their language. What happens when multiple technical languages (e.g., IT and archives) are used in the same place? What happens when one language (e.g., English) becomes dominant in some sectors of society?
- Regional technological infrastructure. This factor refers to technological constraints and enablers that are outside of the organization's control (e.g., Internet availability).

II. Information management knowledge and skills that can be acquired and/or extended in the workplace – This layer is placed in the middle of the pyramid because it builds on the fundamental influences at the bottom. Professional education and on-site training play a major role in shaping information culture at the occupational and organizational level. The skills, knowledge and expertise involved can be divided into two broad categories:

- Information-related competencies. It includes information and digital literacy as essential prerequisites for the development of a diffuse information culture in organizations.
- Awareness of environmental requirements. This factor measures how employees are familiar with, understand and apply the legal, societal, and organisational requirements that frame information management in their organization or a unit within it (e.g., laws concerning access to information, recordkeeping policies).

III. Information infrastructure and trust – At the tip of the pyramid are two organizational aspects that are highly significant to successful information management and are the most susceptible to change:

- IT governance model in place in the organization. The choice of specific information architecture, security features, and other technical options (e.g., using or not using cloud computing) are not neutral and always reflect cultural assumptions. It is critical to be aware of decision-making relating to corporate IT governance and its implications for the creation and use of digital materials, in order to understand some of their characteristics and to take appropriate measures for their preservation.
- Trust in information management systems. It is not about establishing the trustworthiness of the systems and processes adopted by an organization to manage its information, as much as it is about finding out what people think about those systems and processes.

V. TEACHING IMPLICATIONS

With regard to vocational education for digital curation, we believe that introducing the ICF would enhance existing teaching modules. The framework would primarily serve the purpose of raising future digital curators' awareness of the social, ethical, economic, political, technological – in one word, cultural – influences that constrain and enable the creation and use of the artefacts they are interested in, as well as their own actions as socially and culturally embedded information professionals.

The ICF should be presented as one component in the digital curator's toolkit, to be applied in conjunction with other tools such as the Community Capability Model Framework [23] and techniques (for example, data curation profiling [24]). Assessment techniques and practical guidance on how to apply the ICF in order to identify the factors affecting an organization's information culture, particularly in relation to the management of corporate records, have been developed [25]. The records management environment explored in this book is also characterised by a plethora of existing tools, including audits and maturity models. The ICF is not simply another measurement tool, but a way of providing a holistic view of the information environment. By identifying cultural characteristics that, rather than changed, have to be taken into account, it provides a means to address 'how' and 'why' questions.

The assessment techniques that are appropriate (including surveys, interviews, documentary analyses, observations) rely on ethnography as an overarching methodology (or at least attitude). In practice, we recommend the information professional who is interested in understanding what is going on in his/her organization in relation to perceived 'information problems' to become an ethnographer of his/her own 'tribe.' Thus, training in

ethnographic methods will complement or be part of learning about the ICF.

Further development work will be necessary in order to build standardised case studies and templates to be used to inform digital curation practice. One way to contribute to achieving this would be to incorporate ICF perspectives in the design of student assessment work, where relevant techniques could be applied to either scenarios or real life situations, as appropriate.

VI. CONCLUSION

If the human component of digital curation activities is not fully acknowledged, then we are at great risk of developing systems and solutions that are ultimately ineffective. Incorporating ICF perspectives in teaching future digital curators will contribute to enhancing understanding of the very real complexity of working environments. Introducing the ICF in conjunction with more traditional maturity model type tools will assist students in developing the range of skills needed to achieve digital curation objectives.

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Getting Data Creators On Board with the Digital Curation Agenda

Lessons Learned in Developing Training for Researchers

Dr Meriel Patrick and Dr James A. J. Wilson

DaMaRO Project
University of Oxford
Oxford, UK
meriel.patrick@it.ox.ac.uk

Abstract—University research projects are a key source of digital information with potential long-term value. Researchers rarely need to be persuaded that preserving the fruits of their work is in principle a good thing, but may often lack knowledge of the best way to go about doing this. Additionally, time pressures on academics are such that curation can frequently end up being pushed down the priority list. It is therefore important that information professionals working alongside researchers are able to offer appropriate training and advice on both the practicalities of and the rationale for digital curation.

The DaMaRO Project is one of a series of research data management projects based at the University of Oxford. The project's remit includes developing training for researchers (intended to encourage them to consider data sharing and preservation issues at an early stage in their research), plus the development of an institutional data archive (DataBank) and catalogue of datasets (DataFinder). This paper offers some reflections on our experiences thus far, and in particular looks at the question of how researchers and others who are involved in the creation of digital data may most effectively be engaged in planning for and facilitating its long-term preservation.

Keywords—Research data, research data management, digital curation, data creators, researchers, training, universities, HEIs.

I. INTRODUCTION

University research projects are an important source of digital information with potential long-term value. Academic researchers can collect and generate vast quantities of data in the course of their work, and as data are frequently susceptible to a wide range of different types of analysis, interpretation, and comparison, it is rare for any single research project to fully exploit the potential of a given dataset.

However, while researchers will usually wholeheartedly agree that the data they produce are a valuable resource, they are not always fully aware of the most effective and appropriate means of preserving those data, and practical barriers can often stand in the way of the data being made available for future use.

This paper reports some of the findings of work done at the University of Oxford over the last few years, and offers some

reflections on the sort of training and advice that could usefully be offered by information professionals working alongside researchers, with the aim of encouraging and facilitating the effective curation of research outputs.

The work at Oxford has concentrated chiefly on research data management; therefore, the focus of this paper is on the preservation of digital research data, rather than other aspects of digital curation.

II. RESEARCH DATA MANAGEMENT WORK AT THE UNIVERSITY OF OXFORD

Over the past four years, a series of projects focusing on research data management have been undertaken at the University of Oxford. The work has been cross-departmental, involving input from IT Services, the Bodleian Libraries, Research Services, and the academic divisions. Three key projects in the series are Sudamih (Supporting Data Management Infrastructure for the Humanities, 2009-11), VIDaaS (Virtual Infrastructure with Database as a Service, 2011-12), and most recently DaMaRO (Data Management Roll-out at Oxford, 2011-13)⁵⁰.

All three projects have included a training strand, intended to encourage researchers to take a closer look at their data management practices throughout the research lifecycle. An important aspect of this is consideration of what happens to data at the end of a research project: how they can best be preserved, and made available for others to use. Training activities to date have included:

- Two half-day courses for humanities researchers
- A half-day course currently being offered to all four of Oxford's academic divisions
- Training events run in collaboration with the Digital Curation Centre
- Various shorter training events and presentations, offered through individual divisions or departments
- Development of resources for use in researcher induction sessions

⁵⁰ Sudamih and DaMaRO are JISC-funded projects. VIDaaS was funded by HEFCE and JISC as part of the University Modernisation Fund.

- Contributions to the University of Oxford's central Research Data Management website
- Contributions to the University of Oxford's Research Skills Toolkit website
- Leaflets and fact-sheets for researchers

Other project activities have included contributing to the development of the University of Oxford's Policy on the Management of Research Data and Records (formally adopted in July 2012), and development of software tools which will ultimately form part of Oxford's research data management infrastructure. Three major tools that are emerging as part of this process are ORDS (the Online Research Database Service), designed both to aid researchers in working with active research data and to facilitate easy archiving at the end of the project; DataBank, which will be the University of Oxford's institutional data archive; and DataFinder, which will provide a catalogue of Oxford datasets held in DataBank, ORDS, and elsewhere.

To inform the work being undertaken, the projects have also engaged in requirements gathering, exploring researchers' knowledge of and attitudes to a range of research data management issues, and seeking their views on the type of services and training they would like to see provided. This was done through a mixture of face-to-face interviews and online surveys. The findings of the Sudamih and VIDaaS Projects are detailed in their respective Researcher Requirements Reports, both available online. [1] [2].

Information gathering during the DaMaRO Project has included two surveys, both of which took place in late 2012. The first focused specifically on research data management training for researchers working in the sciences⁵¹; the second was open to all University of Oxford researchers, and looked at research data management practice and awareness more generally⁵². The results of these surveys are available from the DaMaRO website [3] [4].

III. KEY CHALLENGES AND POSSIBLE SOLUTIONS

A. *Researchers' Attitudes to Data Preservation and Sharing*

The surveys and interviews conducted in Oxford have tended to focus more on data sharing than on curation or preservation considered in the abstract. However, preservation and sharing are often closely associated in researchers' minds: there is a widespread assumption that if data are being deposited in an archive or repository, or otherwise prepared for long-term storage, this is chiefly for the purpose of making them available for re-use, either immediately or after an embargo period. Hence it is often difficult to separate researchers' attitudes to data curation from attitudes to data sharing.

The Oxford work indicates that many researchers who create or collect data are not averse in principle to sharing

these. However, in practice, a number of factors may prevent this from occurring, or at least make it more problematic.

A 2011 survey of researchers, run as part of the VIDaaS Project, revealed that a large majority (85%) of respondents felt that a substantial portion of their data were of potential value or interest to other researchers in higher education. Almost two thirds (63%) said that this also extended to people outside the HE community. However, only 41% reported that they would be happy to make their own research data available once they had completed the work they intended to do and published the results. Even fewer than this (34%) had previously published data.

The 2012 Oxford RDM survey painted a slightly more encouraging picture. Thirty percent said they would be prepared to share all or most of their data (possibly after an embargo period), and another 40% were willing to share at least some of them.

Practical bars to data sharing include the following:

- Lack of awareness of appropriate places to deposit data
- Lack of knowledge of appropriate way to present material for long term preservation
- Concerns about the risks of sharing data too early
- Lack of time to prepare or deposit data
- Ethical and legal issues
- Financial issues

B. *Lack of Awareness of Appropriate Places to Deposit Data*

The Oxford RDM survey asked researchers whether they had ever deposited data in a dedicated repository or data store. Those who had not (61% of respondents) were asked why this was. The most popular reason (given by almost exactly half of the respondents who had not deposited data) was simply that they did not know of an appropriate place to put it.

This lack of awareness is not limited to data repositories. The same survey also asked researchers whether they had heard of or used a number of tools and services, which included ORA, the University of Oxford's institutional repository for textual research outputs. Almost half (47%) had never heard of it, and most of the rest (a further 41%) had never actually used it.

This is an area in which additional training could clearly be of value: improving researchers' knowledge of repositories and archives is a straightforward way to remove a significant bar to preservation of research data.

However, in some cases, training may need to do more than simply direct researchers to the appropriate archive. A number of respondents in the Oxford RDM survey commented that the sheer size of their datasets (which may be on the terabyte scale) made sharing difficult. In these cases, researchers may also need guidance on data selection, and on appropriate technologies for data storage and transfer. There may also be a need for further development of infrastructure capable of dealing with these volumes of data.

⁵¹ Hereafter referred to as the DaMaRO science training survey.

⁵² Hereafter the Oxford RDM survey.

C. Lack of Knowledge of Appropriate Way to Present Material for Long Term Preservation

Even when researchers know where to deposit data, they may not always know how to prepare it. Some respondents to the Oxford RDM survey commented that they did not know how to put their data into an appropriate format: this seemed to mean more than just not knowing which file formats to use, but extended to uncertainty over the best way to present data to make them re-usable.

This issue also surfaced in the DaMaRO science training survey. This asked researchers about eleven key data management tasks: questions covered their level of confidence, the quantity of training that they had received, and how useful they felt additional training would be. A clear picture emerged: the respondents generally had lower confidence about and expressed a greater desire for training in those aspects of data management which related to long-term preservation.

The four specific areas in which respondents felt additional training would be most useful were:

- Dealing with copyright, licensing, or other IP (intellectual property) issues relating to datasets
- Preparing datasets for long-term preservation
- Data documentation
- Preparing datasets for sharing with researchers outside their research group

D. Concerns About the Risks of Sharing Data Too Early

Researchers are often reluctant to share data before they have been comprehensively mined for publications. In most fields, considerable emphasis is still placed on traditional research outputs such as journal articles and monographs: publication of datasets is not yet regarded as having the sort of value – either in terms of contribution made to the community of knowledge, or in terms of the benefit to an individual researcher’s academic reputation – that traditional publications have. Releasing data into the public sphere at too early a stage is therefore seen as a risky enterprise, as it raises the possibility that another researcher may draw similar conclusions and publish first.

A respondent to the Oxford RDM survey expressed this common concern:

“There is risk of getting ‘scooped’, so given the current funding climate (which is heavily based on publication record), until research is published, I would be hesitant to freely share data.”

Even when publication of initial results has already occurred, if there are further conclusions to be drawn from the data, many researchers would prefer to have the opportunity to do this themselves. This sometimes leads to a perception of researchers as data hoarders, selfishly hugging material to themselves rather than allowing others to make use of it – something which is viewed with particular disapproval if the research that produced the data was publicly funded. However, researchers frequently find themselves in a difficult position: they are under pressure from funding bodies to demonstrate

that they have made good use of the funding, and from their institutions to produce research outputs which will count towards the REF⁵³. Although data publication may count for something (and indeed is increasingly being required by funding bodies – see, for example, the Research Councils UK Common Principles on Data Policy [5]), it remains the case that researchers’ worth is measured chiefly by means of traditional research publications.

A comment from a senior history researcher, interviewed during the Sudamih Project, reflects the tension that many academics feel:

“In principle, you want material to be available, and I believe in sharing. On the other hand, if you’ve just spent five or ten years collecting a dataset and you haven’t yet milked it for what it’s worth, and you’ve had funding to do the project, then you’re very nervous about handing over that dataset.”

Another Oxford RDM survey respondent made a similar point:

“[I have] Often not finished getting the most out of my data, want to be able to return to it at a later date and not have someone else publish my data (which has happened).”

E. Lack of Time to Prepare or Deposit Data

A related point concerns the time and effort required to prepare datasets for preservation and sharing. Data gathering is itself often a lengthy process, and hence researchers tend only to collect what is necessary for the specific purpose they have in mind. Data that have been collected for personal use are thus often untidy and incomplete. They may also employ idiosyncratic standards, and make use of abbreviations or conventions that would require considerable explanation to be intelligible to other users. In some cases, researchers may store the raw data and their own private notes and comments together (in the same database, for example), and the latter may need to be removed before the former can be published.

The process of making datasets fit for public consumption can therefore frequently be an arduous one. A number of researchers interviewed during the Sudamih Project commented that they would need to do significant further work on their data to get them into a state in which they would be happy to publish them. This would inevitably take time away from other academic endeavours, and given the priority of written outputs noted above, there are currently few incentives for researchers to do this.

A comment from an Oxford RDM survey respondent expressed a similar view:

“Part of my reluctance to share data is that my data is fairly roughly organised, and in various stages of polishedness (recordings, transcriptions, etc.), so it would

⁵³ The Research Excellence Framework: the exercise by which the research of British higher education institutions will be assessed, scheduled to take place in 2014.

be quite a big project to get it all presentable, and I'm not sure in what format I would do it."

Additionally, as the deposit of data tends to happen as a project draws to a close, it is also easy for it to get overlooked or pushed to one side in the rush to complete everything on time.

There is some scope for training to address this problem: if researchers can be encouraged to have data preservation in mind from the beginning of a project, there is a greater chance that the data will be collected, organized, and documented in a way that will make them more accessible to subsequent users, thus reducing the need for a large amount of reworking at the end of the project, and increasing the likelihood of a final dataset that the researcher is willing to share.

However, if this point and the one above are to be fully addressed, it is important to take researchers' concerns about data sharing seriously. Training needs to cover not simply the practicalities of preserving research outputs, or even ways of making this more straightforward (although these are both important topics), but also the rationale for doing so – that is, it needs to consider the *why* as well as the *how*. If this is to be effective, it needs to focus not just on researchers' obligations (to share data in order to meet funding bodies' requirements, for example), but also on the benefits to the individual researcher (such as increased potential for citations), and on the usefulness of data to the research community at large.

While the widespread tendency to view datasets solely as a means to an end rather than as valuable research outputs in their own right persists, it is likely that curation of those datasets will continue to be viewed as a lower priority. To rectify this, a major cultural shift in attitudes is needed. While pressure from funding bodies and institutions may help to spur this process on, such a change will ultimately come only from the researchers themselves – from a paradigm shift in perceptions about the value of alternative types of research outputs.

There are some pockets of the research community in which data is already recognized as a valuable resource in its own right. High-energy physics, for example, is an area involving a large number of very specialized roles, and where the contribution of scores of people may be necessary to gather the data required to support a single written research output such as a journal article. It is not uncommon for high-energy physics papers to credit two or even three hundred authors; many of these individuals will not have been actively involved in the writing of the paper, but will instead have worked only on the generation of the dataset underpinning it. Their contribution is nevertheless recognized, valued, and consequently credited. Areas of research that operate in this way are also more likely to have well established processes for preserving and sharing data, and these have typically been initiated from within the research community as a necessary tool to facilitate effective work, rather than imposed from outside as a result of funding bodies' requirements.

Although other areas of research function very differently, the example of high-energy physics provides reason to hope that, given time and appropriate encouragement, a similar culture can be fostered elsewhere. Researchers who have gained a greater appreciation of the benefits of data curation are more likely to engage in it, resulting a greater quantity of high-quality datasets being available for re-use by the academic community. This may even ultimately result in a positive feedback loop, where the perceived value of data preservation (and thus the motivation to ensure it happens) increases as the benefits of having more data available become clear.

Training is, of course, only one part of the picture. There is also a pressing need for further work to be done on lowering the barriers to curation, by providing intuitive, easy-to-use tools and processes that are straightforward to integrate with researchers' existing workflows. Training can and should, however, form an important part of an interim solution, by drawing researchers' attention to the services that already exist, and by advising on ways to make the process as smooth as possible.

F. Ethical and Legal Issues

It is not uncommon for researchers to find themselves unable to share some or all of their data as a result of ethical concerns (generally relating to confidentiality, and appropriate consent from research subjects), or legal issues relating to data ownership, especially when datasets have been supplied by third parties.

While it is clearly desirable for confidential information to be suitably protected, there is a strong case to be made for encouraging researchers to give careful consideration to the permissions they ask for when obtaining consent from research subjects. In some cases, data with significant potential re-use value may have to be kept private (or even destroyed), not because the subjects of the research were unwilling for data to be shared, but simply because they were never asked. Researchers working with sensitive data may thus benefit from guidance on how they can meet their responsibilities to their subjects without unnecessarily restricting data use. This may include advice on appropriate wording for consent forms, and on anonymization of datasets intended for wider dissemination. (The UK Data Archive provides a range of helpful resources for researchers on this and related topics: see, for example, [6].)

G. Financial Issues

Finally, financial issues are a consideration for some researchers. Long-term preservation of data comes at a cost, and it is not infrequently the researchers themselves who have the responsibility of securing funding for this. The University of Oxford's DataBank service, for example, is likely to be run on a cost recovery basis for projects with more than a very small amount of data to preserve. While it is hoped that it will ultimately be possible to secure central University funding to cover the cost of storing data from unfunded research, in the short term, it is probable that the service will only be able to accommodate data that come with funding attached.

This means that the long-term curation of data may often need to be factored into project budgets and grant applications – which in turn means that it needs to be planned for from the very earliest stages of a project, before the research itself has even begun (at least one respondent in the Oxford RDM survey stated that data had not been deposited because this had not been budgeted for in the grant, and potential solutions proved too expensive). Researchers need to be made aware of the various options that are available to them, and of the costs attached to these. Funding bodies also vary in the extent to which they are prepared to pay for long-term curation, so researchers may also need guidance on this front.

IV. PRACTICAL ASPECTS OF TRAINING

A. Nature and Format of Training

Researchers are busy people with many calls on their time, and while they may acknowledge in theory that digital curation is an important topic it would be helpful to know more about, in practice, attending training about it often comes a long way down the list of priorities. It is therefore important that face-to-face training sessions are kept relatively brief and well focused, and that written guidance material is concise and easy to navigate.

Opinions were divided regarding the relative usefulness of face-to-face training courses and online or print materials: both were acknowledged to have advantages and disadvantages. Paradoxically, a chief advantage of online training materials – the fact that they are available to be consulted at any time – was also viewed as a disadvantage, in some cases by the same researchers who had cited this as a benefit. It was noted that the fact that online training can be done at any time often leads to it not being done at all; face-to-face training, on the other hand, requires researchers to set aside a specific time period for the course, and having done this, they are then likely to spend that time focusing on the topic under consideration.

It also seems that researchers use face-to-face training and online guidance in different ways: the former is more likely to be sought out by those who want an overview of the subject as a whole, whereas written guidance is often used when researchers are seeking an immediate answer to a specific question or problem that has arisen in the course of their work. There is thus a strong case for having both available where possible.

B. Timing of Training

During the course of the work in Oxford, it has become very clear that digital curation cannot be viewed simply as something to be bolted on to the end of the research process. If consideration is not given to how data will be preserved from an early stage in a project, it is substantially less likely that this will happen at all: data may be in an inappropriate format, or lacking documentation, or there may be a lack of budgetary provision for long-term storage, or researchers may simply run out of time before data can be prepared and deposited.

