ADVOCATING ELECTRONIC RECORDS:
ARCHIVAL AND RECORDS MANAGEMENT PROMOTION OF NEW
APPROACHES TO LONG-TERM DIGITAL PRESERVATION

By

Daniel Elves

A Thesis Submitted to the Faculty of Graduate Studies of
the University of Manitoba
in Partial Fulfilment of the Requirements of the Degree of

MASTER OF ARTS

Department of History (Archival Studies)
Joint Masters Program
University of Manitoba/University of Winnipeg
Winnipeg, Manitoba

TABLE OF CONTENTS

ABSTRACT

For over forty years, archivists and records managers have developed and advocated numerous theories and methodologies for the preservation of authentic and reliable organizational digital records. Many different tools, standards, and guidelines have been created to enhance and safeguard the content and context of digital records across multiple migrations. In addition, several archives have been able to create and sustain full-scale digital preservation programs. However, in spite of these successes, most archives and records management programs are not yet capable of preserving digital records indefinitely. Long-term archival digital preservation advocacy is defined as efforts undertaken by archivists and records managers to convince others, inside and outside their professions, to support the concepts, methodologies, and resources necessary to implement long-term digital preservation. Advocacy as a political- and policy-focused activity to convince a targeted audience to act is distinguished from archival "public programming" that is centered around outreach, publicity, exhibitions, and reference services. Advocacy for long-term digital preservation has not been widely successful, as evidenced by the relative small number of fully supported and fully functional archival digital preservation programs. As a result, the potential for a "dark age" characterized over the long term by a dearth of surviving, readable, and contextualized digital records is very real.

This thesis explores why advocacy efforts have created only limited success, as well as what might be done to improve this situation. It rethinks long-term digital preservation as an issue of advocacy and will, as well as one of technology, strategy,

or theory. Chapter One opens the thesis with a brief discussion of computers and digital records, placing advocacy efforts within a historical and technological context. Chapter Two presents an intellectual history of long-term digital records preservation advocacy literature and practice, demonstrating how advocacy "messages" have been formulated, disseminated, and "sold." It also illustrates the multitude of informational resources and technological "solutions" that are now available to assist archivists and records managers in undertaking long-term digital preservation activities.

Chapter Three tests the resonance of advocacy efforts through a series of surveys which I conducted with archivists and records managers from a variety of government, corporate, educational, and other institutions, as well as follow-up interviews with Manitoba-based records professionals. Survey questions were developed based on my examination of long-term digital preservation advocacy literature in Chapter Two, while interview questions were based on the responses of survey participants. Chapter Four concludes the thesis with a series of recommendations on improving long-term digital preservation advocacy. It argues for archivists and records managers to increase their personal commitment to long-term digital preservation, which includes having the will to embrace change and get started. Records professionals must also produce more practical internal guidance to assist archivists and records managers in undertaking preservation activities. In addition, the development and delivery of external advocacy "messages" must be improved, so that advocacy arguments better resonate with those responsible for funding organizational records management and archival preservation programs for digital records.

ACKNOWLEDGEMENTS

INTRODUCTION:

THE DIGITAL PRESERVATION DISPARITY

Twenty-first century society is obsessed with digital technology. Across the world, in the universities, businesses, research laboratories, and government offices of our interconnected "global village," among many other locations, people of all socioeconomic, educational, and cultural backgrounds use digital devices – such as desktop, laptop, and tablet computers; portable devices such as smartphones, e-readers, and audio players; and digital cameras and video recorders – to design, create, view, and communicate innumerous digital media outputs. Indeed, modern society and its institutions could not operate without the support of a myriad of digital technologies, and it is difficult to imagine that this reliance will lessen as more and more government, business, organizational, and even personal functions are enhanced or automated through the use of computers.

Concurrent to the development and global dissemination of computers and digital technology over the past sixty years, and particularly in the last several decades, heightened scrutiny concerning public policy issues such as privacy, government accountability, minority and Aboriginal rights, and access to information has reinforced the historical and cultural mandate for archivists to preserve and make available authentic, reliable records to document society and its institutions, regardless of format. Reflecting this role as stewards of society's recorded heritage, archivists have been very focused on the use of digital devices and more specifically, on their outputs – digital records. For archival studies and practice, the creation,

management, and long-term preservation of and access to digital records is particularly relevant, as the overwhelming majority of records are now created, used, and stored in digital formats.

Although widespread and essential to the working operations of society, digital records are also ephemeral and fragile. Digital records are much more vulnerable to damage or destruction, or being rendered incomprehensible, by hardware and software obsolescence, storage media deterioration, a lack of embedded and easily discernible contextual metadata, and the reality often of multi-creator, multi-provenance records – to say nothing of human error or deliberate deletion of data. The archival profession has, therefore, invested considerable material and human resources in researching how digital records can be preserved and made available over the long term, particularly for records of government, businesses, universities, and other organizations or institutions, those that are subject to records management people and processes. Such concerns over long-term digital preservation (LTDP) have generated many journal articles, research project grants, websites, books, conferences, blogs, training seminars, and online tutorials. For over forty years, archivists and records managers[1] have devoted incalculable hours to developing and disseminating theoretical concepts, strategies, methodological processes, and technological requirements, all with the goal of ensuring that digital records remain reliable, authentic, and accessible for generations to come.

---

[1] Although records managers focus on the management of active and semi-active records, those with very long retention periods (over a hundred years, in some instances) must be preserved and made available over the long term. In addition, one individual is sometimes responsible for performing the duties of both archivist and records manager. Indeed, in certain archival traditions (such as in Australia and New Zealand), there is a close connection between the roles of archivists and records managers. This thesis is primarily focused on the contributions of archivists in addressing long-term digital preservation, but will include records managers where applicable.

What began with the need to adapt "traditional" archival functions (such as appraisal, acquisition, and description) for "machine-readable" records, such as relatively straightforward digital records including social-science and statistical "flat file" databases, soon developed into protracted professional discourses on topics such as the characteristics of a digital "record;" the functional requirements of recordkeeping and archiving systems; metadata standards, stable file formats and other digital preservation best practices; and technological preservation techniques. This research into the requirements for long-term archival digital preservation – primarily through the development of theory, standards, and technological "solutions," and almost entirely for institutional or organizational digital records, those that provide evidence of administrative and operational work processes – provides archivists with an array of information and advice to guide preservation activities. The proliferation of the internet has also facilitated increased collaboration between archivists and other professionals with an interest in accurate, reliable records. These include records managers, freedom of information and privacy officers, and librarians.

Within archival theory and practice, however, there is no universally-accepted definition of what constitutes LTDP, save to say that archival records must be preserved and made available, without loss of context or content, for as long as they have cultural, historical, or other evidential value. Even a definition of "long-term" is, understandably, vague. For example, one definition of "long-term" is "a period of time long enough for there to be concern about the impacts of changing technologies, including support for new media and data formats, and of a changing user

community, on the information being held in a repository. This period extends into the indefinite future."[2] For the purposes of this thesis, and particularly the primary research portion, however, I chose to adopt a more rigourous understanding of long-term archival digital preservation.

To begin, LTDP is not a "one time" activity; the transient nature and extreme vulnerability of digital records negates such a simple solution. Instead, LTDP represents a dedicated, persistent commitment by archivists and records managers to guarantee the ingest, safe storage, and continual migration of digital records over time (while ensuring contextual and preservation metadata remain intact throughout these processes), for continuing and meaningful access and use, indefinitely. Not simply a systems-based or technological solution, LTDP involves a dedication of human, organizational, and financial resources to develop policies, procedures, and activities that ensure authentic, reliable digital records are preserved and made available forever.

Even though there is no universal definition of what constitutes a LTDP program, I consider the following as important, if not essential, requirements for the indefinite preservation and accessibility of digital records in organizations:

- The enshrinement of LTDP in the archives or sponsoring organization's legal mandate, vision statements, or organizational goals;
- Policies and procedures for the appraisal, acquisition, and description of archival digital records, including what types of digital records the archives will collect, what digital formats it will support, and how records will be described;

---

[2] Consultative Committee for Space Data Systems, *Reference Model for an Open Archival Information System* (Rome: 2009), 1-11, http://public.ccsds.org/publications/archive/650x0b1.pdf (accessed November 4, 2011).

- The identification of specific outcomes or goals for the LTDP program, which support important and ongoing operational functions of the archives or its sponsoring organization;

- Sufficient intellectual and legal control over records, including considerations for the protection and maintenance of copyright and other intellectual property protection measures;

- The allocation of specific and continuous human and financial resources for LTDP, with the necessary planning measures in place to commit to ensure that they will be available in perpetuity;

- The identification of a defined community of users, to which archival digital records must be preserved and made available forever;

- Policies and procedures for the creation and capture of context- and provenance-rich digital records in an electronic document and records management system (EDRMS), with additional metadata "tagging," and the assurance that the EDRMS will manage records in a way that preserves authenticity and reliability until transfer to a digital preservation system;

- The identification and adoption of a specific preservation technique (migration, emulation, software and hardware conservation, etc.), and considerations for where, and how, the archives will store back-up records;

- The identification and adoption of a digital preservation system software program to manage the ingest, storage, and maintenance of archival digital records, including considerations for what metadata schemas it will support; and

- Policies and procedures for disaster and business continuity planning, as well as for when all software and storage media will be periodically updated and/or migrated.[3]

Although many archives have some digital holdings – a few diskettes or CDs; a digital photograph or audiovisual record collection; the archives' own digital records, such as word processor files, spreadsheets, web pages, and emails; or material downloaded from the web – these are mostly collected ad hoc, and even when planned, such activities do not amount to a "full" LTDP program as identified above.

---

[3] These requirements are based primarily on those found in Northeast Document Conservation Center, *Planning for Digital Preservation: A Self-Assessment Tool*, http://www.nedcc.org/resources/digital/downloads/DigitalPreservationSelfAssessmentfinal.pdf (accessed March 4, 2012); and Consultative Committee for Space Data Systems, *Reference Model for an Open Archival Information System – Recommended Practice* (Washington: 2012), 3-1 – 3-6, http://public.ccsds.org/publications/archive/650x0m2.pdf (accessed March 4, 2012).

Taking into account the prevalence of digital records in every facet of twenty-first century society, and the availability of numerous journal articles, research reports, and online resources to assist archivists and records managers in managing, preserving, and making available digital records, one might assume that the majority of institutional archives would have committed programs, adhering to the requirements above, to ensure that the digital records within their jurisdictions remain reliable, authentic, and accessible over the long term. In reality, however, most organizational archives, including corporate, religious, and educational archives, in addition to those situated within municipal, provincial, or federal government, have no or inadequate programs in place to preserve and make available digital records. Compared to their analogue counterparts, digital records are vastly underrepresented in the archival record in relation to their proportion of all records created in society and its institutions. Those digital records archives that do exist are overwhelmingly focused on the institutional needs of their supporting government, business, or university, and rarely on records created by private individuals, smaller organizations, or records created through social networking, forums, or other online experiences.[4]

Although members of the archival profession have articulated many of the problems inherent in digital records preservation, and offered a series of often

---

[4] While there has been some limited archival advocacy for private digital records, this thesis is almost exclusively focused on the records of organizations stemming from work and work processes, those that are subject to records and information management intervention and interaction with archivists. For discussions on the long-term preservation of personal digital records, see Lucie Paquet, "Appraisal, Acquisition, and Control of Personal Electronic Records: From Myth to Reality," *Archives and Manuscripts* 28, 2 (November 2000), 71-91; Adrian Cunningham, "Waiting for the Ghost Train: Strategies for Managing Electronic Personal Records Before it is Too Late," in Christopher A. Lee, ed., *I, Digital: Personal Digital Collections in the Digital Era* (Chicago: Society of American Archivists, 2011), 78-89; and Jordan Bass, "Getting Personal: Confronting the Challenges of Archiving Personal Records in a Digital Age," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 2012).

detailed recommendations to solve these challenges, progress in actually realizing the
construction of digital archives programs to implement such digital records theory
and strategy has been markedly slower. Only a small percentage of North American
archives have stable, resourced, full-function programs to preserve and make
available digital records over the long-term, and these mostly at the national level and
in universities. It has been over fifty years since the advent of computer-generated
records, yet many state, local, and provincial governments, even those possessing
large in-house information technology facilities and state-of-the-art archival
equipment for other records media, have no, or very inadequate, arrangements for
archiving digital records. Long-term archival digital preservation advocacy – defined
as the development and delivery of political- and policy-focused measures that
attempt to convince a targeted community of individuals or organizations, inside or
outside the archives and records management professions, to support the concepts,
methodologies, and resources necessary to preserve and make available digital
records over the long term – has not achieved much resonance, if judged by the
results of the very few robust programs in existence. Advocacy is differentiated from
"public programming" activities such as reference, archival outreach, and publicity,
which concentrate instead on highlighting archival resources and encouraging new
and former patrons to make use of the archives' facilities and records.

The underrepresentation of digital records in archives is a serious concern.
Without reliable and authentic organizational records, well preserved across time and
in understandable context, citizens lose many of their fundamental rights, including
freedom of information and protection of privacy. Democracy itself is therefore

jeopardized, while individuals, groups, and nations lose a sense of their various pasts, upon which identity and community depend. Creators of records and their societies will be unable to use records for the myriad of purposes archives are now used for – from educational and economic purposes to scientific and health care uses. History, heritage, and culture based on a knowledge of the past are threatened. Therefore, among other duties, a central dimension of the archivist's professional responsibility in a digital age must be to prevent these undesirable consequences.

Why then have more organizations not been able to initiate and maintain full-function LTDP programs? Have digital records management and long-term preservation advocacy "messages" not reached their intended audience? Is the content of the "messages" themselves flawed? Have the "messages" been poorly communicated, with those responsible for funding archives and records management programs not hearing them? What can archivists and records managers do to argue better for the creation and maintenance of robust, well-resourced LTDP programs? What else needs to be done to facilitate the growth of digital archives?

This thesis intends to address these advocacy questions, through four chapters, and will focus almost exclusively on organizational digital records. Such records – including those created in government (of all levels), universities, corporations, businesses, hospitals, and similar institutions, and which are generally contingent on the intercession of records and information management specialists and processes – have been the overwhelming focal point of LTDP advocacy literature and practice. The preservation of private or personal digital records has, in comparison, received only very limited attention in archives and records management literature, and is

placed beyond the scope of the thesis.

Chapter One situates later discussions about LTDP advocacy by presenting a brief examination of computers and organizational digital records, using published sources including journal articles, books, and theses. This places advocacy within a historical and technological context that reflects the impact of digital technology on the archival profession. This chapter also analyzes how the manner in which computer technology was developed, marketed, and embraced by government, business, and other social sectors, led to the formation of distinct alliances, or a lack thereof, between archivists and other stakeholders in the records and information professions. Chapter Two lays the groundwork for the primary research portion of the thesis, through an examination of the intellectual history of themes in organizational digital records preservation advocacy spanning the last four decades. This demonstrates how advocacy "messages" have been formulated, disseminated, and "sold," using such sources as journal articles, research project reports, books, surveys, web sites of ongoing long-term digital preservation programs, and blogs. This chapter analyzes which arguments archivists and records managers have advanced to convince sponsors to allocate funding and other resources for LTDP programs, while also illustrating the multitude of resources available to assist archivists and records managers in undertaking long-term digital preservation activities. These "messages" are then used to inform the subsequent primary research portion of the thesis.

Chapter Three examines the content and resonance of LTDP advocacy through a series of online surveys and, with special focus on Manitoba, follow-up one-on-one interviews conducted with archivists and records managers from a variety

of corporations, educational facilities, government bodies, and other organizations. Survey questions, some twenty-seven in total, were developed based on common themes identified in my examination of LTDP advocacy literature in Chapter Two. The surveys were released through three online listservs, two of which targeted primarily archivists, and one which targeted primarily records managers. In total, fifty-four respondents from a wide variety of archives and records managements programs completed the surveys. Ten Manitoba-based archivists and records managers – five representing each profession – agreed to participate in the targeted interviews. Interviewees were initially contacted by email, with follow-up interviews conducted in-person, over the phone, and by email. Interviewees were chosen as a representative sample of the major types of organizational archives and records management programs in Manitoba – provincial, city, federal, university, and corporate. Interview questions, of which no interviewee was asked to answer more than ten, were developed based on common responses and opinions of survey respondents. Copies of the survey and interview questions are available in the appendices.[5]

By directly soliciting the opinions of archivists and records managers at the working and managerial levels, this chapter provides evidence concerning which arguments have been successful in convincing more senior levels of management to accept, then fund, and continue to fund, LTDP programs. It also analyzes, among other topics, why the respondents and interviewees believe there are so few vigourous

---

[5] The survey questions are reproduced in Appendix A but, due to space constraints, only those for archivists are included. The questions for records managers are almost duplicates, excluding some small changes to introduce wording and terminology more appropriate to records managers. Interview questions for archivists are reproduced in Appendix B, while those for records managers are in Appendix C.

and fully-supported archival programs dedicated to the preservation of digital records, as well as what strategies and methodologies might be adopted to increase their numbers. Finally, Chapter Four offers a series of concluding observations from the surveys and interviews; three recommendations on improving long-term digital preservation advocacy, both internal and external, developed from the survey and interview responses and my own examination of LTDP advocacy literature; comparisons with the findings of two other major surveys; and suggestions for future research.

All surveys and targeted interviews were conducted with the formal approval of the University of Manitoba Research and Ethics Board. Interview participants were required to sign a release form which informed them of their privacy rights, how their information will be stored and disposed of, and provided three options for how they would be identified in this thesis or any subsequent publications: direction quotation and attribution by name and employer; paraphrased only and attribution by name and employer; or paraphrased only and not identified by name, employer, or any other detectable trait.[6] Throughout this thesis, all survey and interview participants are quoted in their chosen manner. Respondents to the surveys were offered the same options. Strict confidentiality, where requested, has been maintained throughout the thesis research and writing process.

---

[6] A copy of the interview consent form is included in Appendix D.

CHAPTER ONE

FROM MAINFRAME TO MINI TO MICRO TO MAC:

A BRIEF HISTORY OF COMPUTERS AND DIGITAL RECORDS

The history of digital records[1] is inextricably linked to the history of the

computer itself. As successive generations of computer technology are developed,

refined, marketed, and adopted by users, then eventually declared obsolete and

relegated to the silicon scrapheap, their recorded digital outputs often suffer a similar

fate. In a rapidly developing industry such as computers, technical obsolescence is

simply a fact of life; once something faster, cheaper, or more user-friendly comes

along, or once consumers demand new functionality from their machines, the old

technology is discarded in favour of new. Likewise with digital records, as hardware,

software, operating systems, and storage media evolve, files created on older

machines may be erased, destroyed, rendered unreadable, or simply neglected on

earlier storage media to die a not-so-slow digital death. Although technical

obsolescence may not present an issue for computer hardware and software

developers – on the contrary it may be beneficial to meeting client or customer needs,

---

[1] With the advent of fully electronic computing technology after the Second World War, information and records produced on computers became known as "machine-readable," as they could only be rendered, viewed, and altered through computer hardware and software mediation. Later, beginning in the late 1970s and 1980s, such information and records became increasingly referred to as "electronic," highlighting the distinction between strictly electronic computer inputs from keyboards, sensors, cameras, and other devices and electronic outputs stored on media such as magnetic tapes and disks, as contrasted with earlier analogue input/output such as punch cards. Within current professional archives and records management discourse, computer-generated information and records are now generally referred to as "digital," although "electronic" also remains in use. The writer treats "digital" and "electronic" as interchangeable, but will generally conform to current usage and refer to such records as "digital." However, terms including "machine-readable" and "electronic" will be used to highlight specific time periods and "generations" of digital records.

and to advancing their own careers – archivists entrusted with preserving and making

available society's most important records, regardless of media, must adopt,

implement, and advocate a long-term vision for digital records. An examination of the

history of computers and digital records is necessary to place organizational digital

records advocacy within a broader historical and technological context, reflecting the

impact of digital technology on the archival profession. Although the development of

computers for personal private uses (by authors, students, hobbyists, etc.) will be

discussed to illuminate the history of computers, where necessary, this chapter, as

well as the thesis as a whole, is almost entirely focussed on organizational digital

records – such as those produced in government offices, businesses, non-

governmental organizations, universities, etc. – which are, generally, subject to

intervention from records managers at some stage of their "life-cycle."

The first "computers" were designed by nineteenth-century English

mathematician Charles Babbage, who devoted his research to exploring how complex

and error-inducing mathematical tables might be better calculated by mechanical

means. Babbage designed two automated machines, known as engines, which were

hand-cranked mechanical calculators[2] operating with a series of gears, wheels, and

levers. After a set of figures was entered into the machine, and one of several

calculations performed, a suitable set of tables was produced and outputted onto a

---

[2] Mechanical calculators, first developed in the seventeenth century, performed mathematical calculations through the manipulation of ratchets or keys driving various gears, counters, and dials. Originally hand powered and later driven by electric motors, mechanical calculators remained in wide-spread use until the middle of the twentieth century. For the history of these calculators, see George C. Chase, "History of Mechanical Computing Machinery," *IEEE Annals of the History of Computing* 2, 3 (July-September 1980), 198-226; and William Aspray, *Computing Before Computers* (Ames, IA: Iowa State University Press, 1990), 34-57.

separate medium for analysis and use.[3] Babbage's engines were structured around the

decimal system,[4] as the inventor found that its base-ten arrangement both simplified

the construction of the engines and facilitated efficient input/output operations.[5]

Punch card technology would provide the input and output functions. Unfortunately

for Babbage, his engines were never completed. However, one component of these

early computers – the punch card – would go on to revolutionize data processing.

Beginning in the 1890s, electro-mechanical tabulating machines, the first of

which was designed by German-American inventor Herman Hollerith, allowed huge

quantities of data on punch cards to be processed in a fraction of the time required for

calculation by hand. By the turn of the twentieth century, railways, steel companies,

postal services, insurance firms, and other businesses began to adopt these machines

to manage their own ever-increasing amounts of information.[6] The use of electro-

mechanical tabulators to support business data processing exploded during the

interwar period. Common business functions based on numerical calculations, such as

the calculation of financial statements, payroll accounting, accounts payable, sales

analysis, and inventory control and costs, were automated for the first time.

Before the Second World War, mechanical tabulating machines represented

the state-of-the-art in computing technology. These machines were composed of a

series of mechanical gears, notched wheels, drums, and cogs that represented banks

---

[3] Martin Campbell-Kelly and William Aspray, *Computer: A History of the Information Machine* (Boulder: Westview Press, 2004), 9.
[4] Decimal number systems are those that increase as powers of the base of 10: 1, 10, 100, 1000, etc. See Georges Ifrah, *The Universal History of Computing: From the Abacus to the Quantum Computer* (New York: John Wiley & Sons, Inc., 2001), 86.
[5] Allan G. Bromley, "Charles Babbage's Analytical Engine, 1838," *IEEE Annals of the History of Computing* 20, 4 (April-June, 1998), 30.
[6] Robert V. Williams, "The Use of Punched Cards in US Libraries and Documentation Centers 1936-1965," *IEEE Annals of the History of Computing* 24, 2 (April 2002), 16.

of decimal numbers. When activated by a mechanical crank or electronic current, these parts interacted to perform various mathematical calculations as specified by the input medium, generally punch cards. The results of these calculations were then outputted onto a storage media such as paper tape or more punch cards. In contrast, fully electronic computers, such as those that began to appear in the 1940s and 1950s, are able to perform calculations exponentially faster as they lack slow-moving mechanical components such as gears and wheels. Instead of mechanical interaction, electronic computers only require a digital input, such as binary numerical code, to perform various calculations. The binary coding system represents alpha-numeric values using only ones and zeros. The straightforward yes/no (or on/off) nature of the binary system lends itself well to the creation of digital computing code as complex instructions can easily be expressed using various sequences ("bit strings" or "bit arrays") of ones and zeros. Regardless of input/output media, or internal processing mechanisms, all electronic computers process calculations at speeds incomparable to their mechanical predecessors, as zeros and ones were distinguished by the electrical current being switched off or on.

The Genesis of the Digital Computer, 1943-1957

Designed between 1943 and 1946, ENIAC, the world's first general-purpose digital computer, was powered by some eighteen-thousand vacuum tubes, linked in parallel and powered by a "master programmer" console which provided the input function for units of multiplication, division, the computation of square roots, the storage of fixed constants, and the reading and printing of output data on punch cards.[7] While ENIAC could perform calculations at previously unheard-of speeds, as

---

[7] Mitchell Marcus and Atushi Akera, "Exploring the Architecture of an Early Machine: The Historical

electricity moves through the vacuum tubes exponentially faster than mechanical gears and wheels, it was still an "expensive, hardly-reliable monster of a system that proved difficult to use."[8] Moreover, the vacuum tube "processors" were prone to failure. Although ENIAC was thus far from perfect, the concept of electronic digital data processing ensured that many individuals took notice of this first digital computer, and could envision its application well beyond the crisis realm of wartime government.

By the early 1950s, companies such as the Eckert-Mauchly Computer Corporation (EMCC), creators of ENIAC, and the International Business Machines Corporation (IBM) were approaching public officials to secure contracts for the development of new business computers. At the same time, middle managers and senior executives were sponsoring their own internal studies to ascertain how computers could be harnessed to simplify, accelerate, and generally improve work processes.[9] In fact, this commercialization of the computer during the 1950s was the impetus for various advancements such as faster processors and larger memories, as well as new uses for computers such as computer-based management and accounting, beyond the electronic computer's origins as fast adding machines.[10]

By the mid-1950s, IBM had established itself as a leading innovator in mainframe[11] computer technology. For example, it was the first company to introduce

Relevance of the ENIAC Machine Architecture," *IEEE Annals of the History of Computing* 18, 1 (Spring 1996), 19-21.

[8] James Cortada, "The ENIAC's Influence on Business Computing, 1940s-1950s," *IEEE Annals of the History of Computing* 28, 2 (April-June 2006), 28.

[9] Ibid., 27.

[10] Michael Sean Mahoney, *Histories of Computing* (Harvard: Harvard University Press, 2011), 88-89.

[11] Although there is no strict definition of what constitutes a "mainframe," they are generally characterized as powerful and expensive computers with the ability to serve multiple users simultaneously. See the *Dictionary of Computer and Internet Terms* (New York: Barron's Educational

magnetic disk storage in 1956. In addition to greater storage capacity, magnetic disks

provided computers for the first time with the true qualities of random access. This

meant that any single piece of data was as accessible as any other, in contrast to a

sequentially-arranged deck of punch cards or a reel of magnetic tape.[12] In addition,

disk systems allowed for a single repository into which data could be entered, stored,

checked, retrieved, and updated by many different programs. The ability to instantly

access any single piece of data also facilitated the growth of "real-time" systems,

whereby the computer could be queried and a result instantly attained. No previous

data-processing technology had been able to produce real-time results, and the

potential of this technology for improving business and other organizational processes

and profitability was immense.[13]

Despite the early adoption of mainframe computers by government and

business, vacuum tube-based computers were ultimately too expensive, fragile, and

unreliable to achieve widespread acceptance. Like light bulbs, vacuum tubes burned

out, and thousands of them generated great heat, causing the computer to malfunction

or "crash." In addition, software (programs that tell a computer what functions to

perform) during this period was rudimentary and inaccessible to almost all users. Due

to these reasons and more, computers would achieve only moderate acceptance in

organizational cultures until both the size, as well as the cost, of computing could be

lowered, and their reliability not to "crash," significantly improved.

Services, 2009), 299, for a simple definition of the modern mainframe as, "a large computer occupying
a specially air-conditioned room and supporting hundreds of users at one time." Until the introduction
of minicomputers in the 1960s, all computers can be characterized as mainframes, and this era,
predating the wide-scale use of smaller, often networked mini and microcomputers, can be known as
the "mainframe era." Mainframes are still very much in use, but have also been supplemented by
various other forms of computers.

[12] Paul Ceruzzi, *A History of Modern Computing* (Cambridge: The MIT Press, 2003), 70.

[13] Campbell-Kelly and Aspray, *Computer: A History*, 144.

