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
kshilton@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 CDMA 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.

Acknowledgments

The authors would like to thank the UMD faculty who worked to shape the specialization, including Brian Butler, Mary Choquette, Kari Kraus, Trevor Muñoz, and Ricardo Punzalan. In addition, many thanks to iSchool Dean Jennifer Preece for encouragement and support of this program.

References

[1] Danah boyd and K. Crawford, "Critical questions for big data," Information, Communication & Society, vol. 15, no. 5, pp. 662–679, 2012.

[2] T. Hey and A. E. Trefethen, "The data deluge: an e-Science Perspective," in Grid Computing: Making the Global Infrastructure a Reality, New York: Wiley, 2003, pp. 809–824.

[3] "Personal data: the emergence of a new asset class," World Economic Forum, Geneva, Switzerland, Jan. 2011.

[4] L. Jahnke, A. Asher, and S. D. C. Keralis, "The Problem of Data," Council on Library and Information Resources, Washington, D.C., Aug. 2012.

[5] J. Manyika, M. Chui, B. Brown, J. Bughin, R. Dobbs, C. Roxburgh, and A. H. Byers, "Big data: The next frontier for innovation, competition, and productivity," McKinsey Global Institute, Seoul, San Francisco, London, and Washington DC, May 2011.

[6] E. Yakel, "Digital curation," OCLC Systems & Services, vol. 23, no. 4, pp. 335–340, Nov. 2007.

[7] A. Wiggins and S. Sawyer, "Intellectual diversity and the faculty composition of iSchools," Journal of the American Society for Information Science and Technology.

[8] C. A. Lee, "Matrix of Digital Curation Knowledge and Competencies," DigCCurr, Chapel Hill, NC, Jun. 2009.

[9] J. M. Wing, "Computational thinking," Commun. ACM, vol. 49, no. 3, pp. 33–35, Mar. 2006.

[10] Partnership for 21st Century Skills, "Framework for 21st century learning," Partnership for 21st Century Learning, Washington, D.C., Mar. 2011.

[11] J. M. O'Toole, "The History of Archives and the Archives Profession," in Understanding Archives and Manuscripts, Chicago, IL: Society of American Archivists, 1990, pp. 27–47.