Training provision therefore needs to reflect this: guidance needs to be available to researchers at all points in the research

lifecycle. The Oxford interviews revealed a general consensus that it would be useful for researchers to receive initial training relatively early during their time as graduate students. However, it was felt that the best time was not right at the beginning of the course, but after a few weeks or months – perhaps during the second term. This was for two reasons: first, because students often find themselves overwhelmed with information when beginning a new course, and secondly, because once graduates have spent a little time engaged in research, they have a better idea of the issues they are likely to face, and thus have a clearer idea of how to apply what they learn to their own work.

C. Content of Training

With regard to the content of training, comments from attendees at Oxford courses have indicated that researchers find it extremely helpful to have concrete examples to illustrate the points under discussion. Digital curation involves concepts that may be unfamiliar to researchers (“ingest”, “metadata”, and “migration”, for example), and these can often be best conveyed by demonstrating what they might look like in a real-world situation.

Fig. 1 and Fig. 2 below are word clouds generated from participant feedback from two research data management training events held in Oxford. Attendees were asked how the courses could be improved. The size of the words is proportional to their frequency of occurrence, and in both cases clearly shows the demand for more examples.

D. Choice of Language in Training Materials

A question from the Oxford RDM survey also highlighted the importance of using language that is familiar to researchers. The question asked whether respondents had ever deposited research data “in a dedicated repository or data store”, and was intended to elicit whether researchers had made arrangements for the long-term preservation of their research data. Many researchers understood it this way, and answered accordingly, reporting that they had deposited data with the UK Data Archive, the Dryad Digital Repository, the Archaeology Data Service, and a range of similar bodies. However, at least a third of the respondents interpreted the question as asking about their day-to-day arrangements for storing active research data: answers included departmental or research group shared storage, the University of Oxford’s central back-up service, Dropbox, and even external hard drives. This emphasizes the need for clarity, and an awareness that key terms such as “repository” may not conjure up the same set of associations for all parties.

working harder: they are generally highly motivated and highly skilled individuals who take a great deal of pride in what they do, and thus are more likely to embrace digital curation as a worthy goal if persuaded of its merits.

A fine example of this approach is provided by a leaflet produced jointly between the DICE, SHARD, and PrePARE Projects⁵⁴: this outlines the benefits of research data preservation (plus the skills necessary to achieve it), under the title ‘Sending your research material into the future’. A PDF of the leaflet is available online [7].

The half-day training workshop currently being offered to Oxford researchers as part of the DaMaRO Project begins by summarizing the University’s Policy on the Management of Research Data and Records. As this focuses chiefly on researchers’ responsibilities, this may at first sight appear to be an obligation-based approach rather than a benefit-driven one. However, an institutional policy is a document that serves multiple purposes: in addition to setting out what is expected of members of that institution, it also provides a statement of the institution’s values. Drawing researchers’ attention to the University’s policy – which states in its opening sentences that research data are valuable – sends a strong message that their institution regards data as an important resource, and that caring for and preserving them appropriately constitutes a crucial part of good academic practice.

There is, however, something to be said for placing more of an emphasis on the requirements of external bodies such as funders in discussions *about* training – that is, in proposals for new training courses, or when arguing the case for the inclusion of digital curation training as part of an existing curriculum. In such circumstances, highlighting the financial considerations can often provide a swift and effective way of stressing the importance of the topic, and may thus be helpful in securing institutional buy-in.

V. SUMMARY AND CONCLUSION

If research data are to be effectively curated, the creators or compilers of those data need to be engaged with the curation process from the earliest stages of a project. The work at the University of Oxford indicates that researchers often need guidance regarding the practicalities of curation – where and how to deposit data, and the best format in which to present them. In some cases, they may also need some encouragement to regard data curation as a worthwhile activity – something that is of sufficient value to merit taking time away from other academic endeavours.

Training and guidance needs to be available to researchers throughout the research process, starting from an early stage in their careers. As researchers have many calls on their time, training should be kept relatively concise, and ideally offered in multiple formats (e.g. face-to-face courses plus online materials) to provide a measure of flexibility. Researchers have a definite preference for material with a practical focus, using familiar language, and offering specific concrete examples.

Finally, it is important that training does not dwell too much on researchers’ obligations and the penalties for failing to meet them, but that it also emphasizes the benefits of digital curation: its chief aim should be not to threaten, but to inspire.

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⁵⁴ All three of these projects were funded by JISC.

Session 3 - Mainstreaming digital curation education

Digital Stewardship Education at the Graduate School of Library & Information Science, Simmons College

Martha Mahard and Ross Harvey
Graduate School of Library & Information Science
Simmons College
Boston, USA
martha.mahard@simmons.edu

Abstract—This paper describes two initiatives based in the Graduate School of Library and Information Science, Simmons College that contribute to meeting educational and training needs in digital stewardship: the online Digital Stewardship Certificate and the Digital Curriculum Laboratory.

Keywords—Digital, curation, stewardship, Digital Stewardship Certificate, Digital Curriculum Laboratory, Simmons.

I. INTRODUCTION

The state of perpetual motion, constant change and assessment that most libraries and archives exist in today has had a dramatic affect on the field of preservation and education for the field. Numerous reports have appeared attempting to describe the new skills and knowledge needed to conduct digital preservation. We need to equip librarians, archivists, and a growing number of preservationists from other fields to function more effectively as stewards of the digital cultural legacy. Educational and training opportunities are needed at three levels: formal credentials, such as graduate awards; short courses, perhaps also available as formal credentials or continuing education credits; and informal learning opportunities, perhaps in the form of on-the-job training or workshops.

The new skills and knowledge needed for effective digital preservation are the focus of recent reports (for example, that of Bahr, Lindlar and Vlaeminck [1]). Two of the top trends identified in academic libraries in 2012 are data curation and digital preservation [2]. These reports also stress the lack of adequate numbers of trained staff to engage with digital preservation responsibilities; for example, the DigCurV report identifies ‘a substantial need for appropriate training’ [3]. Recommendations from the final report of the influential DigCCurrI project stress the importance of hands-on professional experience [4]. At the Library of Congress, the Digital Preservation Outreach and Education (DPOE) Program

acknowledges the national need to ‘provide training to individuals and organizations seeking to preserve their digital content ... to make digital preservation training more widely available to working professionals’ [5].

This paper describes two initiatives based in the Graduate School of Library and Information Science (GSLIS) at Simmons College, Boston that contribute to meeting educational and training needs in digital stewardship: the Digital Stewardship Certificate (DSC), an online program and the Digital Curriculum Laboratory (DCL).

II. THE DIGITAL STEWARDSHIP CERTIFICATE

The DSC is one of several graduate certificates recently offered by universities in the United States. (Among other programs are the University of Maine’s Graduate Certificate in Digital Education, the University of Arizona’s Digital Information Certificate, and the University of North Carolina at Chapel Hill’s Post Master’s Certificate in Data Curation.) It is a *fully online* program of five graduate-level courses (15 credits). Its aim is to impart the concepts and skills needed to create and manage a sustainable digital repository, library, or archive. The main pre-requisite is a master’s degree in library and information science (LIS), archives management, or another field relevant to digital stewardship. Students enrolled in the DSC select one of two schedules: either one course per semester for five semesters (almost two years, with three semesters – Summer, Spring and Fall – per year); or a 1-2-2 schedule over one year. The required courses and electives that make up the DSC curriculum are also available to eligible students enrolled in master’s degrees at GSLIS. They were in fact originally developed for the master’s programs.

As their first course students take the required LIS 448 *Digital Stewardship*. It introduces them to the field through a life-cycle model, covering topics such as planning the digital

archive, information structure, technology, access, and broader management issues. Table 1 notes the topics covered in this course. The second required course is LIS 444, *Archiving and Preserving Digital Media*. This course is more technical, requiring students to learn about and engage with the command-line interface and install, populate and write procedures and policies for a digital archive (currently DSpace; we are also considering adding Archivematica). Students then select two elective courses, chosen from a range that at present includes courses on metadata, database management, web development and information architecture, and XML. Additional courses are being developed, including LIS 532F *Digital Asset Management in Libraries, Archives and Museums* and LIS 532G *Scientific Research Data Management*. Students complete the program by undertaking either an internship or an independent study.

TABLE 1: TOPICS COVERED IN LIS448 *DIGITAL STEWARDSHIP*

Module 1: Context and Generalities

1. Defining digital stewardship
2. The problems: Obsolescence, reproduction, longevity; Access vs. preservation
3. Models: The OAIS Reference Model; The DCC Curation Lifecycle Model; Other life-cycle models.

Module 2: Planning the Digital Archive

1. The Curation Lifecycle as the basis of a digital archive
2. Essentials: Planning, standards
3. Making digital materials preservation-friendly.

Module 3: Information Structure

1. Description & Representation Information
2. *Appraise & Select*
3. *Ingest*.

Module 4: Technology

1. Preserving the data: *Preservation Action*
2. Preserving the data: *Store*
3. Trusted Digital Repositories
4. Preservation methods.

Module 5: Access

1. A focus on users: *Access, Use & Reuse, Transform, Migrate*
2. Open access and sharing data
3. Restrictions to access
4. Access controls and authentication.

Module 6: Organization and Management

1. The costs of digital stewardship
2. Sustaining digital stewardship
3. Where are we heading?

The first intake of students in the DSC was in Summer 2012. Students in the first cohort hold master's degrees in LIS, archaeology, photography, and computer science; among the members of this group are the Chief Information Officer of a large company, a professional photographer, and archivists and librarians, ranging from beginning professionals to the archivist of a major British university. The first students will graduate in May 2013, as this paper is being presented. We are still assessing applications for the second cohort, which also has applicants from outside the U.S. and more applicants outside New England compared with the first intake.

III. THE DIGITAL CURRICULUM LABORATORY

The DCL is an integral part of courses in the DSC. This is a high-touch experiential online laboratory developed to support online education in digital stewardship. High-touch is a fundamental aspect of the approach taken to the delivery of all courses at Simmons GSLIS. High-touch characteristics of GSLIS's online courses include a cohort-based model, group assignments, extensive online discussion, and significant online presence of experienced instructors.

The DCL was developed with the support of funding from the National Historical Publications and Records Commission (NHPRC, project name Archives and Preservation Digital Curriculum Lab) and the Institute of Museum and Library Services (IMLS, grant number RE-05-09-0082-09) and Simmons College. The DCL and related activities have been noted in numerous publications and conference papers, many of which are available through the DCL web site (<http://gslis.simmons.edu/dcl/public/publications>). The DCL empowers experimentation in a risk-free, educational environment with a wide range of digital stewardship activities by providing integrated access to digital content, open-source tools and applications, scenarios, and exercises. More information about its development is available on the DCL website (<http://gslis.simmons.edu/dcl/public/about>). The target audiences for the DCL are:

- 1) Faculty in LIS programs and courses teaching archives, preservation, digital curation and stewardship, and records management, and students in these courses.
- 2) Staff in institutions charged with or interested in learning more about digital stewardship and preservation.
- 3) Professionals from a wide range of digital environments who need online workshops or short courses to learn how to apply digital stewardship principles to their specific situation.

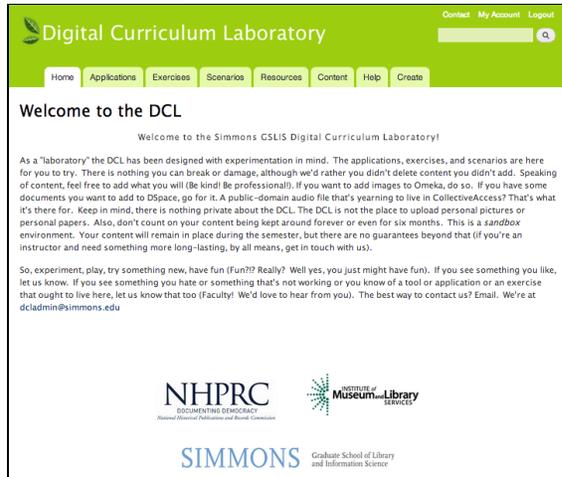


Figure 1: Digital Curriculum Laboratory

Other LIS schools, both in the United States (University of Wisconsin-Milwaukee) and in other countries (Sweden and England), also participate as partners, and the number of requests from LIS schools and libraries to use the DCL is increasing significantly. Recent inquiries have come from the Library of Congress in partnership with IMLS for use in its upcoming National Digital Stewardship Residency Program, the Smithsonian internship program, the NHPRC, and from LIS educational institutions in the United States, Scandinavia and New Zealand.

The DCL's potential has been clearly and convincingly demonstrated in courses at Simmons and the other LIS schools where it is used and through the numerous expressions of interest and requests for trial access received. Simmons GLIS has guaranteed sustainability for the DCL by creating a new full-time staff position, the Curriculum Support Developer, whose primary charge is to maintain the DCL, specifically to support Simmons GSLIS faculty and students in the master's and doctoral programs.

The DCL consists of three main sections: applications, exercises, and scenarios. The applications are installed instances of open-source software and include DSpace, EPrints, Fedora Commons, Greenstone and Omeka. The exercises – there are currently 24 of them, with more being developed – provide students with realistic experience in manipulating digital objects through the use of open-source tools. The scenarios allow students to walk through tasks such as identifying file formats, automating workflows, and migrating files using the software available in the DCL. Other sections provide access to content that can be used in the exercises and scenarios, and to online resources.

Redevelopment and expansion of the DCL is in the planning stage. The scenarios, exercises, tutorials and specialized content already in the DCL will be further developed. The key outcome will be a stable, rich online environment that is available to a wide audience (not just to traditional LIS programs) nationally and internationally, supporting programs offering formal credentials and continuing education programs.

The DCL was initially envisaged as a platform that would provide tools to faculty, educators and trainers in digital stewardship and archives management for building educational modules. It has proven its worth, albeit in a limited context. What we are aiming at next is an interactive online environment that provides high-touch educational experiences in digital stewardship. These tools will be shared in educational forums, and educators, broadly defined to encompass LIS faculty, institutional trainers and continuing education workshop leaders, will be encouraged to use them.

IV. CONTINUING EDUCATION COURSES

The expansion of the DCL also has the aim of supporting continuing education modules for digital stewardship that have DCL exercises as their basis and focus. These modules are being developed and delivered online in conjunction with the Simmons GSLIS Continuing Education program (<http://www.simmons.edu/gslis/careers/continuing-education/>), which has extensive experience in offering learning opportunities, online and face-to-face, for librarians and archivists. The Simmons GSLIS Continuing Education program offers more than 70 workshops a year in several different formats, including fully asynchronous online workshops run over one month. The instructors are experienced Simmons GSLIS faculty and adjuncts, *Library Journal Movers & Shakers*, authors, and practitioners – and all have practical expertise in the subjects they teach. A list of workshops is available on the web (<http://alanis.simmons.edu/ceweb/>). Continuing education workshops are open to all, including but by no means limited to practicing information professionals.

The online continuing education modules focusing on digital stewardship will be available to a wide audience that extends beyond traditional library and information science programs. Sixteen have been planned and three are complete or almost complete at the time of writing.

TABLE 2: TOPICS COVERED IN ONLINE CONTINUING EDUCATION COURSES

1. Digital Stewardship: Getting Started
2. Digital Preservation Planning
3. Appraisal and Selection of Digital Objects
4. Exploring and Evaluating Open Source Digital Asset Management Systems
5. Managing Born-Digital Content Received on Physical Media
6. Ingest – Getting Data into the Archive
7. Storage of Digital Collections
8. Access of Digital Collections
9. Preservation Approaches
10. Description and Representation Information (a.k.a. Metadata)
11. Introduction to Legal Issues in the Digital Archive
12. Introduction to Research Data Management for the Social Sciences and Humanities
13. Cloud Storage – What do I need to know?
14. Introduction to Email Archiving
15. Introduction to Web Archiving
16. Introduction to Social Media Archiving

We anticipate that several workshops will be piloted later in 2013 and the full suite offered starting in 2014.

V. RECEPTION OF THE DSC

It is still too early to know how graduates of the DSC are being received by the professions. There is some limited evidence available about how students, some of whom are already experienced professionals, perceive the program and the courses within it.

Student evaluations of courses provide one body of evidence. Evaluations of the first required course for the DSC cohort, *Digital Stewardship* taken in Summer 2012, pointed out areas for improvement (as expected). Students considered the course to be ‘an excellent introduction to the field of digital stewardship’. The hands-on exercises, using the DCL, were positively commented on: ‘I loved the hands-on exercises we did with actual files. I would have loved to have seen more of this ... Hopefully we get that in a future class!’ The online delivery mode was also considered positively: it ‘presents a rich learning environment’ and ‘the format of the course presentation

(Moodle) is great! This is the best format for online course delivery that I have experienced. The module format worked well with this subject matter.’

Some unsolicited comments have been received. The course is being recommended to others, always a positive sign: ‘I have recommended this certificate program to colleagues in the UN [United Nations] system of libraries and one thing I mentioned was [the Program Director's] dedication to the program.’ Another student incorrectly assumed that the DSC was being developed before another program and provided this comment: ‘I was interested to see the announcement of a program at Chapel Hill similar to the one at Simmons. ... Perhaps some will think of it as competition... my experience in industry is that when a product or service is new and perhaps unique and someone else brings out a similar product or service, it legitimizes the first. Another way to put it is that imitation is the sincerest form of flattery. Congratulations on putting together a great program and then having your lead followed by the likes of UNC.’ A third student commented on how relevant the course was to her duties as an intern in a university’s digital program. She noted: ‘I want to thank you for giving me such a great grounding in the field of Digital Stewardship and Digital Archives last semester. ... when I unexpectedly got this internship, I felt that I really knew what I was getting into, and could understand the issues my supervisor ... was dealing with.’

These are, obviously, selective comments from the earliest phase of the program. Full evaluation of the program will be sought from graduates of the DSC once they have completed the program, and we are in the process of developing the instrument for this purpose.

VI. CONCLUSION

Recognizing that both theoretical concepts and experiential learning are essential pieces in the education of future digital curation professionals, the Simmons DSC combined with the DCL offers its students a thorough, well-rounded preparation for their participation in a rapidly emerging field. The program encourages innovation and experimentation, and supports students through field experience and course work. Formal qualifications are only one part of the education and training required, so Simmons is also developing continuing education courses in this field.

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Integrating Digital Curation in a Digital Library curriculum: the International Master DILL case study

Anna Maria Tamaro

*Information Engineering Department.
DILL Local Master Coordinator
University of Parma Parma Italy
annamaria.tamaro@unipr.it*

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 TPD 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 participate 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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Learning Hands-on and by Trial & Error with Data Curation Profiles

D. Scott Brandt

Purdue University Libraries
West Lafayette, IN US
techman@purdue.edu

Abstract— The Data Curation Profiles Toolkit can be used in several ways to capture requirements for data sets, as articulated by researchers. As a flexible instrument it can facilitate dialog between librarians and researchers to discuss data concerns, current data workflow, and possible outcomes for the future. As a structured tool it can help identify areas of concern and need, to begin to making informed decisions about the data. Published Profiles offer insight into similarities and variations in data and data workflow, across multiple research areas or sub-disciplines. Designed as a tool for practitioners, it can help build knowledge and skill through application. Librarians who have completed Profiles have found the process to improve their comfort, increase their confidence, and build competencies in working with researchers. Mapping use of the Profiles Toolkit to the DigCurV Curriculum Framework can help identify strengths and weaknesses in what is currently a hands-on, trial and error self-learning approach.

Keywords: data curation, competencies, learning outcomes, workshop, self-learning, Curriculum Framework, Data Curation Profiles Toolkit

I. INTRODUCTION

The Data Curation Profiles (DCP), and its associated Toolkit, is an outcome of a research investigation launched in 2007 to understand data sharing, particularly amongst single or small groups of investigators [1]. The instrument probes the kinds of data researchers are working with, what they are currently doing with it, and what they would like to do with it. Librarians and other information professionals use the DCP Toolkit to interview researchers, and the result can produce a stand-alone publication describing a researcher's intent and needs related to a data set—the Data Curation Profiles Directory currently has published 30 Profiles [2]. In effect, the DCP Toolkit supports the role of librarian or information professional that finds herself or himself in the position of mediator between the researcher and the archivist.

There is no explicit curriculum for learning how to use the DCP Toolkit, which consists of a User Guide, Interviewer Manual, Interviewee Worksheet and Profile Template. The US Institute of Museum and Library Services, who funded the

original research project that produced the Toolkit, supported a short project to teach librarians how to use it. Over 300 librarians attended a series of twelve workshops taught between 2011-2012. The workshops were developed to guide attendees in how to use the DCP Toolkit and what to expect when doing so. The goal was for participants to gain comfort using a tool, so that they could gain confidence in exploring researcher needs and concerns, and later gain competence in working with researchers on data management planning and depositing data in a repository [3].

To this point training has consisted of a one-day session focused on instruction in using the DCP Toolkit. It has covered concepts of data curation as they relate to researchers (identified in the original DCP research), how the components of the Toolkit were designed to probe them, and detailed information on working through two main sections, data lifecycle and data sharing [4]. Probing about the research data lifecycle is seen as important for both researcher and librarian because it uncovers what might otherwise be unrecognized: that the research process can be seen as stages of data collection and analysis that produce tangible products (data sets) in addition to intellectual findings disseminated in articles. Probing about data sharing also is seen as important because it helps identify researcher concerns in doing so.