Commercial Computing Comes of Age – Transistorized Computers

The introduction of transistor technology in 1955 set a new standard for computer reliability, affordability, and processing speed. Transistors – solid-state (generally silicon) devices which regulate electrical current flow and act as switches or gates – were much more reliable than vacuum tubes, produced less heat, and consumed less power. In addition, as transistorized computers processed information much quicker than their vacuum-tube predecessors, a greater number of applications, particularly business applications, became suitable for digital data processing.[14] The economic benefits of transistorized computers outweighed their high start-up cost, and computer systems now had enough power, memory, and speed to be attractive long-term investments.[15]

If computer use in the early 1950s was dominated by scientific and military calculation in support of research, or for computation of vast amounts of numerical sums for business, by the end of the decade this balance had shifted decisively towards data processing for business applications beyond the mathematical. This shift "provided computer vendors with the economic wherewithal to build and sell more machines. Customers provided economic incentives and demand for additional functions that motivated computer designers to provide newer, different, faster, cheaper, and more reliable devices and software."[16] The largest obstacle hampering the further dissemination of computing technology was the size and expense of hardware itself – the cumbersome and costly mainframe computer.

---

[14] Phillip Bantin, *Understanding Data and Information Systems for Recordkeeping* (New York: Neal-Schuman Publishers, 2008), 2.
[15] James Cortada, "Commercial Applications of the Digital Computer in American Corporations, 1945-1995," *IEEE Annals of the History of Computing* 18, 2 (Summer 1996), 19.
[16] Ibid., 18.

At this time, access to mainframe computers was achieved through "service bureaus" or "computer utilities," for students, novices, or other small-scale users (essentially anyone without the millions of dollars required for an in-house mainframe installation, such as major governments, the military, large business corporations, or major universities). Such small-scale users were able to rent time on an hourly basis to program the machine, input one's data, have the calculation performed, and receive an output report. Access to such "utilities" was not inexpensive, and as such, time for innovative experimentation, and correcting and re-running for programming errors, was an expensive undertaking. As a result, there was a strong impetus for the introduction of new modes of computing and hardware technology to alleviate the high cost of computing and enable more and more users to gain first-hand experience with computers at lower cost.

Minicomputers and "Machine-Readable" Archives

The compact size and lower cost of transistorized computers, and later the introduction of integrated circuits (ICs – digital circuits produced on a thin silicon board), or "chips," led to the development of a new class of computer – the minicomputer. Essentially scaled-down mainframes, minicomputers were packaged to be affordable, efficient, easy-to-use, and suitable for a wide variety of functions. The first commercially available minicomputer, the Digital Equipment Corporation (DEC) PDP-8, was introduced in 1965. Due to their low cost and compact size, many PDP-8s were purchased in multiple numbers by colleges and research laboratories. This enabled students and faculty to experience hands-on computing for the first time, with many users becoming attached to their "personal" machine. Some users –

students as well as experienced computer engineers – designed and programmed simple games for their machines, and in doing so a fledgling hobbyist computer sub-culture began to emerge.

In addition, the 1960s experienced a huge increase in the production of software. By 1968 some five hundred companies were producing software, employing over ten thousand programmers at the turn of the 1970s. Throughout this period, the minicomputer market also boomed with dozens of new entrants every year.[17] Still, minicomputers were too expensive to be purchased on an individual basis for each single worker, even in large governments and corporations. However, the introduction of microprocessor silicon chips in the 1970s would – through lower costs and improved performance – finally allow desktop computers to become commonplace in many types of organizations. The introduction of microprocessor-based computers in turn would also allow for the creation of many new types of digital records such as word processor and spreadsheet files, digital images and sounds, and small databases and graphic designs, as the computing audience broadened to encompass many more possible users for computer technology.

"Machine-readable" records produced on mainframes and minicomputers represent a first "generation" of organizational archival digital records. The records most commonly produced on computers during this era consisted of statistical and social-science data files. Stored primarily on magnetic tape or cassettes, in addition to paper tape and ever-ubiquitous punch cards, these were primarily forms, questionnaires, or surveys which, for ease of tabulation and manipulation, had been made machine-readable. Although the content of these files varied, the way in which

---

[17] Mahoney, *Histories of Computing*, 89.

they were stored was generally consistent. Most were saved as "flat files," generally in non-proprietary ASCII text format (.txt). Flat files store digital records in the most basic and straight-forward manner possible. Lines of text represent fields within a database, these fields are separated by a limiter such as a comma, and the length of the fields is fixed so that it is apparent when one field ends and another begins. As such, it is very easy to recreate and render a simple database using a flat file. Such early digital records received attention from a handful of archivists, with the vast majority of archivists having little-to-no contact with digital records in their day-to-day activities.

In addition, although there was no shortage of computer-generated information being produced, much of it was not considered "records," either by archivists, or by records creators themselves. Moreover, the organizational information created on the early machines was "housekeeping" or "administrative" in large part, which had rarely interested archivists as having any value in older paper formats. Why should "machine-readable" versions of such paper documents be any different? When, for example, an early paper on digital records archiving was delivered at the International Council of Archives (ICA) annual meeting in 1964, almost no discussion or response was generated.[18] Many archivists adopted a position whereby digital records would not be appraised and accessioned into archival repositories unless they were first transferred to paper or microfilm. Even as late as 1974, half of North American archivists surveyed responded that they did not consider digital media to be record material, and did not plan to accession them into

---

[18] Betsey Baldwin, "Confronting Computers: Debates about Computers at the Public Archives of Canada During the 1960s," *Archivaria* 62 (Fall 2006), 174.

their collections.[19] For many archivists, computers were tools designed for the rapid processing of information, and digital data was simply a transitory by-product created in the processing stage between inputs and paper "hard copy" outputs.

Records creators adopted a similar viewpoint, with paper considered the ultimate medium for "official" records and long-term preservation. As such, a "print to file" mentality became prevalent. If records creators wanted to maintain information contained in a digital record over the long term, most simply printed a paper copy of the record and considered this a "preservation copy" worthy of retention. "Printing to file," however, is an unacceptable substitute for archival digital preservation, as a paper copy of a digital record contains little, if any, contextual metadata (data about data) about how, and by whom, that record was created, used, copied, altered, or viewed. In addition, many digital records, such as relational database files which will be explored later in this chapter, only have meaning in the way that they relate to other records. "Printing to file" is also meaningless for audio-visual and sound records, or for complex interactive ones where a piece of data may be combined in numerous ways, and not a single view for printing. In addition, "printing to file" and applying "traditional" records management and archival processes entails high human and facilities resources.[20] Therefore, printing off a "snapshot" of such a record is an inadequate preservation technique and unacceptable by archival standards.

Machine-readable records of the first "generation" of mainframe computing

---

[19] Thomas Elton Brown, "The Society of American Archivists Confronts the Computer," *American Archivist* 47, 4 (Fall 1984), 373.

[20] David Horky, "Archival Perspectives on the Evolution and Organizational Impact of E-mail System Technologies," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 1998), 30.

were generally either "one shot," stand-alone social science or statistical files, or administrative files which, although perhaps more reflective of the actual functions, activities, and organization of their creating agency, and thus rich in contextual information, were merely classified as "data." As such, these "data" files were not generally considered valuable enough to warrant long-term preservation.[21] The information contained within was valued by those scientists and sociologists who created the file, yet, as these records were retained almost exclusively for their informational content, the context surrounding their creation and use – and therefore their archival provenance – was largely unimportant. Although lacking in provenance and contextual linkages to their creation and use, these files were the first digital records to be appraised and accessioned into archival custody. The simpler nature of early machine-readable records facilitated an "easing-in" period during which computer-minded archivists began to familiarize themselves with the theoretical and technical requirements for appraising, acquiring, accessioning, describing, and conserving digital records. However, the development of complex and ever-more pervasive digital records would strain archivists' abilities to perform these "traditional" archival duties with newer and more complex digital applications. The introduction of microcomputers, PCs, and the growth of the "automated office" would further contribute to an ever-more untenable position for the earliest "generation" of digital records archivists, eventually leading to various professional discussions on how archivists should respond to increasingly complex and voluminous organizational digital records.

---

[21] Terry Cook, "The Electronic Records Archival Program at the National Archives of Canada: Evolution and Critical Factors of Success," in Margaret Hedstrom, ed., *Electronic Records Management Program Strategies* (Pittsburgh: Archives & Museum Informatics, 1993), 38.

Microprocessors and Microcomputers: Computing Reaches the Masses

By the dawn of the 1970s, interest in smaller, more-efficient, cheaper, easier-to-program, and more "personal" computers continued to grow. In addition, simplified programming languages such as BASIC[22] helped introduce computer programming to scores of students and other novice users. However, with the cheapest minicomputers still costing upwards of ten thousand dollars, most independent users and computer hobbyists were unable to purchase their own system. Computers did not, therefore, disseminate beyond the production floors, university campuses, major business offices, and research and development laboratories they currently occupied. Eventually, however, advancements in semiconductor technology would finally create a product – the microprocessor – that would allow computers to reach "ordinary users," thereby facilitating the introduction of personal computers and the avalanche of digital information that we now experience.

Microprocessors, first developed by Intel in 1971, can be understood as "mini computers" on a chip. A microprocessor encompasses all of the basic functions of a computer's central processing unit (CPU) on a single integrated circuit. By greatly reducing the chip count in a standard minicomputer, let alone a mainframe, the use of microprocessors drastically lowered the price of computers.[23] By 1975 the first microprocessor-powered computers began to enter the marketplace, led by the Altair

---

[22] BASIC, as the name suggests, was a simple, straightforward programming language designed for undergraduate students, academics, and other users lacking the previously prerequisite background in computer electrical engineering, science, or mathematics. A general level of proficiency with BASIC could be achieved after only a few hours of lectures and, as such, it soon became the introductory programming language taught to almost all non-specialist students learning computers. See Campbell-Kelly and Aspray, *Computer: A History*, 199-202.

[23] Janet Abbate, "Getting Small: A Short History of the Personal Computer," *IEEE Annals of the History of Computing* 87, 9 (September 1999), 1695.

8800. Described by some as the first "personal computer,"[24] the Altair 8800, initially

sold in kit form through mail-order advertisements in popular technology magazines,

and to be assembled by the user at home, sold thousands of units. Although a

rudimentary machine with limited capabilities, the Altair 8800 created a great deal of

interest in the idea of inexpensive, personal computers, thereby expanding and

solidifying the computer hobbyist sub-culture.[25] The limitations of microcomputers,

however, were also in some ways beneficial to the advancement of personal

computing. Almost immediately after microcomputers appeared on the market,

various small start-up firms began producing add-on circuit boards so that extra

memory and other accessories could be added to the machines to enhance their

power, speed, memory, or functionality.[26] In addition to hardware and peripherals, the

market for microcomputer software also represented a new and emerging business

opportunity.

Beginning in 1977, a second wave of microcomputers appeared that more

closely articulated the vision of the microcomputer as a "personal" information

machine. The inexpensive Tandy TRS-80, released that summer, came ready

equipped with its own keyboard, monitor, and a magnetic cassette tape drive for

loading software programs as well as storing output data. Its wide-scale distribution

through Radio Shack stores, then a market leader in home electronics retail sales,

allowed the TRS-80 to reach a much wider audience than previous microcomputer

offerings and provided an introduction to computing for many novice users such as

---

[24] Campbell-Kelly and Aspray, *Computer: A History*, 213.
[25] Abbate, "Getting Small," 1696.
[26] Campbell-Kelly and Aspray, *Computer: A History*, 214.

small business owners and stay-at-home authors.[27] Many educational institutions, even elementary and secondary schools, also purchased TRS-80s due to their low cost and widespread availability. Apple Computer, Inc. entered this second-generation microcomputer market with the release of the Apple II in 1977. Among other features, the Apple II supported the use of two 5.25" floppy disk drives, one for the software instructions diskette and one for the output data (text, tables, etc.), thus eliminating the need for switching diskettes continually as in one-drive machines. With a disk capacity of up to 113KB of data, floppy disks created a market for larger, more sophisticated software programs, especially games and similar entertainment applications, than had been previously available. The introduction of a common microcomputer operating system, CP/M, also encouraged the production of software as programs could now be run on many different machines.[28]

IBM entered the microcomputer market in 1981 with the release of its IBM 8088 personal computer, quickly dubbed the "PC." When introduced, the IBM PC was the lowest-priced personal computer available, and came complete with 16KB of memory (expandable to 256KB), a floppy disk drive, and a monitor.[29] In addition, IBM had approached the Microsoft Corporation to create a 16-bit disk operating system (DOS) suitable for the 8088. The resulting product, known alternatively as PC-DOS and MS-DOS by IBM and Microsoft respectively, proved to be a powerful, user-friendly, and long-lasting operating system (to say nothing of launching the career of Bill Gates, who wrote the program and co-launched Microsoft as a garage-based start-up company). In addition to supplying IBM, Microsoft independently

---

[27] Ceruzzi, *A History*, 263-264.
[28] Ibid., 266.
[29] Gerard O'Regan, *A Brief History of Computing* (London: Springer Verlag, 2008), 212.

marketed MS-DOS as a cross-platform operating system. Due to this cross-platform capability, software manufacturers who wanted to market their products as widely as possible needed to make sure they were compatible with MS-DOS. Therefore, MS-DOS and the IBM PC architecture became a *de facto* microcomputer standard for many years.

Putting the "Personal" in "Personal Computing"

It was during the 1980s that advancements in software, services, and ease-of-use finally made personal computing attractive to a wide audience of ordinary consumers. For example, in the workplace, every worker could now be expected to work on such user-friendly machines to accomplish scores of complex tasks, without needing to be programmers, computer scientists, or devoted hobbyist "geeks." As work (as well as personal) activities spread from beyond the "machine-readable" world of mass-scale calculations of traditional records made "machine-readable," so did their outputs, as recorded products, or "records," pass increasingly from a paper-based to a digital-only form. Increasingly called "electronic records," these documented almost every conceivable work or personal activity previously recorded by analogue media such as paper, film, sound, or parchment.

Advancements in software provided new uses, as well as new users, for computers. In particular, two new classes of business- or work-process software would dominate the personal computer market during the 1980s, introduce many new users to computers, and remain immensely popular until this day: spreadsheets and word processors.[30] VisiCalc, a spreadsheet program first released in 1979, was a

---

[30] Although spreadsheets, word processors, and similar "office suite" software applications remain hugely popular, video game software now outsells all business software, in addition to all film, music,

massive success and sold hundreds of thousands of copies. Indeed, it is argued that

VisiCalc was one of the main justifications behind the rapid dissemination and

acceptance of personal computers, particularly for businesses.[31] VisiCalc allowed

users such as accountants, financial analysts, tax planners, and business managers to

populate and manipulate spreadsheets in real-time using a simple graphical interface.

If the figures in one cell were recalculated, the entire spreadsheet would automatically

recalculate as well. As such, budget projections and other "what if" situations could

be instantly developed and analyzed.[32] Users could save their "records" on magnetic

cassettes or floppy disks as needed for future updating or recalculation.

The response to spreadsheet programs was eclipsed perhaps only by the

enthusiasm shown for word processing on microcomputers. Programs such as Electric

Pencil and EasyWriter allowed workplace users to create, edit, save, and print a

variety of textual documents including correspondence, reports, manuscripts, and

forms, to say nothing of personal letters, diaries, and memoirs. Programs such as

these featured WYSIWYG (what you see is what you get) text editors, in which

changes to formatting options, such as italicizing, bolding, margins, and fonts, are

instantly displayed on the screen in real-time and applied across the whole document

at once.[33] Gone were the days of painstakingly retyping whole drafts or using "white

out" liquid to allow for correcting individual typographical errors, manually, letter by

letter. Word-processing documents, like spreadsheets, could also be copied for

---

and many other software types combined. As this thesis is focused on organizational digital records, however, I am discussing software only in the context of business or other organizational use.

[31] Burton Grad, "The Creation and Demise of VisiCalc," *IEEE Annals of the History of Computing* 29, 3 (July-September 2007), 20.

[32] Ibid., 20-21.

[33] David Levy, *Scrolling Forward: Making Sense of Documents in the Digital Age* (New York: Arcade Publishing, 2001), 146-147.

storage onto cassette tapes or floppy disks for preservation and reuse or revision, or for printing later. Massively popular, these programs sold millions of copies during the 1980s.[34]

Another important innovation during the 1980s which helped to demystify computers was the development of graphical user interfaces (GUIs). Before the introduction of GUIs, computer users interacted with their machines through the use of a command line interface (CLI), often Microsoft's MS-DOS CLI. Using CLI instructions required meticulous typing by the user, wholly without error, of unfriendly lines of complex code. While CLIs presented a useful mechanism for technically-minded individuals to communicate with their computer, many non-technical users, such as office workers, administrative assistants, and authors working from home, found CLIs difficult and intimidating to use. GUIs, particularly after the introduction of the computer mouse in 1981, offered a much more user-friendly mechanism for human-to-computer interaction. Not only do GUIs operate under the notion that pictures are easier to understand than text, they also allow people to use slight hand movement and a "click," rather than strings of words, to control their computer.[35] The first commercially successful GUI was released with the Apple Macintosh 128 in 1984. The 128's GUI was its most revolutionary feature, utilizing a graphical series of file icons or small pictures or symbols for folders storing data, menus of instructions (like copy, save, and delete), and all executed by aiming an arrow on the monitor and clicking the mouse, instead than typing lines of code.

Microsoft released its own GUI in 1985 as part of its combined operating

---

[34] Thomas Bergin, "The Origins of Word Processing Software for Personal Computers: 1976-1985," *IEEE Annals of the History of Computing* 28, 4 (October-December 2006), 32-47.
[35] Abbate, "Getting Small," 1697.

system/graphical user interface known as Windows. Competitively priced, Windows 1.0 sold upwards of a million copies, but did not at first unseat the MS-DOS CLI among the majority of users. However, a major redesign in 1987 – Windows 2.0 – performed more smoothly, was easier-to-use, featured better and more intuitive icons, and came packaged with two additional Microsoft software programs; Excel for spreadsheets and Word for word processing.[36] Both Excel and Word, as well as the Windows GUI, would prove to be extremely popular with consumers and, frequently updated every two or three years, remain industry mainstays to this day. Later versions of Windows added more software programs for an "Office" suite of functionality: PowerPoint for multimedia presentations, Access for desktop database functionality, photograph, film, and music editors and viewers.

"Electronic" records produced on minicomputers and PCs represent a "second generation" of organizational archival digital records. While such database applications as census processing and computer-based surveys of the first "generation" in flat-file formats continued to be of importance, large hierarchical, networked, interactive, and relational databases now became the norm. In such systems, information is constantly being added and subtracted and is stored in several different internal tables or structures which only have meaning as they are related to one another.[37] To reveal these complicated contextual arrangements, database management software is required and must be preserved along with the record if it is to be understood and contextual provenance be preserved. Information such as the creator of the record, any alterations, additions, or subtractions to the record, new

---

[36] Campbell-Kelly and Aspray, *Computer: A History*, 245-246.
[37] Terry Cook, "Easy to Byte, Harder to Chew: The Second Generation of Electronic Records Archives," *Archivaria* 33 (Winter 1991-1992), 205.

versions of the record, as well as time and date stamps to indicate "who saw what record when" become of paramount importance.

The growth of the PC-powered "automated office" also saw the creation of more and more records as users created email and word processor documents, spreadsheets, and small-scale databases, to only name a few record types. Stored in a variety of proprietary file formats on various media, these new records were increasingly problematic in that they were often produced "ad-hoc" on employees' individual computers. As such, these documents were highly unstructured, unscheduled for retention or destruction, and poorly managed as a corporate resource, constituting, in a well-known observation, a "wild frontier" in electronic records archiving, where anything goes.[38]

At the same time, it was no longer a question of paper documents or survey forms being automated for ease of manipulation. The majority of electronic records were no longer "made digital," but were "born digital," and constituted letters, memos, policy statements, financial information, presentations, design and image material, and other key records documenting the most important functions and activities of the creating agency.[39] Lacking paper counterparts, these "born digital" records served as the sole repository for organizational evidence and accountability. In addition, increasingly complex, "special media" digital records began to appear along with records from the "automated office." These records included digital photographs, digital video, as well as records created on proprietary architectural and geographical information systems, to only name a few. The complex nature of

---

[38] John McDonald, "Managing Records in the Modern Office: Taming the Wild Frontier," *Archivaria* 39 (Spring 1995), 70-79.
[39] Cook, "Easy to Byte," 206.

"second generation" electronic records would further challenge archivists' abilities to preserve and make available these records, with full contextual information intact, over the long term.

Networked Computing and the World Wide Web

As the price of microcomputers and software dropped throughout the 1970s and 1980s, so too did the incentive disappear to share computer resources through awkward mechanisms such as dummy terminals and time-sharing. However, PCs still needed to be able to communicate with each other, and local area networks (LAN) solved this dilemma. LAN software allowed a network of PCs to connect to a central file server where data and office automation software would be located and disseminated to each individual PC, as required. Network users could also easily exchange files and messages among each other.[40] As network-based computing became increasingly popular among business and academic users, there existed a growing desire to further connect the world's computers outside the "local" institutional setting. Early projects such as NSFNET (National Science Foundation Network) connected multiple LAN networks across North America, over which individuals could share files and exchange digital mail. By the mid-1990s, this "internet" had grown to encompass over fifty thousand networks across the world.[41]

To enable computer users to navigate and search for specific internet content, in 1990 Tim Berners-Lee began developing what is now known as the World Wide Web. He designed the requirements for a "web" of linked "hypertext" documents which could be viewed through the use of "browsers." Hypertext refers to the ability

---

[40] Ceruzzi, *A History*, 294-295.
[41] Campbell-Kelly and Aspray, *Computer: A History*, 263-266.

to link multiple fragments of text together via computer, while browsers are specially-designed software program that would render hypertext and display it on a screen in natural language formats.[42] With the development of the Mosaic internet browser in 1993, it became possible to render hypertext documents on a computer no matter where in the world they were actually stored.

As more and more people went online, email continued to grow in popularity, while other web services began to emerge. These include e-commerce sites such as Amazon.com, which has been hugely successful in developing a secure browsing and purchasing platform for a multitude of consumer items. Peer-to-peer file-sharing services such as Napster allowed users to exchange music, images, and texts, while online video gaming networks facilitated unprecedented multiplayer experiences. In the mid-1990s, "search engines" such as Altavista and Yahoo! appeared, which enabled internet users to enter key word searches to find relevant web content. By around 2000, Google began to eclipse its competitors as the web's most dominant search engine, and is now a multi-billion dollar company offering an array of popular desktop applications and web-based products and services. For example, Google Docs, its web-based records storage service, rationalizes a multitude of file formats into its own proprietary formats for access and migration. In addition, over the past few years, a new breed of services known as "Web 2.0" applications has appeared, which concentrate on enabling users, often with little technical knowledge or programming experience, to socialize by creating and sharing their own media, art,

---

[42] Ceruzzi, *A History*, 302.

music, opinions, and information, as well as personal connections.[43] Flickr, for example, is a hugely popular image and video hosting site. It allows users to upload digital media in a variety of formats which are then seamlessly shared, blogged, or otherwise disseminated across the web.

Web 2.0 and other web-based records represent a currently developing third "generation" of archival digital records. Although the internet has presented new possibilities for the archival profession to capture records highly reflective of online social interaction, it should not be understood as a record producer, so much as a record communicator. In addition, the web is increasingly becoming a mechanism for records storage ("cloud storage," in which data and records are stored on remote servers and accessed via the internet).

Advancements in computer technology have provided archivists with opportunities (and no few challenges) to appraise, acquire, describe, preserve, and make available digital records reflective of society's individual and group interactions with computers, as well as with each other. As computer and online trends come and go, along with successive generations of hardware, software, operating systems, storage media, and peripheral devices, their collective digital outputs linger on – although how long they will linger and be intelligible is unpredictable at best. Whether produced on a large mainframe computer processing millions of business transactions or accounts in a single day, a minicomputer installed in a 1970s university computer science laboratory, or on any number of microcomputers, or PCs, these digital records are reflective of the organizational functions, programs,

---

[43] Brea Barthel and Teresa M. Harrison, "Wielding New Media in Web 2.0: Exploring the History of Engagement with the Collaborative Construction of Media Products," *New Media Society* 11, 1-2 (February/March 2009), 157.

activities, and motivations which underpinned their creation and contemporary use.

CHAPTER TWO

"SELLING" SOLUTIONS:

ARCHIVAL ADVOCACY FOR LONG-TERM DIGITAL PRESERVATION

Digital records are considerably more volatile than their paper counterparts, and require early and active archival intervention to ensure they remain intelligible, authentic, and trustworthy over time.[1] Archivists and records managers have therefore advocated for the creation and maintenance of programs to acquire, manage, preserve, and make available, in context, digital records over the long term. These advocacy efforts – almost entirely focused on organizational digital records – demonstrate what archivists and records managers, at various times, have articulated as the challenges, as well as benefits, to long-term digital preservation (LTDP), and the necessary activities required to ensure that digital records remain reliable and accessible indefinitely.

Simply defined, advocacy is "activities consciously aimed to persuade individuals or organizations to act on behalf of a program or institution."[2] Contrasting advocacy against the related concept of outreach, Richard Cox argues that "archival outreach is a public relations process, whereas archival advocacy is a political

---

[1] Radio, television programs, music recordings, films, and oral history tapes, among other media, also had a similar machine-dependence, but on a much simpler scale. Provided machines were available on which to access them, these records, being analogue, could be heard or seen without further intervention. A computer is a far more complex machine, and of almost infinite technological variety. Even if a computer could remain operational over the long term, digital media cannot be rendered intelligible to the human senses without software intervention, which is itself transient, variable, and written to work on specific operating systems for particular machines that may no longer exist. As such, the long-term accessibility and preservation of digital records can only be secured through deliberate and ongoing intervention.

[2] Larry J. Hackman, *Many Happy Returns: Advocacy and the Development of Archives* (Chicago: Society of American Archivists, 2011), vii.

process, encompassing all the stresses and strains associated with working for political aims and teaching about them."[3] Larry J. Hackman further defines archival advocacy as comprising three distinct aspects: issues advocacy, or "externally focused activity that seeks to influence law or policy creation or change;" service advocacy, or "externally or internally focused activity that publicizes archival services and resources, including outreach to actual or desired archival user or donor communities;" and sustainable advocacy, or "largely internally or donor-focused activity that seeks to sustain the existence of archival repositories."[4] In addition, Gabrielle Blais and David Enns offered a widened definition of "public programming" that embraces some of the characteristics of advocacy. Instead of focusing simply on reference and outreach, the writers call on archivists to undertake broad-based activities that promote the function of archives in society to gain the support "necessary to achieve an archival repository's mission and fulfil its mandate."[5] These examples aside, however, definitions of archival advocacy are difficult to find.

Within archives and records management literature, until Hackman's recent book at least, advocacy largely remains an undefined, and often unmentioned, term.[6] In addition, when advocacy is discussed, there is often a lack of distinction between internal organizational advocacy and the larger aims of wide-scale societal advocacy.[7] In particular, direct advocacy overtly arguing for the creation of robust LTDP

---

[3] Richard Cox, "Unpleasant Things: Teaching Advocacy in Archival Education Programs," *Interactions: UCLA Journal of Education and Information Studies* 5, 1 (2009), 2.
[4] Hackman, *Many Happy Returns*, vii.
[5] Gabrielle Blais and David Enns, "From Paper Archives to People Archives: Public Programming in the Management of Archives," *Archivaria* 31 (Winter 1990-1991), 101-103.
[6] Julia Hendry recently reviewed Hackman's work in *Archivaria* 74 (Fall 2012), 219-221.
[7] Hackman, *Many Happy Returns*, 376.

programs is relatively scarce in published literature, as compared to other digital records-related topics. As such, a discussion of digital preservation advocacy must include sources drawn from multiple themes and sub-topics within archives and records management literature.

Although advocacy may rarely appear in the title of journal articles, conference papers, presentations, and books about digital archiving, this does not indicate a lack of activity by archivists and records managers in developing and advocating strategies for long-term preservation. Through these and other venues, archivists and records managers have been arguing for the creation of organizational LTDP programs for over four decades, as well as for the necessary prerequisites, whether technological, theoretical, or political, required to achieve such programs. Advocacy can take many forms, depending on the audience to which it is directed, as well as the manner in which it supports long-term archival preservation.