An instructional design approach, ADDIE, was used in developing the workshop. It required identification of users' needs (how to use the Toolkit), developing specific learning outcomes (application of skills), designing learning objectives to meet the outcomes through lecture, discussion, exercises and additional resources, to scaffold learning (scenarios) [5]. Assessing the workshop with the Framework would be helpful in building and expanding training. Initially it is assumed that training will continue to be generic in regard to digital curation overall, but specific in focusing on the particular use of the Toolkit. It is also hoped that the framework will help us describe the value of the training in a meaningful way for a broader range of people.

II. CURRICULUM FRAMEWORK AS ASSESSMENT TOOL

The Framework is meant to be useful to those building new training courses. Depending on the user's aims, the Framework can assist in providing a structure for a generic training program for the role of digital curator, or it can suggest which subjects should be covered in shorter, more specialized courses addressing one particular area of professional digital curation practice. The Framework may also supply a common language to allow those building and developing training to meaningfully describe the value of their training offerings.

Utilizing the Framework to assess the DCP Toolkit and associated learning initially seems somewhat problematic. First, training is focused on emulating use of the DCP Toolkit. The workshop gives context (lecture), offers instruction (reading), provides modeling (videos) and employs problem solving (exercises). Basically, the learning objectives are meant to facilitate self-learning through scenarios of how others employed the DCP Toolkit, and providing expert feedback by workshop leader during discussion. Second, users of the DCP Toolkit are not learning about data curation per se (i.e., digital preservation), they seek to learn what researchers are doing with their research (i.e., data management). This is because the DCP Toolkit supports the role of librarian or information professional in the position of mediator between the researcher and the archivist. However, the Framework can still be helpful in assessing learning goals and outcomes.

III. ASSESSING WITH THE FRAMEWORK

The Framework looks first at the knowledge and principles to be learned. The DCP Toolkit outcomes map especially well with understanding research data management. That is, the elements under the Framework map with the goal of understanding the concepts and terminology employed in research data collection and analysis, organizing and describing or documenting it, and meeting funder or institutional requirements. However, beyond a general data lifecycle, it is hard to anticipate what someone will encounter when meeting with a researcher—methodology differs between physical, life and social science, not to mention the humanities. What has been key, is to represent a data lifecycle in a data table depicting various stages of collecting data, processing or anonymizing it, analyzing it, and depositing and publishing it. Classifying data stages can help clarify what will or won't or can't be shared.

Assessment with the Framework at this level raises the question of how much knowledge about digital curation a librarian needs to interview a researcher to get "the story" around his research data and workflow. Up to now, the goal of using the DCP Toolkit is to gain insight and to gather many Profiles so they can be studied to understand research data in broader terms, in order to give greater context to digital curation. However, to fulfill a mediating role and provide

specific services would demand more knowledge and application of related principles. For instance, to make suggestions about depositing a mediator would need to know more about requirements related to file formats (i.e., which are more appropriate for preservation).

In assessing skills and competences, it can be argued in this case that there are three perspectives: those related to the researcher, to the librarian or information professional (as mediator) and to the archivist. Subject knowledge in the discipline relates to the researcher, and anyone who uses the DCP Toolkit to interview should have some familiarity with the discipline (i.e., background, or should review the researchers work to become familiar with it). Skills for the librarian or information professional include first those that help in interviewing the researcher, which are enumerated in the Framework: creativity (inquiring mind), professional conduct (ethics regarding confidentiality, familiarity with institutional policies), and communication (articulating and clarifying needs). Skills for the librarian or information professional also include those related to creating Profiles to publish: creativity (an inquiring mind to pursue the interview), personal qualities (able to engage in deep conversation), self-management (self-initiative) professional conduct (clear and accurate reporting of information synthesized), research management (project planning/delivery) and, obviously, communication. Competence is required, even if these are considered "soft skills;" although it is not clear how to teach them. This is an area in particular for which the workshop employs hands-on practice, and practicing through trial and error is important.

IV. AMBIGUITIES IN DESIGN

Understanding how the DCP Toolkit fits with a digital curation lifecycle depends mostly on where or how the research lifecycle is seen as having overlap. As with skills and competences, learning here may depend on three perspectives, the researcher, the librarian or informational professional and the archivist. Researchers may not see themselves directly involved in digital curation. However, they conceptualize the research project and associated data, and the intersection with data management planning. Obviously they create or receive data to analyze, they perform a kind of appraisal and selection determining what they will share or publish of a given project, and they allow access (e.g., usually to peers). Librarians and information professionals need to understand how and where the research lifecycle intersects the digital curation cycle, and when or where to work with archivists and preservation.

We have argued up to now that using the DCP Toolkit can be learned through hands-on application and trial and error. The Toolkit includes interview questions and a worksheet, along with suggestions for how to ask questions, what to focus on, and how to stay on track. By following general instructions on how to probe data needs and concerns, a practitioner can demonstrate success at a performing a set of associated tasks,

which evidences learning. As there are no “right” answers, practitioners can (must) use trial and error to work through the interview process, collecting information and distilling information into a Profile. Trial and error is important because “[W]hen the problem space is too large to explore completely, a learning agent must have the ability to guess about new situations based on experience with similar situations” [6]. In previous workshops, several teaching methods were used: lecture, small group exercise, manual, one-to-one training, and workshops. The Framework helps understand how training will likely require using an online approach that integrates webinars, readings and videos and allowing learners to move at their own pace. Without funding for more workshops, it will be critical to use the Framework as a guide to create a tutorial in which there will be no expert leading the lessons.

V. CONCLUSION

There is a paradox that is highlighted by using the Framework in assessing this situation. The knowledge to be gained is about the researcher’s data (workflow, etc.), yet the skill is about learning to explore and understand the needs before being able to attend to them. As the gatekeeper, some researchers hold onto their data for reasons associated with lack of time to do more and lack of understanding how to organize and disseminate it. For the researcher to relinquish the gatekeeper goal, librarians must understand the researchers’ perspective, context, situation and needs. They must, in effect, learn to use a tool to learn about the researcher data, and then learn what can be done with it [7].

Trying to map the use of the DCP Toolkit to the Framework reveals some weaknesses and strengths in relying

on the Toolkit itself to facilitate “self-training,” and a traditional training approach. The Framework is meant to be useful to those building new training courses, but can give insight into assessing for changes or using different approaches, which will be a next step for us. While the Framework doesn’t assist in providing a structure for a generic training program, it has helped identify the need to clarify perspectives, clarify which subjects should be covered, and where more specialized coursework addressing professional digital curation practice would be helpful. With further application, the Framework will help articulate better the value of learning how to use, and use, the DCP Toolkit.

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The digital curator between continuity and change:

developing a training course at the University of Turin

Maurizio Vivarelli*, Maria Cassella**

Department of Historical Studies*
University Library System**
University of Turin
Turin

maurizio.vivarelli@unito.it; maria.cassella@unito.it

Federico Valacchi

Department of Education, Cultural Heritage and Tourism
University of Macerata
Macerata

valacchif@unimc.it

Abstract—The paper tackles with the challenges and the opportunities to establish a training course for digital curators in an Italian university, namely the University of Turin. The authors give a broad perspective of the role of the digital curator who is a figure that adds to the technical, communicative, managerial and legal skills the ability to embed these skills in more complex cultural ecosystems, which regulate and define the mechanisms of production and communication of the cultural heritage.¹

Cultural Heritage, digital curator, information professionals, professional training course, libraries, archives, museums.

I. THE INFORMATION PROFESSIONALS EVOLVING SCENARIO IN ITALY

In Italy the scenario in information professionals (librarians, archivists and museums specialists) is fast evolving. Some key drivers of this change are the huge impact on professions of the technology (the digital paradigm) and a growing trend to a cultural and political interoperability.

In the last ten years the digital paradigm has fostered the evolution of new professional roles. Some of these roles emerge from an evolution of the traditional LIS disciplines: the electronic resources librarian, the knowledge manager, the metadata librarian, while others are more interoperable and share their competencies with other information professionals: i.e. the repository manager, the data specialist, the digital curator.

In Italy the need to explore skills and competencies of these new information professionals has also fostered a political convergence. In 2010 in Piedmont the regional sections of the three associations representing the information professionals (ANAI, ICOM, AIB) founded the MAB (Musei, Archivi, Biblioteche) a political regional coordination of the

three associations. The scope was to promote discussions on topics interesting the three professional associations, to foster interoperability at political level and common strategies for the future of the information professionals.

One year later the MAB became a national permanent coordination. Key goal of the national MAB is to explore the prospects of convergence between the institutions and the professionals belonging to archives, libraries, museums.

Another key driver in the evolution and future change of the information professionals scenario in Italy is the recent approval and publication at December 2012 of the law "Disposizioni in materia di professioni non organizzate" which aligns the Italian legislation to the European framework defined by the Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications.²

II. DIGITAL PROFESSIONS AND DISCIPLINARY TRADITIONS

The theme of the so-called convergence between archives, libraries and museums is not born only from the comparison between the professions, but has a long and complex history, which passes through various stages, and which is rooted in founding moments of European cultural history of the modern age. To recover the traces, at least the most recent ones, it is necessary to begin the route at least from the early sixteenth century, when, in the context of the recovery of the classical arts of memory, grafted in magical and symbolic elements that characterize the rediscovery of the thought of Ramon Llull, they begin to take shape the first traces of those who, many centuries later, would be characterized as the "disciplines" related to the organization and management of cultural heritage. In the large, shaded and opaque context of the *historia literaria*, and the tensions arising from the search for

¹ The authors share together the contents of the article. In particular, it is to be attributed to Maurizio Vivarelli paragraphs 2, 4, and 6, to Maria Cassella paragraphs 1, 3, 4, and 5; to Federico Valacchi paragraph 4.

² Available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005L0036:EN:HTML>.

universal models for the organization of knowledge (from the *Bibliotheca Universalis* by Conrad Gesner to the *pansophia* of John Amos Comenius, the search for the universal languages of John Wilkins and George Dalgarno until the *clavis universalis* of Gottfried Wilhelm Leibniz), the second sixteenth and seventeenth centuries are covered by a swarm of practice, trial and error, research, of the most diverse nature, which have as their object on the one hand the general principles of the organization of knowledge, and on the other the organization of the books and documents in which that order is manifested.

This context includes mnemotechnical studies of Giordano Bruno, who in *De umbris idearum* (1582) modified and innovated the concepts of 'place' and 'image', which is no longer static, but strongly dynamic, to describe the relationships that correlate the different types of information. Similar objectives, for example, characterize the activity of the French humanist Christophe de Savigny, in the sixteenth century, who in his work *Tableaux accomplis de tous les arts libéraux* [...], processes one of the first encyclopedic models in which the relationships between the different partitions of knowledge are represented in a reticular way, thus overcoming the symbolism of the tree as an unitary element of integration and of the the usual hierarchical models based on dichotomy.³

Only at a much later date, as mentioned, it outlines the whole profile of the current disciplinary traditions, which were then grafted onto the profiles of the professions. As for the archives, in an extremely schematic and synthetic way, the chronological details of this process can be identified between 1794, when the French Convention, with the Law of 25 June (7 Messidor II) affirms the principle of 'advertising' of archives, reorganized under the same law⁴, and in 1928, the year in which the scholar of archival science Eugenio Casanova systematizes the disciplinary field of its relevance in the treaty *Archivistica*. Library science, in the contemporary sense, begins to define its scope in the first place between 1808 and 1829, a period in which the Benedictine monk Martin Schrettinger began to use the term 'Bibliothekswissenschaft' (*Versuch eines der vollständigen Lehrbuches Bibliothekswissenschaft* 1829), until *Handbuch der Bibliothekswissenschaft* of 1834. This marks the 'science of the library', a term translated as 'bibliothéconomie' by Léopold Auguste Constantin Hesse in 1839.⁵

Museology, finally, is formalized disciplinary action in its most application primarily since 1948, so connected to the establishment of the ICOM. International Council of Museums (<http://icom.museum/the-organisation/history/>), to the more precise definition of the scope of activities carried out in 1977

by the International Committee for Museology (IFOCOM).⁶ Beyond the eighteenth century museological tradition (taken in *Museographia* of Caspar Friedrich Neickel 1727), museology finally acquires the character of an applied science that deals with the museum as a permanent institution that acquires, preserves and communicates the material evidence and Intangible Heritage of Humanity for study, education and enjoyment.⁷

Following the gradual definition of the disciplinary fields, also for reasons related to academic policies, researchers (widely examined in the book by Peter Burke *A Social History of Knowledge. From Gutenberg to Diderot*, Cambridge, Polity, 2000) have strongly defended the 'borders' of the same disciplinary fields.

The interest of disciplinary communities gradually established, in the complex dynamics thereafter, is oriented mainly to discuss and motivate the differences rather than to consider the commonalities. This occurred in particular for relations between archives and libraries, particularly contrasted by a debate that involved, from the first half of the last century many scholars including Giorgio Cencetti, Guido Battelli, Armando Petrucci, Piero Innocenti.⁸

Over the past few years, and in this scenario highly eventful, the world of documentary institutions has continued to be invested by profound changes in various capacities related to the spread of digital technologies and of new models of representation of information in a digital environment.

Here it can be useful limit to pointing out that, in a context certainly very problematic, can be differentiated the positions of those who believe that it is right to provide elements of continuity between pre-digital and post-digital traditions, and instead the positions of those that are oriented more strongly in the direction of change, considering that the management and information processing by computers in itself can be considered the basis on which to found a new disciplinary tradition which, if not altogether different from that classic, give value first (if not exclusively) to the differences. In the context of these changes are located the tensions that generally invest the debate on the identification of the contents which should focus on the training of operators of the archives, libraries and museums.

In this sense, in the meantime, we can say that there is no miracle recipe, which is magically able to iron out all the difficulties; however, for this reason, it may be reasonable to assume that the correct way may lie in a sort of middle ground

⁶ See *Key Concepts in Museology*, 2010.

⁷ See Lugli, 1992.

⁸ Cencetti, 1939; Cencetti 1973; Battelli, 1962-1963; Petrucci, 1964; Innocenti, 1994.

³ See Serrai, 1977.

⁴ See Brenneke, 1968.

⁵ See *Guida alla biblioteconomia*, 2008.

in which, in principle, are equally legitimate the different types of requests and issues, historical, theoretical and technical applications.

The theme of change brought about by the spread of digital technologies must therefore be addressed, in terms of training, with restraint and caution. First, in any type of curriculum for the training of operators devoted to the planning and / or implementation of these information environments, must be guaranteed an adequate presence of general cultural skills, mainly of historical-literary and therefore, in a broad sense, humanistic. On this cultural basis must then position an equally strong culture of each discipline, within which to ensure the understanding of how, historically and culturally, principles have been developed and then, from them, have developed technical applications. Finally, the last level of this metaphorical pyramid must necessarily be located technical and managerial skills.

Because of this complex set of reasons it becomes essential to acquire the permanent conviction that the operators of archives, libraries and museums, now and in the future, should ensure the ability to orient themselves in the many problems of complex and continuously changing information scenario. In this sense, in terms of definition of a new curriculum, the answer can not only consist in strengthening of the technological skills, whose proper knowledge must, however, for obvious reasons, be guaranteed. In this sense we are oriented reasoning carried out to design the outline of the course at the University of Turin, in seeking a meeting point of intersection between technology and disciplinary traditions.

III. THE DIGITAL CURATOR: A NEW INTER-DISCIPLINARY ROLE TO "CURATE" DIGITAL ASSETS

In the last twenty years the huge development of digital libraries has fostered the need to develop and educate new skills and competencies in Library and Information Sciences. New professional roles have emerged to cope with the management of digital libraries.

Some of these roles stem directly from the traditional principles and skills of librarianship, i.e. the electronic resources librarian, the knowledge manager, the metadata librarian, whereas other roles, i.e. the repository manager, the data manager, the copyright specialist and, last but not least, the digital curator are more interoperable and share their competencies with other kind of information professionals (e.g. archivists and museum specialists).

The term "digital curation" was first used at the "Digital Curation: digital archives, libraries and e-science seminar" sponsored by the Digital Preservation Coalition and the British National Space Centre held in London on the 19th October 2001. The British seminar also fostered a cross-sector dialogue among archivists, librarians, data managers, information specialists each of them bringing their practical experience on

curation and preservation of digital assets (Beagrie & Pothen, 2001).

Despite the publication of manifold studies e.g. Swan and Brown, 2008, Dallas and Doorn, 2009 and the establishment of national research centres on digital curation e.g. in UK where in 2004 the JISC established the Digital Curation Centre and in Greece where in 2007 the Athena Research Centre funded the establishment of the Greek Digital Curation Unit, to date there is still no unique definition of digital curator, its skills and competencies.

This difficulty in identifying the role is basically due to the fact that responsibilities in digital curation can apply to a diverse range of employment characteristics and roles (Pryor, Donnelly, 2009)

Initially digital preservation was seen as the strategic aspect in the digital curation. Later on the term "digital curation" has been increasingly used to refer to the maintenance of big research data and other digital materials over their entire life-cycle and over time for current and future generations of users (Beagrie, 2006): from the creation to the preservation and storage till the idea of re-use of digital assets and research data, both digital born and digitalized.⁹

Currently the concept of digital curation also includes the idea of added value to the management of digital materials,¹⁰ e.g. through metadata enrichment. It also involves the concept of a community of practice and of shared learning for different professionals.

Due to the growing mass of digital assets in research centres, universities, archives, museums and libraries, the role of digital curator is now slowly consolidating in many cultural institutions and research centres as an inter-disciplinary figure with a solid subject domain background, mixing skills of data curation and digital preservation.¹¹

Currently the concepts and the ideas arising from the maturation of the digital curation as an autonomous discipline allow us to interpret the digital curator as an interoperable role with a blend of traditional principles and LIS domain skills and competencies and skills belonging to other specific non-LIS domains, including both technical and interpersonal skills, i.e. management and communication skills, knowledge and expertise in copyright issues and licensing, ICT skills.

⁹ See the Digital Curation Lifecycle Model <http://www.dcc.ac.uk/resources/curation-lifecycle-model>.

¹⁰ In digital curation digital material is regarded according to a holistic approach and include cultural digital assets, raw research data and all other kind of material created digitally

¹¹ In the biological sciences the term curation has also frequently been used to refer to the maintenance and publishing of databases. It was indeed originally implicitly digital.

The DigCurV European project closing up in 2013 whose goal is to establish a vocational training for digital curators in Europe will hopefully bring a clearer definition of digital curator and its skills.

As boundaries of this new role are still blurred and involve some non-LIS skills it is legitimate to wonder if information specialists (librarians, archivists or museums specialists) will maintain in the next future a leading position in digital curation.

A great responsibility “to ensure that Library “leaders-in-waiting” are given the appropriate leadership training to equip them to operate in this data centric world” (Lyon, 2012) will obviously be placed on professional organizations (e.g. SCONUL, Research Libraries UK, Italian Libraries Association (AIB), Italian National Association of Archivists (ANAI) ...) and on higher education institutions who run a leading role in educating and training the future information professionals.

IV. DEVELOPING A PROFESSIONAL TRAINING COURSE FOR DIGITAL CURATOR AT THE DEPARTMENT OF HISTORICAL STUDIES, UNIVERSITY OF TURIN

In Italy the scenario of academic curricula for information professionals is fragmented and still evolving.

Archives and Information Science (Archivistica Informatica), for example, is a discipline that is still struggling to establish itself in the Italian educational context where it is often hard to identify with precision the exact disciplinary statute¹² and technological applications to the historical archives may be sometimes confused with the computer files themselves.

Guercio (2011) gives a dark description of the scenario of the academic curricula for digital archivists in Italy: “il quadro già difficile è ormai gravemente compromesso a seguito dell’ultimo provvedimento del ministro Gelmini [...]. Il risultato inevitabile [...] è la chiusura forse definitiva di gran parte dei corsi di laurea magistrale dedicati alle discipline archivistiche e biblioteconomiche in quasi tutti gli atenei italiani a partire dall’anno accademico 2012-2013.”

“The complex scenario is now severely compromised as a result of the last decision of the Minister Gelmini [...] The inevitable result [...] is perhaps the definitive closure of most degree courses devoted to librarianship and archival disciplines in almost all Italian universities in the academic year 2012-2013.”

Moreover the tables that regulate (and fossilize!) the educational offer of the Italian universities do not allow archival information to be dropped in the context of multi-disciplinary approach, by “relegating” *de facto* the archival

studies in the humanities area, where many of skills necessary to digital curators (e.g. management and legal skills) are not provided. This problem particularly appears when you look at libraries, archives and museums as potential and future cultural heritage and you are forced to acknowledge the paradox that courses oriented to the preservation of cultural heritage undermine its development.

A few masters currently concentrate on digital themes to train digital curators.¹³ No first level graduate course is specifically available for digital curators.

Among the few post-graduate training courses the Master in “Education, management and preservation of digital archives” (Formazione, Gestione e Conservazione degli archivi digitali (FGCAD) run jointly by the university of Macerata and the university of Padua represents a good practice.

The goal of the Master is to train professionals capable of streamlining processes in document management, by exploiting the potentiality offered by information technologies and by providing training and preservation on analog and digital archives.

The master curriculum includes 300 hours of teaching provided both in the presence and online, one stage of 300 hours in institutions whose goals and activities are consistent with the educational goals of the master and 900 hours of personal study.

The master includes disciplines that belong to disciplinary area of archival, computer science and law.

Beside the educational framework the Italian scenario is further complicated by the lack of a recognized career path for digital curators. Indeed this is a problem that this specific role shares with manifold other professional roles which support the development of the digital libraries, archives and museums.

Due to this uncertain scenario, both in education and in profession, and in order to accomplish a growing demand in Piedmont for specialized professional figures able to manage the digital complexity two of the authors, both working at the university of Turin, conceived to set up a professional training course for digital curators at Department of Historical Studies of the University of Turin.

We felt the need to define a curriculum that recognizes the complexity of the changes and aims to define the profile of an information professional whose skills are based on the technical and operational capacity to interpret the nature of the information content present in the documents of libraries, archives and museums, and then to transfer in the digital

¹² See Valacchi, 2007

¹³ Among the others it is worth citing the international master on digital libraries run by the university of Parma.

environment the wealth of relationships and connections related to the various types of cultural objects. According to this perspective, the project is focused not only on the synchronic dimension of the production of digital objects and their metadata, but extends to a diachronic view and perspective that can integrate and connect the different contexts, historically and culturally determined, that ensure the persistence of communication values of libraries, archives, and museums in the digital context.

We strongly believe that digital curation is a complex activity that a single professional role cannot perform. As a matter of fact digital curation is a staff performed activity where automation process combine with a deep knowledge of the nature of the information resources. It also involves a greater share of responsibilities (Beagrie, 2006).

Therefore our aim by conceiving this training course was to educate information professionals able to communicate and work in team with ICT specialists and computer scientists, both internally and externally, to better perform documents digital curation.

The rationale to establish a digital curator training course at the university of Turin was the need to develop competencies and skills to support some library digitization projects and a long-term sustainable strategy for the digitization plans of the university of Turin libraries.

Particularly in November 2012 the university library system launched a customized access platform for digitalized assets, namely DigitUnito,¹⁴ by implementing the open source software Omeka.¹⁵ Omeka is a Content Management System conceived by the Roy Rosenzweig Center for History and New Media - George Mason University. Omeka offers manifold advantages to user community: e.g. it is OAI-PMH compliant,¹⁶ allows both the use of the Dublin Core simple and extended and of MODS, it is easy to implement and user-friendly to use for data entry. Different themes allows the customization of the interface and a very active user community supports the platform development.

The launch of the DigitUnito platform has obviously created at the University of Turin a rising demand for archivists and librarians who are well trained to apply the latest tools and methods to effectively manage and preserve material that is converted by university libraries to digital form.

The decision to launch the training course is also consistent with the expectation that according to the United States

¹⁴ <http://www.omeka.unito.it/omeka/>

¹⁵ <http://omeka.org/>

¹⁶ This function is performed through the Omeka plug-in OAI-PMH Repository. The list of Omeka plug-ins is available at: <http://omeka.org/add-ons/plugins/>

“Occupational Outlook Handbook”, 2010-11¹⁷ Edition digital curation will increase by 23% between 2008 and 2018, which is much faster than the average for all occupations.

V. THE UNIVERSITY OF TURIN DIGITAL CURATOR COURSE CURRICULUM IN THE FRAMEWORK OF THE DCC CURATION LIFECYCLE MODEL

As the University of Turin digital curator course is mainly addressed to information professionals (librarians, archivists, and museums specialists) we preferred to set up a training course rather than a master, being the first more flexible in organization and structure.

Whilst specifically aimed at information professionals, we believe the course can represent a valid postgraduate educational experience for first level graduates in cultural heritage too.

Consistent with the complexity of the digital curation experience we conceived a curriculum course of 600 hours, of both teaching and personal work, modulated into six sections, i.e. :

1. The document in the transition from analog to digital;
2. The culture heritage and the digital perspective;
3. Metadata, standards, and tools for digitization projects;
4. Communication in the digital age
5. Preservation in the digital age
 - 5.1 Access rights, licensing, public domain, and orphan works in digitization projects
6. Case studies

We conceptually conceived the course referring both to the DCC Curation Lifecycle Model, the reference model developed by the Digital Curation Centre which provides an overview of the lifecycle stages required for successful digital curation (Higgins, 2008), and to the lesson learned from the digitization projects of the University of Turin.

Goal of the first two sections of the course is to root the figure of digital curator in the cultural heritage memory, by linking historically memory traditions and digital innovations. As a matter of fact educating information professionals and students of cultural heritage to work in digital curation requires a broad vision in cultural heritage beyond the silos of libraries, archives and museums towards the convergence of the subject-disciplines and of a wide variety of data in both physical and virtual forms.

In this context it is extremely important that “[information professionals] and students of cultural heritage informatics (who include digital curators) learn to respect both the physical and the digital, to manage, value and preserve a wide variety of formats, to identify connections, to evaluate and

¹⁷ <http://www.bls.gov/ooh/>

select systems that suit the needs of their institution best, to appreciate and create relationships among materials, and to imagine and implement the merging of contexts and the provision of access.”¹⁸

The third section of the course is devoted to teaching metadata sets, application profiles, standards and tools necessary to support the development of the digital libraries: basically DC, TEI, MAG, METS, and XML, the repositories and the interoperability concept. This section is aligned both with the action “Description and representation information” and with the action “Community watch and participation” of the DCC Curation Lifecycle Model.

The fourth section deals with the topics of the peculiarity of communication issues in the web and in the group work. This section aligns more specifically with the action “Community watch and participation” of the DCC Curation Lifecycle Model.

The fifth section tackles with two main issues in digital curation:

- a. the intellectual property rights in the digital age: licensing, access rights, the issues of the public domain and of the orphan works, their impact on digitization projects;
- b. the tools, standards, and services in digital preservation particularly referring to the repository scenario (i.e. the OAIS reference model).

We decided to give a very soft technical approach to the theme of digital preservation in our course. Our main goal was to raise awareness on the challenges of digital preservation, both at national¹⁹ and at international level, among information professionals and to stress the importance of a high level of cooperation in developing digital preservation strategies.

Previous studies have shown that it is extremely difficult to train professionals on digital preservation as levels of knowledge among participants may differ enormously. Courses and events on digital preservation should therefore distinguish between information needed for librarians, archivists and managers and that required by IT professionals and developers (Casarosa, Molloy and Snow, 2011);

In whole section five refers to the action “Preservation planning” of the DCC Curation Lifecycle Model. As a matter of fact both the technical preservation issues and the metadata

rights – mainly licensing and access rights - play a relevant part in the digital preservation workflow.²⁰

Finally, the sixth section is mainly devoted to describe case studies, best practices, and territorial experiences in digital libraries, namely: Museo Torino, DigitUnito, and the BEIC Digital Library.

As internship is essential in providing both students and professionals with up-to-date and relevant digital curation knowledge and skills the course programme includes two laboratories and five internships. The first laboratory will be carried out on the scanning tools of the DigiLib LT Project, one of the digitization projects of the University of Turin,²¹ to teach the course students the digitization production workflow;

The second laboratory will be performed by using software for the image definition and for the optical character recognition and, finally, the Omeka platform.

The goal of this laboratory is to allow professionals and students to move in a seamless way in a digital interoperable environment between digital postproduction workflow and metadata description of digital objects of different origin and forms.

The five internships will be hosted in university and non-university libraries and at the State Archive of Turin and supervised by IT professionals, academic librarians, and archivists.

The University of Turin learning moodle platform will be used to upload slides and presentations and to create a dynamic learning experience with the course participants.

The course will be active from the academic year 2014-2015.

VI. CONCLUSIONS

The characteristics of the digital curator course of the University of Turin, as it is clear from the title of this paper, need consciously to be located between continuity and change. We believe that skills related to the information technology issues are not sufficient by themselves to educate professionals aware of the complexity of the information content associated with the entities which are the object of digitization. As a matter of fact information content should absolutely be preserved during the complex transition to digital.

For these reasons the course, in its introduction, examines the history and concepts of 'document' and 'collection', and shows, synthetically in relation to those topics, some aspects

¹⁸ Harvey, Bastian, 2011

¹⁹ In Italy it is worth citing the experience of “Magazzini Digitali”, a project run by the Biblioteca Nazionale Centrale di Firenze, linked to the digital legal deposit. URL: <http://www.depositolegale.it/>

²⁰ On the importance of the metadata rights in the digitization projects see: i2010 European Digital Libraries Initiative. High Level Expert Group, Copyright Subgroup, 2008 .

²¹ <http://www.digiliblt.unipmn.it/>

of the different disciplinary traditions. The understanding of the complex nature of the relationships that connect documents to the context to which they belong is therefore to be considered an essential condition so that students can realize the deep meaning of working in a digital environment: i.e. not only the ability to reproduce objects but, even more important, to build contexts that ensure the possibility to recognize the multiple perspectives of interpretation which may be associated with the digital object in itself.

The authors therefore believe that the professional figure of the digital curator should add to the skills needed to navigate the digital ecosystems the ability to embed these skills in more complex cultural ecosystems, which regulate and define the mechanisms of production and communication of the cultural heritage.

Therefore according to our point of view and to the course curriculum, the professional digital curator must be characterized by possessing, calling and actualizing Blaise Pascal significant doses of *esprit de finesse*, as well as of *esprit numérique*.

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Mainstreaming Digital Curation

An overview of activity in the UK archives and records management profession

Jenny Bunn

Department of Information Studies
University College London
London, UK
j.bunn@ucl.ac.uk

Sarah Higgins

Department of Information Studies
Aberystwyth University
Aberystwyth, Wales
sjh@aber.ac.uk

Abstract— This paper seeks to describe recent moves to address the need for digital curation training from within the UK archives and records management profession. It outlines how such training has been included within established archival education programmes, at Aberystwyth University and University College London, as well as discussing moves by the recognised professional body, the Archives and Records Association, to address the issue of providing digital curation training to existing professionals, as part of their continuing professional development (CPD).

Keywords—Archives and records management education, continuing professional development, digital curation.

I. ENTERING THE UK ARCHIVES AND RECORDS MANAGEMENT PROFESSION

Currently in the UK the main route into the archives and records management profession is the completion of a qualification accredited by the UK and Ireland's professional body, the Archives and Records Association (ARA). Such qualifications predominately require the completion of a postgraduate university course, although the Society of Archivists (one of the three predecessor bodies to the Archives and Records Association) did run its own distance learning Diploma course from 1980-2001. Accredited courses in the UK and Ireland are currently run by Aberystwyth University, University College Dublin, University College London, University of Dundee, University of Glasgow, University of Liverpool and the University of Northumbria at Newcastle. This paper initially focuses on digital curation training at two of the universities at which ARA accredited courses currently run; University College London and Aberystwyth University.

University College London (UCL) was one of the first UK universities to offer an academic qualification in archival studies, with a course being established in 1947. The current programme is known as the Cert/Dip/MA in Archives and Records Management (the Certificate is not accredited by ARA) and is based within the Department of Information Studies, which also

runs programmes in librarianship, publishing and digital humanities.

Aberystwyth University's predecessor body (University of Wales, Aberystwyth) established its Archive Administration programme in conjunction with the National Library of Wales in 1957. Since 1997 a separate degree in Records Management has been offered to enable students to specialise in the more business orientated aspect of the profession [1]. Distance learning provision for Records Management started in 1999 followed by Archive Administration in 2002. Currently three courses embrace the archives and records management disciplines and are based in the Department of Information Studies: Cert/Dip/MSc Econ in Archive Administration; Cert/Dip/MSc Econ in International Archives, Records and Information Management and Cert/Dip/MSc Econ in Information Governance and Assurance. (The Certificates and the Dip/MSc Econ in Information Governance and Assurance are not accredited by ARA). The latter two can only be taken through distance learning, while the first can be undertaken either full-time on campus or through distance learning. The department also offers courses in information management and library studies.

II. UNIVERSITY COLLEGE LONDON

The archives and records management programme at UCL constantly seeks to keep up to date with emerging practice in the field, and so by 2010, the question of dealing with records in digital form pervaded much of the existing teaching. This very interweaving of the digital in all aspects of the programme meant however, that it became almost invisible and it was decided that it needed to be brought more to the fore. And so, in 2010, as part of a major review, attempts were made to stress that the programme was, as it was phrased at the time, 'digitally aware'. In addition, internal funding was gained to undertake a pilot project to experiment with what it would mean to offer more distinct digital content, and in particular to investigate how to provide students with the opportunity to gain familiarity with

some of the many software tools available for use in the area. This was felt to be important, because the need for active experimentation seemed to be stressed both within practice, and also within educational circles. For example, Simon Wilson writing of his experience with the AIMS (Born Digital Collections – An Inter-Institutional Model for Stewardship) project which has allowed Hull University to move towards dealing with its digital archival records has written that ‘The biggest recommendation I can make is to start having a play with the software’ [2]. Then again, Patricia Galloway, reflecting on her over ten years’ experience with running a course in digital archiving at the University of Texas argues that ‘digital archiving education needs to remain exploratory and experimental, certainly at the graduate level’ [3].

This pilot project was entitled DiSARM: Digital Scenarios in Archives and Records Management and took place during the 2011-12 academic year. The project involved the development of a number of exercises and scenarios, the most ambitious of which, the Digital Accessioning Scenario, which was taught as part of the existing module on Archival Description, required students to work in groups to develop both a donor interview template and a workflow for accessioning born digital material. It also required them to investigate and evaluate a number of different tools, such as DROID, FTK Imager Lite and Karen’s Directory Printer, for undertaking parts of that workflow. Although generally successful (evaluation showed that 94% of students believed that their understanding of conceptual models and theories relating to digital archives had improved to some degree), the project did highlight some of the challenges with teaching digital curation.

For example, it became clear that the prevailing technical infrastructure within the university was unsuited to teaching the active rather than passive use of software. Given that the downloading and installation of the software in question was seen as a part of the process of learning required in this instance, the model of the computer cluster providing access to preloaded software was inadequate and the students were for the most part working on their own machines. This in turn raised a question over whether it was fair to expect students to experiment with software which might have unexpected effects upon a personal computer. It also made it practically impossible to ensure consistency since the exercises could not be completed on the level playing field of a single operating environment. Then again, it also became clear that there was considerable variation in students’ background technological competencies and that there was a need to provide an optional introductory session or preliminary reading materials to cover some basic principles of Information Technology in preparation for later teaching and learning focusing on digital curation. Finally, from a pedagogical

standpoint, it became apparent that there was a slight mismatch between the idea that the programme was designed to teach best practice in the field of archives and records management and the fact that best practice in the area of digital curation is still only beginning to emerge.

The challenges identified cannot be solved all at once, but with respect to the last, it is hoped that this will be dealt with by the development of a separate digital curation module during the academic year 2012-13 for delivery from September 2013. For, by placing digital curation within its own module it will have a space of its own to develop in, whilst still being a part of and feeding into broader archival practice. Recognising though that digital curation is not simply of interest to those in the archival profession, it is intended that this new module will not be developed solely by those who have an archives background, but rather in conjunction with colleagues across the Department of Information Studies and beyond; bringing together individuals from across the university who are wrestling with digital curation challenges on a day to day basis, such as Research Computing, Library Services and the Records Office. Moreover, it is also being developed with an eye to seeing digital curation as an international practice. A memorandum of agreement has recently been signed between UCL, Simmons College, Boston and Mid-Sweden University, which will involve, amongst other things, UCL taking a more active role in the Digital Curriculum Laboratory initially developed by the other two partners [4]. The DCL allows the partners to share amongst themselves a set of exercises and scenarios for use in teaching digital curation. The planning process for the new module is proving exciting, but it is not yet possible to give very full details. Work will be continuing over the Summer and use is already being made of both the Matrix of Digital Curation Knowledge and Competencies and the DigCurV Evaluation Framework [5, 6].

III. ABERYSTWYTH UNIVERSITY

Aberystwyth University’s Archive Administration programme has always focused on teaching both specialist historical skills and up-to-date professional skills. As early as 1974 the application of databases to the intellectual control of modern records was an integral part of the course. From the mid-1980s teaching considered the interface between archives, records and computer technology, particularly for managing modern records, indexing and the creation of metadata [1]. Modules that specifically addressed electronic records and electronic cataloguing were introduced from the late 1990s initially with supporting training in ICT.

The Records Management programme was first introduced in 1997 to cater for students who wanted to specialise in the management of more modern information. From the outset the

course included modules in electronic records, information systems and systems analysis.

Like UCL, the ubiquitous nature of digital material means strategies for their effective management and access has become interwoven into the full-time Archive Administration course. The policies, systems and activities required to maintain archival principles and preserve the fundamental characteristics of a record are taught “format neutral”. Students are given opportunities to consider the specialist preservation needs of different carrier formats: paper, vellum, photographs, audio materials and digital materials, while gaining an understanding of how to maintain access to them through service delivery, audience development and the effective use of metadata. Earlier stark distinctions between digital and non-digital cataloguing methodologies and records format have been erased with students taught the wider principles of information governance in a digital age.

The course is designed to support experiential learning as described by Kolb’s learning cycle [7]. Theoretical principles, taught in practicals, seminars and lectures, enable reflection on mandatory pre-course experience. Abstract conceptualisation is facilitated by summative assessments, and professional visits, which consider theoretical principles and their implementation in practice.

Throughout the second semester full-time Archive Administration students are engaged in active experimentation through an extended group practical project. Students are embedded in a professional environment while they design the methodologies required, before proceeding to process and prepare a collection for public access. Projects offered embrace a range of archival materials, with those that involve digitisation of analogue formats to enable access, or preparing born-digital materials for ingest into management systems, particularly popular options. Students are assessed on their project management, team skills, personal effort, presentation skills and professional skills. The latter include: the application of archival theory, creation of appropriate metadata and use of appropriate software tools. A variety of relevant software is made available in an open access computer lab with training undertaken early in the project to enable students to experiment and practice. These include open source and proprietary digital asset management software, metadata creation tools, database tools and XML editors. Specific tools for digital ingest procedures e.g. DROID, are usually specified and made available by project hosts. The assessment significantly includes the group’s ability to recognise and undertake preservation action relevant to the condition and format of the material, and make recommendations for future preservation needs.

Distance-learning Archive Administration students have also been learning in a “format neutral” environment with readings and examples relating to the care of all types of archival material embedded in their learning materials. Their practical project is undertaken individually, usually based in their employing organisation. This being the case the choice of projects is limited by their organisation’s collection strategy and processing priorities, meaning that hands-on experience with digital materials may not be possible. To address this distance-learning Archive Administration students have been offered optional modules (which were already offered to Information and Library Studies students), in Digital Information Management and Digital Preservation, since 2011. From 2013-2014 academic year this more explicit digital curation education will be offered as an option to full-time Archive Administration students, to enable them to study the subject in more depth.

In response to demand from overseas students, the distance-learning International Archives, Records and Information Management degree was launched in 2011. This course offers a selection of pathways, and has a greater degree of optionality than the more UK biased Archive Administration degree. This flexibility enables interested distance-learning students to specialise more decisively in digital curation. Digital Risk and Asset Management constitutes a core subject and a number of optional modules such as Digital Information Management, Digital Preservation, Information Systems and Information Assurance can be combined to gain in-depth curation knowledge.

Meanwhile, the Records Management programme at Aberystwyth University, which has always been firmly grounded in business processes, has been completely redesigned and rewritten to keep abreast of emerging practice. Re-launched in 2012 as Information Governance and Assurance, the course focuses almost entirely on record-keeping in a digital environment. Students study asset management, risk, compliance, preservation, law and ethics for a digital records environment. Information assurance is taught under licence from the University of Washington Centre for Information Assurance and Cyber Security.

An observed barrier to effective understanding of the digital curation education included in the courses is the ICT proficiency of the students undertaking them. ICT as a discrete assessable subject was dropped from Aberystwyth University’s archives and records management courses in 2002-2003, as students joined the courses with a sufficient degree of competency. Like UCL, recent discussions have considered the possible re-introduction of an ICT “concepts” course, possibly as mandatory prior reading. Although students undertaking the courses are able to use popular software tools, their understanding of a number of basic concepts for digital curation such as: the differences between

vector, raster and structured data; or the use of mark-up standards and namespaces limits their understanding and progress.

Aberystwyth University's Department of Information Studies is constantly revising the programmes offered to equip students for professional practice, ensuring that the relevant knowledge and skills are acquired. The need for graduates from archives and records management programmes to enter the workplace "digital ready", able to manage digital material from the outset, is increasing. Programme changes are responding to this, and from academic year 2013-2014 a dedicated MSc in Digital Curation will be offered alongside current schemes. Existing module provision is being revised to ensure an in-depth understanding of the curation lifecycle and complementary digital literacy; while new modules which address knowledge and information architecture and information management systems have been developed. Synergies with the Computer Science Department are being explored to extend the optional module choices to students. A digital ingest and digital forensics laboratory is being established. The design and development of this course was informed by: the DCC Curation Lifecycle Model, the Matrix of Digital Curation Knowledge and Competencies and the DigCurV Evaluation Framework [5, 6, 8]. It is hoped that the degree will appeal to students with a higher degree of digital competency than those undertaking the current courses offered.

Meanwhile, an awareness that practicing professionals sometimes need to improve their skills in selected areas means that digital preservation will shortly be added to the short assessed CPD courses offered by the department.