For example, a journal article which challenges archivists, records managers, upper management, and others in positions of power, to make digital preservation a priority in their organization, for reasons of preserving history, safeguarding against litigation, or for increased organizational efficiency, among other reasons, is an example of direct, overt digital preservation advocacy. Such conspicuous arguments, however, are rare compared to more practical advocacy topics within the canon of digital preservation literature. Most research and literature does not overtly advocate for the creation of digital preservation programs, but rather focuses on pragmatic issues which support and enable preservation activities. Anne Gilliland identifies these issues as, primarily, "theory building in terms of identifying the nature of the

electronic record, developing alternative conceptual models, establishing the determinants of reliability and authenticity in active and preserved electronic records, identifying functional and metadata requirements for record keeping, developing and testing preservation strategies for archival records, and prototyping automated tools and techniques."[8] Additional topics in digital preservation advocacy literature include general archival theory in light of digital records, appraisal values and methodologies, strategies for implementing an electronic document and records management system (EDRMS), inter-disciplinary collaboration between records management, archives, and information technology, and professional development and training for digital records archivists. This research and literature provides the theoretical and practical basis on which long-term preservation programs are based, and represents over forty years of study into how to best preserve and make available "born digital" archival records.

Scholarly articles on digital preservation first appeared in journals such as *The American Archivist*, *l'Archiviste/The Archivist*, and *Archivaria* in the early 1970s. Articulating messages through these and other archives and records management journals, conferences, books, websites, blogs, and other venues, archivists and records managers have called on records creators, upper management, government officials, librarians, as well as their fellow archivists and records managers, to dedicate more, new, and different resources to ensure the long-term preservation and accessibility of organizational digital records. Although striving toward a shared goal of long-term preservation and access to digital records, the archives and records management

---

[8] Anne Gilliland, "Electronic Records Management," *Annual Review of Information Science and Technology* 39 (2005), 219.

professions have not articulated a single, over-arching approach by which to achieve this aim. Instead, archivists and records managers have proposed many different methods to advance the cause of digital preservation and fulfil their professional obligations in the "information age."

An examination of digital preservation literature and research over the last four decades will illuminate the development and delivery of archival advocacy for LTDP. In particular, various advocacy "messages" will be discussed, representing how archivists and records managers have argued for long-term preservation; what they have perceived as the most important elements to achieving this goal; what they have perceived as impediments to the development and sustainment of long-term preservation programs; as well as how they have articulated and disseminated various best practices for the management and preservation of organizational digital media. As these advocacy efforts have been almost entirely focussed on the preservation of organizational digital records, and respecting the scope of the thesis, this examination will not discuss advocacy for the long-term preservation of personal digital records.

Preserving History and Promoting Research:
The Emergence of Digital Records Archives

In the English-speaking archival world, the earliest proponents for the preservation of machine-readable records emerged primarily from the two largest national archives programs in North America, the Washington-based National Archives and Records Service (NARS, as it was then called) and the Public Archives of Canada (PAC), now Library and Archives Canada. Large government archives were the only institutions with the funding, resources, and staff required to perform "traditional" archival functions, such as appraisal, acquisition, description,

conservation, and reference services on early machine-readable records. Government archivists initially advocated for long-term preservation in order to preserve digital records with potential research or historical value, particularly social-science data, survey results, statistics, and other content-rich records.

Meyer Fishbein, a staff member at NARS, was one of the first archivists to advocate for the long-term preservation of digital records, arguing for them to receive the same emphasis as archival records in any other format. Failing this, archivists would be relegated to solely preserving old, paper-only records of the *ancien regime.*[9] Charles Dollar, also at NARS, advocated for the preservation of machine-readable records lest huge swaths of historically important records be left to disappear on steadily deteriorating computers and storage media scattered throughout government.[10] Then director of all archival programs at the PAC, Hugh Taylor called for archivists to be conversant with digital records in order to maintain their long-standing position as protectors of government information. Taylor envisioned the retention of these records primarily for their informational and potential research value.[11] Kenneth Thibodeau, Dollar's successor as head of NARS' Machine Readable Archives Division, likewise saw value in the preservation of digital records as "they contain enormous amounts of information which hopefully will allow more systematic, extensive, and objective historical analysis in the future."[12] This initial focus on the informational and historical research value of machine-readable records

---

[9] Meyer Fishbein, "Appraising Information in Machine Language Form," *American Archivist* 35, 1 (July/October 1972), 35-36.

[10] Charles Dollar, "Appraising Machine-Readable Records," *American Archivist* 41, 4 (October 1978), 424.

[11] Hugh Taylor, "Information Retrieval and the Training of the Archivist," *Canadian Archivist* 2, 3 (1972), 33.

[12] Kenneth Thibodeau, "Machine Readable Archives and Future History," *Computers and the Humanities* 10, 2 (March-April 1976), 89-92.

would act as the central impetus for advocacy efforts throughout the 1970s and into the 1980s, as it has long done for paper records, and thus forms the earliest LTDP advocacy "message."

Much like a census record or monograph, early digital records were "treated as publications, with their contextual relationship to creators, inventories, fonds, series, and related system information being either secondary or non-existent compared to highlighting their informational content as discrete bibliographic units."[13] With digital records viewed as sources of information for potential research, a relationship was forged between early digital records archivists and librarians, in particular "data-librarians," library staff who specialized in cataloguing and providing reference services for computer data files. Sue Dodd and Ann M. Sandberg-Fox's monograph, *Cataloging Microcomputer Files*, provides an example of the close relationship between the archives and library professions. A discussion of cataloguing standards for machine-readable archival records based on the library-standard Anglo-American Cataloging Rules, their monograph makes no provisions for digital records to be considered as little more than isolated, static files, much like library books, in need of cataloguing and organization by author and subject, one by one, with little concern for their context of creation, or provenance.[14] This move towards developing library-based systems to catalogue and classify digital records forms another early LTDP advocacy "message." Other "first generation" archivists focused on developing

---

[13] Terry Cook and Eldon Frost, "The Electronic Records Archival Program at the National Archives of Canada: Evolution and Critical Factors of Success," *Archives and Museum Informatics Technical Report No. 18* (1991), 39.

[14] Sue Dodd and Ann M. Sandberg-Fox, *Cataloging Microcomputer Files: A Manual of Interpretation for AACR* (Chicago: American Library Association, 1985), xii.

updated practices for cataloguing,[15] scheduling,[16] and appraising[17] machine-readable records, among other topics.

Lacking formalized records management structures for the transfer of machine-readable records to archives, and therefore acquiring primarily content-rich records on an intermittent basis dictated by personal relationships between archivists and records creators, "first-generation" archivists did not directly advocate for the wider organizational or societal value of digital preservation. Archivists working in large government institutions such as NARS or PAC had little in the way of training, literature, professional development courses, standards, or procedures to guide their efforts, and possessed few allies in the records management and information technology professions. Therefore, these archivists focused on learning how to appraise, acquire, process, debug, transfer, preserve, and make available machine-readable records on their own, in their own archives.

While archivists who wanted, or were required, to include digital records in their holdings had to struggle with massive hard-copy computer code books and distinctly user-unfriendly computers, the actual files they were processing, such as simple statistical tables stored as ASCII flat files on magnetic tapes, were relatively straightforward. As such, it was possible for archivists with some on-the-job training to perform the required processing and conservation steps themselves, especially, as was often the case, if their educational or employment background included working

---

[15] E.O. Alldredge, "Inventorying Magnetic-Media Records," *American Archivist* 35 (October 1972), 337-345.

[16] Katherine Gavrel, "Scheduling and Archival Appraisal: An Integrated Approach to EDP Records," *Archivist/l'Archiviste* 13, 4 (July/August 1986), 6-7; and John McDonald, "Scheduling Data in Systems: Three PAC Pilot Projects," *Archivaria* 20 (Summer 1985), 241-244.

[17] Katherine Gavrel and John McDonald, *Appraisal Guidelines in the Machine Readable Archives Division* (Ottawa: Public Archives of Canada, 1981); and Harold Naugler, *The Archival Appraisal of Machine-Readable Records: A RAMP Study With Guidelines* (Paris: UNESCO, 1984).

with computer data.[18] These "data-archivists" possessed dual identities as both archivist and computer specialist, and could undertake most required processing and preservation activities in addition to their "traditional" archival duties, and use service bureaus to do the rest.

In the 1980s, some archival authors advocated that, due to the fragility, impermanence, and scattered nature of digital records, particularly those then being produced in the new "automated office," archivists should re-orient their professional goals to be more in line with those of records managers. Unlike relatively straight-forward electronic records such as "one-shot" survey files and flat-file ASCII databases of the "first-generation," the records of the "automated office" were much more difficult to apply "traditional" archival principles to, primarily because the records produced on desktop personal computers were "ad-hoc," authored by multiple employees, on systems normally outside of the reach of paper-based records management systems, and stored in a variety of file formats and software dependencies, all rapidly changing or vanishing. Likewise, increasingly widespread relational databases, in which information is constantly being added and deleted, and various tables only have meaning in the way in which they relate in context to other tables within the database, were difficult to manage and preserve in ways to maintain those contextual relationships, as compared to the "first-generation" one-time surveys that were done and complete, and never thereafter altered.

Responding to this, Hugh Taylor, an early proponent for much closer cooperation between records managers and archivists, argued that many archivists

---

[18] Terry Cook, "Easy to Byte, Harder to Chew: The Second Generation of Electronic Records Archives," *Archivaria* 33 (Winter 1991-1992), 205.

had allowed themselves to be "sidetracked" onto a "historic shunt," concerned only

with old records, and therefore unable to respond to the challenges of preserving the

complex, organizational digital records then-appearing in the 1980s. He advocated for

archivists to abandon this "shunt" and become "information generalists," possessing a

mixture of recordkeeping skills, computer knowledge, and archival skills. In addition,

he called for the creation of small, in-house departmental archives which would

supervise all aspects of records creation and management, for both active and

dormant records, and those appraised as archival.[19] Other archivists joined Taylor in

attacking what they perceived as the inability of "traditional" archivists to cope with

digital records archiving. For example, Bob Taylor-Vaisey, records manager and

archivist for the Imperial Oil Company, suggested archivists should abandon their

historical-scholarly orientation, and focus instead on controlling digital records at the

time of their creation.[20] International records management specialist Richard Kesner

took this suggestion even further, arguing that in the "digital age," when the accurate

and timely delivery of current data was of paramount importance in business and

government, there was little need for archivists at all.[21] Writers such as these

challenged the archival profession to abandon its "obsession" with history and the

research value of records, and instead take on many of the functions and roles of

records managers. By doing so, doubt and uncertainty was created within the

profession concerning its ability to adequately respond to the present ever-expanding

---

[19] Hugh Taylor, "Information Ecology and the Archives of the 1980s," *Archivaria* 18 (Summer 1984), 32.

[20] Bob Taylor-Vaisey, "Archivist-Historians Ignore Information Revolution," *Archivaria* 19 (Winter 1984/1985), 308.

[21] Richard Kesner, "Automated Information Management: Is There a Role for the Archivist in the Office of the Future?," *Archivaria* 19 (Winter 1984/1985), 163.

and ever-transforming "digital age," while still maintaining the knowledge and skills to manage older "historical" archives. This assertion to abandon traditional archival "back end" custodial strategies, in order to manage digital records with "up front" tactics at or before the time of their creation, forms another early LTDP advocacy "message."

Challenging the position of writers such as Taylor and Kesner, other archivists supported "traditional" archival values, such as context and provenance relationships, as now particularly relevant when archiving digital records. For example, then-PAC archivist Terry Cook argued against the notion that the "traditional" functions of archives needed to be abandoned in the face of complex organizations and multi-provenance digital records. Rallying against the concept of "information generalists," he stated that provenance and context were the cornerstones of archival practice.[22] This was particularly true for digital records which lacked much of the traditional contextual information of paper records. In order to support wide-scale digital preservation, and provide archivists with the mechanisms, both intellectual and practical, to preserve complex, multi-provenance digital records, the archival profession needed to develop and articulate provenance and contextuality as a central point around which preservation research and advocacy could be oriented.

The Profession Returns to its Roots:
Provenance, "Recordness," Authenticity, and Reliability

Fittingly, as archivists specialize in the articulation and preservation of context, it was the theory of archival provenance that would provide archivists with a

---

[22] Terry Cook, "From Information to Knowledge: An Intellectual Paradigm for Archives," *Archivaria* 19 (Winter 1984/1985), 29-49.

central focus around which to orient digital records research and literature, and thus advocacy. This shift away from information subject content and towards provenance context signalled the transition[23] between the first and second "generations" of digital records archivists,[24] marking "the end of the ascendancy of social science, data-driven approaches and the rise of a record- and evidence-driven approach informed by empirical study."[25] Arguing for the importance of context and evidence in digital records would become a key advocacy "message" of the second "generation" of digital records archivists.

In 1985, American archivists David Bearman and Richard Lytle published their seminal work, "The Power of the Principle of Provenance," in Canada's leading archival journal. They argued that, as digital records creators become ever-more diverse, and produce increasingly complex records in an unstructured fashion using a variety of hardware and software, only a re-commitment to the principle of archival provenance would provide archivists with the necessary theoretical or conceptual

---

[23] In "Myth or Reality: Is There a Generation Gap among Electronic Records Archivists," Thomas Elton Brown criticizes Cook's characterization of the "first-generation" of digital records archivists. He argues that, before 1980, NARA accessioned various "machine-readable" records that contrast with Cook's assertion that "first-generation" records were overwhelmingly social-science statistical survey and census files. These include military records from the Vietnam War, records of the Watergate Special Prosecution Force, and operational records from federal financial regulatory bodies. He also criticized Richard Cox's assertion that, essentially, archivists did little to advance the cause of long-term digital preservation before the mid-1980s by not prioritizing the development of digital records-specific skills and techniques for archivists. Brown argues that NARA began hiring automated data processing-specific archivists in 1973, choosing individuals on the basis of their knowledge of both archives and computers, and then training them further on-the-job. Overall, he asserts that the "gap" between the first and second "generations" of digital records archivists should be understood as a gradual continuum stretching decades, rather than an abrupt "stop" as characterized by Cook and especially Cox. Ironically, Cook makes exactly that point, that there is a gradual evolution, and the change is one of perspective and emphasis, not a sudden stop. See Thomas Elton Brown, "Myth or Reality: Is There a Generation Gap Among Electronic Records Archivists," *Archivaria* 41 (Spring 1996), 234-243; and Richard Cox, *The First Generation of Electronic Records Archivists in the United States: A Study in Professionalization* (New York: The Haworth Press, 1994).
[24] "Second-generation" digital archivists are first mentioned in Cook, "Easy to Byte," 202-216.
[25] Anne Gilliland, "Electronic Records Management," *Annual Review of Information Science and Technology* 39 (2005), 219. Here, a decade on, after much research on and experience with digital records, Gilliland is reinforcing Cook's framework of analysis over that of Thomas Elton Brown.

grounding to develop appropriate strategies and methodologies to ensure the long-term preservation of digital records. Instead of focusing on the content and potential research value of records, Bearman and Lytle called upon archivists to emphasize the form, function, and context of creation of digital records.[26] This call for the profession to prioritize the preservation of context and evidence in digital records provided archivists with a renewed warrant for the "information age" – archivists are not computer scientists, nor are they records managers, nor some hybrid generalist. Instead, archivists are specialists in provenance, context, and evidence, and these traits should therefore guide their efforts in preserving digital records. Bearman and Lytle provided a focal point around which to orient digital records research and literature, encouraging the development of collaborative, profession-wide strategies to facilitate long-term preservation.[27]

For archivists, to retain their own legitimacy and value in the digital age, they must focus their efforts on preserving archival digital records for posterity with full context and complex provenance clearly intact. However, lacking the seals, signatures, and letterheads of traditional paper records that, as but three examples, demonstrated such authentic evidential contexts of creation, archivists needed to find new ways to ensure context was preserved in digital records. In addition, there was no consensus among the archival community on what constituted evidence in a digital record, or, for that matter, what exactly a digital record was. Building on his earlier

---

[26] David Bearman and Richard Lytle, "The Power of the Principle of Provenance," *Archivaria* 21 (Winter 1985-1986), 14-22.

[27] A few years later, in 1993, Tom Nesmith edited a collection of essays that, in addition to his exemplary introductory chapter, are indicative of the renewed concern about provenance that Bearman was discussing in the mid-1980s. See Tom Nesmith, ed., *Canadian Archival Studies and the Rediscovery of Provenance* (Metuchen, NJ and London: The Scarecrow Press, 1993).

ideas, in "Record-keeping Systems," David Bearman argued that data and subject-content information were of no concern to archivists; only digital files that demonstrated business transactions and displayed evidential value (clearly linked to the provenance context of creation and contemporary use) should be considered "records."[28] To achieve these conditions for "recordness," Bearman argued that digital records should be carefully managed through evidence-based recordkeeping systems, ascertaining that such systems are "the locus of the evidential significance of records; therefore, their management is critical to the preservation of evidential meaning."[29] Bearman argued for archivists to appraise and accession recordkeeping systems, and their full relationship-linking functionality, not individual records, as it was recordkeeping systems that actively determined how information was used and what records were created by whom, when, for what purposes, shared, altered, and so on.[30]

Determining the characteristics of records and evidence-based recordkeeping systems, rather than context-void, non-record, information systems, would become the central focus of digital records research, and forms another important LTDP advocacy "message" of the second "generation" of digital records archivists. Realizing that, in order to preserve authentic, reliable, contextually-rich records over the long term, records must possess such qualities at (or even before) the time they are created, archivists and records managers had a vitally important common cause and a renewed partnership. Accordingly, they have collaborated on a number of

---

[28] Terry Cook, "The Impact of David Bearman on Modern Archival Thinking: An Essay of Personal Reflection and Critique," *Archives and Museum Informatics* 11, 1 (March 1997), 23.
[29] David Bearman, "Record-keeping Systems," *Archivaria* 36 (Autumn 1993), 16.
[30] Ibid., 20-22.

research studies devoted to identifying, managing, and preserving evidence in digital records. These research studies provide the conceptual and theoretical foundation on which today's digital preservation programs are based, by equipping archivists and records managers with both theoretical and practical strategies for long-term preservation. By developing such studies, archivists have prioritized recordkeeping, and the creation of reliable, "archives-ready" records, as the critical condition that must be met before addressing the technical dimensions of long-term preservation of such digital "records." One must first have "records," as Bearman defined them, before one can preserve them.

The National Archives of Canada's IMOSA (Information Management and Office Systems Advancement) project, established in 1989, was among the first research studies developed to investigate the requirements for recordkeeping in the "automated office." The findings of IMOSA stressed the importance of clear responsibility and accountability for the management of corporate digital records; thoroughly developed rules to provide guidance to users in managing their own records; research into how a particular office operates in order to generate functions and activities to which information management and information technology could be applied; evidence requirements for information management to guide the development of recordkeeping systems; and the development of metadata standards to imbed contextual information in digital documents.[31] Metadata – essentially data about data, or information about the bit structure, creation, context, content, and use of a digital record, plus other information about a record, its format, its rendering

---

[31] John McDonald, "Managing Information in an Office Systems Environment: The IMOSA Project," *American Archivist* 58, 2 (Spring 1995), 146-151.

software, or its relationship to other records – would replace the seals, signatures, and stamps of analogue records. Upon completion in 1992, the findings of IMOSA were widely disseminated through several reports and articles.[32]

Active between 1993 and 1996, the University of Pittsburgh School of Library and Information Science's digital records research project (the "Pittsburgh Project") was developed to investigate the "conceptual, economic, and technological constraints on the long-term retention of electronic records and establish criteria against which to measure the effectiveness of policies, methods, and programs."[33] The guiding forces behind this research were Richard Cox and especially David Bearman. The findings of the Pittsburgh Project first articulated three general requirements for the long-term preservation of digital records: compliant organizations, accountable recordkeeping systems, and functional records. Specifically, Pittsburgh identified seven general requirements for functional records in an accountable recordkeeping system, each with its own detailed characteristics and sub-requirements. To be compliant in such a system, records needed to be comprehensive, identifiable, complete, accurate, understandable, meaningful, and authentic over the long term. Overall, the Pittsburgh Project articulated some twenty functional requirements for the design of recordkeeping systems.[34] As part of these requirements, Pittsburgh also developed additional guidelines for the design of

---

[32] For further information on IMOSA and its findings, see National Archives of Canada, *The IMOSA Project: Information Management and Office Systems Advancement – Overview* (Ottawa: 1991); *The IMOSA Project: Information Management and Office Systems Advancement – Phase 1 Report* (Ottawa: 1991); *The IMOSA Project: Functional Requirements for a Corporate Information Management* (Ottawa: 1992); and *The IMOSA Project: An Initial Analysis of Document Management and Retrieval Systems* (Ottawa: 1992). The summary statement by its guiding light, John McDonald, is his "Managing Information in an Office Systems Environment: The IMOSA Project."

[33] Richard Cox, "Re-discovering the Archival Mission: The Recordkeeping Functional Requirements Project at the University of Pittsburgh," *Archives and Museum Informatics* 8, 4 (1994), 282.

[34] Bearman, "Record-keeping Systems," 30-32.

recordkeeping systems which would create and maintain metadata-encapsulated

digital records, in which data would be captured with contextual metadata and

together preserved to comprise a "record." The Pittsburgh Project identified sixty

metadata specifications,[35] and was among the first major studies to articulate how

archivists could set into motion the requirements for LTDP – both through the design

of recordkeeping systems, as well as by dictating the requirements that would ensure

records remained trustworthy and useable over the long term. The "message" of the

Pittsburgh Project was disseminated through several channels, including multiple

articles by Cox, Bearman, and others in archives and records management journals;[36]

conference presentations;[37] and the Project's website.[38]

The functional requirements identified by Pittsburgh were tested and further

refined by the Indiana University (IU) Archives between 1995 and 1997, under the

direction of Phillip Bantin. The IU project focused on two aspects of the Pittsburgh

Project: testing general strategies for preserving evidence in digital records, and

developing metadata standards that would both satisfy the requirements for evidence

and guarantee that a record remains usable and trustworthy indefinitely. Like

---

[35] Wendy Duff, "Ensuring the Preservation of Reliable Evidence: A Research Project Funded by the NHPRC," *Archivaria* 42 (Fall 1996), 36.

[36] In addition to the articles above, see David Bearman and Wendy Duff, "Grounding Archival Description in the Functional Requirements for Evidence," *Archivaria* 41 (Spring 1996), 275-303; Richard Cox and Wendy Duff, "Warrant and the Definition of Electronic Records: Questions Arising from the Pittsburgh Project," *Archives and Museum Informatics* 11, 3-4 (1997), 223-231; Richard Cox, "More than Diplomatic: Functional Requirements for Evidence in Recordkeeping," *Records Management Journal* 7, 1 (April 1997), 31-57; Wendy Duff, "Increasing the Acceptance of Functional Requirements for Electronic Evidence," *Archives and Museum Informatics* 10, 4 (December 1996), 326-351; and Margaret Hedstrom, "Applications of the Pittsburgh Functional Requirements for Evidence in Recordkeeping: A Review of Testing and Implementation," *Archives and Manuscripts* 25, 1 (1997), 84-87.

[37] Mark Giguere, "Metadata-Enhanced Electronic Records," *Second IEEE Metadata Conference*, (Silver Springs, Maryland: 1997).

[38] The original website of the Pittsburgh Project was lost, ironically enough, when the university switched servers, unbeknownst to its creators. A partially recovered version is available through the Internet Archive at http://www.sis.pitt.edu/~bcallery/pgh/MainPage.htm (accessed August 28, 2012).

Pittsburgh, the IU project found that, if digital records were to stand as long-term surrogates of evidence-based transactions over time, organizational compliance was of paramount importance. Additionally, the IU project identified three areas for archivists to improve their knowledge and training: metadata and metadata systems, information system analysis and design, and the management skills required to translate archival needs into strategic plans.[39] Although agreeing with the basic findings of the Pittsburgh Project, the IU project came to the conclusion that many of Pittsburgh's specific requirements could not be applied in their present condition at IU, arguing that every organization needed to articulate its own requirements for evidence in digital records and collaborate with records management to design recordkeeping systems that would capture and maintain this contextual evidence organically though day-to-day business processes.[40] However, by converting the Pittsburgh Project's requirements into a working model at the University, the IU project provided a case study for other archives looking to create similar recordkeeping programs. In addition to reports and white papers available on the project's website, the results of the IU project have been disseminated through several articles in archives and records management journals, a book by Bantin, and numerous conference presentations.[41]

Underway at approximately the same time as the IU study, a University of British Columbia (UBC) research project entitled, "The Preservation of the Integrity

---

[39] Phillip Bantin, "The Indiana University Electronic Records Project: Lessons Learned," *Information Management Journal* 35, 1 (January 2001), 18-19.

[40] Philip Bantin, "Developing a Strategy for Managing Electronic Records: The Findings of the Indiana University Electronic Records Project," *American Archivist* 61, 2 (Fall 1998), 340-347. Bantin further updates and consolidates these findings in *Understanding Data and Information Systems for Recordkeeping* (New York: Neal-Schuman Publishers, 2008).

[41] A list of project reports, conference presentations, and other publications is available on the IU project's website at http://www.libraries.iub.edu/index.php?pageId=3313 (accessed August 28, 2012).

of Electronic Records," sought to identify the individual components of a digital

record and the conditions necessary to ensure reliability and authenticity over time.

Guided by the concept of diplomatics, the centuries-old branch of study concerned

with recognizing contextual clues to authenticate written documents, and lead by

Luciana Duranti, the UBC project determined that a digital record featured eight

elements worthy of preservation: medium, content, physical form, intellectual form,

action, four persons (the author, addressee, writer, and creator), archival bond (the

mechanism that links related records), and context of creation and use. Reliability was

defined as a record's trustworthiness as to its content, while authenticity was defined

as the characteristic of a record that it is what it purports to be, and has not been

tampered with or otherwise altered since its creation.[42] The UBC project argued that

reliability and authenticity are best preserved by embedding procedural rules within

recordkeeping systems and by integrating business and documentary processes

together. Contrary to Pittsburgh and Indiana, UBC strictly divided the responsibility

for preserving integrity between records managers when a record is active, and

archivists after its administrative life is over.[43] Like the Pittsburgh Project, the

requirements identified by UBC would be tested in actual recordkeeping programs,

both at the university as well as in institutions world-wide as part of the follow-up

InterPARES project (International Research on Permanent Authentic Records in

Electronic Systems).

       The first manifestation of InterPARES, active between 1994 and 1997,

---

[42] Luciana Duranti, "The Impact of Digital Technology on Archival Science," *Archival Science* 1, 1 (2001), 43-45.

[43] Luciana Duranti and Heather MacNeil, "The Protection of the Integrity of Electronic Records: An Overview of the UBC-MAS Research Project," *Archivaria* 42 (Fall 1996), 58-61.

focused on investigating procedures, rules, and software system requirements for

preserving authentic digital records. Using the findings of the UBC project as its

starting point, InterPARES 1 conducted a series of case studies in government,

university, and corporate organizations in Canada, the United States, Europe, and

elsewhere,[44] and was divided into various "domains." Among these "domains," the

"authenticity task force" studied how digital records are embedded in various

technological, documentary, procedural, and administrative contexts, and ascertained

requirements for assessing and maintaining their authenticity over the long term.[45]

These requirements stipulated the creation and preservation of metadata ascertaining

a record's identity, author(s), dates, attachments, integrity, access privileges,

protective procedures, documentary form, authority, whether the record has been

transferred or removed from the recordkeeping system, whether the record has been

reproduced, and the archival description of the fonds to which the record belongs.[46]

The "preservation task force" produced a twenty-six-page guide outlining steps for

the management, ingest, maintenance, and reproduction of records in a digital

preservation system.[47]

InterPARES 2, underway between 2002 and 2007, increased the project's

scope by involving various non-information professions to ensure that recorded

memory produced by artistic, scientific, and various government activities "can be

---

[44] Anne Gilliland, "Testing our Truths: Delineating the Parameters of the Authentic Archival Electronic Record," *American Archivist* 65, 2 (Fall-Winter 2002), 199.

[45] InterPARES 1, *Authenticity Task Force Report* (Vancouver: 1997), 32, http://interpares.org/book/interpares_book_d_part1.pdf (accessed October 22, 2011).