IV. CONTINUING PROFESSIONAL DEVELOPMENT

The authors, whilst teaching individually at the universities discussed above, also work together on the Committee of the Archives and Records Association's Section for Archives and Technology (ARA SAT). This section (previously the Data Standards Group) was recently renamed to reflect its growing concern with issues of interoperability, digitisation and digital curation.

In 2009-2010 ARA SAT collaborated with the Digital Preservation Coalition (DPC), the UK National Archives (TNA) and Museums, Archives and Libraries Wales (CyMAL) to present a series of nationwide digital preservation road-shows which raised awareness of tools and techniques. The ARA now wishes to build on the success of these, with the help of ARA SAT, to develop a rolling programme of digital curation CPD, as part of a portfolio of topics identified in consultation with members. The level at which to pitch such training, and the practicalities of providing it were investigated through a

membership survey and open roundtable discussion, as outlined below.

The ARA SAT committee developed a small survey, for the ARA Conference 2012 (Brighton), to explore: the extent to which ARA members were already dealing with born digital material; their awareness of existing tools and resources for digital preservation; and their level of confidence with respect to their ability to meet the challenges presented by such material. This was intended to give an in-depth snapshot of the state of play on which to build further training.

Due to the small number of responses (62), the results of the survey should not be taken as conclusive or, necessarily, representative of all ARA members, but they begin to fill out a picture of a profession just starting to incorporate born digital material into their day to day working practices, but also one secure in the belief that ensuring the long-term preservation of such material is very much their business. For example:

- Most practitioners are reasonably confident that the digital material they hold will be accessible in 10 years' time;
- There are decidedly mixed levels of awareness with regards to projects, models, organisations and tools within the field, e.g. whereas 43.4% (23 out of 53) have heard of the OAIS (Open Archival Information System) Reference Model, only 11.3% (6 out of 53) have heard of ISO 16363 (Audit and Certification of Trustworthy Digital Repositories);
- Even when awareness of a specific tool is high, use of that tool as a normal part of preservation workflow is low, e.g. Only 30.2% (16 out of 53) had no idea what DROID (Digital Record Object Identification) was, but of the other 69.8% who had heard of it, only 11.3% (6 out of 53) were using it as a part of their work;
- Only 30.2% (16 out of 53) described themselves as being currently active in the preservation of born digital material;
- Just under half (25 out of 53) would not consider applying for a post advertised with the job title 'Digital Archivist'. From the comments it became clear that, although some did not wish to lay claim to the title 'Digital Archivist' because 'I don't have the technical knowledge to warrant such a description', others took against the title because they did not wish to recognise such a format distinction, e.g. 'I am an archivist that deals with all material regardless of format.'

Following on from the survey, ARA SAT convened an open roundtable discussion on digital curation training at the British Library in November 2012. The 40 participants included stakeholders from ARA, DPC (a membership organisation to which ARA subscribes), TNA and JISC. The discussion proved to be wide ranging: it explored synergies between the different

stakeholder organisations to help establish possible joint working to reduce duplication of effort; examined possible models for training; and identified other areas of activity which could support the development of digital curation knowledge and implementation amongst archivists and records managers.

ARA SAT is a voluntary body with members undertaking work in their free time, or through limited release from their other professional duties. In addition little funding is available to develop CPD training, and there was an acknowledgement that doing so may just be “re-inventing the wheel”. Rather than undertaking the development of ARA specific training, ARA SAT identified their role as facilitators in ensuring that the ARA membership was able to access existing information and training provision to manage their own learning. To this end activities which ARA SAT is considering as a result of the roundtable include; a series of monthly articles in the ARA newsletter ARC to raise awareness, active participation in the forthcoming 2013 Day of Digital Archives [9], and the re-development of the ARA SAT pages on the ARA web-site. This re-development will not seek to duplicate information provided by other organisations (e.g. DPC, Digital Curation Exchange and Digital Curation Centre) but rather to point to it; providing ARA members with a gateway in their own space which structures this information in the way that makes best sense to them.

At the roundtable, the discussion of digital curation training followed a short presentation from Caroline Williams who outlined her recent work in developing a framework of competencies for ARA [10]. Aligning the framework with the skills acquisition educational theories of Bloom and Drefus, Williams identifies 5 levels of professional proficiency, rather than the three identified in area 2 of the DigCurV Evaluation Framework (Practical, Managerial, Executive) [6, 11, 12]. She also identifies 3 areas of competency, 10 functions and 38 individual competencies. One of these competencies deals explicitly with ‘digital curation: preserving born-digital and digitised records and archives’. This work was represented at the roundtable because ARA SAT takes the view that, although it is helpful (and currently necessary) to seek to define digital curation in terms of a body of knowledge and competencies, it is also important to define it in terms of wider professional frameworks. For, if we are to help archivists and records managers develop in digital curation, it is not enough to define a fixed set of knowledge and skills that they must acquire, but rather they must be able to see a dynamic progression of development for themselves within this area.

The dynamic progression suggested by the ARA framework of competencies is as follows, with 1 being the basic level of competence and 5 the most advanced:

1. “Can describe and apply rules relating to safe preservation of born-digital and/or digitised records and/or archives as appropriate to own workplace, appreciating the differences where these apply;
2. Understand and applies principles and processes of digital curation and preservation both in relation to born-digital documents created within the organisation/service/unit and to records/archives that have been digitised (perhaps as part of a digitisation project), and the systems that support them, the addition of metadata etc;
3. Competent and confident in assisting in the development of preservation policies and processes that impact upon born digital records and/or those generated as part of an archival digitisation project and in training others in their use;
4. Regularly ensures and evaluates the development and delivery of policies and processes relating to the preservation of born-digital and digitised records, ensuring that appropriate training is in place, and measuring outcomes and impact;
5. Responsible for ensuring the long-term survival of all digital records, whether born digital or as part of an archive digitisation project in line with organisational goals, within budget” [10].

That the question of progression was of relevance was evidenced by the fact that much of the discussion at the roundtable centered on the idea that there was a need to take archivists and records managers ‘to the next level’ with regards to digital curation. What this meant remained ill defined, but it was sometimes expressed in terms of a movement from being ‘digital aware’ to being ‘digital ready’. It also seemed to be associated with the provision of more ‘hands-on’ training, whereby digital curation could be experienced in practice and not just in words, models and ideas. As a next step, it would be worthwhile to investigate whether/how this perceived ‘next level’ maps onto the levels suggested by the ARA framework and to expand our thinking about the development of digital curation in this sense of continuing professional development. Certainly this is something ARA SAT are starting to do and a model which describes a ‘hands-on’ development approach, drawn from discussions at the roundtable is outlined below (Table 1).

TABLE 1: DEVELOPING IN DIGITAL CURATION

Indicative competency level	Skill	Learning acquisition
Level 1	Awareness of digital preservation and IT skills to understand the challenges	Awareness of the challenges of digital preservation and acquisition of the appropriate IT skills and data management concepts required to understand the technical component of digital preservation

Level 2	Using digital preservation tools	Experiential knowledge of the functionality of appropriate digital preservation standards and tools and how these can be applied in practice.
Level 3	Working with IT development professionals	Knowledge of the IT profession and how to establish an effective dialogue to ensure appropriate digital preservation solutions, using the appropriate tools, standards and policies, can be established.
Level 4	Solving technical digital preservation problems	Working with other relevant professionals to establish effective solutions to technical problems relating to ingest, storage or access of digital materials.
Level 5	Business planning for digital preservation	Enabling effective planning for digital continuity at an organisational level through the preparation and implementation of policies and procedures.

When comparing the above emerging thinking from ARA SAT with the ARA competencies outlined earlier, two differences present themselves, which would seem to be related both with each other and the issue of technical competency. For, whereas the ARA competencies speak more in terms of policies and processes, the thinking above includes discussion of experiential knowledge of tools. Moreover, with this increased emphasis on tools (and hence technology), the thinking above also looks explicitly outwards to the IT and other relevant professions, whereas the ARA competency for digital curation does not. Is it this then that lies at the heart of the distinction between ‘digital aware’ and ‘digital ready’? Certainly it is part of it, but equally it would seem too simplistic to see it solely in terms of whether or not someone has a technical skill set. Negotiating the nature of this boundary will therefore be an ongoing process for all those involved in the archive and records management profession for many years to come.

V. CONCLUSION

As this paper shows steps are being taken by those embodying the infrastructure of the archives and records management profession in the UK (the educators of new entrants and the professional body) to address the need for digital curation training for the profession. The way in which those involved span the boundary between the provision of entry-level education and continuing professional development makes it possible to see a distinction between developing digital curation, as a subject, as a body of knowledge and competencies required by those who wish to do digital curation; and developing in digital curation, as a framework within which those working in fields such as archives and records management can see themselves progressing. It is only by addressing development in both these

senses that we can ever hope to achieve the mainstreaming of digital curation.

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Bridging By Design: The Curation and Management of Digital Assets Specialization at the University of Maryland

Katie Shilton, Bruce Ambacher, Michael Kurtz,

Erik Mitchell, Ann Weeks

College of Information Studies,
University of Maryland College Park
College Park, MD, USA

ksilton@umd.edu, bambache@umd.edu, mkurtz1@umd.edu,
erik@umd.edu, acweeks@umd.edu

Douglas W. Oard

College of Information Studies and UMIACS
University of Maryland College Park, College Park, MD, USA

oard@umd.edu

Abstract—The Curation and Management of Digital Assets specialization in the College of Information Studies at the University of Maryland focuses on instruction in the creation, management and use, long-term preservation, and access to digital assets in a variety of disciplines and sectors of the economy. This paper describes the development of this new specialization, which will include students from two degree programs: a Master’s in Library & Information Science, and a Master’s in Information Management. The paper discusses interdisciplinary opportunities for the program, including a demonstrated cross-sector need among employers in the region, as well as the opportunity to strengthen the college’s interdisciplinary mission. It also discusses challenges presented by the program, including developing curriculum to train students with diverse work backgrounds and technical expertise, and bridging divergent expertise and skill sets among the faculty and professionals who will teach in the program.

Keywords—Digital curation, curriculum development.

I. INTRODUCTION

Digital information is at the heart of our society’s ability to learn, conduct business, and manage scientific, technological, industrial, and information infrastructure. Technical, societal, and conceptual challenges confront the effective curation and management of digital assets in the public, private, and not-for-profit sectors nationally and internationally. The field of digital assets curation and management is a relatively new and rapidly evolving area for research and practice. The rapid growth of electronic information and the need to actively manage this information is recognized in diverse communities [1]–[3].

The Curation and Management of Digital Assets (CMDA) specialization in the College of Information Studies at the University of Maryland (the UMD iSchool) has been designed to focus on the creation, management and use, long-term

preservation, and current and future access to digital assets in a variety of disciplines and sectors of the economy. While many Information School (iSchool) and Library and Information Science (LIS) programs focus on curation of science and research data [4], our program has adopted a broader scope. Because of our location, student needs, and faculty expertise, we are developing a curriculum to highlight data curation throughout the information professions, ranging from cultural heritage data, to sensitive personal data in the healthcare, advertising, and security industries, to the “big data” cultivated by scientists and other researchers. To accomplish this range of instruction, we are taking a multidisciplinary approach that bridges two master’s degree programs: the Master’s in Information Management (MIM), with a focus on strategic deployment of information technology; and the Master’s in Library Science (MLS), with a focus on professional information services.

II. OPPORTUNITIES: DEFINING THE NEED

The human capital needed to manage digital information is currently outstripped by the amount of digital information being created. It is estimated that by 2018, the United States will have a shortage of 140,000-190,000 people with the analytical and technical skills needed to manage large holdings of digital assets [5]. Moreover, it is estimated that as many as 1.5 million managers and analysts will need to have the knowledge to use managed digital assets in strategic decision-making [5]. Digital curation skills are necessarily multidisciplinary in nature, and these skills are a pressing need in public, academic and corporate environments [6].

In the Washington, D.C.-Baltimore metropolitan region, the need for professionals to curate and manage digital assets is acute. Major corporations, international organizations,

universities, a diverse ecosystem of not-for-profit entities and advocacy groups, and an exceptional range of cultural institutions, all have a need for skilled professionals in the digital assets arena. The region's employers also include federal, state, and local agencies dealing with e-government challenges, and military and intelligence agencies that require scalable, responsive and secure management of digital assets. Similar needs exist among the broad and diverse range of research institutions in our community, which develop and use particularly complex forms of digital information. These activities include advanced medical imaging research at the National Institutes of Health, the National Institute of Standards and Technology's long-term commitment to material science, extensive environmental data assembled by the Environmental Protection Agency, the National Oceanic and Atmospheric Administration's vital meteorological data, and geospatial, satellite and remote sensing data collected by a range of federal agencies. Add to this one of the largest concentrations of major research universities in the nation, and the market demand for these skills becomes clear.

As an example that is particularly salient for the UMD iSchool student body (about three-fifths of whom are studying for an ALA-accredited degree), on the most recent American Library Association (ALA) Jobsite, 20% of 267 position announcements were either specifically seeking digital resource managers/archivists, or listed the expectation that successful candidates would have knowledge, skills, and abilities in managing, preserving, curating, and cataloging digital resources.

The potential student population for this proposed specialization is substantial. The UMD iSchool currently enrolls about 500 students across four highly selective graduate programs. Our students have embraced the idea of specializations, which allow them to focus their educational experience on a rich and important aspect of their studies. As an example, an existing specialization in Archives and Records Management was able to accept only about one-third of the 125 applicants for its Fall 2012 class. Offering the CMDA will expand the popular specialization option.

There are currently few programs of this type in the Washington-Baltimore region. Though several US information schools have begun digital curation programs, none are in this geographic area [4]. It is also important to note that although neighboring business schools and technology programs do include a focus on data analysis, they tend not to emphasize digital curation, management, and preservation.

III. MEETING THE NEED

The UMD iSchool plans to meet this multi-sector need for data curation training and research by creating an integrated

specialization that will serve two distinct student groups: those pursuing an MLS (Master of Library Science) degree, and those pursuing an MIM (Master of Information Management) degree. In addition, the coursework developed for the CDMA specialization can support students in our doctoral program who are interested in pursuing research in this dynamic area.

In recent years, the UMD iSchool has responded to increasing interest in information technology education by adding a new master's degree program focused on human-computer interaction. Adding new degree programs allows us to serve new markets, but new degree programs alone would not fully realize the potential of an iSchool for integrating across different types of knowledge and different ways of knowing. That's one reason why we elected to create a multiple-program specialization for digital curation rather than rolling out a new degree program.

The evolution of library schools into iSchools, of which UMD's transition to an iSchool is an example, has provided an opportunity to embrace the kinds of knowledge required for the management and curation of digital assets. The UMD iSchool focuses on the intersection of people, technologies, and social context. The school retains a deep focus on LIS education, and includes existing specializations in Archives and Records Management, E-Government, School Libraries, and Information and Diverse Populations. Principles and skills taught in these programs, such as appraisal, preservation, and information policy, provide a rich foundation for the new CDMA specialization. One notable characteristic of the evolution of LIS programs into iSchools has been an increased integration of information technology in many aspects of our work [7]. Our growth as an iSchool has introduced new faculty and new infrastructure that the CDMA specialization will be able to draw upon. This will facilitate instruction in skills such as database design, migration and emulation, information retrieval, and web-scale information processing.

CMDA will be the first "joint" specialization in the UMD iSchool, designed to meet the needs of students in more than one of our masters programs. This responds to the expressed interests of MLS and MIM students in opportunities to draw on skills and perspectives well developed in the other program. A cross-program focus gives us the opportunity to accomplish this skill sharing by creating an interdisciplinary learning community patterned after the design of iSchools themselves.

Students from both degree programs will take classes together and share their skills. While this will create some challenges—students in these programs often come from different undergraduate and professional backgrounds and have diverse interests—it will also create unique synergies. Information professionals of all stripes must learn the

interdisciplinary skills required to work in a 21st century information economy. This requires professionals trained in traditional information practices such as reference or preservation to work alongside professionals with strong technical backgrounds. Helping students embrace interdisciplinarity requires building the necessary trust relationships to work side-by-side with those who bring different experience and expertise. Students graduating from the digital curation specialization will have the academic, technical, and practical and experiential skills to work in diverse organizational settings in the business and commercial sectors, cultural organizations, the digital arts and humanities, and scientific research and development.

The specialization will enable students to develop a range of practical and analytical skills to provide the technical and management leadership for born-digital and digitized assets as defined by research in the broader digital curation community. Our program follows core competencies such as those developed by the ongoing DigCur research project [8] and throughout the digital curation literature [6]. Students will master core competencies in managing the digital assets life cycle in the classroom, and will demonstrate this mastery in hands-on, real-world internship opportunities. Upon successfully completing the Curation and Management of Digital Assets specialization a student will be able to:

- Manage digital assets over the life cycle from pre-creation activities (systems design, file formats, and data creation standards) through the capture of contextual information for assets in long-term repositories.
- Understand the issues and challenges involved in managing digital assets in diverse professional environments (e.g., business, science, the arts and humanities, libraries, archives, and museums).
- Identify and apply best practices and strategies for long-term preservation and access to digital assets.
- Understand linkages between analog and digital assets and how to effectively manage diverse holdings and collections.
- Conduct and apply research affecting the on-going evolution in managing digital assets.
- Demonstrate awareness of the social contexts involved in managing digital assets and the needs and roles of various stakeholders.
- Demonstrate an understanding of the intersection of legal, ethical, policy, and political sensitivities in managing digital assets.
- Apply academic principles and theories in a practical work setting involving the management of digital (and digitalized) assets in the public, commercial, or not-for-profit sector.

A. Curriculum

The Curation and Management of Digital Assets specialization will consist of three courses that are required of all students (described below), plus two additional curation-focused electives. Students will take these classes in addition to the core and elective courses for their MLS or MIM degree program.

Principles of Digital Curation is the introductory course for the specialization, focusing on teaching the values, principles, and approaches underlying the profession [6], [8]. This course explores the principles, theories, and standards involved in designing and implementing programs for the long-term management of digital assets, both born-digital and digitized assets. Digital assets management decision-making is analyzed by evaluating the technical, practical, economic, legal, social and political factors that provide the framework for the retention, use, and preservation of digital assets. Case studies are presented in classes that explore the analytic prisms through which digital assets management decisions are made.

Implementing Digital Curation focuses on introducing students to the functions and skills necessary for digital curation, as well as the types of resources with which they should be familiar. It will instruct students in the management of, and technology tools for, application of digital curation principles in specific settings. This course will highlight characteristics, representation, conversion, and preservation of digital objects, and instruct in the application of standards for digitization, description, and preservation. Students will gain experience planning for sustainability, risk mitigation and disaster recovery.

Policy Issues in Digital Curation focuses on the organizational, political and cultural contexts in which impact digital curation. The course will explore the intellectual property, privacy, and security issues related to curation and long-term preservation of digital information. Bridging law, social science, computer science, and professional practice, this course will focus on understanding copyright and other forms of intellectual property raised by preservation copies of digital data and records; dealing with complex privacy issues in digital data and records; securing integrity and trust in digital information and content throughout the information lifecycle; and implementing security for digital information in a range of contexts.

After completing the required courses, specialization students will select two elective courses from a range of curation-focused possibilities, including new courses such as personal digital curation and curation in cultural institutions; technology-focused courses such as database design, information retrieval systems, and information architecture; and courses from our archives and records management specialization such as principles of records and information management and electronic records. Integrating

archival principles with data management education will allow students to prepare for diverse disciplinary and multi-sector careers.

B. Instruction

The faculty who will teach in the CMDA specialization draw on a broad range of expertise, including electronic records management, digitization, digital preservation, databases, information retrieval systems, ethics, and privacy. They also bring experience in a broad range of institutional settings in the public, commercial and not-for-profit sectors. They are developing a range of pedagogical activities to build knowledge of information technologies and bridge this expertise with the larger technical, social and policy issues that shape the practice of digital curation. For example, the familiar site Facebook takes on layers of complexity when students are asked to evaluate the medium from the standpoints of professional data managers, preservation professionals, current and future employers, or law enforcement agencies. A design game might ask students to sit in the position of engineers, and make choices between values such as long-term retention, efficiency, and privacy: values choices that data managers must face every day. Projects in each course expand on these experiences by engaging students directly in systems thinking. Like the computational thinking [9], we see systems thinking as applicable across the full range of technical, organizational and social issues that inform digital curation decisions.

The goal of these activities is to foster mastery of 21st century skills such as critical thinking, decision making, and problem solving [10]. To evaluate student learning in these areas, instructors will use a combination of classroom participation, oral presentations, written assignments, and technical assignments.

C. Promoting Multiple Areas of Expertise

One component of the CMDA specialization is the ability for students to double-specialize, gaining expertise in both digital curation and another area of information management or LIS practice. Digital curation is inextricably linked with many other topics, and both MLS and MIM degree programs have additional specializations that CMDA students may wish to pursue. For example, an MLS student might pursue a specialization in E-government, in Archives and Records Management, or in Information and Diverse Populations; a MIM student might pursue a specialization in Strategic Management of Information or in Technology Development and Deployment.

The combination of humanistic, social science, and technology literacy fostered in information programs is a crucial and useful blend. The CMDA specialization is designed to take advantage of this combination. Information professionals with a

multidisciplinary curation background can be influential actors in the emerging data economy. Training professionals who can grapple with both the social and technical impacts of emerging technologies will strengthen our ability to deal with the data deluge.