[46] InterPARES 1, *Requirements for Assessing and Maintaining the Authenticity of Electronic Records* (Vancouver: 1997), 5-8, http://interpares.org/book/interpares_book_k_app02.pdf (accessed October 22, 2011).

[47] InterPARES 1, *How to Preserve Authentic Electronic Records* (Vancouver: 1997), http://www.interpares.org/book/interpares_book_o_app06.pdf (accessed October 23, 2011).

created in accurate and reliable form, and maintained and preserved in authentic form, both in the short and long term, for the use of those who created it and society at large, regardless of digital technology obsolescence and media fragility."[48] Based on these requirements InterPARES 2 has produced numerous books, articles, pamphlets, web sites, and other publications on topics such as preservation strategies for digital video, geographical information systems, photographic records, and digital art, among others.[49]

Currently underway, InterPARES 3 seeks to translate the preservation requirements of InterPARES 1 and InterPARES 2 into concrete, implementable, real-world solutions for archives, particularly small and medium-sized institutions with limited budgets and resources. In addition, training modules are being developed for in-house training programs, continuing education workshops, and academic curricula to equip archival professionals with the knowledge required to both preserve digital records over the long term, and also ensure the accountability of organizations by protecting the authenticity and ensuring the reliability of the digital records they produce.[50]

In the European archival community, the CASPAR (Cultural, Artistic, and Scientific Knowledge for Preservation, Access, and Retrieval) research project is involved in researching and implementing technology-neutral strategies to preserve the "knowledge, intelligibility, integrity, and identity" of digital information.

---

[48] Luciana Duranti, "The InterPARES 2 Project (2002-2007): An Overview," *Archivaria* 64 (Fall 2007), 114-115.

[49] A full listing of InterPARES 2 publications is available at http://www.interpares.org/ip2/ip2_dissemination.cfm?proj=ip2 (accessed October 26, 2011).

[50] InterPARES 3, *Welcome to the InterPARES 3 Project*, http://www.interpares.org/ip3/ip3_index.cfm (accessed October 23, 2011).

CASPAR has commissioned various case studies to test digital records preservation in diverse user communities, as well as to raise awareness of digital preservation and develop systems and services that are readily implementable and tailored to specific user groups.[51]

In Australia, the VERS (Victorian Electronic Records Strategy) Project, founded in 1995 by the Public Record Office for the State of Victoria (PROV), provides standards, guidance, and training centred around the goal of archiving reliable and authentic digital records. VERS investigates business practices that lead to records creation, as well as how records are managed and used throughout the "continuum."[52] From this, "recordkeeping" requirements are produced articulating the metadata required to be captured when a digital record is created, to solve both current and archival needs.[53] The VERS standard, first released in 2002, provides specifications and advice including technical systems requirements for a long-term preservation system, a VERS metadata schema, and a list of suitable file formats which can be used to create a VERS encapsulated object (VEO) for long-term

---

[51] CASPAR, *The CASPAR Project*, http://www.casparpreserves.eu/caspar-project.html (accessed October 24, 2011).

[52] The Australian "continuum theory" differs from a traditional "life-cycle" approach in that it encourages archival participation at every stage of a record's existence, from pre-creation to creation, active use, dormant storage, and transfer to archival custody, as well as traditional post-transfer curatorial and access functions. In a "life-cycle" approach, archival intervention usually takes place only after records are "dead," and having reached the end of their administrative "life." For an introduction to "continuum theory," see Sue McKemmish, "Placing Records Continuum Theory and Practice," *Archival Science* 1, 4 (December 2001), 333-359; or Frank Upward, "Structuring the Records Continuum Part One: Post-custodial Principles and Properties," *Archives and Manuscripts* 24, 2 (November 1996), 268-285; and "Structuring the Records Continuum Part Two: Structuration Theory and Recordkeeping," *Archives and Manuscripts* 25, 1 (May 1997), 10-35.

[53] Justine Heazlewood and Ross Gibbs, "Electronic Records: Problem Solved? A Report on the Public Record Office Victoria's Electronic Records Strategy," *Archives and Manuscripts* 27, 1 (May 1999), 96-99.

preservation.[54]

VERS and the other research projects mentioned above are simply a few of the many initiatives which have been developed to ascertain the functional and evidence requirements of a digital recordkeeping or preservation system. These research studies provide archivists with "real-world" examples of preservation strategies to emulate at their own institutions, and demonstrate archivists' commitment to creating and advocating programs and systems which produce reliable, trustworthy archival records.

However, in a comparative study of functional requirements for electronic recordkeeping systems, such as those produced by the Pittsburgh, UBC, or PROV projects, Konrad Krahn argues that, although these requirements result from years' worth of multi-disciplinary research by archivists and records managers, they remain inaccessible to most records creators and records professionals, let alone their senior managers or sponsors. Archivists, records managers, and other information professionals have thus been largely unable to implement these functional requirements at their own institutions, particularly in smaller ones. In addition to the critical need for advocating for policies and resources for the implementation of a suite of functional requirements for electronic recordkeeping systems, he warns that, as governments, business, and other organizations begin to rely on new records communication and storage resources such as social media and cloud computing, existing functional requirements may have to be re-conceptualized with additional

---

[54] Victorian Electronic Records Strategy (VERS), *PROV Standard Management of Electronic Records PROS 99/007 V Version 2* (Melbourne: 2002), http://210.8.122.120/vers/standard/pef/99-7_ver2-0.pdf (accessed November 10, 2011).

metadata requirements to fully capture the contextual evidence found in modern work-process digital records.[55]

Inter-disciplinary Collaboration:
Archivists, Records Managers, and other Information "Actors"

In order to preserve digital records over the long term in an organizational setting, archivists benefit from alliances with groups such as records managers, information technology staff, auditors, program evaluators, and freedom of information and privacy protection officers, among others. John McDonald argued early on for archivists to work closely with information professionals such as data administrators and office systems program managers. To achieve effective inter-disciplinary collaboration, he stipulated three requirements: clear-cut management frameworks to formalize the relationship between archivists and records management, professional development programs for archivists and records management to foster a cooperative spirit and encourage knowledge of both professions, and communication strategies to ensure archivists and records management, in addition to senior administrators, are kept abreast of new insights and projects underway, as well as to encourage further collaboration.[56] This is one of the first "advocacy" frameworks for digital records to promote the need for better strategies and resources.

Describing their work as a "joint enterprise," Charles Dollar likewise called upon archivists and records managers to work together to preserve the integrity of digital records as evidence of actions and transactions over the long term. He felt they

---

[55] Konrad Krahn, "Looking Under the Hood: Unravelling the Content, Structure, and Context of Functional Requirements for Electronic Recordkeeping Systems," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 2012), 2-6; 123-124.
[56] John McDonald, "Archives and Cooperation in the Information Age," *Archivaria* 35 (Spring 1993), 110-116.

should concentrate their efforts on developing international standards to address three key requirements: maintaining records integrity, incorporating records disposition into the design of recordkeeping systems, and facilitating access over time.[57] Margaret Hedstrom challenged archivists to increase their visibility and organizational value by adopting a centralized and strategic position in relation to information technology and its use by organizations. She also argued for archivists to work closely with records managers, as well as records creators and upper management, to intervene when new technologies are about to be adopted by an organization and ensure they meet archival requirements.[58]

The National Archivist of Canada for most of the 1990s, Jean-Pierre Wallot, advocated that archivists "adopt an attitude of technological and professional convergence" with librarians, records managers, and museum staff, as well as work closely with records users, systems analysts, lawyers, auditors, managers, and computer specialists.[59] Likewise searching for input from beyond the archival community, Margaret Hedstrom argued that archivists should seek out examples of information technologies which address concerns of authenticity, integrity, and preservation, and which could be adapted for archival purposes; the banking industry had certainly developed, by necessity, just such systems for its millions of digital transactions every day. First, however, archivists must work with records managers to identify what combination of policies, standards, systems requirements, and

---

[57] Charles Dollar, "Archivists and Records Managers in the Information Age," *Archivaria* 36 (Autumn 1993), 37-47.
[58] Margaret Hedstrom, "Understanding Electronic Incunabula: A Framework for Research on Electronic Records," *American Archivist* 54, 1 (Spring 1991), 334-343.
[59] Jean-Pierre Wallot, "Limited Identities for a Common Identity: Archivists in the 21st Century," *Archivaria* 41 (Spring 1996), 18-24.

technologies would have the greatest impact on their particular organizational culture or business environment.[60] Similarly, New Zealand archivist Adam Stapleton appeals for archivists and records managers to consider adopting practices from the information security industry, as it too focuses on retention and protection of evidence.[61]

Terry Cook recommends that archivists collaborate with systems and information technology staff, records managers, web-content, communications, and public-relations experts, as well as other specialized digital media users to create an organization-wide approach to electronic recordkeeping and archiving. Individuals such as program evaluators, accountants, lawyers, and freedom of information and privacy staff, among others, have a vested interest in sound recordkeeping and may be valuable allies for archivists.[62] Finally, Minnesota state archivist Robert Horton advocates for archivists to prioritize the development of "soft skills" of personal communication and team building to establish and maintain relationships and partnerships that cross professional, organizational, and geographic boundaries.[63] These calls for collaboration with records management and information technology specialists to ensure records are created that fulfil archival requirements for evidence, accountability, and trustworthiness form another advocacy "message" of the second "generation" of digital records archivists.

---

[60] Margaret Hedstrom, "Building Record Keeping Systems: Archivists are Not Alone on the Wild Frontier," *Archivaria* 44 (Fall 1997), 56-62.

[61] Adam Stapleton, "Cross-Town Traffic: A Case for Recordkeeping to Learn from its Information Security Cognate," *Archifacts* (April 2006), 8-18.

[62] Terry Cook, "Byte-ing Off What You Can Chew: Electronic Records Strategies for Small Archival Institutions," *Archifacts* (April 2004), 9-10.

[63] Robert Horton, "A Cautionary Tale About Laws, Records, and Technology: Making a Case for Electronic Records Management," in Terry Cook, ed., *Controlling the Past: Documenting Society and Institutions – Essays in Honor of Helen Willa Samuels* (Chicago: Society of American Archivists, 2011), 190-191.

Organizational Self-Interest: Demonstrating the Benefits of LTDP

In order to create, fund, and sustain LTDP programs, archivists must garner the support of upper management in order to secure the necessary human, financial, and technological resources. Among methods by which this support can be gained, archival writers have advocated for the importance of making archival programs visible and valuable within organizations and to society – archives as a "continuing issue" rather than just being stereotyped as relevant only for history, genealogy, and vague heritage nostalgia.[64] By promoting the organizational or societal value of archives to current issues – political, economic, social – so this argument goes, archivists can better position their advocacy arguments with more powerful audiences and achieve thereby greater success in securing resources for preservation activities.

To help gain the support of upper management for long-term archival digital preservation activities, Richard Cox appealed for archivists to have a more focused role in corporate memory and accountability by focusing on evidence preservation, continued access for business continuity, and risk management. In order to achieve these aims, however, archivists needed to become well-versed with current and emerging digital recordkeeping technologies in order to influence records creators to adopt systems that best provide for the creation, maintenance, and security of digital records as evidence, to say nothing of understanding for better management theory and the processes underlying organizational culture and behaviour.[65] James Currall and Michael Moss believe that many records managers and archivists feel that their

---

[64] Gregory Sandford, "Travelling in a Hellenic World: An Odyssey from Oral History and Documentation to Strategy to Continuing Issues and Integrated Recordkeeping," in Cook, ed., *Controlling the Past*, 51-68.
[65] Richard Cox, "Why Records are Important in the Information Age," *Records Management Quarterly* 32, 1 (January 1998), 44-48.

skills are undervalued within their organization, and that senior management does not

understand what they can contribute to the workplace. The authors place partial

blame for this on archivists and records managers themselves, arguing that, in order

to engage with senior management, they must "speak the language" of management.

They must also align their needs with operational priorities and strategic successes,

and ensure that senior management recognizes the value and necessity of digital

records management and preservation.[66]

From Scotland, Gordon Reid also argues that archivists and records managers

need to align their goals with the priorities of their sponsoring agencies, particularly

at a time when public sector finances are under scrutiny. In a world of constant

elections and ever-shifting political fortunes, archivists and records managers must

articulate how their services can be of immediate assistance and value, and align their

needs with clearly demonstrable benefits to their sponsoring agencies.[67] Improving

the appeal for better managed digital archives by demonstrating organizational self-

interest in that outcome forms yet another prevalent advocacy "message" of the

second "generation" of digital records archivists.

To gain managerial support for institutional digital preservation

programming, archivists must first convince their sponsoring agencies of the benefits

to long-term preservation. Such arguments present examples of direct, overt digital

preservation advocacy. Perhaps the most commonly articulated justification for long-

term digital preservation is the need to demonstrate and maintain accountability

---

[66] James Currall and Michael Moss, "We Are Archivists, But Are We OK?," *Records Management Journal* 18, 1 (2008), 79-81.

[67] Gordon Reid, "The Challenge of Making Archives Relevant to Local Authorities," *Records Management Journal* 20, 2 (2010), 229-241.

through the evidence found in authentic and reliable digital records. The tenets of

good governance and sound business ethics, including transparency, accountability,

and equity, are assured through accessibility to trustworthy records. Appealing for

archivists to play an active role in protecting public faith in accountable government,

David Bearman focused on a need for evidence in a "digital democracy." He argued

for archivists to use this justification to articulate forcefully for the creation and

management of recordkeeping and archiving systems which preserve digital records

with full contextual evidence intact. If archivists do not safeguard the preservation of

evidential digital records, they squander their role as protectors of public interest in

accountable government.[68] British archival educator Elizabeth Shepherd argues that

well-managed and well-preserved digital records allow for government to conduct

business in an efficient and accountable manner, and also allow for faster and more

effective program delivery. Similar to Bearman, she explains that context- and

evidence-rich digital records are necessary to satisfy regulatory and audit

requirements, as well as provide evidence of government functions and activities in

order to respond to litigation.[69] Minnesota state archivist Robert Horton likewise calls

for the promotion of standards and solutions that support the tenets of good

governance and focus on accountability and freedom of information. However, in a

time of constrained budgets and "cost and benefit" propositions, he cautions that any

preservation solution must provide some tangible return on investment. Well-

managed records must be perceived as an asset, whether by increasing efficiency,

---

[68] David Bearman, "The Implications of *Armstrong v. Executive of the President* for the Archival Management of Electronic Records," *American Archivist* 56, 4 (Fall 1993), 688-689.
[69] Elizabeth Shepherd, "Why Are Records in the Public Sector Organizational Assets?," *Records Management Journal* 16, 1 (2006), 10-11.

meeting customer/citizen expectations, or lowering costs, among other factors.[70]

Unfortunately, "intangible assets," such as digital records, are difficult to value or assess in financial terms, and propositions based around vaguer justifications such as "better managing information" may not convince upper management to act. As such, clearly defined business case models for digital preservation have a much greater chance for success, particularly when presented as investment opportunities. One such example, the Espida project at the University of Glasgow, found that digital preservation is best presented as an investment in the "public good" by supporting evidence and accountability, as an income-generating proposal by selling or leasing the rights to digital intellectual property, or by cost reductions through savings in labour or storage space.[71] Yet, long-time American information management consultant Rick Barry argues that archivists have been unsuccessful to date in justifying the business case for digital preservation. He stresses for archivists the need to present how the management and preservation of digital records can make work easier and more productive for all staff within an organization. In addition, Barry calls for archivists to collaborate actively with chief information officers, procurement officers, and facility managers to demonstrate the benefits of evidence-based digital management and preservation and link preservation to the broader, strategic concerns of these groups.[72]

Likewise focusing on the tangible benefits of archival digital records, James

---

[70] Horton, "A Cautionary Tale," 185-189.
[71] James Currall, Claire Johnson, and Peter McKinney, "The World is All Grown Digital…How Shall A Man Persuade Management What to Do in Such Times?," *International Journal of Digital Curation* 1, 2 (2007), 12-20.
[72] Rick Barry, "Keeping Records in Changing Organizations," in Cook, ed., *Controlling the Past*, 202-210.

Currall and Peter McKinney argue that costing scenarios take for granted that records must be preserved, rather than presenting why they must be preserved. The authors therefore advocate for the development of clear-cut business models which present the benefits of long-term preservation – such as the protection of intellectual property and efficiency of operation – in order to convince organizations why they should allocate funds for preservation initiatives, rather than spend them on other business operations.[73]

Finally, Terry Cook offers an extensive list detailing the benefits of archival digital records, including enhanced decision making based on reliable information; efficient and comprehensive documentation of decision making allowing organizations to meet accountability benchmarks and prove achievement of stated goals; increased efficiency through easy access to previous projects and past precedents; increased efficiency and cost savings facilitated by greatly reduced search times for records; providing corporate memory and operational continuity; permitting organizations to meet legal regulations and policies; conforming to industry standards; ensuring the protection of legal rights such as freedom of information and protection of personal privacy; enabling organizations to implement effective safeguards against potential disasters; allowing the public to better understand organizational activities, thus strengthening public support for democratic governance; and contributing to the overall archival record so that the organization's role in the historical process is not lost.[74] The above direct, overt advocacy arguments

---

[73] James Currall and Peter McKinney, "Investing in Value: A Perspective on Digital Preservation," *D-Lib Magazine* 12, 4 (April 2006), 2-9, http://www.dlib.org/dlib/april06/mckinney/04mckinney.html (accessed November 10, 2011).
[74] Cook, "Byte-ing Off What You Can Chew," 11-12.

represent only some of the justifications presented by archivists and records managers in favour of LTDP, and form another important advocacy "message" of the second "generation" of digital records archivists.

Tools for the Job: Digital Preservation Education, Training, and Resources

In order to effectively communicate archival needs to their sponsors, archival training must provide archivists with specific skill-sets. As early as 1972, Hugh Taylor argued that archivists should undertake training in computers and digital records, lest they become isolated at "the fringe of administration" and fail to safeguard records for the future.[75] Canadian archival educator Terry Eastwood lamented the lack of defined skills and requirements in formal archival training, and argued for greater emphasis to be placed on computer literacy and familiarity with information technologies.[76] He also advocated for analytical skills to be added to archival studies curricula, particularly so archivists will know how to design and implement recordkeeping systems. In addition, Eastwood calls for an increase in practical internships, management skills, reference skills, as well as training into the creation and use of digital records within organizations.[77]

Richard Cox also argues that archival training has not kept pace with the increased importance of accountability, evidence, and the memory role of archives, particularly with digital records.[78] Society of American Archivists President Richard Pearce-Moses advocates for archivists to have the same level of knowledge of digital

---

[75] Hugh Taylor, "Information Retrieval and the Training of the Archivist," *Canadian Archivist* 2, 3 (1972), 33.

[76] Terry Eastwood, "Educating Archivists about Information Technology," *American Archivist* 56, 3 (Summer 1993), 464-466.

[77] Terry Eastwood, "Building Archival Skills and Knowledge in the Digital Age," *Archival Science* 6, 2 (2006), 166-169.

[78] Richard Cox, "Employing Records Professionals in the Information Age," *Information Management Journal* 34, 1 (January 2000), 18.

records as they do for traditional analogue media, and stresses that more needs to be

done to translate theoretical, academic knowledge about digital records archiving into

practical knowledge that can be applied by archivists in "real-world" situations. He

argues that all archivists, not only dedicated digital archivists, require technical

computer skills and training in information technology, as working with digital

records will be commonplace throughout the profession, with the majority of records

being preserved in digital formats.[79]

In response to these and other calls for more and better specialized digital

preservation training, several surveys have been developed to assess archivists' digital

preservation training needs from organizations such as the United States Library of

Congress,[80] the DigCurV (Digital Curator Vocational Education Europe) Project,[81]

and the United Kingdom-based Digital Preservation Coalition.[82] In addition to digital

records training in graduate-level archival studies programs, courses are offered or

facilitated by various state/provincial archives and archival professional

organizations, and by university and government archives, among other groups. For

example, the Library of Congress maintains a directory[83] of upcoming digital

preservation courses and workshops offered in the United States, while other course

---

[79] Richard Pearce-Moses, "Janus in Cyberspace: Archives on the Threshold of the Digital Era," *American Archivist* 70 (Spring/Summer 2007), 17-18.

[80] Library of Congress, *Findings From a Library of Congress Survey on Digital Preservation Training* (Washington: 2010), http://www.digitapreservation.gov/news/2011/20110113news_dp_training_survey.html (accessed November 3, 2011).

[81] Digital Curator Vocational Education Europe Project, *Survey on Training Opportunities in Digital Curation*, http://www.surveygizmo.com/s3/477850/Survey-on-training-opportunities-in-digital-curation (accessed November 3, 2011).

[82] Digital Preservation Coalition, *Mind the Gap: Assessing Digital Preservation Needs in the UK*, http://www.dpconline.org/advocacy/mind-the-gap (accessed November 3, 2011).

[83] Library of Congress, *Digital Preservation Courses and Workshops*, http://digitalpreservation.gov/education/courses/ (accessed November 4, 2011).

offerings can be found on archival email list services such as ARCAN-L,[84] and on the

websites of archival organizations such as the Society of American Archivists[85] and

the Association of Canadian Archivists.[86] Overall, the promotion of these and other

digital preservation training and awareness resources forms another advocacy

"message" of the second "generation" of digital records archivists.

The archival profession has also produced large amounts of online content

designed to help archivists plan, create, and sustain a long-term preservation program,

including websites, blogs, and free and open-source preservation software. For

example, national organizations such as Library and Archives Canada,[87] the Library

of Congress,[88] the United States National Archives and Records Administration,[89] the

National Archives (UK),[90] the National Archives of Australia,[91] and the Archives of

New Zealand,[92] all maintain websites with rich information on their digital

preservation initiatives, with some also containing advice for smaller archives on how

to best pursue a preservation strategy. Numerous blogs devoted to digital preservation

exist, including the Joint Information Systems Committee's *Beginner's Guide to*

---

[84] Information on ARCAN-L, a Canadian archives email list service, is available at
http://www.mailman.srv.ualberta.ca/mailman/listinfo/arcan-l (accessed November 10, 2011).
[85] Society of American Archivists, *Continuing Professional Education Catalog*,
http://www2.archivists.org/prof-education/course-catalog (accessed November 12, 2011).
[86] Association of Canadian Archivists, *Workshops and Institutes*,
http://archivists.ca/content/workshops-institutes (accessed November 12, 2011).
[87] Library and Archives Canada, *Digital Initiatives at LAC,* http://www.collectionscanada.gc.ca/digital-
initiatives/index-e.html (accessed November 4, 2011).
[88] Library of Congress, *Digital Preservation*, http://digitalpreservation.gov/ (accessed November 4,
2011).
[89] National Archives and Records Administration, *Electronic Records Archives*,
http://www.archives.gov/era/ (accessed November 4, 2011).
[90] National Archives, *Digital Preservation*, http://www.nationalarchives.gov.uk/information-
management/projects-and-work/digital-preservation.htm (accessed November 4, 2011).
[91] National Archives of Australia, *E-Preservation*, http://www.naa.gov.au/records-
management/agency/preserve/e-preservation/ (accessed December 12, 2011).
[92] Archives of New Zealand, *Government Digital Archives Program*,
http://archives.govt.nz/advice/government-digital-archive-programme (accessed November 4, 2011).

Digital Preservation[93] and the Library of Congress' *The Signal*, a blog dedicated to

various digital preservation stories, activities, and easy-to-understand advice.[94] In

addition, the United Kingdom-based Digital Curation Centre maintains a blog

devoted to various issues related to the long-term preservation of digital science and

research data,[95] while the Open Planets Foundation's blog provides advice on

practical services and tools to help ensure long-term access to digital records.[96] The

University of London Computer Centre also maintains a blog on its digital archives

and libraries preservation projects.[97]

　　Additional online resources include glossaries of digital preservation

terminology,[98] advice on selecting preservation file formats,[99] and free and open-

source preservation software from organizations such as the National Archives of

Australia,[100] Dspace,[101] Archivematica,[102] and the LOCKSS (Lots of Copies Keeps

---

[93] Joint Information System Committee, *Beginner's Guide to Digital Preservation*,
http://blogs.ukoln.ac.uk/jisc-bgdp/ (accessed November 4, 2011).
[94] Library of Congress, *The Signal*, http://blogs.loc.gov/digitalpreservation (accessed November 3, 2011).
[95] Digital Curation Centre, *Digital Curation Blog*, http://digitalcuration.blogspot.com/ (accessed November 3, 2011).
[96] Open Planet Foundation, *Open Planet Foundation Blog*,
http://www.openplanetsfoundation.org/blog?page=1 (accessed November 3, 2011).
[97] University of London Computer Centre, *Digital Archives Blog*, http://dablog.ulcc.ac.uk/ (accessed November 4, 2011).
[98] Digital Curation Centre, *Glossary*, http://www.doc.ac.uk/digital-curation/glossary (accessed November 4, 2011).
[99] Harvard University, *File Formats and Guidelines*, http://hul.harvard.edu/ois/digpres/guidance.html (accessed November 4, 2011); and National Archives, *Selecting File Formats for Long-Term Preservation* (Surrey: 2008), www.nationalarchives.gov.uk/documents/selecting-file-formats.pdf (accessed November 4, 2011).
[100] National Archives of Australia, *Digital Preservation Software Platform*, http://dpsp.sourceforge.net/ (accessed November 4, 2011).
[101] Information about the Dspace open-source software platform is available at http://www.dspace.org (accessed November 10, 2011).
[102] Archivematica is a free, OAIS-compliant preservation program which supports METS, Dublin Core, and other preservation metadata schema. Archivematica is available at http://archivematica.org (accessed February 24, 2012).

Stuff Safe) project.[103] As a whole, these resources provide archivists and records

managers with practical advice on how to plan and implement a long-term

preservation program, and their easy availability forms another advocacy "message"

of the second "generation" of digital records archivists.

Compliance is Key: Digital Recordkeeping and Preservation Standards

Numerous archives and recordkeeping standards have been produced to

provide profession-wide best practices and enable the monitoring and evaluation of

preservation programs. Standards establish a common language and requirements for

systems, policies, and procedures. They are important to encourage interoperability

and collaboration between user communities, as well as to create a professional

environment of best practices and provide a benchmark for monitoring and

auditing.[104] National standards organizations, such as the Standards Council of

Canada and the American National Standards Institute, operate standards systems

through which various organizations (such as manufacturers, laboratories, inspection

agencies, etc.) can receive accreditation to certify that their products, processes, and

auditing mechanisms, among other operational activities, are created and undertaken

along strict guidelines. The ISO (International Organization for Standardization) is a

body made up of representatives from various national standards organizations and

operates as the premier standard-setting institution in the world. Among other

commercial uses, standards are critically important for the manufacturing,

procurement, and purchase of information technology hardware and software.

---

[103] The LOCKSS project provides free, open-source, and OAIS-compliant preservation software
through its website at http://www.lockss.org/lockss/home (accessed November 10, 2011).
[104] Margaret Pember, "Sorting out the Standards: What Every Records and Information Professional
Should Know," *Records Management Journal* 16, 1 (2006), 26.

Companies creating computers and software will try to be compliant with all relevant

ISO standards, in order to increase their market share. This occurs because major

government and business IT procurement policies dictate that only ISO-compliant

goods and services may be purchased for use in the organization. As such, ISO

standards are extremely detailed, stringent (the process for creating an ISO standard is

very long and rigorous[105]), and constantly under review, and therefore represent the

pinnacle benchmark for a given product or process.

Many such standards are now in place, thanks to hard work and lobbying by

archivists and records managers over the past two decades, first nationally and then

internationally. For example, ISO 15489, in use by both records managers and

archivists, provides a standard against which to evaluate critical components of a

good recordkeeping program. Made up of two parts, part one provides a basic outline

of best practices for managing records at all levels within an organization, while part

two provides detailed recommendations for a records management system to ensure

that records are properly created, easily accessible, and correctly documented, and

that they retain the characteristics of authenticity, reliability, usability, and integrity

over time.[106] Utilized in conjunction with this standard, ISO 23081 assesses a number

of different metadata sets based on their suitability for ISO 15489 compliance and

judges their ability to support both business and records management requirements.[107]

Originally based on the findings of the UBC "The Preservation of the Integrity

---

[105] International Organization for Standardization, *How are ISO Standards Developed?*,
http://www.iso.org/iso/standards_development/processes_and_procedures/how_are_standards_develop
ed.htm (accessed February 24, 2012).