D. Internship

All students enrolled in the digital curation specialization will be expected to complete a supervised internship (a “field study”) focused on the curation of digital assets. The internship can be completed at any of a wide variety of area businesses, non-profits, government agencies, or cultural heritage institutions. The student will gain hands-on practical experience, acquire skills for their career, and begin to build a network for future employment. The UMD iSchool has a database of approximately 150 institutions that have expressed an ongoing interest in providing field study experiences for students, and we anticipate that our new CMDA specialization will generate interest from additional employers.

E. Research Opportunities

Digital curation is a field ripe for research exploration, with unanswered questions in work processes and practice, technology applications, policy and ethics, and market and political economies. For both master’s and doctoral students interested in pursuing research related to the curation and management of digital assets, there are opportunities available through partnerships with individual faculty and through working with a broad range of research labs and centers. The specialization articulates with, and draws upon, related research interests of our faculty. For example, venues where research on the technical, policy, and implementation challenges of digital curation is being conducted include the Information Policy and Access Center (www.ipac@umd.edu), the Human Computer Interaction Laboratory (<http://hcil.cs.umd.edu>), the Maryland Institute for Technology in the Humanities (<http://mith.umd.edu>), the Center for the Advanced Study of Communities and Information (<http://casci.umd.edu>), and the Computational Linguistics and Information Processing Lab (<http://wiki.umiacs.umd.edu/clip/>). Faculty projects include preservation of online games, data curation by online communities, participatory data management in health and science, ethical challenges in personal information management, and experiential reconstruction of the Apollo missions from archival sources.

IV. CHALLENGES

The Creation and Management of Digital Assets specialization will begin in the fall of 2013. Although we are excited to launch the specialization, we anticipate some challenges as well. One major challenge will be the diversity of

student preparation for the societal, organizational and technical aspects of the program. For example, some students interested in the CMDA specialization might arrive with strong academic preparation, but little work experience. Others might have extensive organizational and management experience, but little hands-on familiarity with advanced information technologies. Still others may have extensive knowledge of information systems, but less understanding of the organizational and social factors that shape, and are shaped by, their work. It is a challenge to address all of these types of knowledge gaps at one time and in one classroom.

Realizing the full potential of our program will require that we draw heavily on peer learning. While this diversity of expertise and experience is a pedagogical challenge, it is simultaneously a team-building strength. We envision CMDA students working together in agile teams that foster peer learning, and reorganizing those teams around different challenges as they emerge over the course of a semester.

A second important challenge is integrating the broad and diverse intellectual content that underpins the CDMA specialization. Such integration is complicated by divergent expertise and skill sets among both faculty and professionals who will teach in this program. Meeting this challenge will not be achieved by assigning single faculty members to teach single courses. Instead, we will need to work together, not just in planning the specialization but also as we implement the educational experience for our students. Integration of diverse disciplinary knowledge has always been a challenging task, but this integration, writ large, is the very mission for which iSchools were created. That's not said to minimize the scope of the challenge, but rather to claim that the challenge is worth facing in this way.

These pedagogical and disciplinary challenges highlight the need for ongoing faculty preparation for teaching digital curation. We have taken the first step by assembling a broad team of faculty with diverse expertise and experience, drawn from both academia and professional practice. Attending professional development events such as the DigCurV conference will be an important step as we learn to think broadly together about how best to address these challenges.

V. CONCLUSION

We see the new specialization in Curation and Management of Digital Assets as a natural next step on a path we have been following for many years. Decades ago, education in archives and records management, once the domain of Ph.D. programs in History, professionalized within library schools [11]. More recently, library schools transitioned into iSchools, in part by

adding exactly the kinds of technical expertise that we now need to draw on as digital curation extends its organizational scope and reach. In our new specialization we now take the next logical step in building on this confluence of interest.

As Dennis Gabor (the inventor of holography) observed in 1963, the future cannot be predicted, but futures can be invented. It is the role of a research university to teach at the leading edge of what we know, to teach when there is not yet complete agreement on what should be taught, and to add to what we know as we teach it. For an iSchool, that leading edge has reached to digital curation, and that, therefore, is where we plan to be.

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Session 4 – Developing 21st Century professionals

Infusing Digital Curation Competencies into the SLIS Curriculum

Patricia C. Franks, Ph.D.

School of Library and Information Science
San José State University
San José, CA, USA
patricia.franks@sjsu.edu

Abstract— The unprecedented rate of growth of digital information requires professionals with digital curation skills and knowledge. However, education and training programs are inadequate to meet the demand. An infusion of digital curation competencies into the Library and Information Science curriculum is required to ensure that today’s digital assets are available today and tomorrow. The purpose of this paper is to describe the ways in which Digital Curation Competencies are integrated into the MLIS curriculum at San José State University. Course descriptions are provided for several MLIS courses, and a crosswalk is presented demonstrating the correlation between the MLIS core competencies supported by those courses and the operational and professional core competencies identified as necessary for Digital Curators. One course, *Professional Experiences: Internship*, is offered as an effective way for students to apply their digital curation skills and knowledge in the real world, either by working on site or working remotely.

Keywords—*Digital curation, core competencies, curriculum, internship*

I. INTRODUCTION

“From the days of the early cave dwellers who painted symbols onto stone walls through today when social media-savvy citizens post their own digital messages on Facebook walls, three factors remain constant: human beings are compelled to record their experiences, using the tools and technologies available to them, with the intent to share that information with others” [1] today and in the future.

The act of creating and disseminating information was an enormous challenge to early record keepers, and the privilege and responsibility for doing so was placed in the hands of a select few. Whether chiseled in stone or written on parchment, these records allow us to learn more about the history and culture of ancient civilizations.

The task of preservation was taken seriously, as evidenced by the estimated 20,000 clay tablets stored in the archives of Ebla (modern Tell Mardikh, Syria) dating from approximately 2250 BCE [2] and the hundreds of thousands of papyrus rolls--estimates range from 200,000 to 700,00--stored in the Great Library of Alexandria [3]. Although natural and man-made disasters destroyed many of these ancient records, others have been preserved naturally and discovered accidentally, including the Dead Sea Scrolls written on parchment, dating from approximately 250 B.C. to about 65 A.D., and discovered in caves along the shores of the Dead Sea from 1947 to 1956 [4].

Today’s technology has placed the task of creation and dissemination of information into the hands of many but in doing so has made the task of capturing and preserving information more complex than at any time in our history.

The amount of information created worldwide in digital format surpassed 1.8 zettabytes (1.8 billion terabytes) during 2011. By 2020, the world will generate 50 times that amount. This digital data is generated by “numerous devices in numerous forms: remote sensors, online retail transactions, text documents, e-mail messages, web posts, camera and video images, computers running large-scale simulations, and scientific instruments such as particle accelerators and telescopes” [5].

It is not surprising that there is a rapidly increasing demand for information professionals who can manage the burgeoning data generated by the nation’s researchers, serve as stewards of the nation’s cultural legacy, and meet the needs of businesses and government agencies as they manage their growing volume of digital assets. This relatively new and pressing need has created a rising demand for archivists, librarians, and museum professionals who are trained to apply the latest tools and methods to effectively manage and preserve material that is born digital or converted to digital form.

According to the Occupational Outlook Handbook, 2010-11 Edition, employment of digital curators is expected to increase by 23% between 2008 and 2018, which is much faster than the average for all occupations.

In 2007 digital curation was recognized as a new, umbrella concept that includes digital preservation, data curation, electronic records management, and digital asset management. Digital curators were labeled as the newest type of information professional on the block [6].

However, six years later, the call for contributions on the DigCurV 2013 international conference website describes digital curation as “a central challenge and activity for libraries, archives, museums and other cultural organizations” [7]. In 2012, Abreu, Acker, and Hank, acknowledged that “planning and managing digital collections for current and future access and re-use is [still] a significant challenge in our contemporary information landscape, transcending sub-domains under the umbrella of information science, including the fields of archives, digital preservation and curation, and records management” [8].

These challenges can only be met by educating all users of the need to identify, capture, manage, organize, use and reuse, add value to, and preserve information—i.e., master the core competencies required for each phase of the digital curation lifecycle.

This position does not negate the need for digital curators but insists a dual approach to digital curation education is called for: 1) digital curation education and training programs to train digital curators and 2) an infusion of digital curation competencies into the SLIS curriculum for everyone else. This paper addresses the second approach.

II. DIGITAL CURATION COMPETENCIES

In the US, the Institute of Museums and Library Science has funded the development of digital curation programs in graduate schools since 2006. The funding has supported the development of robust programs (including core curricula, specialized elective courses, and required internships in established digital repositories) in a number of institutions, including the University of Illinois Urbana Champaign, the University of North Carolina at Chapel Hill, and the University of Tennessee [9]. But other universities and institutions, including the School of Library and Information Science at San Jose State University, have not followed this path for a number of reasons.

Qualifications listed for jobs that contain “curator” in the title often vary widely. And job openings that do not contain the term “Curator” in the title often require digital curation skills and knowledge.

The DCC Curation Lifecycle Model [10] includes the following sequential actions: conceptualize; create or receive; appraise and select; ingest; preservation action; store; access, use, and reuse; and transform. It also identifies the following occasional actions: dispose, reappraise, and migrate.

The foundation of the Digital Curation Center (DCC) reflected the belief that long-term stewardship of digital assets is the responsibility of everyone in the digital information value chain [11]. Although the DCC is mainly focused with “data” curation, other types of information objects must be managed throughout their lifecycle.

An analysis of the jobs posted to the Digital Curation Exchange on February 5, 2013, revealed the diversity of the opportunities for digital curators [12]. Of 29 listings posted between January 1, 2013 and February 5, 2013, there were no job titles that used the term “digital curator.” However one listing announced a position for a *Director of Research Data Curation Service*. Examples of job titles include: King County Archivist, Institutional Repository Coordinator, Emerging Technologies Librarian, and Digital Asset Metadata and Taxonomy Specialist.

In addition to developing Centers of Professional Digital Curation Training and Education, such as the Certificate in Digital Curation offered by the School of Information and Library Science at the University of North Carolina, a proactive approach is needed to integrate digital curation knowledge and skills within all library and information science programs of study.

In this digital age, disciplines that once found little common ground, now find their roles converging when it comes to the care and preservation of digital assets. To encompass the widest audience possible, Digital curation can be broadly interpreted as “maintaining and adding value to a trusted body of digital information for current and future use [13].

And when identifying core competencies for SLIS curriculum, the Delphi common definition of digital curation is used:

“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.” [14]

Table 1 describes two required and five elective SJSU SLIS courses and maps them to the phases of the Digital Curation Lifecycle based on an analysis of the most recent syllabus posted for each.

These courses were not designed as part of a digital curation curriculum but as courses either required of all students or elective courses open to all students and strongly recommended for students following either the digital services and management career pathway or the digitization and preservation of cultural heritage and records (archival studies and records management) career pathway.

Yakel, Conway, Hedstrom, and Wallace identify three components of a strong curriculum for digital curation as: 1) coursework, 2) practice-based internships, and 3) a solid technology infrastructure [15.] Tamaro, Casarosa, and Madrid (2012) organized twenty digital curation core competencies identified through a Delphi Study into ten operational competencies and ten managerial competencies that digital curators should possess [16].

The phases of the Digital Curation Lifecycle to which SJSU / SLIS courses have been mapped are:

- 1 – Conceptualize**
- 2 – Create or Receive**
- 3 – Appraise & Select**
- 4 – Ingest**
- 5 - Preservation Action (e.g., migration, emulation)**
- 6 – Store**
- 7 – Access, Use, & Reuse**
- 8 – Transform**
- 9 – Preservation Planning**

The seven courses included in Table I support various phases of the digital curation lifecycle. Both LIBR 202 (3 units of credit) and LIBR 203 (1 unit of credit) are required of all students. The five additional courses are taught as special topics under the LIBR 284 – Seminar in Archives and Records Management course category.

TABLE I. SJSU / SLIS COURSES MAPPED TO PHASES OF THE DIGITAL CURATION LIFECYCLE

Course Designator & Title	Course Description and Link to a Recent Syllabus	Digital Curation Lifecycle Phases (Area 4) (major focus)
LIBR 203 Online Social Networking Technologies and tools (Required: 1 unit of credit)	This course introduces students to a variety of new and emerging technologies used in today's online environment. It covers various social networking platforms, content and learning management tools, web conferencing, and other trends in social computing. Link to syllabus: http://slisapps.sjsu.edu/gss/ajax/showSheet.php?id=4976	2 – Create or Receive 4 – Access, Use & Reuse 6 - Store
LIBR 202 Information Retrieval (Required: 3 units of credit)	Principles of information retrieval and their application to information systems and services. Emphasizing models of user information seeking behavior, human information processing and their relationship to retrieval models in information systems. Link to syllabus: http://slisapps.sjsu.edu/gss/ajax/showSheet.php?id=4970	1 – Conceptualize 2 – Create or Receive 3 – Selection & Appraisal 4 – Access, Use & reuse
LIBR 284 Seminar in Archives & Records Management <i>Topic: Characteristics and Curation of New Digital Media</i>	In this course, we will explore approaches to the collection and curation of selected new digital media in libraries and other cultural repositories. In the first stage of the course, roughly the first four weeks, the focus will be on developing an understanding of the characteristics of new media and refining what we mean by the term "curation." The second stage will make up most of the course, consisting of five two-week engagements with five specific media and issues associated with them. Each of the five media will be paired with a specific issue about the impact of games on curation – selection/appraisal, acquisitions, description/archiving, preservation, and access/exhibition. Link to syllabus: http://slisapps.sjsu.edu/gss/ajax/showSheet.php?id=4938	1 – Conceptualize 2 – Create or Receive 3 – Selection & Appraisal 4 - Ingest 5 – Preservation Action (emulation) 6 - Store 7 - Access, Use, & Reuse 9 – Preservation Planning

<p>LIBR 284 Seminar in Archives & Records Management</p> <p>Topic: Digitization and Digital Preservation</p>	<p>This course will provide an introduction to the digitization of archival, library, and museum materials, as well as an introduction to the digital preservation of the resulting digital objects. Students will learn about using digital technologies to provide better access to and sometimes to preserve text, images, sound, and video. [Please note: the majority of the course will focus on the digitization of text and image because of the nature of this class and equipment requirements.] Particular topics to be explored in depth include: selection for digitization, legal and copyright issues, digitization requirements for text and images, metadata, and technology issues. The course will provide a broad foundation of the principles, processes and standards guiding the digitization of cultural heritage materials.</p> <p>Link to syllabus: http://slisapps.sjsu.edu/gss/ajax/showSheet.php?id=5144</p>	<p>2 – Create & Receive 3 – Appraise & Select 6 - Store 7 – Access & Use 9 – Preservation Planning</p>
<p>LIBR 284 Seminar in Archives and Records Management</p> <p>Topic: EAD</p>	<p>This class will cover in-depth Encoded Archival Description (EAD), and provide a brief introduction to Encoded Archival Context (EAC), the international standards for the presentation of archival descriptive information and records creator authority records on the World Wide Web.</p> <p>Link to syllabus: http://slisapps.sjsu.edu/gss/ajax/showSheet.php?id=5137</p>	<p>2 – Create or Receive (metadata) 7 – Access, Use, & Reuse</p>
<p>LIBR 284 Seminar in Archives and Records Management</p> <p>Topic: Electronic Records Management</p>	<p>This course is an introduction to the management and long-term preservation of unstructured content created or maintained electronically. This course examines the ways in which new information technologies challenge organizations' capacities to define, identify, control, manage, and preserve electronic records. Topics include the nature of electronic records as evidence; reliability and authenticity in electronic records; electronic records management policy formulation; business continuity planning; information security; the role and nature of recordkeeping metadata; strategies, techniques, and technologies for the long-term preservation of electronic records; individual electronic recordkeeping behaviors, as well as industry, national, and international standards relating to electronic recordkeeping.</p> <p>Link to syllabus: http://slisapps.sjsu.edu/gss/ajax/showSheet.php?id=5141</p>	<p>6 – Store 7 – Access, Use, & Reuse 9 – Preservation Planning</p>
<p>LIBR 284 Seminar in Archives and Records Management</p> <p>Topic: Managing Photographic Collections</p>	<p>This class will examine issues involving managing photographic collections in archives. Topics covered will include photographic process identification, visual literacy, arrangement and description, storage/preservation needs, access, reference, digitization, rights and reproductions, curation, and born-digital image archives. <i>Note: This course applies to both analog and digital collections.</i></p> <p>Link to syllabus: http://slisapps.sjsu.edu/gss/ajax/showSheet.php?id=5139</p>	<p>2 – Create or Receive 3 – Appraise & Select 7 – Access, Use, & Reuse 8 – Transform (for website or display space)</p>

Each of the three components, two of the ten operational competencies, and two of the ten managerial competencies are used in Section III to demonstrate how digital curation competencies are integrated into the SLIS program at San Jose State University.

III. COMPONENT #1: CURRICULUM

Fourteen core competencies provide the foundation for the MLIS program offered through the School of Library and Information Science at San Jose State University. These competencies are supplemented by student learning outcomes specific to the various career pathways. Of the twelve career pathways offered to provide guidance in the selection of elective courses, the one selected by students seeking careers related to digital curation is *Management, Digitization, and Preservation of Cultural Heritage and Records (Archival Studies and Records Management)*.

Three of the MLIS core competencies that are of value to students preparing to assume digital curation responsibilities are:

- (D) Apply the fundamental principles of planning, management, marketing, and advocacy
- (F) Demonstrate understanding of basic principles and standards involved in organizing information including classification, cataloging, metadata, or other systems
- (G) Demonstrate proficiency in identifying, using, and evaluating current and emerging information and communication technologies

A. Operational Competencies

Two of the ten operational competencies identified by the Delphi Study are listed in the first column of Table II, along with a letter designating the corresponding MLIS core competency. One example of a SLIS course that supports each competency is listed in column 2.

LIBR 259 - Preservation Management - Digital provides an examination of preservation practice, with an emphasis on emerging theories, models and technologies. It is a foundation course for students pursuing the *Management, Digitization and Preservation of Cultural Heritage and Records* career pathway.

LIBR 202 – Information Retrieval introduces the principles of information retrieval and their application to information systems and services with an emphasis on user information seeking behavior, human information processing and their relationship to retrieval models in information systems. This course is required of all SLIS students.

TABLE II. OPERATIONAL COMPETENCIES AND SLIS COURSES

Competency	Course(s)
Selects and appraises digital documents for long-term preservation Comp F at SJSU/SLIS	<i>LIBR 259: Preservation Management—Digital Only</i>
Is aware of requirements to information infrastructure in order to ensure proper access, storage and data recovery. Comp G at SJSU/SLIS	<i>LIBR 202: Information Retrieval</i>

B. Managerial Competencies

Two of the ten managerial competencies identified by Tammaro, Casarosa, and Madrid are listed in the first column of Table III, along with a letter identifying the corresponding MLIS core competency. One example of a SLIS course that supports each competency is listed in column 2.

LIBR 282 – Seminar in Library Management—Digital Asset Management is designed to introduce students to the fundamental concepts, terminology, practice and application of digital asset management in the public and private sector. It will feature discussions on metadata, workflow, taxonomy, data security, and preservation of digital assets.

LIBR 284: Seminar in Archives and Records Management—EAD provides an in-depth overview of Encoded Archival Description (EAD) and a brief introduction to Encoded Archival Context (EAC), the international standards for the presentation of archival descriptive information and records creator authority records on the World Wide Web.

TABLE III. MANAGERIAL COMPETENCIES AND SLIS COURSES

Competency	Course(s)
Plans, implements, and monitors digital curation projects. Comp D at SJSU/SLIS	<i>LIBR 282: Seminar in Library Management—Digital Asset Management</i>
Organizes and manages the use of metadata standards, access controls and authentication procedures Comp G at SJSU/SLIS	<i>LIBR 284: Seminar in Archives and Records Management--EAD</i>

We can look to the success of students in the workplace to support our contention that digital curation competencies have been infused in the curriculum in a way that is meaningful for students. In Figure 1, Matt Carmichael explains how the skills and knowledge he gained by taking MLIS courses prepared him for his work in a museum.

Example of Student Applying Digital Curation Skills and Knowledge in a Museum Setting

On the topic of digital curation, Matt Carmichael states, “Digital curation is a new concept for many museum professionals and is a more inclusive concept than digital archiving and digital preservation.” In his position, Matt used the knowledge and skills he developed through SLIS coursework to design a digitization policy that included a long-term plan for managing digital content. When asked which were the courses that best prepared him for his position at the History Museum, Matt listed *LIBR 259 – Preservation Management*, *LIBR 284-Seminar in Archives and Records Management, Topic: Digital Asset Management*, and *LIBR 284-Seminar in Archives and Records Management, Topic: Digital Curation of New Media*.