[106] Digital Curation Centre, *Standards Watch Papers: ISO 15489* (Aberystwyth: 2007),
http://www.dcc.ac.uk/resources/briefing-papers/standards-watch-papers/iso-15489 (accessed
November 5, 2011).

[107] Digital Curation Centre, *Digital Curation Standards: ISO 23081*,
www.dcc.ac.uk/resources/standards/diffuse/show?standard_id=78 (accessed November 4, 2011).

of Electronic Records" research program, the United States Department of Defense

(DoD) standard DoD 5015 provides functional and metadata requirements and,

because of DoD's huge purchasing power that manufacturers conform to, has been

adopted *de facto* as a standard by public and private organizations in the United States

and worldwide.[108] A number of other metadata standards exist. For example, the

Dublin Core metadata standard, now recognized as ISO 15836, provides, in its most

basic version, fifteen "core" metadata elements, such as title, creator, subject, date,

format, and language, among others, which can be applied to the majority of digital

documents and provide for simple description and interoperability between different

preservation systems.[109] From the European Union, the MoReq2 standard (Model

Requirements for the Management of Electronic Records, Version 2) provides

functional requirements for the management of digital records in an EDRMS that

include metadata requirements.[110] A refined version of Dublin Core, the United States

Department of Defense's DDMS 3.1 standard (Department of Defense Discovery

Metadata Specification, Version 3.1) provides metadata elements which can ideally

be applied to almost any document or data asset.[111] The DDI (Data Documentation

Initiative) metadata standard provides an XML (extensible markup language)

standard for describing data from social, behavioural, and economic science

---

[108] Nikki Swartz, "Revising *DoD 5015.2*, the de facto RM Software Standard," *Information Management Journal* 42, 4 (July/August 2008), 26.

[109] Information on the Dublin Core Metadata Initiative is available at http://dublincore.org/ (accessed November 10, 2011).

[110] The MoReq2 standard is available at http://ec.europa.eu/transparency/archival_policy/moreq/doc/moreq2_spec.pdf (accessed July 4, 2012).

[111] Information about DDMS is available at http://metadata.ces.mil/mdr/irs/ddms/ (accessed November 10, 2011).

communities,[112] while METS (Metadata Encoding and Transmission Standard) is an

XML standard which allows for existing records metadata to be "wrapped" with

structural, technical, and preservation metadata into a single metadata object. METS

facilitates both the long-term intelligibility of digital records and the transfer of

records between different repositories.[113]

  Articulating the requirements of a digital preservation system, a group of

international researchers under the leadership of the Consultative Committee for

Space Data Systems developed a standard eventually recognized as ISO 14721,

otherwise known as an Open Archival Information System (OAIS). The OAIS

standard specifies detailed requirements for "an archive, consisting of an organization

of people and systems, that has accepted the responsibility to preserve information

and make it available for a designated community." In addition, the OAIS "provides a

framework for the understanding and increased awareness of archival concepts

needed for long term digital information preservation and access," and also "for

describing and comparing different long term preservation strategies and

techniques."[114] The OAIS model stipulates requirements for archival functions such

as the ingest of records, the storage of records as "archival information packages

(AIPs)," the development and management of metadata packages generated from the

ingest function, the day-to-day operation of an OAIS, preservation planning to

monitor the evolution of digital technology and the needs of designated communities

---

[112] Data Documentation Initiative, *What is DDI?*, http://www.ddialliance.org/what (accessed November 4, 2011).

[113] Library of Congress, *METS: An Overview and Tutorial* (Washington: 2011), http://www.loc.gov/standards/mets/METSOverview.v2.html (accessed November 10, 2011).

[114] Consultative Committee for Space Data Systems, *Reference Model for an Open Archival Information System* (Rome: 2009), 1, http://public.ccsds.org/publications/archive/650x0b1.pdf (accessed November 4, 2011).

to form preservation strategies and techniques, as well as access to ensure users are able to identify, locate, and access records of interest and understand them in context.[115]

Further developing the OAIS model, beginning in 2000 a group of researchers began investigating requirements for standardizing and certifying digital repositories which would maintain and preserve records in context, known as Trusted Digital Repositories (TDRs). All TDRs, whether institution-specific, shared among institutions, or hosted by a third-party, must adhere to a series of specifications which include having an organizational system that supports the long-term viability of the repository, as well as of the records managed in the repository; possessing financial responsibility and sustainability; adhering to commonly accepted conventions and standards, including the OAIS standard, for the management, access, and security of records deposited within it; establishing methodologies for system evaluation to meet expectations of trustworthiness; and possessing policies and practices that can be audited and measured, among other requirements.[116] TDRs are certified using Trusted Repositories Audit & Certification (TRAC) guidelines, a series of protocols for measuring the organizational and technical infrastructure of a TDR, as well as the manner in which it manages, preserves, and assures the security of digital objects.[117]

---

[115] Donald Sawyer, Lou Reich, David Giaretta, Patrick Mazal, Claude Huc, Michel Nonon-Latapie, and Nestor Peccia, "The Open Archival Information System (OAIS) Reference Model and its Usage," *SpaceOps 2002 Abstracts, Papers, and Presentations* (Houston: 2002), 5, http://www.aiaa.org/Spaceops2002Archive/papers/SpaceOps02-P-T5-39.pdf (accessed November 4, 2011).

[116] Research Libraries Group and Online Computer Library Center, *Trusted Digital Repositories: Attributes and Responsibilities* (Mountain View, California: 2002), 5, http://www.oclc.org/programs/ourwork/past/trustedrep/repositories.pdf (accessed November 11, 2011).

[117] Center for Research Libraries and Online Computer Library Center, *Trustworthy Repositories Audit & Certification: Criteria and Checklist* (Chicago: 2007), 9-49, http://www.crl.edu/sites/default/files/attachments/pages/trac_0.pdf (accessed November 12, 2011).

TRAC guidelines are now certified as ISO 16363, *Audit and Certification of Trustworthy Digital Repositories*.

Overall, archives and recordkeeping standards encourage communities of best practice, facilitate interoperability between institutions, and encourage "standardization" in what was described less than two decades ago as a "wild frontier,"[118] a complete chaos of hundreds of incompatible IT systems and software, rendering the likelihood of the long-term preservation of any of it almost impossible to conceive in practical terms. The development of archives and recordkeeping standards forms yet another central advocacy "message" of the second "generation" of digital records archivists.

Making "Good" Records Last: EDRMS and Digital Preservation Techniques

For any archives seeking to create a long-term preservation program, the consideration of which preservation technique, or techniques, to utilize is an important one. While there is no universal preservation technique appropriate to all records and suitable for all archival programs, several guidelines and specifications exist to assist archivists in finding the right preservation technique for their institution, a process known as preservation planning. For example, the 170-page UNESCO publication, *Guidelines for the Preservation of Digital Heritage*, contains technical and practical information on the strengths, weaknesses, and appropriateness of various preservation techniques.[119] The Digital Preservation Coalition's *Preservation Management of Digital Materials: The Handbook* is an extensive

---

[118] John McDonald, "Managing Records in the Modern Office: Taming the Wild Frontier," *Archivaria* 39 (Spring 1995), 70-79.

[119] UNESCO, *Guidelines for the Preservation of Digital Heritage* (Canberra: 2003), http://www.unesdoc.unesco.org/images/0013/001300/130071e.pdf (accessed December 5, 2011).

resource including digital preservation definitions, links to preservation research

studies, descriptions and best practices for various preservation techniques, as well as

various media- and format-specific guidelines.[120] The National Library of Australia's

PADI (Preserving Access to Digital Information) project provides information on best

practices for preservation strategies, guidelines, and techniques,[121] while from the

European Union, the PLANETS project (Preservation and Long-term Access

Through Networked Services), a consortium of libraries, archives, and universities,

develops and disseminates various strategies and guidelines for preservation

planning.[122] Other publications and best practices for preservation planning include

reports such as *How to Choose a Digital Preservation Strategy: Evaluating a*

Preservation Planning Procedure,[123] and *Preserving Digital Information: Challenges*

and Solutions.[124] These ample and impressive resources collectively provide

archivists and other records professionals with practical advice on choosing the

preservation technique, or techniques, best suited for their archival institution and its

preservation needs.

While choosing the right preservation technique is an important consideration

for any long-term preservation program, for many organizations, selecting and

successfully implementing the right electronic document and records management

---

[120] Digital Preservation Coalition, *Preservation Management of Digital Material* (Heslington: 2008), http://www.dpconline.org/advice/preservationhandbook (accessed November 7, 2011).

[121] Information about PADI is available at http://www.nla.gov.au/padi/about.html (accessed November 10, 2011).

[122] Information about the PLANETS project is available at available at http://www.planets-project.eu/ (accessed November 10, 2011).

[123] Stephan Strodl, Cristoph Becker, Robert Neumayer, and Andreas Raubner, "How to Choose a Digital Preservation Strategy: Evaluation a Preservation Planning Procedure," *Proceedings of the ACM IEEE Joint Conference on Digital Libraries (JCDL'07)* (Vancouver: 2007), http://www.ifs.tuwien.ac.at/~strodl/paper/FP060-strodl.pdf (accessed November 10, 2011).

[124] Alan Howell, *Preserving Digital Information: Challenges and Solutions* (Melbourne: 2001), http://www.alanhowell.com.au/Papers/DigitalPreservationWorkshop/J0516-070412pdiManual%20copy.pdf (accessed November 10, 2011).

system (EDRMS) is of perhaps equal importance, as an EDRMS is crucial in

producing and managing accurate, reliable, and preservation-ready records.

Accordingly, archivists and records managers have produced advice on how to best

implement and sustain an EDRMS, which forms another advocacy "message" of the

second "generation" of digital records archivists.

Lynette Downing, for example, argues that the essential elements of a

successful EDRMS implementation include making the process transparent,

managing user expectations, focusing on staff satisfaction, constant and effective

training, and understanding and adapting to change, among others.[125] Describing

experiences at government departments in Australia, Adrian Cunningham cautions

archivists to make sure an EDRMS accurately supports actual business processes in

all commonly used systems. Otherwise, staff will continue to "print to file" or bypass

the EDRMS and store data on individual rather than corporate drives. Cunningham

argues that, in the past, archivists have done a poor job of implementing EDRMS by

making recordkeeping requirements overly complicated and unrealistic for day-to-day

business practices. He argues that staff often do not understand the benefits of an

EDRMS, instead viewing it as an onerous "add-on" which only complicates their

daily work and the larger business processes. To successfully implement an EDRMS,

Cunningham argues that recordkeeping must be perceived as a business priority and a

natural, organic aspect of business processes. What is needed to achieve this, apart

from changes in organizational culture, is more tools and guidance solidly rooted in

---

[125] Lynette Downing, "Implementing EDMS: Putting People First," *Information Management Journal* 40, 4 (July/August 2006), 45-49.

business processes and in "recordkeeping first principles."[126]

In a study of North American university archives and records management programs, Guillermo Fiebelkorn argues that, although universities are ideally situated to implement electronic records management programs and EDRMS – as many have participated in research studies, have access to specialist knowledge and training, and must comply with records management legislation – few have yet fully embraced best practice methodologies and standards, such as ISO 15489. In addition, universities have been largely unsuccessful in articulating compelling business cases for electronic records management programs. Fiebelkorn argues for increased compliance with standardized methodologies for the implementation of electronic records management programs. Gradual and measured implementation allows universities to gain credibility with various university stakeholders, leading to the eventual introduction of EDRMS.[127]

Rachael Maguire argues that, to be successful, an EDRMS must be simple and user friendly, with automatically populated contextual metadata – trustworthy records are much more unlikely to result if users are required to manually add metadata themselves. Most importantly, there must be thorough and regular training to accompany the EDRMS implementation, as well as refresher training to maintain user confidence and comfort.[128] Finally, a report produced by the National Archives of Australia (NAA) found that an EDRMS is best justified on the basis of improving

---

[126] Adrian Cunningham, "Good Digital Records Just Don't 'Happen:' Embedding Digital Recordskeeping as an Organic Component of Business Processes and Systems," *Archivaria* 71 (Spring 2011), 23-24.
[127] Guillermo Fiebelkorn, "Why Does It Take So Long? Implementing Electronic Records Programs at Universities," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 2012), 1-4; 101-103.
[128] Rachael Macguire, "Lessons Learned from Implementing an Electronic Records Management System," *Records Management Journal* 15, 3 (2005), 156.

business practices, particularly by automating work flows and through the cost

savings provided by more efficient records management. In addition, ongoing

resources needed to be allocated to monitor the quality of data input into the system,

to provide system support, and to facilitate the ongoing training of current and new

users.[129] To help archivists and records managers advocate for the creation of an

EDRMS, the NAA also produced a document for senior management which explains

the concept and benefits of an EDRMS, as well as special considerations for

management.[130]

      Archivists and records managers have thus developed and disseminated many

different strategies and advocacy "messages" to advance the cause of digital

preservation and fulfil their professional obligations in the "information age." Yet,

despite over four decades of advocacy, and this avalanche of literature, projects,

standards, best practice, and proven solutions, most archives still have no or very

inadequate programs in place to preserve digital records over the long term. Even

those archives with decades-old preservation programs in place are lacking the

resources to do the digital preservation job well. Yet, in addition to the large national

archives with such programs, smaller archives, such as the Indiana State Archives and

the City of Vancouver Archives, have developed innovative digital records programs

and adopted policies that situate "born-digital" records as an important and integral

component of their archival operations. Why this disparity exists will now be

---

[129] National Archives of Australia, *Implementing an EDRMS – Lessons from Agencies* (Canberra: 2011), http://www.naa.gov.au/Images/EDRMS%20ten%20lessons%20publication%20-%20April%202011_tcm16-47290.pdf (accessed November 3, 2011).

[130] National Archives of Australia, *Implementing an EDRMS – Information for Senior Management* (Canberra: 2011), http://www.naa.gov.au/Images/EDRMS%20senior%20management%20publication%20-%20April%202011_tcm16-47285.pdf (accessed November 3, 2011).

addressed, in so far as it relates to advocacy messages, their delivery, and their reception.

CHAPTER THREE

ASSESSING ADVOCACY EFFECTIVENESS:

ARCHIVISTS AND RECORDS MANAGERS "SOUND OFF"

To explore why relatively few archives and records management programs have been able to create and sustain robust, full-resourced, long-term digital preservation (LTDP) programs, I have developed two surveys – one targeting archivists, the other records managers – to gather information on which advocacy arguments have been used to convince more senior levels of management in government, business, universities, or other institutions to accept, then fund, and continue to fund, digital preservation programs. These general survey results were followed up by in-depth interviews with record professionals in Manitoba institutions.

Distributed through three email listservs, these surveys are designed to gather information from archivists and records managers at both the working and managerial levels, generally for Canada, and specifically for Manitoba as a case study. Survey questions, some twenty-seven in total, were developed based on common themes which I identified in my examination of LTDP advocacy literature in Chapter Two. The first survey, targeting archivists, was distributed through ARCAN-L, a Canadian-based listserv for "the discussion of archival interests of particular relevance to Canadian archives and archivists,"[1] as well as the Association for Manitoba Archives' (AMA) listserv.[2] The second, targeting records managers, was distributed through RECMGMT-L, a popular University of Florida-based records management listserv

---

[1] ARCAN-L, *Info Page*, http://www.mailman.srv.ualberta.ca/mailman/listinfo/arcan-l (accessed December 6, 2011).

[2] While the AMA's listserv is private, information about the AMA and its member institutions is available at http://mbarchives.mb.ca (accessed December 6, 2011).

with members across North America and world-wide.[3] The surveys were posted, and one reminder sent out over subsequent weeks. Representing a variety of archives and records management programs, thirty-seven respondents completed the archives survey and seventeen completed the records management survey over an eight-week period in autumn 2011.

In addition to the surveys, ten targeted interviews were conducted in-person, over the phone, and by email in spring and summer 2012. Interviewees were initially contacted by email, and were chosen as representatives of the major types of organizational archives and records management programs in Manitoba – provincial, federal, city, corporate, and university. Soliciting responses from Manitoba-based archivists and records managers (five representing each profession), my interviews were designed to explore certain survey topics in greater detail and assess the state of digital records management and preservation in the province. By taking the survey themes and probing down to a deeper level, with a representative variety of Manitoba institutions and recordkeeping practices, the interviews are intended to produce useful suggestions on how archivists and records managers can better advocate to promote the creation and maintenance of LTDP programs, as well as identify issues for further research.

The survey questions are reproduced in appendix A of this thesis but, in the interest of saving space, only those for archivists are included. The questions for records managers are almost identical, but with natural wording and terminology change. The interview questions are reproduced in the other two appendices of this

---

[3] RECMGMT-L, *RECMGMT-L List*, http://lists.ufl.edu/cgi-bin/wa?A0=RECMGMT-L (accessed December 6, 2011).

thesis: for archivists (B) and records managers (C).

These interviews and surveys are not the first projects undertaken to solicit the opinions and experiences of archivists and records managers with digital records management and preservation. For example, Rick Barry's *Report on the Society and Archives Survey*,[4] and Cohasset Associates' *Electronic Records Management Survey*,[5] represent additional examples of wide-scale assessments on the state of digital records management and preservation. Barry's one-time survey is designed to elicit opinions from archivists and records managers on how they believe records creators, public officials, and society as a whole perceive archives, and particularly digital archives. The Cohasset survey, co-sponsored by ARMA and AIIM (Association for Information and Image Management), is designed to assess the current state of digital records management and preservation. A biennial undertaking, the Cohasset survey asks similar, if not identical, questions from year to year, enabling changing attitudes and practices among records managers to be tracked over time. Findings from both the Barry and Cohasset surveys will be presented later in this thesis for comparison with my survey and interview results.

Introduction: Surveys and Targeted Interviews

All survey participants provided background information on their archives or records management program. After this preliminary line of enquiry, the main body of questions, developed from my examination of advocacy literature and LTDP practice in chapter two, solicit opinions on seven general themes:

---

[4] Rick Barry, *Report on the Society and Archives Survey*, http://www.mybestdocs.com/barry-r-soc-arc-surv-report-030129toc.htm (accessed March 3, 2012).

[5] Cohasset Associates, *Electronic Records Management Survey: Call for Sustainable Capabilities* (2009), http://www.cohasset.com/retrievePDF.php?id=10 (accessed March 3, 2012).

- Published sources of information and advice on LTDP including archives and records management journals and the final reports of major digital records research projects;

- LTDP education and professional development including training, conferences, and workshops;

- LTDP advocacy focused on such justifications as authenticity, history and heritage, accountability, and risk management;

- Working relationships between archivists, records managers, information technology staff, and others;

- Canada's archives organizations and "collaborative consortium" digital repositories;

- Why there are few active, full-resource LTDP programs; and

- How archivists and records managers can better argue for the maintenance of existing LTDP programs and the creation of new ones.

Targeted interview questions also generally subscribe to this framework, with many based on common survey responses. However, as the interviews follow a more unstructured and open-ended format, participants were allowed to comment on any aspect of digital records management and preservation, some of which are difficult to categorize in the seven general themes above.

Although I did not directly target survey respondents from the United States or other non-Canadians, the relatively few non-Canadian responses received are not excluded from the reporting that follows. Surveygizmo.com, the online survey software used to create and disseminate the surveys, does not identify the geographic location of survey participants; respondents must self-identify. It would have, therefore, been difficult, if not impossible, to completely exclude non-Canadian survey responses. As such, the reporting that follows does not entirely reflect the professional opinions of Canadian archivists and records managers, but overwhelmingly does so.

In addition, I chose not to offer a definition of LTDP to the survey respondents and interviewees, as so not to bias their responses in any particular direction, and because a universally accepted definition does not exist. In addition, by not providing a definition of LTDP, I intended for the survey and interview questions to provide an informal LTDP "self-assessment," so that survey and interview respondents could identify whether they felt that their archives or records management program possessed a LTDP program, regardless of whether such program satisfied the definition of LTDP for the purposes of this thesis, as set out in the introduction.

To reiterate, a "full" LTDP program comprises a number of components which must be conceived, approved, implemented, and sustained over decades and, have the potential at least, for over centuries. A LTDP program should support one or several operational functions of its archives or supporting organization, with its existence enshrined in vision statements, strategic plans, or other institutional governance documents such as charters, legislation, by-laws, or regulations. A LTDP program should also be associated with specific organizational outcomes or goals, and must receive dedicated and continuing human and financial resources. Defined policies and procedures must be created and followed for all aspects of the LTDP program, such as the appraisal, acquisition, and description of archival digital records; the capture and maintenance of active or semi-active records in an EDRMS; the making accessible of the archives' digital holdings to a defined community of users; the maintenance of legal and intellectual control over the digital records in its custody; and the provision of disaster and business continuity planning, among

others. The archives must also identify and adopt – using best practice guidance and adhering to standards wherever possible – software programs to facilitate the ingest, storage, maintenance, and management of its long-term archival digital holdings. In addition, a specific preservation technique (migration, refreshing, emulation, software and hardware conservation, etc.) must be adopted, as well as policies and procedures for the back-up of records, and for the periodic updating and/or migration of software and storage media.

As I did not provide this lengthy definition of LTDP to survey respondents and interviewees, the reporting that follows must be approached with this stipulation in mind. For example, a respondent who has only a few CDs or magnetic tapes in an otherwise analogue record collection, would likely answer yes when asked if they currently retain any digital records within their holdings. This does not, however, indicate that they have any mechanism in place, let alone a "full" LTDP program, to preserve and make these records available over the long term. Likewise, even for those survey respondents who indicated that their archives or records management program is undertaking some LTDP activities (such as migration, emulation, etc.), this does mean that they possess a robust, fully-resourced LTDP program, complete with all required policies, procedures, and degrees of organizational support, as defined above. In addition, respondents from those archives or records management programs that are engaging in some LTDP activities, and who are, therefore, likely feeling positive about what their program is accomplishing, may be more inclined to respond to the surveys, thus making the overall situation of archival LTDP appear better than it actually is.

Archives and Records Management Program Information: Surveys

The thirty-seven respondents to the archives survey are distributed among the following types of archives institutions: three national; three state/provincial/territorial; twelve municipal/county; three corporate; two religious; eleven university/college; five museum/historical society; two theme-based; and one in some other type of institution. Almost half (49%) of respondents[6] work in small archives employing ten or less full-time staff, while the rest work in large- and medium-sized archives, employing up to one thousand full-time staff at a national institution. A majority of respondents (87%)[7] currently retain some digital records within the holdings of their archives, including the archives' own digital records or those of its sponsoring agency, the most common of which include word processor files, digital video, digital audio, and graphical presentations such as Microsoft PowerPoint. Likewise, most archives (68%) have a mandate that implicitly or explicitly supports the preservation of digital records.

Almost all respondents' (89%) archives have at least considered implementing a LTDP strategy. The most common arguments or justifications that were/would be used to support the creation of this strategy include supporting cultural memory, history, and heritage; a "total archives"[8] approach encompassing all records

---

[6] All figures in parentheses represent the percentage of respondents who answered a given question. However, as not all respondents answered every question, these numbers to not represent a percentage of total survey respondents.

[7] This figure does not indicate that 87% of respondents have a LTDP program in place, but only that they have some digital records in their holdings.

[8] The Canadian "total archives" theory is founded on the belief that archivists should acquire, preserve, and make available records in all formats and media, both analogue and digital, including textual records, documentary art, audiovisual records, photographs, and so on; and they should do so from their official sponsor's records (whether government, university, church, etc.) and from related private and personal sources, so that the official and personal records complement and supplement each other.

regardless of media; and for sound risk management to ensure accountability, transparency, and possibly legal discovery requirements. However, the number of archives that are actually engaging in at least some LTDP activities is much smaller (46%). The most common activities include migrating records to a new preservation format such as PDF/A, TIFF or XML; refreshing, replacing, or updating storage media; migrating records to the newest versions of originating (native) software; and hardware and software technology preservation.

For those archives (62%) which have not yet implemented any form of a LTDP strategy, the most common reasons for this include lack of resources (funding, staff, equipment, and training); poor relationships or lack of common interest and support between records management, information technology, and archives; and difficulty convincing senior management within their sponsoring jurisdiction (excluding the archives' own senior management.) A majority (60%) of archivists are responsible for the management of both active organizational and archival records. Finally, when asked to indicate the reporting structure and sources of funding for their archives, the most common responses include libraries branch/division; archives branch/division; centralized clerk's office or record services; and freedom of information or privacy office.

The seventeen respondents to the records management survey are distributed among the following types of institutions: four state/provincial/territorial; two national; four municipal/county; four corporate/private; one religious; three university/college; one museum/historical society; and one in some other type of

---

For more information on "total archives," see Laura Millar, "Discharging our Debt: The Evolution of the Total Archives Concept in English Canada," *Archivaria* 46 (Fall 1998), 103-146.

institution not mentioned above. Most (76%) work in small records management programs employing ten or less full-time staff, while the rest work in medium- and large-sized programs, employing up to several hundred full-time staff in a large institution. A majority of respondents (82%)[9] currently manage some digital records within their holdings, the most common of which include word processor files, graphical presentations such as Microsoft PowerPoint, digital photographs, and email. Most (83%) also indicate that their program's mandate implicitly or explicitly supports the management of digital records.

Furthermore, most respondents' (88%) programs have at least considered implementing a LTDP strategy. The most common arguments or justifications that were/would be used to support the creation of this strategy include for sound risk management to ensure accountability, transparency, and possible legal discovery requirements; to satisfy an internal records and information management (RIM) policy; to comply with recordkeeping or archival legislation; and to enhance decision making facilitated by quick access to key records. However, the number of records management programs that are actually engaging in at least some LTDP activities is much smaller (47%), the most common of which include refreshing, replacing, or updating storage media; migration to newest versions of originating (native) software; migration to a new preservation platform such as PDF/A, TIFF, or XML; and hardware and software technology preservation.

For those records managers programs (55%) which have not yet implemented a LTDP strategy, the most common reasons for this include lack of resources

---

[9] This figure does not indicate that 82% of respondents have a LTDP program in place, but only that they have some digital records in their holdings.

(funding, staff, equipment, and training); lack of support by RIM senior management; difficulty convincing senior management within their sponsoring jurisdiction (excluding RIM's own senior management); and confusion about best practices to undertake. A majority (77%) of records managers indicate they are responsible for the management of both active organizational and archival records. When asked to indicate the reporting structure and sources of funding for their records management program, the most common responses include office of the chief information officer; wholly independent; IT branch/division; and RIM branch/division.

Archives and Records Management Program Information: Targeted Interviews

I deliberately targeted Manitoba-based archivists and records managers for the follow-up interviews. As such, the reporting that follows is focused on a relatively small community of archivists and records managers and limited to a distinct geographic area. In addition, many other Manitoba-based archivists and records managers were not contacted for an interview, while others declined or were willing, but unable, to participate. The reporting below should, therefore, not be construed as the uniform opinion of the Manitoban archives and records management community. Due to this limited focus, many areas for further research are possible, whether in different or multiple geographic areas, or with other Manitoba-based respondents.

Province

Scott Goodine, Archivist of Manitoba, is the chief executive authority for the Archives of Manitoba's archives and records advisory programs. The primarily governing legislation of the Archives, *The Archives and Recordkeeping Act*, is media-neutral. Currently, the Archives has no LTDP program. It has created pilot digital

records projects in the past, largely records management focused, but has been unable to put any permanent programs in place. Between capacity and cost, the Archives finds it difficult to focus on digital records management and preservation. It is, however, beginning to make an argument for increased digital records storage capacity similar to what it receives for analogue records storage.

City

Jody Baltessen is Archivist for the City of Winnipeg and Scott Reid is Senior Records Manager. The governing bylaw of the City Archives and Records Control Branch is media neutral and encompasses, as its name implies, both archives and records management. The Archives per se does not retain any digital records within its holdings. Its mandate focuses on consulting with departments to provide advice and training, promote best practices, and assist in the implementation of the bylaw. The Archives does not now have the capacity to create a LTDP program or enterprise-wide EDRMS. However, among other initiatives, the Archives has produced a report on standards and principles for digital records governance and management. Recordkeeping, social media, and email directives also exist. Baltessen indicates that the Archives is hampered by differing organizational cultures and a lack of records management capacity in many City departments. Reid identifies City administration as reactive by nature, and among the stakeholders it must satisfy, the impetus for an enterprise-wide EDRMS has not yet emerged.

Allan Stevenson is Records Manager for a City of Winnipeg department and Ian Richards is Records Manager for the City of Brandon. Both have media-neutral programs and use EDRMS to manage their digital holdings. Stevenson's EDRMS is

justified by factors including document management, retention of contracts in their native digital formats, and other basic business requirements. Richards' EDRMS supports various operational and administrative requirements, including complying with legislation; undertaking risk management assessment; ensuring accountability and transparency; facilitating possible e-discovery; enhancing decision making by providing quick access to key records; and enhancing organizational continuity through precedent and past practice.

University

Shelley Sweeney is Head at the University of Manitoba Archives and Special Collections. The Archives' acquisition policy is media-neutral and it currently has some digital records within its holdings. Although the Archives has no formal LTDP program in place, its digital archivist is currently working on a policy to adopt Archivematica as a preservation system. Jordan Bass is Archivist at the University of Manitoba Faculty of Medicine Archives, and is currently managing and preserving digital records. The Archives' LTDP program is justified to facilitate the evolution of recorded information from paper to digital, and has been developed through the use of open-source technology, experimentation in a controlled computing environment, and online collaboration with other archivists, librarians, and IT specialists.

Corporate

Rachelle Ross is an archivist for the Great West Life (GWL) Assurance Company, which has a combined archives and records management program. The Archives' mandate is media-neutral and, although it retains some digital records as archives, it does not have a LTDP program in place. It is now, however, beginning to

explore how to manage and preserve its digital content over the long term, based on

justifications such as allowing clients to better manage their own digital records, and

providing the Company with greater control over its records to ensure internal and

shareholder accountability. Tom Winston is Records Manager for Kochanski

Enterprises, a Winnipeg-based manufacturing firm. His program is media neutral and

currently manages some digital records, but does not have a LTDP component.

Winston describes preservation as a "latent issue" for his program, as its primary

focus is on records with short and medium lifespans. However, it does promote the

use of best-practice preservation file formats and the creation of context- and

metadata-rich digital records, to facilitate long-term access and eventual preservation

for records of historical or enduring value.

Federal

Shelly Smith is Records Officer at the Public Health Agency of the

Government of Canada (PHAC) in Winnipeg. The mandate of her program is media

neutral but does not include a LTDP component, as any records appraised as archival

must be transferred to Library and Archives Canada, the repository for all long-term

preservation of digital media after their operational values ceases, for all departments

and agencies of the federal government – national, regional, or local. To manage its

digital records, PHAC utilizes an enterprise-wide EDRMS, which is justified through

a mixture of business benefits and adherence to legislative and program requirements.

Published Resources: Archives and Records Management Journals

Most archivists read archives journals on a regular basis, although few

indicate that they are helpful with their daily digital records management and

preservation activities. Although one archivist states that archives journals "provide me with important resources both in choosing my course of action and in lobbying for better digital record creation/keeping practices," many respondents consult them only when referencing a particular problem or situation. Several respondents also perceive archives journals as too theoretical or not applicable to the working realities of their archives. One museum/historical society archivist comments that archives journals "do not help with day-to-day work as most journals and 'advice' seems to be intended for large corporate/government or academic archives...small organizations with no budget are rarely discussed at conferences or in journals." In addition, a college/university archivist responds that, archives journals, "provide a very important theoretical base. Unfortunately, they rarely move beyond that. Our real-world issues, [such as] limited funding, understanding, and support, are rarely covered in these best case scenarios." Few archivists regularly read records management journals and none identify them as helpful in their daily work with digital records.

Among records managers, almost all regularly read records management journals, yet few feel that these journals are helpful in their daily work with digital records, and instead identify them as useful only for reference and informational purposes. As a city records analyst and archivist states, "Many articles are more 'inspirational' than helpful especially those dealing with best practices in environments more technologically advanced or better funded than ours." Furthermore, a corporate records manager answers, "[I read a] variety of records and information management publications. I don't feel their benefit on day-to-day efforts

is as important as their strategic planning benefits." Some records managers also

believe that journals function primarily as outlets for vendor advertisement or contain

articles that are only relevant to large, well-funded records management programs.

Finally, almost no records managers regularly read archives journals, and none

identify them as helpful in their daily work with digital records.

Of those targeted interviewees who comment on this question, almost half

believe peer-reviewed journals can provide some day-to-day assistance with digital

records management and preservation, although none use them to guide their daily

operations. A few respondents feel journals are seldom, if ever, useful, while others

provide examples of alternate sources of information and advice on LTDP that they

feel are more helpful with day-to-day activities. For example, Rachelle Ross "rarely"

finds anything relevant to her daily work in academic journals, and identifies online

forums and other collaborative outlets, such as social media, as the best venues for

gaining information and advice on LTDP. Another archivist believes that peer-

reviewed journals can be helpful in planning a digital preservation program, although

"only to an extent" as they offer little practical guidance. Instead, blogs and other

online resources guide his day-to-day preservation work. Finally, Scott Goodine

answers that, although the intention of such journals is not to provide day-to-day

guidance, he would like to see articles on digital records management and

preservation standards published at a level that can be understood outside specialist

communities. As these can potentially be perceived as "too complicated," Goodine

believes it would be beneficial for those groups producing standards to create succinct

versions which could be presented to non-specialist audiences and gain instant

understanding.

Published Resources: Final Reports of Major Digital Records Research Projects

Most archivists follow these research projects, if only casually, but very few identify their reports as helpful in their daily work. Report findings are referenced when a specific situation arises, or when archivists are considering adopting new standards or practices, but rarely used to structure day-to-day operations. Only InterPARES is cited by two archivists as providing some daily utility. Several respondents also perceive major projects as overly complex, too theoretical, and not applicable to the working realities of their archives. For example, one city records manager (speaking as an archivist) replies, "These projects are so large and complex that they almost seem monolithic." Furthermore, a university archivist and records manager states, "If [such projects] were simplified and easily modified for actual application, they would be more useful."

Many records managers also follow, at least casually, these final reports, but comment on their reference and informational value, rather than their usefulness in day-to-day operations. For example, one records manager replies, "[I] sometimes will browse [final reports], but seldom find information that is of immediate interest," while another answers, "We have followed these [reports] somewhat; I would say they have informed our day-to-day work in a theoretical way, but not in a direct way." Although two records managers indicate that major report findings guide their daily work with digital records, neither elaborates the project's findings to which they subscribe.

Among those targeted interviewees who comment on this theme, all except

one follow major digital records preservation project findings. None, however, use them to guide their day-to-day digital records management and preservation activities, and several offer suggestions on how research projects could be more relevant to their daily working realities. For example, one archivist argues for the production of essentialized versions of major research findings. As his boss "doesn't have a week of her time to investigate InterPARES," he needs a simplified version to effectively promote and make project findings accessible. Jordan Bass feels that the findings of major projects may be too large-scale and inaccessible for some archives. He subscribes to projects that have "synthesized their findings into accessible and useable workbooks and appendices," such as the U.K.-based Digital Lives Research Project and Paradigm Project. Bass believes a valuable research project might combine archival perspectives on LTDP with other disciplinary approaches from economics, business, human-computer interaction, and personal information management studies. Finally, another archivist believes that major report findings may be too high-level for some archives without a need for comprehensive LTDP requirements. She believes that most archives need standards and best practices incorporated into "turn-key" solutions which can be purchased and rolled-out to users.

Digital Preservation Education and Training, Conferences, and Workshops

Almost all archivists attend LTDP conferences, training, and workshops, with several identifying them as their preferred venues for gaining practical advice and best practices for LTDP. Some also indicate that information from such training sessions can be useful when advocating for funding and other resources to support

LTDP activities. One archivist comments, "[Digital preservation workshops] provide ammunition for business cases," while a university archivist replies, "I have used ideas and best practices [from training sessions] in the development of digitization standards and in a reformatting policy for audio/visual records." A few other archivists, however, provide different opinions. One university archivist states, "Yes I attend such workshops...they are good for networking and commiserating, but not much else." In addition, a city archivist feels, "[Digital preservation workshops] could be beneficial, but are lacking in detail."

No archivists believe formal archival education alone is sufficient to prepare archivists to perform their core functions in a digital environment. Many perceive formal education as overly theoretical and lacking in practical guidance, while others suggest changes to archival studies program curricula. As one archivist comments, "[Archival education] provides lots of theory which is useful but little direction on how to implement theory." Another states, "I don't think the Masters programs in Canada, except perhaps University of British Columbia because of InterPARES, have any practical training [in digital records management and preservation]. Workshops and on-the-job training are really the only way to learn." Several respondents believe masters level curricula should include subjects such as communications, management, and business plan development.

A majority of records managers attend, at least occasionally, digital preservation workshops, conferences, and other training sessions, with many identifying them as the most effective means for gaining information and practical guidance on LTDP. Several also indicate that such training is helpful when

advocating for funding and other resources. For example, an archivist and records manager employed for a religious organization replies, "[Attending conferences and workshops] is the way that I get info about digital preservation." A city records analyst and archivist also comments, "[I] have brought back things learned at conferences (either through presentations or conversations) and applied them to work." A few records managers, however, identify conferences and workshops as inaccessible, not applicable to their working realities, or too expensive. They instead identify blogs, webinars, and other online resources as more effective (and affordable) sources for information and advice on LTDP.

Most records managers do not believe that records management education sufficiently equips graduates to perform their core functions in a digital environment. Several argue that education is overwhelmingly focused on analogue environments, and call for an increased focus on subjects such as information technology; risk management; business continuity planning; and all aspects of digital records management and preservation. For example, one state records manager replies, "There is little attention paid to the hybrid world (paper and digital) where most of us exist. Also, there is an assumption that everyone has an enterprise information management system – but some don't." In addition, another respondent comments, "Much more emphasis on electronic records generally, and email, social media capture, and web 2.0 specifically is required. Other training is needed in continuity of operations and disaster recovery in an electronic environment."

Among those targeted interviewees who comment on this theme, all support the allocation of funds and other resources for digital records management and

preservation training for records professionals, for staff tasked with creating records, or both. For example, Ian Richards believes information management training for records creators offers a way for organizations to invest in their staff and foster knowledge-based cultures reliant on well-managed records and information. In addition, he believes records managers who focus their own training solely on analogue records are not able to offer full value to their organizations in a digital technology-reliant environment. Shelly Smith agrees, believing that records managers should tailor training around those issues and technologies most pressing to their organization. In addition, by participating in social-media or cloud computer training, for example, then utilizing these same technologies to deliver training to staff, records managers are able to support workplace-specific experience and understanding. Finally, another respondent believes that training must keep pace and evolve with advancements in digital technology. As there are no "silver bullet solutions" that can solve all problems related to digital records management and preservation, he feels every effort must be made to train and educate staff on these issues to keep the entire organization abreast of new developments.

Advocacy Arguments: Authenticity, History, Accountability, and Others

A majority of archivists believe that preserving authenticity and trust in digital records is an effective argument for LTDP, although only a few have ever been required to formally or informally prove the authenticity of a digital record in front of a court or similar tribunal. However, many feel that such an argument would not be effective at their institution, as their program sponsors would not be compelled to allocate funds for evidence-based LTDP initiatives, unless a crisis of authenticity

developed directly affecting the sponsoring organization. For example, one university

archivist answers, "Sponsors want the bare minimum and if they have had not had

their fingers rapped for poor recordkeeping yet, there's no reason to put money into

it." Another comments, "Institutions tend to be reactive rather than pro-active. I've

advocated but institutions seem to need a crisis for attention to be paid." Some

archivists also provide examples of instances when they unsuccessfully used an

authenticity-based justification when approaching their sponsors for funding in

support of digital records management and preservation. As one university archivist

explains, "My archives presented a RM proposal, which included digital records

management, during strategic planning three years ago...nothing has been done in the

past three years to make it a reality."

Most archivists also indicate that digital preservation advocacy based on the

preservation of historical digital records would not be effective at their institution, but

do not feel that archivists are therefore failing in their duty to preserve and make

available digital history and heritage. For example, one city archivist responds,

"Regardless of arguments put forth there is just so much money to go around. I don't

agree that archivists are failing...if there is a failure it is a collective failure [of]

information management specialists and the institutions for which they

work...archivists are doing what they can given the resources available." Furthermore,

a university archivist comments, "I don't think archivists are neglecting digital

records on purpose; there are just not enough practical solutions for their everyday

management." Other respondents indicate that advocacy based on risk management

or the business benefits of LTDP is more effective in securing funding and other

resources for preservation activities, and blame poor relationships with IT and RM, insufficient resources, and a lack of easily implementable digital preservation solutions as potentially responsible for the loss of historical digital records.

Almost all archivists agree that the archival profession has a duty to act as protector of public interest by ensuring the preservation of authentic, reliable government digital records, but few feel this would be an effective advocacy argument at their own archives. For example, one university archivist comments, "It may be one component of an effective argument at my institution, although likely of little importance." Another responds, "I agree [with the statement] and no I don't think it would be an effective argument." A few respondents also question whether it is possible for archives to help ensure accountable government, and whether archives sponsors truly want to promote transparency. As one archivist explains, "This would not be an effective argument at my institution because they don't even bother to claim to want to protect public interest or be accountable or transparent, let alone actually do anything to support any of those goals." In addition, a university archivist and records manager explains, "We get our funding from governments and sponsors who are not necessarily interested in revealing the truth...the role of protector of public interest has already been assumed by access to information legislation."

Among records managers, most believe that ensuring authenticity and reliability in digital records is an effective argument for LTDP, and many feel this justification would be an effective means for advocating at their own institution. For example, one state archivist (acting as a records manager) comments, "Authenticity and e-discovery are two strong arguments for digital preservation." In addition, an

archivist and records manager employed for a religious organization indicates his program must "routinely" defend the authenticity of digital documents, and has used this justification to secure funding for LTDP activities. However, another records manager responds, "Having been in records for twenty-three years I have used this argument with mixed results. Insurance against a phantom bogeyman is a difficult sell." Finally, a municipal records manager indicates that, "Most effective are arguments that start from the business purpose of the record, and what value it has to a given records custodian...approaches based on these generally are more effective than litigation/risk arguments because they speak to experiences most employees and managers have had."

When asked if the archival profession is failing in its duty to preserve and make available historical digital records over the long term, over half of records managers agree. Most also indicate that LTDP advocacy based on safeguarding historical digital records would not be effective at their institution, although a few have unsuccessfully tried to use this argument. For example, a corporate records manager replies, "I agree [that archivists are failing], although with the caveat that I don't think there are overall enough resources for preservation and archiving, digital or not. My institution is really just concerned with keeping records for business continuity and legal purposes; I don't think cultural/heritage [arguments] would work here." Furthermore, a university records manager comments, "At the university we are now beginning to understand the need to pay attention to digital preservation but for operational purposes not for heritage, historical or cultural purposes." Finally, a senior business analyst replies, "To stay in compliance with statutes and regulations,

our institution must preserve all records of historical or cultural import. The tricky part is having the funding to follow through on stated policy. I have made this argument many times, but inevitably run up against the lack of funding issue."

Most records managers do not believe archivists have a duty to safeguard government accountability through the preservation of authentic and reliable digital records. In addition, only some respondents feel that ensuring accountability would be an effective argument for LTDP at their own institution. For example, one corporate records manager comments, "While I agree with the statement, in my organization they are more likely to want to hide information from the public than share it!" Others argue that it is not the role of archivists to ensure accountable and transparent government. As a state records manager replies, "Records managers are more responsible [than archivists] to preserve evidence." Furthermore, a corporate records manager comments "I don't believe archivists are the protectors of the public interest. In most cases, the archives obtains the information after the time-frame for meaningful accountability has passed." Of those respondents who have successfully advocated for LTDP based on this justification, a county records manager replies, "Government transparency has long been one of our primary goals. We state this plainly in our mission statement, and, I am happy to say, get at times enthusiastic support from our elected officials."

Among those targeted interviewees who comment on this theme, all but one believes archivists and records managers should better promote their role as defenders of faith in accountable government, as well as raise the profile of archives and records management in general. Several advocate for an increase in public education and

awareness campaigns, while others instead promote at their own workplace the role played by archivists and records managers in safeguarding accountability. For example, Rachelle Ross believes that, while proponents of freedom of information (FOI) legislation have been highly successful in positioning themselves as stewards of accountability, the public does not yet assign this role to records managers and archivists. She therefore identifies a need to demonstrate that all levels of records management and archiving enable FOI, and believes organizations such as the ACA or ARMA may have a role to play in developing high-level advocacy stressing this point. Another respondent believes that archivists must better interact with society and develop their professional role as stewards of accountability. He believes groups such as the ACA and AMA should focus more on educating the public, including "face-to-face interactions with designated communities of users," rather than just serving the needs of archivists. Finally, one archivist believes that advocating for government accountability "can be a double-edged sword," as FOI can easily become politicized, and if used to deny access to records, destroys public faith in government accountability. However, if records managers participate in proactive disclosure, and, when possible, provide access to records without making people go through a formal ATI application, the public, as well as government itself, is able to see value in well-managed and accessible records.

**Working Better Together:
Records Management, Information Technology, Archives, and Others**

Most archivists do not believe that they should, or even could, take on the duties of IT specialists while still performing their core archival duties, and should focus instead on effective collaboration. One archivist comments, "It is just not

practical for a single person to be a full time archivist and IT specialist," while

another answers, "I believe archivists and IT specialists should work closely together

but they each have their own area of expertise." Furthermore, one university archivist

states that, "if you have a close working relationship with an IT department, you do

not require much of this knowledge yourself," while another responds, "While I think

archives should work with other information professions to an extent, they too often

get pulled into systems or practices that do nothing to advance archives and actually

take away from what they are doing." A few respondents, however, indicate support

for the amalgamation of archivists, librarians, and records managers. One university

archivist favours such an idea, provided that "archives aren't gobbled up into that

wider information framework so that the intrinsic qualities and importance of

materiality are lost." Finally, a city archivist also agrees, stating, "'Records is records;'

archivists are way too insular and this leads to obscurity and dis-empowerment."

Almost all archivists agree that records should be treated equally regardless of

media, and very few have separate programs for digital records at their archives. In

those archives that do, however, funding for LTDP is comparable to that dedicated

for analogue media preservation. For example, one respondent comments, "Both

[analogue and digital media preservation] are funded according to the demand, the

electronic side being supported in part by information technology infrastructure."

Another responds, "I suppose [our digital preservation program] receives a little less

funding, but not by much. This is because we don't spend a whole lot on preservation

in general."

Most archivists also indicate their support for a "continuum model" approach

to digital records management and archiving. For example, one archivist states, "I think archivists should be involved somewhat in the management of current records, especially in the areas of assigned metadata and descriptive standards." In addition, a city archivist responds, "I am very much a believer in the continuum model and have been actively developing a closer relationship with RIM staff. I have also been advocating to have greater records management responsibility as RIM staff do not have enough time to accomplish program requirements and I believe it's more important for me to be involved earlier in the process, particularly if this process is disintegrating." Of those who subscribe to a "life-cycle" approach, a university archivist answers, "We follow a bit of a life-cycle model. I tend not to interfere in departmental managing of active records, but I do help as needed." Finally, also based in a university setting, an archivist and records manager replies, "I tend towards the records continuum model, but in reality, records creators identify more with the life-cycle model…for the most part they want an easy answer."

A majority of records managers believe that archivists, records managers, and other information professionals should work closely together, although none support amalgamation. For example, a corporate records manager replies, "Collaboration is a must...I worked directly with the archives. We were able to implement technologies that enabled long term preservation of materials in both electronic and analogue preservation formats." A county records manager also answers, "I actually think, in government anyways, that the archival profession is the future of government records management. Too many private sector RMs are becoming, in essence, managers of RIM applications – more of an IT function. We should all work together, and we do."

Most records managers also believe that records should be treated equally regardless of media, and very few reply that their program has a separate component for digital records. As one explains, "Records are records. Funding is for records and is to be applied as necessary to meet the needs of the company." In addition, a senior business system analyst states, "RIM programs I have worked for have made no distinction between digital and non-digital records." Although most respondents support the joint management of analogue and digital records, some records managers cite concerns on the cost of managing and preserving certain software and file formats. Others have few digital holdings, and as such, allocate considerably more funds for analogue records management.

Records managers are equally divided among those who follow the "life-cycle" approach at their institution, and those who follow the "records continuum" model. Almost all agree, however, that archivists should have some involvement in the management of active records. For example, one respondent answers that "The current paradigm is life-cycle with [archival long-term] preservation as the final step where appropriate. Archivists could be involved from the beginning to help determine the best format/medium on which to preserve records." A state records manager agrees, responding, "Archivists have input into the life-cycle at the time a schedule is written and again when material is accessioned, as described in the schedule." Proponents of a "continuum" approach include a city records analyst and archivist, who states, "As archivists we can't afford not to be involved in the management of current records; processes of appraisal and arrangement will need to happen some time, and it is more efficient to do so as early as possible through staff training and

policies." Furthermore, a corporate records manager responds, "We follow more of a continuum model. I combine archivist and RM functions, but I generally think they should work closely together."

Among those targeted interviewees who comment on this theme, several provide examples of how archivists can gain the support of records managers and jointly stress the need for digital records management and preservation. Almost all focus on promoting the business benefits of digital records management and preservation. Other interviewees provide suggestions on how to effectively collaborate with information technology specialists when advocating or creating a LTDP program. For example, one archivist calls on archivists to promote the tangible business benefits of LTDP such as increased accountability, enhanced documentation, and the protection of intellectual property, thereby creating commonalities with their records management colleagues. She also believes many archivists and records managers do not understand the IT profession, and should therefore work harder to educate themselves and "speak the language" of their IT colleagues. Jody Baltessen agrees, believing that, if archivists want to fully appreciate the various dimensions of digital records management and archiving, and understand the pressures faced by their records management colleagues in managing information and responding to public demands, they must be engaged in similar work themselves. In addition, she feels that archivists need to improve particularly their working relationship with IT professionals who generally "drive all decisions around systems and direction." To encourage a close working relationship, the City of Winnipeg Records Committee, a group made up of archivists, records managers, representatives from legal services,

audit, and finance, as well as two citizen members, also includes a representative from IT. This inclusion facilitates dialogue with IT and involves it in decisions and directions regarding records and information.

Allan Stevenson also sits on a committee with a representative from IT, through which they are jointly involved in decisions regarding records and information. He believes that, although IT staff do not initially view digital records management and preservation as important, they are very good at understanding processes. If the records "life cycle" is explained as a process-driven construct, it is a "natural fit" for IT, and Stevenson is able to insert records management requirements at the onset of process development. Finally, one archivist explains that, as some records managers may be reluctant to invest resources into the preservation of records with "archival" or "historical" value, he tries to avoid these terms when discussing LTDP. Instead, he argues for the preservation of records which hold "tremendous business value in terms of alumni and donor relations," and demonstrate institutional stability which can be appealing to "interested outside third parties." In addition, he states that, for archivists, "Gone are the days of only having a rudimentary understanding of digital records and the platforms that create, preserve, and provide access to them." He therefore believes archivists must engage IT "in their own vernacular," an issue he feels should be addressed by graduate-level archival education.

The Power of Many: Shared Digital Repositories and Canada's Archives Organizations

A majority of archivists indicate that their institution would consider participating in a "collaborative consortium" long-term digital preservation program,

with some having already advocated for such an arrangement. For example, a municipal archivist responds, "We would most definitely be interested, and are participating in just such a program." In addition, a city archivist comments, "I would definitely be interested in this type of partnership. As a small institution, I have considered proposing a collaboration with another neighbouring small institution to begin a program. I have also considered approaching a larger neighbouring institution that is far more advanced in its digital records preservation to discuss whether they are able to provide guidance or assistance in starting a program." However, some respondents are reluctant to participate in a shared digital repository. A few believe that their institution is too small or remote to effectively collaborate with other archives, or indicate that their institutional sponsors would not approve of sharing records storage with other archives, or possibly losing "control" of records for which they are legally responsible.

Among records managers, almost none are interested in a collaborative LTDP program. Several express concern with the security and privacy implications of a shared digital repository. Others explain that they would violate their mandate or shareholder obligations if they were to develop or "buy-into" such a system. As one records manager replies, "No, [a shared repository] is not acceptable, too much possibility of [a] confidentiality breach in a shared system." A records analyst and archivist also states, "We deal with many records for which there are important security and privacy concerns as well as preservation and access. Sharing information and ideas is good, but we can't currently share storage or technologies." A corporate records manager further replies, "[We] would love to share resources, but the nature

of our business doesn't allow us to do this." Among those few in favour of a shared

digital repository, one records manager replies that, "in the public sector this would

be a great idea," and explains that his institution has participated in a study facilitated

by the Library of Congress to "examine the technologies and structures necessary to

implement such a shared resource."

Almost all targeted interviewees who comment on this theme are potentially

interested in participating in a shared digital repository, although several doubt

whether their sponsoring agency would allocate funding and resources to support

such a project. Others, however, are not interested in participating in a "collaborative

consortium," due to concerns such as information security or a belief that

collaboration would conflict with their institutional mandate. In addition, most

interviewees believe that Canada's archives organizations could be doing more to

champion LTDP, with several offering suggested actions. For example, one

interviewee indicates that his archives would potentially be "very interested" in

joining a "collaborative consortium," provided it was offered with "a cost-effective

business plan that guaranteed autonomy over their records." He feels that the hardest

aspect of advocating for such a system would involve "selling" it to his organization's

IT department, who may or may not provide their support. He also believes that,

although it might be difficult for Canada's volunteer-run archives organizations to "do

more" to champion LTDP, they could consider promoting digital preservation by

developing literature targeted at archives, requesting that their employees be allowed

to spend a portion of their time doing digital preservation-related work on behalf of

the organization. Shelley Sweeney indicates that, if a larger archives wanted to host

and implement a shared digital repository, the University of Manitoba Archives would be happy to take part. As the Archives is already engaged in collaborative projects, she feels that the University would support additional initiatives. Sweeney also believes that Canada's archives organizations "could probably do more" to champion LTDP, but are "volunteer-driven and very much hamstrung by that." However, she believes opportunities exist for promoting preservation standards and software, thereby sending out "national signals" that encourage collaboration and standardization among archives.

Jody Baltessen indicates that the City of Winnipeg Archives would be open to participating in a "collaborative consortium." However, as the City is only now using cloud technology in response to business case pressures, she feels there is no imperative to consider LTDP. In addition, as the City's IT department is "in the driver's seat" when it comes to technology-based initiatives, Baltessen believes the Archives would have a tough time advocating for participation in a shared digital repository without a "very compelling argument" from its proponents. She also feels that, as much as Canada's archives organizations may champion LTDP, "Each archives exists in an organizational culture of its own, and needs to develop strategies that work within this context." Using the example of grant funding, Baltessen believes that archives must often "contort" to be able to apply for grants that do not exactly address their own particular needs. If archives were given more leeway to design projects without conforming to "inflexible" requirements, they could produce results relevant to their institution. Finally, one other interviewee is in favour of a shared digital repository, "provided the right people were involved." If a

"collaborative consortium" limits itself only to digitization and metadata standards, as he feels other such projects have done in the past, "it would not leave the runway." He further explains that, although the idea of partnering with LAC's TDR may have been attractive in the past, the "very limited success rate of these massive repository projects" makes a regional alternative more appropriate.

How to Better Advocate and "Sell" Long-term Digital Preservation

For the final questions in the archives and records management surveys, respondents are asked to comment on why there are few LTDP programs currently in existence; how archivists and records managers can advocate more successfully for their creation and maintenance; and for those who have pushed digital records off to "the back burner," what it would take to situate LTDP near or at the top of their priorities. Some targeted interviewees are also asked how to advocate for digital records management and preservation in a variety of scenarios. These include how to:

- Counter the perception that there are no effective solutions for LTDP;
- Argue for LTDP in "traditional" archives serving patrons such as genealogists and academic historians;
- Counter the perception that catastrophic data loss, costly litigation, or other digital records "disasters" are unlikely to happen;
- Appeal directly to senior management when lower-level bureaucrats are uninterested in LTDP;
- Manage often large analogue records backlogs while also pursuing digital records management and preservation;
- Counter the perception that archivists and records managers should delay the creation of a LTDP system until they are able to preserve only context- and metadata-rich digital records; and
- Generally better "sell" and "pitch" LTDP.