Figure 1. Excerpt from Matt Carmichael's Community Profile at <http://slisweb.sjsu.edu/people/community-profile/matt-carmichael>

IV. COMPONENT #2: INTERNSHIPS

SLIS currently offers more than 150 internship opportunities each semester for students in the MLIS degree. Students learn of these pre-approved opportunities by searching the SLIS Internship Database and apply for the positions following the instructions provided by the site. If offered a position, students then apply for approval to register for a SLIS internship course. Permission is granted once the student, site supervisor, and faculty internship supervisor agree upon at least three learning outcomes the student will achieve by the end of the internship experience. The course description follows:

LIBR 294 - Professional Experience: Internships (Archival section) is a field-based learning experience that takes place with an archives or other archives-related information-based organization. It allows the student to obtain work experience while pursuing stated learning outcomes. It is designed to provide the student the opportunity to test theories and to practice skills learned in the student's program.

The Internship course can be taken for 2, 3, or 4 units of credit; each unit is equivalent to 45 hours of work. The internship location can be on site, virtual or a combination.

Place-based Internship Experiences:

The benefits to students of engaging in a place-based internship experience include the ability to apply what they have learned within a professional setting, while building beneficial connections with potential future employers. Sixty-six archival listings are included in the database for spring 2013. One example is provided in Figure 2.

The California State Archives

Type of Library: Archives

Website: www.sos.ca.gov/archives/

Location: 1020 O Street, Sacramento, CA 95814

Job Title: Processing Student

Job Description: Under direction of professional staff, students will: complete internal training program, organize historical collections according to standard principles and practices, carry out routine preservation activities, and describe collections using standard format.

Figure 2. Place-based archival Internship listing from the SLIS database.

Student experiences are documented through Community Profiles posted on the SLIS website. The example provided in Figure 3 is an excerpt from an online Community Profile documenting the student's internship experience at NASA.

Example of Student Intern for NASA

Alumna Ratana Ngaothepitak's seven-month internship at the NASA Ames Research Center helped her secure a job as a NASA Archivist. During her Fall 2010 archives internship, Ngaothepitak worked with a collection documenting one of the "human computers" at the National Advisory Committee for Aeronautics (NACA) in the 1940s and 1950s. She processed the Amelia Reid Papers from start to finish by completing the accession record, taking an inventory of the materials, performing preservation work, creating a finding aid and a MARC record, and encoding the finding aid for display in the Online Archive of California.

Figure 3. Excerpt from Ratana Ngaothepitak's community

profile at <http://slisweb.sjsu.edu/community-profile/ratana-ngaotheppitak>

Virtual Internship Experiences: Until the fall of 2010, most of SLIS internships were place-based and as a result, students needed to live near an approved internship site or work with the SLIS internship coordinator to identify an acceptable internship site near their home. This arrangement presented obstacles for many of the School's MLIS students, as the graduate program is delivered fully online, and the School's 2,200 students live in 45 states, as well as in Canada and other nations.

The solution proposed was to develop a virtual internship program, which would allow students to live anywhere and take advantage of a wide range of internship opportunities, regardless of the geographic location of the student or the internship sponsor.

In the fall of 2010, a survey was conducted of 78 internship site supervisors who had participated in the SLIS internship program over the prior three years to determine their needs for digital curation virtual interns. Twenty-five respondents indicated they expected to have a digital curation project within their organization within the next three years and would consider hosting an internship.

Example of Virtual Student Intern

Student Martina Podsklanova, of Belfast, Ireland, was the 2012 recipient of the SLIS NewsBank Scholarship, which helped support her during her fall 2012 virtual internship at [Calisphere](#), an online portal of digitized images of historical artifacts from California repositories. Podsklanova concentrated on improving user access and enhancing the online visibility of Calisphere through current strategies, including search engine optimization (SEO) and the analysis of web metrics. In an interview before the fall internship, Podsklanova said, "The web is the first place researchers go to find a repository or look for documents. Archivists need to create a solid metadata system so users can find the information online, and that's what I'll be doing in my internship."

Figure 4. Virtual archival Internship Listing from the SLIS database.

California State University grant funds were used to support work over the summer of 2011 to identify virtual internship positions, and develop a framework for virtual internships to ensure students could successfully participate at a distance and

site supervisors would be able to assess learning outcomes. During the fall of 2011, virtual internship materials were assembled for students and site supervisors, and several site supervisors participated in a virtual internship panel presentation via web conferencing to introduce students to the concept of virtual internships within their organizations.

The first section of LIBR 294 exclusively for students participating in virtual internships was offered in spring 2012, and 15 students enrolled. One of the 27 virtual internship listings in the SLIS database at that time is shown in Figure 4.

Students taking online courses are uniquely prepared for virtual internships. They are motivated self-starters who are comfortable with communication and information systems. The personal qualities that help them successfully complete online courses can be employed to succeed in virtual internship placements. In Figure 5, a virtual intern shares her perspective on her internship experience.

<p>Stanford University Archives TYPE OF LIBRARY: Archives WEBSITE: library.stanford.edu/depts/spc/uarch/index.html LOCATION: Green Library, 557 Escondido Mall, Stanford, CA 94305 JOB TITLE: EAD Recon Intern JOB DESCRIPTION: Under the direction of the University Archivist the EAD Recon Intern will convert legacy collection inventories (Word, FileMaker Pro, paper) into EAD using Excel, Acrobat, Oxygen, and Archivists' Toolkit.</p>

Figure 5. Excerpt from Martina Ngaotheppitak's Community Profile at <http://slisweb.sjsu.edu/people/community-profile/podsklanova>

The Internship Course involves more than work experience. Students enroll in the course, participate in discussions taking place in a learning management system, and submit a final report describing their experience and providing evidence they have achieved the learning outcomes they agreed upon with the site supervisor at the beginning of the course. In order to foster a sense of community, virtual interns are also required to maintain a blog describing their internship experience through weekly posts and attend at least two of five scheduled web conferences over the course of the semester.

V. COMPONENT #3: TECHNOLOGY INFRASTRUCTURE

The MLIS degree program is 100% online. Students must complete an online social networking course that introduces them to a variety of new and emerging technologies used in today's online environment. The course covers various social networking platforms, content and learning management tools, web conferencing, immersive environments, and other trends in social computing. That introduction and the manner in which all SLIS courses are taught utilizing social media and emerging technologies exposes students to the importance of creating, managing, using, accessing, and preserving digital objects—the artifacts they create throughout their program.

Technology all SJSU/SLIS students are introduced to:

- Blackboard Instant Messaging
- Blackboard Collaborate (web conferencing)
- Desire2Learn Learning Management System
- DB/Textworks
- Gmail
- King Library Online Resources
- Microsoft Office (Word, PowerPoint, Excel, Outlook)
- MySJSU (student management system)
- SJSU Student E-mail Accounts
- SPSS software (data collection, statistics, modeler, and analytical decision management)

Access to a number of services and databases is provided to students based on the courses in which they are enrolled, including CALI, Dialog, Factiva, Gale, LexisNexis, LibGuides, NoveList, OCLC, ProQuest, Refworks, Web of Knowledge, Westlaw, and NoveList.

Technical support is provided to students via online resources and support staff.

VI. CONCLUSION

Digital curators manage, maintain, preserve, and add value to digital data, reduce threats to long-term value, mitigate the risk of digital obsolescence, and enhance the usefulness of digital data for research and scholarship.

Digital curation begins during the planning stage and should be a consideration throughout each stage of the digital curation lifecycle. Although the demand for digital curators is growing, the capacity to educate and train digital curators does not exist.

Students in the School of Library and Information Management's MLIS program are exposed to digital curation competencies throughout their program, through both required and elective courses. They also have the opportunity to select

from more than 60 archival internship opportunities through the SLIS database each semester. In addition, because the MLIS program is 100% online, the students are comfortable with information and communication technology and understand the importance of creating, managing, accessing, using, and preserving their own digital assets.

Infusing digital curation core competencies into the SLIS curriculum will expand the number of professionals prepared to perform digital curation activities in order to protect, add value to, and preserve our digital assets.

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The Digital Content Management Curriculum: A Case Study at Wayne State University's School of Library & Information Science

Joan E. Beaudoin

School of Library & Information Science
Wayne State University
Detroit, Michigan, USA
joane.beaudoin@gmail.com

Abstract—This paper examines the development of a specialization for digital content management at the School of Library and Information Science at Wayne State University. Addressed in this case study are the pedagogical approach taken in the specialization's curriculum development and the steps that were taken in developing the curriculum. The paper highlights five core characteristics that were used to describe the kinds of knowledge and skills expected from students completing the specialization. Additionally, the paper discusses the resources needed to support the specialization and the indicators to be used in the evaluation of its success.

Keywords—digital content, digital curation, curriculum development, curriculum support.

I. INTRODUCTION

This paper discusses the development of a specialization which focuses on the creation, management and preservation of digital content within Wayne State University's School of Library and Information Science (SLIS). The specialization, Digital Content Management (DCM), was developed as a result of an analysis of the School's curriculum that was completed in the fall of 2011. In September of 2011 the Curriculum Subcommittee of the Academic Concerns Committee within the School was charged with making recommendations to the faculty concerning revisions to its current curriculum, its certificates and specializations. The analysis of the School's curriculum was undertaken through several means. Examined first in the analysis was how the School's course offerings, specializations and certificates compared to the other American Library Association accredited programs of library and information science [1]. Against this analysis, the subcommittee examined the potential job opportunities of its graduates by mapping job position titles of recent MLIS graduates against the positions given in the United States Department of Labor, Bureau of Labor Statistics' 2010-2011 edition of *The Occupational Outlook Handbook* [2]. Additional items analyzed during this process of self-examination included the School's mission and its faculty's areas of expertise.

In the analysis of the offerings of other ALA accredited MLIS programs, it was discovered that a third of these supported a concentration that falls within the digital realm. Chief among these digitally-oriented MLIS concentrations were those focusing on digital libraries and digital curation and, or digital preservation. The finding of greater job prospects for the more technically-oriented positions in *The Occupational Outlook Handbook* also contributed to the development of the DCM track. Additional support for the concentration was the general growing awareness among the School's faculty of the importance of digital curation and preservation across all segments of society, thanks in large part to the increasingly digital world we find ourselves operating within today. The impact of digital content in our daily lives is now nearly universal, and this reality continues to evolve as we strive to educate individuals who will be capable of managing and researching ways to preserve our common cultural heritage.

In an effort to contribute to this conversation surrounding digital content in the cultural heritage sector, the DCM specialization was developed. The specialization was designed to prepare individuals to process, manage, preserve and provide access to information-bearing objects that exist in a digital form. As there is a dearth of adequately trained individuals to meet the needs of institutions with collections of digital content, it was felt that the addition of this specialization would make an important contribution to the education of library and information science professionals. A proposal for the specialization was submitted to the Graduate School at Wayne State University in January of 2012 and approval for the changes to the School's offerings was received in the spring of 2012. The specialization was made available to students at the start of the 2012-2013 academic year. At the start of winter 2013 semester, approximately 50 students are following this specialization. This number represents slightly less than 10% of all currently enrolled MLIS students within the SLIS. From the number of students who have already indicated this as their specialization, it would appear that students appreciate the need for individuals

with the knowledge and skills needed to work with digital content.

II. PEDAGOGICAL APPROACH

Behind the development of the DCM curriculum was a strong focus on experiential learning. This approach fits well with the mission of the School and also with several of its faculty's backgrounds. As SLIS has a history of producing graduates with well-developed practical skills, there is long standing tradition within the School of coursework that is strongly supported through interactive practice based learning. Within SLIS' curriculum students are provided with theoretical, historical and foundational content and this is supplemented by hands-on exercises putting their growing knowledge into practice.

The School's tradition of experiential learning runs parallel to the faculty's pedagogical approach, since the topic of managing digital content is seen through a lens of several decades of work experience in this area. Faculty members approach teaching from perspectives informed by real world experience developing collections of digital content to support humanistic study within an academic setting and managing archives and digitization projects within the private sector. Thus, the development of the DCM curriculum was very much informed by the day-to-day realities of those individuals whose job responsibilities include digitizing, describing, managing and preserving digital content.

III. CURRICULUM DEVELOPMENT PROCESS

The specialization's curriculum, which needed to include coverage the entire suite of processes involved in planning for, creating, describing and preserving digital content, was developed using several methods. First, a list of the topics which needed to be covered to develop graduates' skills and knowledge for performing work in this area were identified. This was followed by an assessment of these topics against their coverage within courses currently offered at the School. Those topics which were not treated in sufficient detail within the curriculum were identified, and these were used to develop several new courses within the curriculum. Finally, additional means of supporting the specialization were identified. As the means of curriculum support are not directly related to the content of the coursework, they are treated separately in the next section. What follows is a discussion of the route that was followed to develop the curriculum for the DCM specialization.

A. What Content?

The primary driving question behind developing the curriculum was "What are the critical skills and knowledge that

students need to be able to perform this work?" For this question the available library and information science syllabi and the literature with digitally oriented themes were collected and analyzed for topical coverage. From this analysis a lengthy list of critical knowledge and skills was developed (e.g., code using XML, perform basic image editing tasks using Adobe Photoshop, create entity-relationship diagrams, understand and use the terminology of the profession, track items through several processes belonging to multiple projects, etc.). In order to make the task more manageable, the many entries on the list were combined and abstracted into higher level concepts which were felt to represent the core characteristics expected from students who have successfully completed the DCM curriculum. These abstracted core characteristics focus the specialization's efforts on developing student's knowledge and skills on ways for them to effectively produce, manage, analyze, design, and communicate about, digital content. These characteristics also serve as a rubric within which to analyze expected competencies.

<p>Produce: software proficiencies, digitization techniques, checksum processes, coding, description, metadata creation, knowledge of formats, etc.</p> <p>Manage: social parameters, disposition, project management, personnel, copyright, policies, risk assessment, budgeting, standards, etc.</p> <p>Analyze: system analysis, needs assessment, data modeling, contextual factors, evaluation, strategize, research, etc.</p> <p>Communicate: terminology, presentations, training, document processes and decisions, marketing, outreach, reporting, etc.</p> <p>Design: system development, database design, thesauri creation, color theory, use of visual information, usability, etc.</p>

Fig. 1. Core Characteristics of the Specialization.

With such a long list of topics to be addressed and skills to be learned, natural groupings of course content were noted. Some of these were issues concerning process and techniques when performing work on singular items (Produce), while others were issues that were administrative in nature (Manage). A number of other skills concerned the ability to present, train, write and create reports (Communicate). Another group of pedagogical concepts to be covered had to do with critical thinking, evaluation, assessing information and problem-solving (Analyze). A final group was concerned with developing systems and providing creative solutions (Design).

From the noted groupings of topics, the following abstract core characteristics (Fig. 1) were formed to contain the various core competencies expected from the specialization's students. These are presented here with several examples of the competencies falling within each group.

With this list in hand, the process of developing the curriculum rested on examining the School's course offerings and discovering which competencies were not covered.

B. What Courses?

All of Wayne State University's Master of Library and Information Science graduates take a core of six courses introducing them to the basics of the library and information science profession (vocabulary, ethics, careers, information retrieval, access, etc.). In addition to the core courses, students complete an additional six courses within their specialization. To determine what the curriculum might look like, courses were identified that were already a part of the School's curriculum that would develop the knowledge and skills, as was outlined above. Several courses, (LIS7410 Software Productivity Tools for Information Professionals, LIS7415 Project Management and 7460 Databases Concepts and Applications for Librarians), offered content that would provide students with several experiences considered key to their development. For example, in these two courses students complete assignments working with large amounts of data, managing simultaneous projects, designing and delivering effective technology instruction, and implementing a database design based on systems analysis. Two additional courses, (LIS7900 Digital Libraries and LIS7910 Metadata in Theory and Practice), which had previously been taught as occasional special topics courses, were added to the School's curriculum as a part of the specialization's proposal sent to the Graduate School. These courses covered in detail a full range of topics about metadata (e.g., standard schemas, application profiles, mapping and XML coding) and digital libraries (e.g., collection development, user needs and services, usability and evaluation).

Through the analysis of the course content it was discovered that while several courses offered some coverage of the management and preservation of digital content, the topical depth was not sufficient to prepare students for work in this area. Particular topics that were missing from the current curriculum were an overall view of the data lifecycle, specific actions on data for preservation purposes (e.g., ingesting, validating, authenticating, normalizing, migrating, etc.), and issues surrounding access (legal considerations, security, transformation, etc.). Thus, LIS7920 Digital Curation and Preservation was developed to meet this need. Additionally, students who follow this specialization without any practical

work experience with digital content are strongly encouraged to perform a directed credit-bearing practicum within an institution to receive formalized training in the field.

Like many programs of library and information science in North America, the predominant mode of course delivery in the School is online. Each of the courses in the specialization uses the combination of recorded lectures, lecture notes and online synchronous meetings for delivering pedagogical course content. While this pedagogical method is sufficient for the majority of the curriculum's topics, the development of particular skill sets among the DCM students' is not possible through online instruction. As the hardware and software used to digitize analog items and manipulate digital files at a professional level are beyond the reach of all but a small minority of students, an on-campus institute where they receive hands-on experience within a digital media lab is under development. To begin during the fall of 2013, this credit-bearing intensive course will allow students to create and edit digital content that they will continue to work with as they progress through the DCM curriculum. The institute will introduce students to digitization processes using analog image, audio and video originals through a series of lectures and hands-on activities. With this critical phase of instruction completed they will perform additional processes to these digital items as a part of their online coursework. The underlying idea for the specialization's curriculum is to have students understand the entire lifecycle of digital content so that they are better prepared for the various responsibilities and challenges they will find in the workplace.

IV. SUPPORTING THE CURRICULUM

The curriculum for the DCM specialization is supported by a number of individuals (faculty and staff) and resources (hardware, software, documentation and planning) on campus. The specialization's course content is currently delivered by four individuals. Two individuals hold doctoral degrees in library and information science and are employed within the School as full-time faculty. Complementing this are two individuals with practical experience in their respective areas (information technology and digitization) who hold MLIS degrees. These two individuals are also employed full-time by the School and have a combination of responsibilities associated with administrative or technical support and teaching. Other staff hours are provided by graduate student assistants who supply email, phone and in-person assistance for technical issues to students and faculty, and administrative personnel perform a variety of functions to ensure daily operations within the School.

In addition to the individuals involved in supporting the curriculum for the specialization are a number of resources

beyond those provided to the university's community at large. First among these is the physical space and equipment used for its Digital Media Lab. The Lab, which has been outfitted with hardware and software for image, audio and video digitization processes, replicates what students would encounter in a professional facility. The specialization's students also have access to a virtual online lab for access to software for post-digitization processes used in their coursework. As practice-based projects are expected of all students within the specialization, various forms of digital repository, digital library and digital preservation software are available (hosted by SLIS and outside vendors), and network attached devices currently provide roughly 16 terabytes of storage space for various course projects.

The curriculum is also supported by several School sponsored community building activities. The School hosts a student group associated with National Digital Stewardship Alliance, which brings together individuals who share an interest in working on issues concerning the management and preservation of digital content. The group keeps students up to date on current issues, provides opportunities for hands-on practice, and introduces individuals working in the field. Last fall this group was pivotal in the planning of a colloquium, titled *Converge and Ingest: Learning about Digital Preservation*, which focused attention on issues concerning digital preservation through a series of papers and case studies [3].

V. EVALUATION OF THE SPECIALIZATION

The DCM specialization has the potential to have an important impact within organizations and institutions whose missions involve the care and management of cultural materials. Because of the vital role the School plays in educating professionals in this area, it has set into place methods of evaluating the success of the specialization and its students. The primary outcome to be assessed is how well the specialization meets its goal of increasing the number of individuals with skills and expertise in the areas of digital libraries, data curation, digital preservation and metadata. An evaluation of the specialization's success will be undertaken using indicators which incorporate several dimensions. In the short term, one indicator of its success is the number and percentage of SLIS students who enroll in the School based on the availability of the specialization. A similar measure assesses the number of students who chose this specialization once they have enrolled in the School. An indicator which speaks to the longer term impact of the specialization is the number and percentage of SLIS' graduates who obtain full-time employment in positions where their primary job responsibilities require them to work with digital content. An additional indicator of success, as it is

hoped that the specialization will increase understanding about digital content issues, is the number and percentage of its students and alumni who contribute to the scholarly record through publications on this topic. As the specialization is a new offering at the School, the activities of students and alumni will be tracked as they work through the curriculum and move into the field. This data will provide information to be used for future development of the DCM curriculum.

VI. CONCLUSION

The development of DCM specialization has been a welcomed addition to the School of Library and Information Science at Wayne State University and it has seen a great deal of support at the individual and institutional level. It is clear from the support received for the specialization that there is a deep appreciation for knowledge in this area and an acknowledgement of how critical this issue is in our current world.

After analyzing potential content and developing the curriculum, researching and procuring equipment and the many months of planning to make the specialization a reality, seeing its first students graduate in the next few semesters will be tremendously rewarding. How these individuals progress in their careers and the feedback they provide concerning their experiences will provide critical information concerning the success of the specialization. In an institution with such a long history of graduating practitioners who work with and respect cultural materials, it is hoped that this tradition will be enhanced by highlighting the important and often problematic issues surrounding digital content.