Many archivists believe that, primarily, a lack of funding and other resources is responsible for the low number of active and robust LTDP programs. As a

municipal archivist laments, "I suspect that digital records preservation programs are unknown quantities still to many archives in regards to cost and time requirements." Other respondents blame a lack of LTDP education, training, and hands-on experience. As one municipal archivist comments, "The archival community is still new. Given time (possibly another generation), interest will grow." Another archivist believes that "Far too few archivists have yet committed themselves to making [digital preservation] happen by gaining sufficient education and making born-digital a priority." Some respondents also believe that archivists need to better articulate the organizational and societal benefits of digital preservation. Finally, a few respondents believe that, until their archives is involved in litigation or faces a serious crisis brought about by poor digital records management and preservation, its sponsors will be unwilling to allocate funding and resources for preservation activities.

Archivists also provide numerous suggestions on how to argue more successfully for the creation of LTDP programs. For example, a municipal digital archivist believes that archives organizations such as the ACA need to publicize digital records-related scandals, crises, and instances of catastrophic data loss. Similarly, a university library archivist answers, "I think that using real-life cases of lost data or information is an effective method of advocating." Furthermore, another archivist suggests, "Take advantage of records-based crises and scandals to promote the importance of digital management and preservation." A few respondents also argue for archivists to equate better LTDP with their sponsor's priorities. As a university archivist and records manager responds, "Archivists need to be pragmatic. We need to present cleaner, neater solutions to user issues, then piggy-back our needs

onto their needs." Other common responses include raising the profile of archives within organizations and society; presenting tested strategies and well-developed business plans; and clearly demonstrating the business and organizational benefits of LTDP.

Archivists also provide various opinions on how archivists who have pushed digital records or left them "on the back burner" – either deliberately or regrettably – could situate a LTDP program near or at the top of their program's priorities. For example, a municipal archivist comments, "The larger institution would need to be engaged in a large scale legal battle before they would address the digital records issue." In addition, a respondent from a religious archives comments, "A crisis, or public embarrassment of policy makers [would be required]. That would get peoples' attention." Several other archivists answer that only a mandate from upper management prioritizing digital holdings over existing analogue backlogs would allow them to focus on LTDP. For example, a city archivist comments, "I would love to prioritize [digital records]; however, the only thing that could change the situation would be permission from my superiors to start working on a solution." Finally, other respondents answer that only an influx of new funding, staff, and other resources would allow them to devote their energies to LTDP.

Among records managers, many answer that a lack of funding; a gap of awareness and commitment on the part of senior management; a shortage of proven, easy-to-implement long-term strategies; a paucity of training and knowledge, particularly IT knowledge; and an excess of resistance to change are the most common obstacles preventing the creation and maintenance of LTDP programs. For

example, a corporate records manager argues, "I think most archives/RM programs are under-funded and need to deal with immediate pressing needs first so there are not enough resources/energy left for forward planning." Another respondent answers, "Long term strategies are either too complicated, too expensive, or too new to convince anyone of their long term viability." In addition, a county records manager replies, "We need to get people to want to help...any attempt at digital preservation has to start with approaches that make individual's lives easier." Other respondents believe that archivists and records managers need to re-examine how, and to whom, they advocate for funding and other resources. As a state records manager argues, "Senior executives are not aware of the issues; advocacy needs to move up several layers. Perhaps media coverage may make a difference." Finally, a city records analyst and archives argues that "Advocacy and case studies need to be presented in terms of small victories, feasible goals, improvements that can be made within existing systems, and something that can be improved a step at a time. Digital records preservation also needs to be presented as something that can be understood by RM staff who are not necessarily IT staff."

Records managers also provide a variety of answers on what archivists and records managers could do to advocate more successfully for LTDP. For example, a corporate records manager replies, "I think it will take a massive data loss or similar disaster for senior management to wake up." In addition, a senior business systems analyst replies, "The only thing that gets [senior management] interested is fear of winding up in court, and generally they are not afraid of the law until it comes breathing down their necks." Other respondents call for an increase in LTDP

education and training. For example, a city records analyst and archivist argues for "more computer skills for RM staff at all levels, more and better ERM [electronic records management] software and systems with less vendor domination of the field, opportunities to learn how to work with these systems before making the significant financial investment, [and a] clearer understanding in the field of what digital preservation actually entails." Furthermore, some respondents argue that records managers and archivists need to focus more on meeting the business needs of their clients. As a corporate records manager replies, "We need to speak to the business users, use their arguments when speaking about funding and encourage business users to voice their needs themselves. Then we can move away from sounding like a broken record, and move toward servicing the needs of client groups." Likewise, a county records manager replies, "I think institutions need to first get 'customers' into the system by meeting business needs, by saving money, [and] by saving hassle. I've successfully built archival programs starting with basic customer friendly/cost efficient records programs, and I see no reason why the same approach won't work with electronic records management and digital archives."

Records managers provide a number of opinions on what it would take for those records managers and archivists who have left digital records "on the back burner" to situate a LTDP program near or at the top of priorities. Several answer that only an influx of funding and other resources would allow them to focus on LTDP. For example, a city records analyst and archivist comments, "Right now it is not about prioritization but about feasibility. We are working on proposals but cannot count on receiving the funding." In addition, a state records manager calls for

"funding and resources to focus on the issue." A few respondents also comment that only a major scandal or litigation would allow them to prioritize LTDP. For example, a corporate records manager replies, "One very expensive litigation or regulatory action is always an eye-opener." A senior business system analyst also answers that, "A big fat court case [is required]." Finally, one state archivist is waiting for another institution to develop an effective LTDP system. As they explain, "When the big states with the budgets and expertise figure out a working model, we can follow their lead. I am not seeing this working model, at least not at the beta testing phase that is affordable for us."

How to Counter the Perception that No Effective Solutions for LTDP Exist?

Among those targeted interviewees who comment on this theme, none believes that a "perfect solution" for LTDP does, or will ever, exist. LTDP cannot be approached as a "one-time" activity, but instead requires a dedicated and continual commitment over the long term. As such, targeted interviewees advocate for the adoption of established best practices, standards, and software for the management of digital records, with full provenance and context intact, so that archivists and records managers can prepare for future migrations, even if they are not able to do so at present. For example, Allan Stevenson focuses on "ensuring proper metadata that allows for the migration of the data forward into new systems." As such, he concentrates on up-front planning and creating context- and metadata-rich digital records. Another interviewee is likewise unsure whether a "perfect solution" for LTDP will ever come along, and believes standards and other best practices allow archivists and records managers to "take the best course of action at present." This

includes, for example, adopting PDF/A for scanned documents and ensuring software provides adequate recordkeeping functionality and interoperability with future acquisitions. When advocating for the adoption of a new system, he references case studies from other organizations and levels of government, so his sponsors and colleagues know he is presenting a tested solution. Finally, Tom Winston believes that those records managers who wait for a "perfect solution" are engaging in a "self-fulfilling prophecy" for inaction and failure, and suggests they investigate the numerous (often low- or no-cost) LTDP resources available online. In addition, as he believes long-term preservation is not independent of digital records management, Winston encourages records managers to "do what they can now" by focusing on the production of preservation-ready records.

How to Advocate for Long-Term Digital Preservation in "Traditional" Archives

Of the targeted interviewees who comment on this question, one archivist believes that an emerging generation of researchers will, by default, expect access to "born-digital" archival records to reflect the "continuum of information relevant to their interests." Using the example of letters morphing into emails, she explains that "records generated by our contemporaries will only be usable via digital interfaces," and laments that a lack of archival digital records may shape research dynamics through an "information scarcity." Likewise, Shelley Sweeney believes that most researchers are media neutral; if creators produce records in digital format, archives will become digital archives, and researchers will likewise adapt. In addition, she feels LTDP will become common as more and more people begin to actively preserve their own personal digital records. Another interviewee believes that, as genealogists

and other researchers value quick access to digitized archival records, this may provide a segue towards greater promotion of digital resources, both "made-digital" and especially "born-digital." Finally, one other archivist calls on today's information professionals to draw parallels between digital records and their historical paper-based counterparts, such as emails and letters, or digital photographs and video to their predecessor analogue forms.

How to Counter the Perception That "It Won't Happen to Us"

Several targeted interviewees call for greater publicity of digital records-related litigation, scandals, and privacy breaches. Others promote the business benefits of digital records management and preservation, rather than focus on potential disasters. For example, one interviewee believes that, as attitudes towards LTDP are changing as increasing numbers of people discover that their own personal digital records are becoming inaccessible, it will become increasingly hard to "sell" digital records management and preservation solely on this justification. He therefore promotes the business benefits of digital records management and preservation programs, such as efficient records retrieval, rather than focusing on their records management capabilities. Shelly Smith believes in highlighting litigation, public scandals, and issues around transparency and open government to change perceptions on digital records management and preservation. For those unwilling to listen, Smith can also "sell" digital records management and preservation on the basis of cost savings and other business benefits. Finally, Tom Winston likewise advocates for records managers to promote their digital records programs based on business needs, risk analysis, and improving efficiencies.

How to Navigate Bureaucracy and Appeal to Senior Management

Several targeted interviewees stress the importance of securing senior-level support before beginning any major digital records management or preservation project. For example, one interviewee strongly believes records managers must secure a departmental sponsor on the senior management team before trying to implement any digital records strategies. He believes satisfying low-level users is not as important as gaining support from higher management, who have the authority to force employee compliance. For Ian Richards, as recordkeeping directives are distributed from the top down with the full support of senior management, navigating bureaucracy is less challenging than meeting the needs of mid- and front-level staff who have no choice but to comply. Although senior-level support is a necessary prerequisite before undertaking any digital records management or preservation activities, Richards believes that, for the initiative to be successful, "the key is to make sure that those mid-level people are pushing it." Finally, Tom Winston explains that he does not have difficulty navigating bureaucracy in his organization, as his records management program's first order of business focuses on providing benefits to the company and demonstrating return on investment.

How to Preserve and Manage Digital Records when Faced with Analogue Backlogs

Asked how to implement digital records management and preservation programs when faced with a large backlog of analogue records, and having only fixed or even shrinking resources, most targeted interviewees who comment on this question argue for archivists and records managers to adopt a "day forward"

perspective which prioritizes the creation and management of metadata-rich digital records over existing backlogs. Others attempt to negate the creation of backlogs by focusing more on the intellectual, rather than physical, control of records.

For example, Allan Stevenson feels that "if you are to work on cleaning up the backlog, you will never move forward." His records management program therefore subscribes to a "line in the sand" approach, whereby he determines a go-forward point to implement new policies, and once procedures are developed and programs are working, a return later on to address backlogs. Shelly Smith agrees, believing that, if records managers focus too much on cleaning up analogue backlogs, they will be never be able to manage and preserve their digital holdings. Likewise, another records manager stresses the need to capture digital records at the point of their creation in an EDRMS and manage them with a day-forward perspective. This process allows a gradual change away from paper-based systems, encourages employees to use the EDRMS, and allows migration to be done gradually while encouraging users to see the benefits and take ownership of the new system. Finally, for Tom Winston, analogue backlogs are not a problem, as his program focuses on intellectual custody and basic controls in a decentralized environment. By providing advice to records creators and by offering value to their business operations, his program is able to discourage the stockpiling of analogue records.

Should We Wait Until We Have "Good" Records to Preserve?

When asked if archivists should delay investing in a LTDP system until they are able to preserve only "good," context- and metadata-rich digital records, such as those managed in an EDRMS, all but one targeted interviewee disagreed. Most

believe that delaying digital records preservation activities offers no benefits, and instead further exacerbates the lack of active LTDP programs. Others feel that "perfect" records will never exist, and even if they did, records migrated from an EDRMS, for example, are only one type of digital record requiring long-term preservation. For example, Shelley Sweeney believes it is an "unrealistic notion" to wait for "ideal" digital records, and feels that many records creators also have no desire to input preservation-suitable metadata when creating records. In addition, as archivists will never get to accession "perfect" digital records, there is no point putting off a LTDP system to wait for records which will likely never exist.

Rachelle Ross also sees no reason to wait for "good" digital records before creating a LTDP program. She believes that, as implementing an EDRMS is generally a multi-year project, and such systems often only manage shared drive and other unstructured records, even this is only "part of the solution." If archivists wait for "good" records, they will get "lost in the dust," if they are not already. Finally, instead of waiting for "good" records, Jody Baltessen believes that periods of organizational and functional restructuring represent an ideal moment for the Archives to try to effect change in how departments manage and preserve their digital records. These "door openings," in addition to Archives-led training courses, present opportunities to encourage departments to adopt standards and other best practices for the creation of preservation-suitable digital records.

How to Effectively "Sell" Digital Records Management and Preservation

To begin, Ian Richards believes in securing "buy-in" from senior management first before beginning any digital records management or preservation activities. As

management has greater insight into how information flows throughout an organization, this "scope of vision" will allow them to better realize the potential benefits of well-managed and well-preserved records, instead of records creators who may not perceive a benefit in changing their work practices. He also argues that, if senior management is given proof that other jurisdictions are using a given system successfully, this makes his "pitches" much easier to deliver. In addition, he advocates for records managers to focus on tailored benefits to the organization; do not "sound like a salesman," but instead come across as someone with a very detailed and specific knowledge about records management and how it can benefit the organization.

Likewise, Allan Stevenson promotes the business benefits of well-managed and well-preserved digital records, such as improved security and version control, auto-initiated workflows, and the improved ability to find records through metadata searches. Overall, he believes the most important aspect of successfully "selling" digital records management and preservation involves knowing your clients' business processes and streamlining your needs with theirs. If records management systems speak to their work priorities, they are an "easy sell." Stevenson also calls for baseline, "industry standard" digital records management and preservation cost figures to be established and shared with the records management community to use in business case development.

Scott Reid feels that facilitating FIPPA responses and managing transparency in government may represent the best "selling points" for digital records management and preservation. Finally, Tom Winston argues that, when a records management

program focuses on creating business efficiencies, it is a tangible "money saver," and thus an easy "sell." Effective records management programs also link their efforts with the mission and value statements of the company, and support and build into the work of larger projects.

After gathering this large body of data reflecting the experiences and opinions of a wide range of archivists and records managers, this thesis now turns to the final stage of summarizing this information and producing a series of recommended actions, as well as ideas for future research.

CHAPTER FOUR

CONCLUSIONS: THE WAY FORWARD[1]

Broadcast loudly from multiple sources, advocacy for the long-term preservation of organizational digital records has reached its targeted audience of archivists and records managers. Exposed to advocacy "messages" through published literature and a myriad of other communication vehicles, most records professionals are cognisant of the need to preserve and make available digital records over the long term. Archivists and records managers know about the risks and potential losses inherent to poor digital records management and preservation. They also recognize the historical, business, and societal value and benefits associated with long-term access to reliable, authentic digital records. Almost all archivists and records managers read peer-reviewed journal articles on various LTDP topics, with many also following the final reports of major research projects into identifying and preserving digital records. Countless others seek out LTDP information and advice from webinars, blogs, and other online resources, or through "professional development" training sessions and seminars which are seen as effective in delivering practical guidance. In addition, dozens of records professionals were willing to contribute to this thesis by participating in surveys and targeted interviews, further demonstrating that archivists and records managers are interested in LTDP advocacy.

---

[1] Conclusions are based on my analysis of the literature, as well as the views and personal experiences of the survey respondents and interviewees. As such, conclusions may or may not accurately reflect actual situations, either in individual institutions or across the archives and records management professions. These conclusions are explanatory and qualitative, not statistical or quantitative.

However, although archivists and records managers are concerned about the long-term preservation and accessibility of digital records, they identify a myriad of issues that prevent them from engaging in preservation activities at their workplace. The final reports of major digital preservation research projects are identified as inaccessible. Archives and records management education is perceived as lacking in the practical skills required to advocate, create, and sustain LTDP programs. Many survey respondents and targeted interviewees complain of a lack of human, training, and material resources to pursue LTDP initiatives. Others identify ineffective relationships with senior management and their colleagues in other records and information professions as barriers to the creation of digital archives. Some lament a shortage of proven, easy-to-implement, long-term digital preservation strategies, while still more blame a paucity of IT training and knowledge among archivists and records managers, in addition to their sponsors being resistant to change. Records professionals know that organizational digital records management and preservation is vitally important, but their institutional sponsors are seen as apathetic or unconvinced. The public also fails to understand that authentic and reliable organizational digital records are important to safeguard government accountability, democracy, human rights and social justice, and history and cultural identity.

Advocacy "messages" focusing on protecting authenticity and trust in organizational records are sometimes successful, but many sponsors are reluctant to commit funds for digital records management and preservation until poor recordkeeping practices become a tangible problem, in the form of operational crisis, scandal, or legal risk of court action. Advocacy for the preservation of born-digital

records as support for history and heritage is largely ineffective, as are arguments based on the duty of archivists and records managers to hold government accountable through its digital records. No advocacy "message" seems to have universal resonance with those who fund archives and records management programs, at least to the point of allocating dedicated resources for LTDP. Even "messages" focusing on the tangible business and organizational opportunities through LTDP are seen as lacking sound business cases for cost savings, targeted and specific demonstrable benefits, and accurate timelines and deliverables. Finally, only 68% of archivists and 83% of records managers even have a formal mandate that supports the acquisition and preservation of digital media.

As a whole, long-term digital preservation advocacy has achieved only limited success. Yet, from a basic theoretical, strategic, or technological viewpoint, the problems of digital archiving have largely been solved. Archivists and records managers have determined which characteristics of digital records must be preserved over the long term to keep them authentic and reliable – and they know how to do it. Tools such as digital preservation standards, contextual and preservation metadata schemas, and various preservation software programs have been created through the dedicated and continuing investment of human and material resources. Innumerable journal articles, research reports, blogs, and conference presentations offer a wealth of information and advice for those archivists and records managers looking to create a digital archive at their workplace. Those archives which have been able to create and sustain long-term digital preservation programs also provide examples worthy of emulation. Furthermore, many corporations and other organizations with a vested

interest in trustworthy digital records – Google, Flickr, the Internet Archive, banks, the information security industry, etc. – have developed innovative methods for safeguarding the content and context of digital records over multiple migrations.

In spite of these many successes, however, the potential for a "digital dark age" is very real; archivists and records managers need to find new ways to make advocacy work, the benchmark for such success being the creation and maintenance of LTDP functionality in every type of archives and records management programs. Based on the results of the surveys and targeted interviews, as well as my own analysis of the literature, I suggest three areas in which archivists and records managers must improve their advocacy efforts: the production of plain-language internal guidance; the creation and dissemination of effective external advocacy "messages," and, perhaps most importantly, dedicated personal commitment and will.

Although different in purposes and audiences, Rick Barry's *Report on the Society and Archives Survey,* as well as Cohasset Associate's *Electronic Records Management Survey*, support many of the above findings. For example, respondents to Barry's survey also do not feel that advocacy "messages" are achieving ideal resonance. Records creators have no or a poor opinion of archives, and perceive digital records management and archiving as little more than impediments to their day-to-day work. Organizational sponsors usually ignore archives except when cutting budgets, and the problems of poorly managed and preserved records are only recognized when "bad press" exposes them, and then are forgotten once the "bad press" goes away. In addition, the public does not generally recognize or value the "loftier goals" professed by archivists and records managers such as protection of

human rights, public confidence in accountable government, access to information and the protection of privacy, and promoting democracy, among others.[2]

The Cohasset survey found that "efficient and systematic" control of digital resources represents an unachieved reality in most organizations, and very few records managers are therefore prepared to meet many of their future compliance, legal, and governance responsibilities. Most (75%) respondents to the survey operate under a mandate that includes digital records management and/or preservation, yet few (30%) indicate that their records management program has any formal process in place to migrate records over time, and even fewer (10%) have a specific budget for digital records migration and preservation. More than a third do not even know what digital records storage devices are in use in their organization, a deficiency reflecting the low level of interaction between records managers and their IT colleagues.[3]

Recommendations: Create, Advocate, and Commit

Archivists and records managers are presented with a deluge of theories, strategies, standards, advice, research projects, and other guidance on LTDP. These resources are disseminated through blogs, research project websites, training seminars, conferences, social media sites, scholarly journals and books, formal in-class education, and many other venues. Although there is no shortage of accessible guidance available, archivists and records managers must navigate this "sea of information" on their own. Many seem unable to apply theory and research project findings to their own working realities. Archivists and records managers would

---

[2] Rick Barry, *Report on the Society and Archives Survey*, 2-3, http://www.mybestdocs.com/barry-r-soc-arc-surv-report-030129toc.htm (last accessed March 3, 2012).

[3] Cohasset Associates, *Electronic Records Management Survey: Call for Sustainable Capabilities* (2009), 8-40, http://www.cohasset.com/retrievePDF.php?id=10 (accessed March 3, 2012).

therefore benefit from the creation of more focused and easy-to-understand internal guidance for every aspect of LTDP planning, development, implementation, and sustainability over time.

For example, non-technical journal articles and blogs dedicated to LTDP "first initiatives" – step-by-step instructions to get started with digital preservation – would be beneficial for those archivists and records managers reluctant or uncertain where to begin.[4] More institution-specific advice on creating and sustaining LTDP programs is also needed – targeted "how-to" guidance that reflects the priorities and particular circumstances of various archives or records management programs. A series of institution-specific "advocacy guides" – targeted, for example, at corporate archives or those located in civic government – would give records managers and archivists a relevant and familiar starting point. In addition, case study reports and best practice guidance from a multitude of different digital preservation environments –small government records management programs, universities, hospitals, and so on – would provide "real world" advice and implementable strategies. Such literature would also encourage collaboration between records professionals employed in similar circumstances. Even general, institution-neutral guidance such as "beginner's guides" to digital preservation may empower uncertain archivists and records managers to initiate preservation planning.

Other guidance might include a series of simple, plain-language "archivist's primers" on complex subjects such as digital preservation standards and functional

---

[4] *Demystifying Born Digital*, a research project led by the OCLC Research Library Partnership, is focused on just this, by providing a basic roadmap for records professionals who are interested in creating a LTDP program. Information on the project is available at http://www.oclc.org/research/activities/borndigital.html (last accessed September 20, 2012).

recordkeeping requirements. Not only would these "primers" encourage more archivists and records managers to adopt LTDP standards and other best practice guidance, they would also assist in the "selling" of such preservation models through the development of plain-language summaries to be given to organizational sponsors.

As another form of internal LTPD guidance, in-class records management and archives education curricula may also have to change. More instruction could be given in all things digital, particularly in the form of practical training. At least a basic knowledge of topics such as managerial skills, strategy and business case development, advocacy, coalition building, and navigating organizational cultures – whether as part of core curricula or through supplemental courses – would assist graduates to create compelling arguments for robust, fully-supported LTDP programs in a variety of environments. Archivists and records managers must be able to create effective business plans, grant funding applications, and other "pitches" for LTDP. "Professional development" training could also be supported and expanded. Training seminars and sessions may provide the best opportunities for "hands-on" guidance and advice, in an environment that fosters collaboration between records professionals from multiple institutions. Funds and other resources could be allocated – even diverted from other areas, if necessary – to ensure staff have access to practical training opportunities.

Collaboration between "information actors" is an important component in creating and sustaining LTDP programs. More internal guidance is therefore needed on how to create and sustain effective interdisciplinary relationships, particularly with IT staff who – although outside the "traditional" records realm of archivists, records

managers, and librarians – play a key role in the success of digital preservation activities. Additionally, and particularly in archives, the concept of "collaborative consortium" digital repositories should be investigated further. Many institutions are willing to "buy-in" to an existing LTDP program, and further research may make widespread shared repositories a reality. In particular, guidelines, examples, and other established models for "collaborative consortiums" are required. Although Canada's archives organizations are small and volunteer-driven, they may have a potential role to play in this process. Archives organizations may be able to encourage collaboration on LTDP projects, possibly through the creation of national LTDP initiatives and best practice standardization.

More studies, surveys, and interviews – such as those found in this thesis – are also needed. More insight from "everyday" working archivists and records managers is required, for example on their personal digital preservation needs, what sort of literature and research studies would be beneficial at their workplace, or roadblocks they have faced attempting to create a LTDP program. A single portal should be created to manage and make available all of this practical guidance, information, research studies, and "how-to" instructions on LTDP. New archivists and records managers, or indeed anyone involved in digital records management and preservation, would benefit from a single resource featuring a wealth of practical, plain-language information and guidance.

As evidenced by the few LTDP programs in existence, advocacy messages do not appear to resonate with those groups responsible for funding archives and records management programs. External advocacy "messages" should therefore be redefined

and tailored for specific audiences. For example, although records professionals identify the maintenance of trustworthy, reliable digital records as a strong argument for LTDP, they must find ways to convince their funding sponsors likewise. This might include further publicizing scandals, privacy breaches, major economic losses, legal risk, and other serious issues caused by poor digital records management and preservation. Similarly, although most records managers and archivists support the preservation of digital records for their historical or cultural value, they must find new ways to demonstrate to their sponsors and patrons the continuity between contemporary digital records and their historical analogue predecessors, such as Vermont's very successful "continuing issues" initiative. An increased focus on promoting the management and preservation of personal digital records may help demonstrate to records creators the benefits of long-term access. Records professionals must also create advocacy "messages" that demonstrate, to their sponsors and the public in general, the role played by records management and archives in holding government accountable for its actions. As the most effective advocacy arguments appear to be those focused on the tangible business and organizational benefits of LTDP, archivists and records managers should also further develop and share successful business cases and other "pitches" to senior management that include accurate dollar figures, targeted and specific benefits, as well as accurate timelines and deliverables.

Overall, advocacy arguments must be "sold" as benefiting an organization's core business functions; sponsors must be perceived as customers who demand tangible returns on their investment in LTDP. Digital preservation should not be an

afterthought or "side project," or overhead, but rather made an integral part of all business processes, embedded in the actual work, not an extra addition to it. Library and Archives Canada is now trying to do this across the Government of Canada with the new *Recordkeeping Directive* of 2009 that it developed with the Treasury Board.[5] When developing "pitches" for digital records management and preservation programs, archivists and records managers must also use "real-world" examples of the dangers of poorly managed and preserved digital records, tailored to their own institution.

Finally, the survey and interview responses reveal that many archivists and records managers have not made a dedicated professional commitment to the creation of digital archives. Whether caused by technophobia or a reluctance to alter their analogue-focused workplace milieus and related internal resource allocation (financial and human), these records professionals appear to be waiting for a "silver bullet" solution to LTDP. Digital archiving is perceived largely as a theoretical or hypothetical possibility, but achievable only through an injection of significant new money, training, staff, and technology that is unlikely to occur. Too many survey and interview respondents are waiting for someone else to figure it out. They are interested in LTDP and demonstrate good intentions, but are also filled with doubt and uncertainty. However, waiting and effectively doing nothing is unacceptable given the importance of digital records to modern society. Archivists have a duty to

---

[5] Treasury Board Secretariat of Canada, *Directive on Recordkeeping* (Ottawa: 2009), http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?section=text&id=16552 (accessed August 10, 2012). For additional information on the current state of digital records management and preservation at Library and Archives Canada, see Greg Bak and Pam Armstong, "Points of Convergence: Seamless Long-term Access to Archival Records at Library and Archives Canada," *Archival Science* 8, 4 (2008), 279-293; and Greg Bak, "Continuous Classification: Capturing Dynamic Relationships among Information Resources," *Archival Science* 12, 3 (2012), 287-318.

ensure the records that are or should be in their care are preserved and made available for future generations. The creation of LTDP programs is a necessity, rather than a choice. It is unacceptable to simply believe that LTDP is impossible or that the time is not right. No archivist or records manager in the twenty-first century can afford to ignore digital records management and preservation; to do so is an abdication of responsibility, if not a dereliction of duty.