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‘DIY’ Research Data Management Training Kit for Librarians

Stuart Macdonald
EDINA & Data Library
University of Edinburgh
Edinburgh, Scotland, UK
Stuart.Macdonald@ed.ac.uk

Robin Rice
EDINA & Data Library
University of Edinburgh
Edinburgh, Scotland, UK
Robin.Rice@ed.ac.uk

Abstract – This paper discusses extended professional development training in research data management for librarians piloted at the University of Edinburgh. This is framed by the evolving research data management Roadmap at the University, national and international initiatives in managing research data by bodies such as Jisc and LIBER, and the subsequent need to ‘up skill’ information professionals in the emerging area of academic research data management. This knowledge-transfer exercise includes independent study based on the research data MANTRA course and reflective writing, face to face sessions with different speakers giving short presentations followed by discussion, and group exercises. The resultant training ‘kit’ was released in Spring 2013 with an open licence for other institutions, particularly those without local research data management expertise, to utilise for ‘DIY’ RDM training.

Keywords – research data management, training, librarians

I. INTRODUCTION

The University of Edinburgh Information Services Division (IS) has developed a high-level plan or ‘Roadmap’⁷⁶ to deliver research data services across 4 strategic areas: data management planning, active data infrastructure, data stewardship, and data management support. This cross-divisional Roadmap will help to engage academic units and principal investigators in research data management and provide services to implement the University’s Research Data Management (RDM) Policy⁷⁷ passed by Senate in May 2001.

In order to realise the vision of the Roadmap staff across IS will need to acquire new skills and confidence in engaging with RDM activity and support. As part of this exercise an extended professional development training for four liaison librarians at the University was piloted, facilitated by the Data Library, in relation to RDM and how it may be applicable to

research practises in the disciplinary areas each librarian represents.

II. PILOT COURSE

There is an abundance of pointers in recent literature for academic libraries to move “upstream” in the publication process and work more closely with researchers at the pre-publication stages [1]. For example, in 2012 LIBER (Association of European Research Libraries) set down “Ten Recommendations for Libraries to Get Started with Research Data Management” [2], including providing support services for data management plans, metadata and data standards, developing staff skills in data librarianship, encouraging open data policies, supporting the entire research data lifecycle and promoting data citation. Such ideas have been reinforced by the Jisc Managing Research Data programme⁷⁸ (2011-2013) in particular the Research Data Management Training strand whose aim is to increase research data management skills in UK higher education and research organisations by providing high quality training materials developed to serve the needs of a variety of roles and stakeholders. (While the University of Edinburgh was not funded in this programme, it did participate in programme activities as a DCC institutional engagement participant.)

During autumn and winter 2012-13, data librarians at the University of Edinburgh led a pilot course on Research Data Management (RDM) based on the research data MANTRA open online training modules⁷⁹ originally developed by EDINA and Data Library to reflect best practice in research data management for PhD students and early career researchers. Materials from the training sessions were subsequently assembled to produce the ‘Do-It-Yourself Research Data Management Training Kit for Librarians’.

⁷⁶ http://www.ed.ac.uk/polopoly_fs/1.1012231/fileManager/UoE-RDM-Roadmap201121102.pdf

⁷⁷ <http://www.ed.ac.uk/schools-departments/information-services/about/policies-and-regulations/research-data-policy>

⁷⁸ http://www.jisc.ac.uk/whatwedo/programmes/di_researchmanagement/managingresearchdata.aspx

⁷⁹ <http://datalib.edina.ac.uk/mantra/>

The training kit uses a blended learning approach and is designed to contain everything needed for academic librarians in small groups to get themselves up to speed on five key topics in RDM. It makes no assumptions about the role of librarians in supporting research data management, but aims to empower librarians to support each other in gaining confidence in this area of research support. It also provides some training in three of the identified skills that are named as gaps in the RLUK report 'Re-skilling for Research' [3]:

- Knowledge to advise on data management and curation, including ingest, discovery, access, dissemination, preservation, and portability
- Knowledge to support researchers in complying with the various mandates of funders, including open access requirements
- Knowledge to advocate and advise on the use of metadata,

and touches on some others, such as the "Ability to advise on preserving research outputs."

Digital preservation receives a light touch in the training, partly because it receives a light touch in MANTRA itself partly due to the intended audience of the materials, partly because this topic was seen as worthy of its own extended training, and partly because it may not be the responsibility of liaison librarians to run trusted preservation services such as an institutional data repository. The training kit does however list key resources for further study in digital preservation and other advanced topics.

The training comprises five 2-hour face-to-face sessions. These open with short talks followed by discussion and group exercises from the UK Data Archive, in a private collegiate setting. Emphasis is placed on facilitation and individual learning rather than long lectures and passive listening. MANTRA modules are used as reading assignments and reflective writing questions are designed to help librarians *put themselves in the shoes of the researcher*. Learning is reinforced and put into practice through an independent study assignment of completing and publishing an interview with a researcher using the Data Curation Profile framework developed by D2C2 at Purdue University.

III. TOPICS

The 'DIY Research Data Management Training Kit for Librarians' focuses on learning objectives for the following topics:

1. *Data management planning*

Including an understanding of appropriate data management in accordance with responsible conduct of research, an awareness of good practice in managing research,

and an understanding of what constitutes a data management plan.

2. *Organising & documenting data*

Combining two MANTRA units to provide an understanding of why it is important to organise and document research data including managing data file versioning, naming and re-naming conventions, and an appreciation of why and when to use metadata.

3. *Data storage & security*

Providing an awareness of secure data storage options, encryption, and the importance of regular data backups and backup policies.

4. *Ethics & copyright*

Focusing on the ethical requirements that apply to the collection and management of data involving human subjects, and providing an appreciation of privacy and confidentiality, and how they apply to the management of research data. It also explains what IPR is and how it applies to research data as well as how Freedom of Information and related legislation affects access to research data.

5. *Data sharing*

Introducing the benefits, challenges and drivers associated with sharing research data as well as the raising awareness of the risks to the longevity of digital data. The topic also introduces the basic concepts of digital preservation and trusted repositories, and data licensing.

IV. TRAINING KIT CONTENTS

- Promotional slides for the RDM Training Kit
- Training schedule
- Research Data MANTRA online course developed by EDINA and Data Library, University of Edinburgh: <http://datalib.edina.ac.uk/mantra>
- Reflective writing questions
- Selected group exercises (with answers) from UK Data Archive, University of Essex - Managing and sharing data: Training resources. September, 2011 (PDF). Complete RDM Resources Training Pack available at: <http://data-archive.ac.uk/create-manage/training-resources>
- Podcasts for short talks by the original Edinburgh speakers if running course without 'live' speakers (Windows or Quicktime versions).
- Presentation files (pptx and pdf) if learners decide to take turns presenting each topic.
- Evaluation forms

- Independent study assignment: Data Curation Profile, from D2C2, Purdue University Libraries. Resources available: <http://datacurationprofiles.org/>

V. INDEPENDENT STUDY: DATA CURATION PROFILES

In the University of Edinburgh pilot training, the evaluations indicated that overall the librarians considered what they were learning was of value to them. However, there was no ready way to apply their knowledge in their day-to-day work. In order to test their knowledge and also increase the confidence of the librarians to engage in discussions with researchers about data management, a post-training independent study was assigned. Data Curation Profiles, hosted by the Distributed Data Curation Center at the Purdue University Libraries, were the chosen method for the independent study work.

Data Curation Profiles provide a complete framework for interviewing a researcher in any discipline about their research data and their data management practices. Register on the DCP Toolkit website, <http://datacurationprofiles.org> to download the user guide, interviewer's manual, interview worksheet and template, as well as to access the user support forum.

The pilot training was deemed successful by participants and Information Services managers, and another round of training with another small group is about to begin, with discussions on going to extend training kit materials for technical support staff as well. Meanwhile, the librarians trained in the pilot are in the process of pursuing their independent studies - interviews with researchers from liaison constituencies which will result in new public Data Curation Profiles.

VI. PUBLIC RELEASE

The DIY Training Kit is designed to contain everything needed to complete a similar training course independently (in small groups) and is based on open educational materials. Users can apply their own creativity to reshape the course as they wish. For example, there are a number of group exercises available from the UKDA training resources pack, many of which are not included in the kit.

The public release of the 'Do-It-Yourself Research Data Management Training Kit for Librarians' is now available under a CC-BY (Creative Commons Attribution) licence: <http://datalib.edina.ac.uk/mantra/libtraining.html>.

VII. RECOMMENDATIONS FOR FUTURE STUDY

- In MANTRA there are four software modules in data handling. These modules are based on four common data analysis packages. You can print off the user guide, download the dataset and work through the

exercises at your own pace (some familiarity with each software package is suggested as a pre-requisite).

- *Data Intelligence 4 Librarians* is another online course, developed by data librarians at 3TU.Datacentrum in the Netherlands - available in Dutch and English. Their "Data management" unit is similar to MANTRA, but you could investigate more librarian-specific advanced topics by working through "Technical Skills" and "Acquisition and Advice" on your own.
- The UK Digital Curation Centre (DCC) website provides a clearinghouse of valuable information. In particular, browse their 'Resources for digital curators' to find useful and up to date reading material.
- The DCC also hosts a relevant email discussion list with subscribers from around the world. Join Research-dataman on JISCMail.
- Last but not least we encourage anyone whose job involves academic data support to consider joining IASSIST, the international professional organisation for data professionals from all sorts of environments dealing with social and other types of research data. IASSIST hosts a vibrant annual conference - normally in the US, Canada or Europe. Their Fellows awards provides international travel stipends to selected applicants to broaden attendance from under represented countries.

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Round table

Creating a common vision for digital curation education: building alliances

Chiara Cirinnà
Fondazione Rinascimento Digitale
Florence, Italy
cirinna@rinascimento-digitale.it

Kate Fernie
MDR Partners
London, UK
kate.fernie@mdrpartners.com

Maurizio Lunghi
Fondazione Rinascimento Digitale
Florence, Italy
lunghi@rinascimento-digitale.it

DISCUSSION

The “Framing the digital curation curriculum” conference closed with a lively round table discussion, thanks to all the speakers that participated with enthusiasm to the debate, where the most important issues were again placed under the microscope to be summarized and discussed.

Wendy Duff, Professor at the University of Toronto, Faculty of Information, chaired the session

Participants were the delegates of the organisations that supported the DigCurV conference and the attendees, which sought to draw on the Curriculum Framework (CF) presented by DigCurV, in order to assess and gain further insights into the contribution of all the organisations in further developments and adoption of the CF.

Wendy Duff opened the discussion by asking the participants which benefits and/or obstacles in adopting the CF could be highlighted.

Andrea Caccia is the delegate from ANORC¹, the Italian National Association for digital preservation, a not for profit organisation that acts as a reference point for all the stakeholders involved in the process of digital storage and dematerialisation. ANORC is interested in being involved in the CF development, because it has a precise commitment in delivering training courses to all the professionals involved in digital curation. The CF would significantly benefit from the possibility to transfer the CF into a standardised framework, to help fill the gap of the competences needed by professional at all levels.

Achim Osswald is the delegate from nestor², the German competence network for digital preservation. The nestor network has been involved in the evaluation of the CF and Achim was pleased for the great opportunity to use the results

of the DigCurV project. In the near future he envisages a lot of steps to be done, not only to apply the framework itself (or some of its aspects), but also to try to improve it in some areas. One example would be to create role models or profiles that go beyond the practical lenses. In the German workshops for the evaluation of the CF, they thought the three lenses suggested that there were an equal number of persons involved. Actually there is a great number of practitioners involved in different aspects of digital curation. Therefore a suggestion is that these lenses should be further developed in the future.

Ann Gow, from the DigCurV project, confirms that HATII and the other project partners are committed to continuing the development of the framework.

Wendy Duff asked Achim to clarify what type of roles he is suggesting. Achim indicated that, during the workshops, they discussed different kind of roles and they think that a lens should focus also on IT specialists, on people responsible for technology watch, and digitization; he suggested there is a great variety of activities in digital curation that can be broken down into roles and in different sectors.

Adam Carter is representing EUDAT³ (European Data Infrastructure), a project involved in large-scale data infrastructures. One of the aims of the project is to provide services for community data centre managers, specifically in the subject area of data repositories. EUDAT is trying to develop services to connect subject area repositories together and make sure that data can be reusable and curated in the long term. The conference topic is a bit on the periphery of EUDAT, but it helped Adam better understand the interface between what EUDAT is working on and subject librarians, and what EUDAT needs to train people in. The CF helps to work out the boundaries to what different people can specialize in. Adam will review the framework in more depth, particularly those skills that EUDAT considers relevant and he will suggest whether the lenses should be split into more detailed roles. In general Adam thinks the CF is very useful, as the tool for

¹ http://www.anorc.it/index_ing.php?lang=en

² http://www.langzeitarchivierung.de/Subsites/nestor/EN/Home/home_node.html

³ <http://www.eudat.eu/>

accessing the framework. He suggested the online tool needs a “search” feature. Adam thinks that EUDAT would be interested in joining a prospective Network, depending on what membership entails. In any case he would like to keep abreast of what is happening.

Simon Hodson from the JISC management data research programme, which is designed to support the management of research data of UK universities spoke next. JISC looks at policies, strategies, infrastructures and support roles. Simon emphasises that there is a danger in digital curation: experts have turned digital preservation into a daunting and serious challenge. The challenge is to make digital preservation accessible, practical and applicable to every day activity by researchers and this is what JISC seeks to encourage. With regard to the CF, Simon was excited to hear speakers say how useful the framework was in clarifying the language or their approach. A significant achievement would be to use the framework in networks to define skills and competences and to help clarify terminology. Simon thinks it would be interesting to understand to what extent the CF can be used to define the contents that are a little bit less specialised for the digital curation and what researchers have to do with digital curation, or need to be a little aware of, even if they are not specialist. This leads to the question about handover procedures between responsible parties; he thinks this should be built into the framework and training materials. People need to know where their responsibilities start and stop. This is a moving target and so the handovers are also likely to change.

Wendy Duff asks about a 4th lens. What would it be for the framework to identify a lens for the personal record keeper? Simon Hodson thinks that, since today we live in a digital world, a certain amount of digital curation knowledge is a life skill, so everyone needs a certain amount of knowledge about it.

Helen Tibbo is an Alumni Distinguished Professor at the School of Information and Library Science (SILS) at the University of North Carolina at Chapel Hill (UNC-CH). Helen thinks that graduate education is quite easy as the teacher has a “captive” audience and defined programmes to follow. Her main concern is about vocational education which is very difficult, not only for the contents to teach, but also for the organisation of the training courses and for the financial aspects (who pays for the classes?). Professionals cannot update their competences in a few hours course. Vocational training is a huge challenge. In Helen’s opinion, the CF is great, but it needs to set out some kind of course structures. Helen asks herself if there are organisations in Europe that are going to conduct continuing education: one of the biggest problems is that today projects come and go, as well as funding.

Wendy Duff mentions the Digital Curation Exchange⁴, which contain extensive teaching resources. To deliver a course, a lot of preparation is needed and not only from the

organisational side. Could a Network be of help in delivering training? What role could it have? Should it be international or European? Should we differentiate between secondary education and postgraduate education? In US there are lots of courses with a digital curation component. Wendy is mainly worried about continuing education; at present time there is not an designated organisation with this mission.

Neil Grindley (Programme Manager at JISC) from the audience, declared his interest in the CF and asks how professionals might design courses using the framework. He wonders if there is a scope in student trainees putting the course together themselves choosing from some kind of international catalogue of courses. There is an international community looking for ways of collaborating together to offer this kind of shop window.

Wendy Duff believes that today the business models for universities are changing. There are thousands of students taking courses which are based world-wide. An example is the course on introduction to computer science that was free: 100.000 students signed up, and only 9.000 finished!

Helen Tibbo thinks that a lot of these courses are broad, then people take more specific courses. Another issue is that, to plan a training course, besides text books, you must include exercises and hands-on activities.

Seamus Ross, Dean of the Faculty of Information at the University of Toronto, points out that DCC 101 offers a whole series of introductory topics with exercises. The University of Toronto is also currently offering MOOC, free online courses to experiment with the business models planning.

Mary Molinaro, Associate Dean for Library Technologies at the University of Kentucky Libraries, shares concern about sustainability of training programmes. She believes that low cost solutions should be provided for a wide range of people in vocational education with professional responsibilities for digital contents. She asks if it would be useful to overlay the DigCurV Curriculum Framework over the DPOE curriculum⁵, in order to make them converge. This action would be beneficial for the international collaboration on the definition of curricula. Moreover to have a unique curriculum as a reference could be a benefit as would be easier to maintain and update. Someone is more likely to pay for this joint effort. There is a lot of duplication of events calendars, Library of Congress, Digital Curation Exchange: it may be helpful to have a European one and US one. We need to think about duplication of effort and see if this can be reduced. Overcoming this obstacle is not an easy task; she suggested another grant might help. She shares concerns about the DPOE programme, as there have been cutbacks in the US. Also the Dean of the University of Kentucky supports this work.

Jurate Kupriene is the Director for Innovations and Infrastructure Development at Vilnius University Library. She

⁴ <http://digitalcurationexchange.org>

⁵ <http://www.digitalpreservation.gov/education/curriculum.htm>
1

is partner of the DigCurV project and contributed to the development of the CF, that she considers good to start work. Lithuanian situation is not very developed, there is a big gap in the availability of training for MLA professionals. In 2011 more than 70 structures are going to have a repository and they are talking only about digitization: curation is quite a new thing. The DigCurV framework is useful for Lithuania, Latvia and Estonia to create a movement to go out and talk to colleagues. In parallel the Open Access Movement has been active since 2006, today an Open Access repository for Lithuania is available. This year they started to create a national open access repository for scientific publications and a big project for national research data archive was funded, and Lithuanian Vilnius University is the project manager. The DigCurV CF is a good tool to help explain to managers what they will be responsible for in the initial stages of the projects and to start planning. The CF could also be translated into the Lithuanian language for older people. The framework can be used as a business plan to develop training for academic librarians as we are planning to have a good national training centre for academic librarians, archivists and museums.

Achim Osswald added a note about the national focus that Jurate mentioned. The DigCurV framework offers the opportunity to connect between different experiences and also different nationalities. Although at the conference there were lots of good and enthusiastic presentations from colleagues from the United States, we should be aware that we are talking about the results of a European project, and the main focus was to tackle and solve the problems that are present in Europe. To help to do this, the conference brought in partners from the US to discuss their experiences. Also Britain can be considered sometimes inside and sometimes outside Europe. The main issue is that the CF provides an opportunity to delineate what we have achieved in our national educational activities to get a common understanding and to identify which are the levels we are achieving and the programs that we apply. In Achim's opinion it is important to discuss these issues within the national context. Another important subject is the business model: in many European countries, higher education is not a business area, rather it is a state-funded area: in fact it's up to the university and the activities of the deans of the departments if programs have to be applied, in relation to the demands of the labour market. So the perspective of the business model should be taken into account.

Wendy Duff poses a question to the group regarding how the CF will be maintained, since people's reactions have been very positive. She does not think that looking for the next grant is the answer. So a possibility could be to set something up, so that people's experiences in using the framework can be fed back into the development of the framework.

Neil Grindley suggests that there are contexts where the DigCurV framework could be discussed. He refers about a conference in Tallin in 2011, "Aligning national approaches to digital preservation", which was an excellent discussion of potential alignment strategies across various national preservation programs. The second edition has been scheduled

for Barcelona, Spain, on November 18-20⁶. There are certainly other initiatives that would benefit from having the DigCurV framework included in their programme.

Anna Maria Tammaro, from the Governing Board of IFLA (International Federation of Library Associations and Institutions), intends to support this framework. There is a working group in IFLA on convergence of associations. She invites DigCurV to participate in the IFLA conference in Lyon on August 2014⁷: there is a satellite event dedicated to the convergence issue. Moreover if interested, this DigCurV framework can be included in the strategic initiatives of IFLA (standardization, digital contents). Anna Maria offers to take on the role of diffusing the DigCurV framework within IFLA.

Wendy Duff is interested in what professionals from Archives think about the Framework. The ICA (International Council on Archives) could be interested in the CF. Jenny Bunn offered to take DigCurV Framework to the Archives organization. The ICOM (International Council of Museums) is an international group that might be interested. Wendy Duff asks Ann Gow and Laura Molloy what they think about taking the Framework to various conferences and professional associations. Ann would be pleased to see the Framework used, the only concern is with the EU funding for travel. Laura encourages people to send comments as soon as possible (short focused pieces of feedback would be great). Wendy asks the speakers who spoke about using the framework to send feedback to Laura.

Maurizio Lunghi, from FRD (Fondazione Rinascimento Digitale), invited the PrestoCentre initiative that agreed in principle to share a common approach and in cooperating even if they are not able to attend the conference.

Wendy Duff spoke about the history of Drambora. Anything that can be done to move the Framework towards associations and sustainable contexts would be good.

Andrea Caccia refers about CEN (European Committee for Standardisation), a EU standard organization. They already had workshops about DRAMBORA. If we are able to reach an harmonized competence framework, it would be of help for the mobility of competences across Europe.

Wendy Duff reminds people about business schools, computer science groups that also have educational components.

Wendy Duff closes by encouraging people to send their feedback on the framework and the CURATE game. She says that DigCurV has been an amazing project and hopes it will be sustainable. Such a vibrant community, we need to make sure that the excellent tools the project developed are sustained.

The impression is that we are on the right track.

⁶ <http://www.educopia.org/events/ANADPII>

⁷ <http://conference.ifla.org/ifla80/>