Others professions are doing it well – progress towards the preservation and accessibility of trustworthy digital records is being made outside of the archives and records management communities. While archivists and records managers continue to wait or debate competing standards and models, they are losing control of their own professional "turf." Without a coherent set of goals for LTDP and a plan to achieve them, resource allocators may also point to divisions as an indication of unreadiness and withhold resources until clear objectives and strategies can be articulated. Records professionals have at their disposal extensive theory, methodology, guidance, and technological "solutions" for LTDP. However, issues of will prevent them from applying these best practices to their own working realities; it is a failure to commit and to act.

A commitment to LTDP begins with the recognition that doing something is better than doing nothing. Although some archivists and records managers are reluctant to get involved in LTDP until they have "perfect" records or "foolproof" preservation software systems, this "wait and see" attitude leads to paralysis. Instead, an incremental approach to LTDP should be taken whereby the first priority is simply getting started – "draw a line in the sand" and get involved as soon as possible. LTDP

does not have to be expensive nor does it have to be complicated – archivists and records managers should work with what they have and what is already available. For example, although they may not satisfy all the requirements of a "full" LTDP program, open-source software programs such as Xena, available from the National Archives of Australia, and Archivematica provide sound digital records migration functionality at no cost. Anyone can download and experiment with such programs for no more than a minimum investment of time. Functional requirements for recordkeeping such as DoD 5015.2 and basic principles for digital preservation such as those expressed in InterPARES can be accomplished without resource to expensive systems. In addition, archivists and records managers should not be narrow minded in their approach to digital preservation. They should be open to adopting existing best practices from other professions with a vested interest in accurate and reliable digital records and trusted systems. Partnerships with for-profit firms should also be embraced if they help make LTDP a reality.

Simply becoming involved in digital records management and preservation may also improve the success rate of advocacy "pitches" delivered to senior management. It is easier to argue for resources when you are engaged and able to demonstrate what can be accomplished, rather than advocate for strictly hypothetical realities. In addition, this demonstrates a willingness to adapt to changing circumstances. Although they are small to begin with, pilot projects can lead to institution-wide programs. Archivists and records managers should not lament their inability to preserve and make available digital records over the long term, but instead get started, celebrate their successes, and move gradually from strength to strength.

More LTDP champions are needed – committed individuals who will proselyte advocacy "messages" and lead by example of successful implementation of proven best practices. Such examples are needed to assess the limitations and particularly the successes of LTDP. How have some archivists and records managers been successful in creating digital archives? What advocacy "message" convinced them to get started? How did they adapt and internalize this "message" so that it correlated with their own working realities? What "message" did they use to gain the support of their sponsors? Champions must demonstrate how they were able to make LTDP a reality, so that others can learn from their example. It is important to raise the profile of the success stories, not just the crises. However, even failures should be shared, as they present opportunities for reflection and the development of new advocacy strategies.

To relate with archivists and records managers of all stripes, champions must come from every type of archives and records management institution – government archives and records management programs, community archives, corporate archives and records management programs, religious archives, and "special media" archives, to name only a few examples. Archivists and records managers with little LTDP knowledge and experience must be able to identify champions whose advice and experiences correlate with their own work and personal circumstances. A dedicated commitment to the creation of LTDP programs also involves extensive self-directed and, if necessary, self-funded, education and training. Preservation champions must be knowledgeable in every aspect of advocating, creating, and sustaining LTDP programs, drawing this information from all available sources. By doing so,

champions will be able to build convincing business cases and strategies for LTDP.

Finally, by committing to LTDP, champions also recognize that drastic change is necessary – if an influx of new resources is unlikely, something else must give. For records professionals, the will to change and adapt is a crucial precursor to the wide-scale spread of digital archives. Although the archives and records management communities may not be ready for such a discussion, serious consideration must be given to cutting back significantly those current resources dedicated to analogue records preservation in order to fund LTDP instead. Some records professionals may interpret this as an attack on their professional identity. Archivists and records managers must therefore think strategically and adopt a risk management perspective. On the one hand, if left alone, analogue records backlogs accumulate at a steady rate. On the other hand, if digital records are ignored, they are forever lost. However, it is not necessary to preserve every digital record. To preserve some is better than none and in most instances only a very small subset of an organization's records are worthy of long-term preservation. Not all digital records require multiple layers of deep contextual metadata. Likewise, not all records must be captured in an EDRMS, particularly those with very short retention periods and no archival value. Money allocated for analogue records training could be shifted to fund digital preservation training. Conference trips may be cancelled in favour of webinars and other online training. Champions embrace change and do whatever it takes to make LTDP a reality.

Although they had different focuses and were directed at a different audience of archivists and records manager than my surveys and interviews, the *Report on the*

Society and Archives Survey and the *Electronic Records Management Survey* substantiate the above recommendations. For example, Barry's survey calls for greater publicity to be given to instances where records loss or destruction has affected human rights and government accountability. In addition, more plain-language advocacy articles need to be produced and disseminated, and targeted advocacy "messages" must be produced for politicians, lawyers, and senior management, as well as the media. Finally, Barry also found that advocacy is a subject ripe with research possibilities, and more reports, articles, and theses are required from students, working archivists and records managers, senior management within archives and records management programs, as well as professionals from other disciplines.[6]

Likewise, the Cohasset survey argued that records managers must improve their advocacy efforts, in order to convince their sponsors to allocate human and financial resources for long-term digital records management and preservation. In addition, records managers should engage in additional collaborative partnerships both inside and outside their profession, and foster recognition among their organizational sponsors that the long-term management and preservation of institutional digital records is a key component in meeting business needs and obligations.[7]

Thesis Limitations and Ideas for Future Research

The surveys and interviews were not conducted to obtain scientifically valid data, but rather to solicit relevant advice, opinions, and experiences from those who

---

[6] Barry, *Report on the Society and Archives Survey*, 2-25.
[7] Cohasset Associates, *Electronic Records Management Survey*, 10-11.

are prepared to share their thoughts. As such, direct statistical comparisons with other surveys are difficult to perform. Future researchers interested in digital preservation advocacy may consider creating additional research projects that feature surveys based on statistical methodologies and controls. As each archives and records management program is different – in its mandate, funding allocation, size, level of maturity, state of its digital experience and operations, and legislative, program, and regulatory requirements, among other factors – all questions asked in the surveys and interviews are not uniformly applicable in all instances, and likewise created some difficulties in comparing the opinions and experiences of archivists and records managers. More sector-specific in-depth analysis would usefully build on the work here.

By only interviewing Manitoba-based archivists and records mangers, I have also only focused on one geographical area. Future researchers may well consider conducting interviews representing other or multiple geographic areas, to compare to the Manitoba-based findings presented here. As some records professionals answered both the archives and records management surveys, it is also difficult to draw conclusions about possible differences between the responses of archivists and records managers.

In spite of these limitations, this study can be seen as a contribution to the body of long-term digital preservation advocacy literature. By presenting the responses of archivists and records managers to the "digital age," and collecting dozens of their professional opinions and experiences, the thesis has demonstrated that records professionals are definitely concerned about long-term digital

preservation, but more need to become personally engaged and practically involved. A significant amount of tools, standards, and guidelines are now available to assist them in undertaking preservation activities. If archivists and records managers are able to hone their advocacy efforts in three key areas – internal guidance, external "messages," and dedicated will and commitment – there is every reason to believe that the creation and maintenance of long-term digital preservation programs will be the better for it.

Unless we solve the increasingly grave "digital preservation dilemma" though advocacy, will, and dedicated commitment, we are faced with a "digital dark age" when we will be producing more records and information than at any other time in human history, yet little of this will survive and be intelligible in two hundred years, yet alone in perpetuity. The stakes are extremely high, and it is hoped that this thesis has suggested ways to shine some documentary light in a looming digital darkness, a disaster against which archivists and records managers, as champions of recorded information, must assume the central role in averting. However, although their full and personal commitment to LTDP is pivotal should society have any chance of avoiding this apocalyptic scenario, records professionals cannot stand as the sole bulwarks attempting to stem the tide of records and information scarcity – this is not an internal problem or a professional nicety, limited to those for whom a deficiency in authentic and reliable records will always be a cause for concern. LTDP is a societal necessity – a matter of global interest – and to convince humanity of that truth is the role of advocacy. As the reach of advocacy spreads throughout public and political life, the voices of the converts to the digital preservation "fellowship" are growing

numerous and ever louder. Archivists are working hard to articulate the many ways

that archives, including digital archives, are invaluable to modern society. In

demonstrating how archives can benefit medicine, the arts, science, or human rights,

to name but a few examples, archivists gain supporters for their work even in tough

economic times. By standing alongside archivists and records managers in

championing the cause of LTDP, these supporters offer hope in a disconcerting

digital era, and encourage each of us to do our part in staving off a long-term digital

records catastrophe. Commenting on society's short-term digital memory, one

political scientist reflects this supportive awakening among external observers:

> Given what is perhaps an unprecedented emphasis on the present and immediacy, there seems to be no observable incentive or interest in learning the lessons of the past...this tendency is directly related to the neglect of long-term thinking prevalent in our 'culture of speed.' While archivists and librarians continue to grapple with issues of migration and standards, if we are indeed intent on preserving our cultural heritage for future generations, it is up to all of us to reflect upon the unconscious temporal biases perpetuated by beloved, high-speed, digital new media.[8]

The nation's most prominent steward of government transparency and accountability,

the Auditor General of Canada, offers an inspiring mission for archivists:

> I urge you to build capacity at senior levels of government with respect to information management. I urge you to develop ways to verify the accuracy of digital records, which are becoming ever more important...I urge you to continue building relationships with your clients in government, so you can better know their needs, expectations and constraints. I urge you to be more accountable by communicating to Parliament the results you can achieve and the state of the current situation and what needs to be done. I urge you to take leadership in all these areas now. Time is growing short. You, more than anyone, know that our cultural heritage is at great risk.[9]

---

[8] Kamilla Pietrzyk, "Preserving Digital Narratives in an Age of Present-mindedness," *Convergence: The International Journal of Research into New Media Technologies* 18, 2 (May 2012), 131.
[9] Auditor General of Canada Sheila Fraser, "Notes for an address by Sheila Fraser, FCA, Auditor General of Canada 28 May 2004, Montreal, Quebec," *Ethics and Accountability in the Archival*

Good advocacy draws out such support among important allies. Better directed and

more sustained advocacy will increase that support, and with it the prospects of more

of that digital cultural heritage being preserved for centuries to come.

Sphere: The 29ᵗʰ Annual Conference of the Association of Canadian Archivists (Montreal: 2004), http://www.oag-bvg.gc.ca/internet/English/sp_20040528_e_23862.html (accessed August 20, 2012).

Appendix A: Survey Questions – Archivists

1. What is the type / nature of your archival institution?

2. Approximately how many full-time staff does your archives employ?

3. What types of computer-generated records are included in your holdings for long-term preservation as archives?

4. Does the mandate or collecting policy of your institution, implicitly or explicitly, support the acquisition and preservation of digital records?

5. Has your archives ever considered implementing a preservation strategy to ensure the retention of reliable, authentic digital records over the long term?

6. If yes, what justifications or arguments were / would be used to support the creation of this strategy?

7. If no, what factors do you feel may have inhibited your archives from attempting to develop a preservation strategy?

8. If your archives has a digital preservation program in place, what long-term preservation strategy / strategies do you currently undertake?

9. As an archivist, are you responsible for both the management of active organizational records in addition to archival records?

10. What is the reporting structure of your archives? Who do you rely upon for funding and resources?

11. Do you read regularly archival journals such as *Archivaria*, *the American Archivist*, and *Archival Science*? If yes, do you feel these assist you in your day-to-day work with digital records management and digital records archiving?

12. Do you read regularly RIM journals such as *the Records Management Journal*, *Information Management Journal*, or *the International Journal of Information Management*? If yes, do you feel these assist you in your day-to-day work with digital records?

13. Do you follow closely the final reports of major research projects on identifying and preserving digital records such as InterPARES, the Pittsburgh Project, PARSE.insight, CASPAR, or the Indiana University Electronic Records Project, among others? If yes, do you feel these assist you in your day-to-day work?

14. Do you attend archives or RIM workshops, conferences, or other networking or educational sessions specifically targeting digital records management and archiving? Have you ever used success stories, ideas, or best practices gleaned from one of these

sessions to advocate for increased funding or new projects in your archives? If yes, please describe your results.

15. Do you feel that archival training, whether in-class, on-the-job, or through workshops, provides archivists with the necessary skills and training to do their jobs in a digital environment? If not, specify the required different skills that should be addressed.

16. All records should be treated equally regardless of media. As such, there should be no differentiation between digital and non-digital records, technical processing and preservation nuances aside.

Do you agree with this statement? Does your archives have separate programs or divisions for the preservation of digital and non-digital records? Does your digital records preservation strategy, if one exists, receive a level of funding equal to that earmarked for "traditional" records? Why or why not?

17. To ensure the long-term preservation of digital records, archivists need to become "data-archivists," a hybrid archivist and IT specialist. Limited budgets, coupled with a lack of cooperation and mutual interest between archivists and existing IT staff, dictates that archivists should learn how to perform all necessary technical preservation work themselves.

Do you agree with this statement? Does your archives work closely with IT and computer specialists or do you do all necessary work yourself? If no, have you ever attempted to advocate for better relationships and mutual support between IT and archives in your institution? If so, please describe your results.

18. The "records continuum" model is more effective than the "life-cycle" model in achieving long-term digital preservation. Archives and RIM are allied professions, and should collaborate closely throughout all stages of the "continuum," particularly in the design and ongoing maintenance of recordkeeping systems.

Do you follow a "life-cycle" or a "continuum" model at your institution? Should archivists be involved in the management of current records, or should they wait until records cross the "archival threshold" before they receive archival attention, appraisal aside?

19. Archives are simply one part of a larger RIM system. The archival profession is too insular, and should adopt an attitude of technological and professional affiliation with RIM, librarians, and other information professions.

Do you agree with this statement? Should the archival profession work harder to collaborate with and adopt ideas from other information communities? Do you work closely with RIM, librarians, or other information actors at your institution? Have you ever advocated for a resource-sharing agreement, joint work projects, or any other mechanism designed to foster closer collaboration with these professions in your institution? If so, please describe your results.

20. The careful management and preservation of digital records is important to ensure accountability, as well as to manage risk against possible litigation. However, as few archivists have themselves yet been presented with a situation where authenticity must be proven in court or before tribunals for born-digital records under their control, wide-scale testing of this proposition has not yet occurred.

Do you agree with this statement? Have you ever been confronted with a situation when you needed to prove the authenticity of a digital record in formal judicial proceedings or informally for researchers? Do you feel that your sponsoring agency would be receptive towards funding a digital records preservation program based on this reasoning? Have you ever attempted to put forward this argument? If so, please describe your results.

21. Through the neglect of digital records, archivists are failing in their duty to safeguard history, heritage, and culture, indeed societal identity, for future generations. Massive quantities of archivally valuable digital records are being lost daily, yet the preservation of digital records is still not a priority for many institutions, at least, not to the point where they receive new funding for born-digital records archiving, or are willing or able to shift significant resources away from "traditional" media to deal with digital records.

Do you agree with this statement? Would advocating for a digital records preservation program based on the need to safeguard records for historical, heritage, or cultural purposes be an effective argument at your institution? Have you ever attempted to put forward this argument? If so, please describe your results.

22. As demonstrated by the interest in Wikileaks, among other such organizations, citizens and clients have a strong expectation for ready accessibility to evidence in the digital age. Archivists should advocate for digital records preservation programs to safeguard evidence for all citizens, lest they lose their role as protector of public interest in accountable and transparent government.

Do you agree with this statement? Would this be an effective argument at your institution? Have you ever advocated for the creation of a digital records preservation program in order to preserve and safeguard evidence? If so, please describe your results.

23. Accurate, comprehensive metadata is crucial in preserving reliable, authentic records over the long-term. Archivists and records / information managers therefore need to work together to adopt recordkeeping systems that are compatible with metadata standards including Dublin Core, MoReq2, and DOD 5015.2, among others.

Would this be an effective argument at your institution? Have you ever advocated for the adoption of a recordkeeping system compatible with metadata standards such as MoReq2, DOD 5015.2, Dublin Core, or DDMS 3.0.1? If so, please describe your results.

24. In order to fund a digital records preservation program, smaller archives have banded together to combine budgets, resources, and staff. In addition, some larger archives have decided to champion digital records by providing storage, technical assistance, and access to a digital records preservation program to smaller archives.

Would your institution be interested in such a resource-sharing mechanism, collaborative partnership, or network? If funds are limited, would this be an acceptable alternative to establishing a stand-alone digital records preservation program at your archives? Have you ever attempted to advocate for such a resource-sharing mechanism or collaborative partnership to fund the creation of a digital records preservation program, or to join up with an existing one? If so, please describe your results.

25. Although the archival profession has devoted countless hours and thousands of printed pages towards the development of theories, strategies, methodologies, and best practices for the long-term preservation of digital archival records, many archives – both large and small – have no such preservation strategy in place. Some within the profession have argued that archivists need to do a better job of selling the value of a digital records preservation program, in addition to communicating more effectively with senior management and those responsible for funding.

What do you think archivists could do to advocate more successfully for the creation of digital records preservation programs, in addition to the answers given above?

26. In your opinion, why do few archives have active digital records preservation programs? Are advocacy messages, case studies, best practices, and standards not being properly articulated or poorly communicated? Are these messages being delivered to the wrong audiences?

27. For those archivists who have pushed (or left) digital records "on the back burner" within their archives – either deliberately or regrettably – is there anything that could alter your prioritization? What would it take for you to situate a digital records preservation program near or at the top of your priorities?

Appendix B: Targeted Interview Questions – Archivists

1. Many survey respondents identify peer-reviewed archives journals as unhelpful in the day-to-day management and archiving of digital records. The articles found in such journals are perceived as too academic, overly theoretical, and applicable only to large-scale, well-funded archives.

Do you agree with this perception, and if so, what kinds of advocacy or communication vehicles would you like to see created to promote ideas and best practices about digital preservation, and what content might they contain?

2. Many survey respondents identify records managers as "indifferent" or "uninterested" in archives, and express difficulty in developing and advocating business cases for long-term digital preservation without their support. However, long-term retention of records for business value by records managers and longer-term preservation by archivists for archival value requires similar policy responses and integrated actions, rather than two separate "worlds."

What do you feel archivists can do to better stress both the operational and the historical / heritage uses of digital records as a vital concern to both professions and get records managers "on-board" with long-term digital preservation?

3. Many survey respondents believe that archives organizations such as the Association of Canadian Archivists (ACA), the Association for Manitoba Archives (AMA), and the Canadian Council of Archives (CCA) should articulate and prioritize digital preservation as the "top concern" for the Canadian archival profession. Some respondents feel that, with a strong mandate from these organizations, they would be able to advocate more successfully for funds to undertake preservation activities.

Do you feel that Canada's archives organizations should do more to "champion" long-term digital preservation and make it a top priority for archives in Canada, and if so, what would you like to see from these groups?

4. Many survey respondents employed in history and heritage-based institutions primarily serving "traditional" archives patrons such as genealogists, historians, and academic writers, among others, perceive these groups to have little interest in digital records.

How do you feel archivists working in institutions such as these can convince their sponsoring agencies of the need for long-term digital preservation when their patrons are more interested in old maps, letters, and genealogical records, for example?

5. Many survey respondents express an interest in forming a "collaborative consortium" with other archives to share resources, staff, and infrastructure for a long-term digital preservation system. Other archives express interest in "buying-in"

to a preservation system facilitated by a larger archives institution which they could otherwise not fund and support themselves.

What would it take for your institution to create or join an existing "collaborative consortium," and would it change your perception if an archives association such as the AMA, ACA, or CCA, co-sponsored, possibly with a large institution such as Library and Archives Canada, a secure, trusted digital repository-based system?

6. Very few survey respondents answer that the final reports of major research projects into identifying and preserving digital records, such as InterPARES or CASPAR, are helpful in their daily work with digital records. Major research projects are criticized as too theoretical, too large-scale, and not applicable to the realities of their daily work with digital records.

Do you agree with this assessment, and if so, what would instead be a valuable research project to help you manage and preserve your digital records?

7. Many survey respondents argue that, in order to achieve wide-scale digital records management and preservation, archivists and records managers must better promote the value and benefits of well-managed and well-preserved digital records. These respondents believe that most records creators perceive digital records management and archiving as unrewarding hindrances to their normal day-to-day work, and must be convinced of how a long-term preservation system can be of obvious assistance.

Taking this into consideration, what can archivists and records managers do to better "sell" digital records management and preservation?

8. Several survey respondents believe that a long-term digital preservation system would be of little value to their institution without an existing records management program featuring an organization-wide electronic document and records management system (EDRMS). These respondents insist on preserving only "good" records, and ensuring that the context of a records' creation and use is already ascertained before the record enters archival custody.

Taking this into consideration, do you believe archivists should be advocating for organization-wide digital records management first, before long-term digital preservation?

9. Several survey respondents comment that digital preservation advocacy based on preserving public faith in accountable government is not effective at their institution. These respondents lament that both their sponsors and the general public do not perceive archivists as guarantors of faith in accountable government, instead assigning this role to access to information and privacy legislation.

Taking these views into consideration, how can archivists increase their role as guarantors of faith in accountable government, both to their sponsors and the public at large?

10. Many survey respondents comment that the greatest hindrance to long-term digital preservation at their archives is a lack of support from IT, and lament that IT staff are uninterested in archives and often unwilling to listen to archivists' needs.

How do you feel archivists can craft better relationships with their IT colleagues and gain their support when advocating for the creation of a long-term digital preservation system?

Appendix C: Targeted Interview Questions – Records Managers

1. Many survey respondents believe that only a public scandal, an instance of catastrophic data loss, or costly litigation around abused citizen rights or major commercial or trade losses would motivate their sponsoring agencies to fund digital records management and preservation activities. However, many of these respondents feel that their sponsors believe "it will not happen to us," and as such, do very little or nothing to safeguard or preserve their digital records.

If a perception that "it won't happen to us" exists, what can records managers do to convince their sponsors otherwise and gain their support for digital records management and preservation activities?

2. Many survey respondents comment that the greatest hindrance to digital records management and preservation at their institution is a lack of support from IT, and lament that IT staff are uninterested in records management and often unwilling to listen to records managers' needs.

Does this assessment apply at your institution? What can records managers do to craft better relationships with IT and gain their support for digital records management and preservation activities?

3. Many survey respondents comment that digital records management and preservation based on preserving public faith in accountable government is not an effective argument at their institution. These respondents lament that both their sponsors and the general public do not perceive records managers as responsible for ensuring faith in accountable government.

How do you believe records managers can promote their position as guarantors of faith in accountable government, both to their sponsors and the public at large, and use this new-found authority to advocate for the creation of digital records management and preservation programs?

4. Many survey respondents argue that records managers need to do a better job of promoting and disseminating successful business cases, "pitches," and other established models for records managers to follow when advocating for funds and other resources to undertake digital records management and preservation activities.

Do you agree with this assessment? What would you like to see created to promote successful strategies for the creation of digital records management and preservation programs?

5. Many survey respondents lament that existing analogue records backlogs prevent them from shifting resources to focus on digital records management and preservation.

Does this describe the situation in your records management program, and if so, what would it take for you to shift your time and resources from dealing with analogue backlogs to focus on managing and preserving your digital resources?

6. Many survey respondents argue that, in order to achieve wide-scale digital records management and preservation, records managers should better promote the business and organizational benefits of well-managed and well-preserved digital records. These respondents believe that most records creators perceive digital records management and preservation as unrewarding hindrances to their normal day-to-day work, and must be convinced of how they can be of obvious assistance.

What can records managers do to better "sell" digital records management and preservation, and present it as a beneficial "carrot," rather than a disadvantageous or punitive "stick?"

7. Some survey respondents feel that, although the heads of their institutions are concerned with transparency and accountability, lower-level bureaucrats are not interested in digital records management and preservation as they would prefer not to be held easily accountable for their actions, or take the time to ensure that digital records have sufficient metadata context to be understandable and useable as long-time authentic and reliable information resources, either for the creating institution or for society.

As most records management programs do not report directly to the heads of their organizations, how can records managers navigate a "bureaucratic nightmare" and gain the support of high-level management to secure funds for digital records management and preservation activities, including training of staff who create digital records?

8. A majority of survey respondents identify conferences, workshops, and other training venues as the best way to gain knowledge and skills for digital records management and preservation, although their sponsors are occasionally "uninterested" or "reluctant" to allocate funds for such training opportunities.

Should records management programs, in an era of flat or declining resources, shift significant internal resources from traditional media to training, infrastructure, and operations for born-digital media? What training events would you be interested in or like to see created?

9. Many survey respondents believe that no practical solutions exist yet for long-term digital preservation, and are therefore reluctant to allocate funds for preservation activities until a proven, straightforward, and affordable system is presented to them. Long-term digital preservation is seen as an unknown commodity, without proven and "concrete" solutions.

Do you feel that there are practical solutions available for long-term digital preservation? If so, what can records managers do to counteract this perception of long-term preservation as an "unsolved dilemma"?

INTERVIEW CONSENT FORM

Advocating Electronic Records:
Archival and Records Management Promotion of
New Approaches to Long-Term Digital Preservation
Daniel Elves

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It will give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

My thesis explores archivists and records/information managers' efforts in advocating for the creation of digital records archiving programs through an examination of the intellectual history of computers and digital records advocacy as reflected in professional archival and records management literature. The resonance of this advocacy will then be examined through a series of surveys, interviews, and case studies with university, provincial, corporate/private, federal, and city archives.

For the third chapter of my thesis, it is desirable to conduct interviews with archivists and records/information managers currently employed in Manitoba. These interviews will be used to test the value and effectiveness of certain electronic records advocacy messages, as well as to gain insight into electronic records preservation strategies currently underway in Manitoba. Each participant will initially be interviewed once, with follow-up interviews as necessary and when available.

During these interviews I will be taking notes, either on paper or with a digital device, and I will also produce a digital recording of each interview.

Strict confidentiality will be maintained throughout this process. Participants will be given the option to choose whether they would like to be directly quoted and identified by name and date, to be identified by name and date but paraphrased and not directly quoted, or not to be identified in any discoverable way, and paraphrased only, without direct attribution. The results of the interviews will not be shared with any other individual except my thesis supervisor and will be stored on password-protected systems at my residence. In addition, following the completion of the thesis and any subsequent associated publications, all interview responses will be destroyed within two years (approximately July 2014).

No risks are involved to any participant and any participant may withdraw or stop the interview if desired. Interview participants will be offered a copy of interview notes and recordings once the interview is completed. Research results will be disseminated through the publication of my thesis and any subsequent associated publications. A

digital copy of my thesis will be made available to interview participants upon publication (approximately July 2012).

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights no releases the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and/or refrain from answering any question you wish to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba Research Ethics Board(s) and a representative(s) of the University of Manitoba Research Quality Management/Assurance office may also require access to your research records for safety and quality assurance purposes.

This research has been approved by the Joint Faculty Research and Ethics Board. If you have any concerns or complaints about this project you may contact nay of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122. A copy of this consent form has been given to you to keep for your records and reference.

Participant's Signature _____ Date _____

Researcher's Signature _____ Date _____

Following the interview, please check the appropriate use that the author may make of the material discussed during the interview.

Please indicate the use status that you wish to place on your interview:

"On the Record" for direct quotation (removing any "hums and haws" and obvious fragmented speaking), and for attribution by name and date
_____

"On the Record" for attribution by name and date, but for paraphrasing only and not for direct quotation
_____

"Off the Record" for authors' background information and paraphrase only, without attribution by name or other personal identifier
_____

BIBLIOGRAPHY

PRIMARY SOURCES

BOOKS

Bantin, Phillip, *Understanding Data and Information Systems for Recordkeeping* (New York: Neal-Schuman Publishers, 2008).

Cook, Terry, ed., *Controlling the Past*: *Documenting Society and Institutions – Essays in Honor of Helen Willa Samuels* (Chicago: Society of American Archivists, 2011).

Cox, Richard, *The First Generation of Electronic Records Archivists in the United States: A Study in Professionalization* (New York: The Haworth Press, 1994).

Dodd, Sue, and Ann M. Sandberg-Fox, *Cataloging Microcomputer Files: A Manual of Interpretation for AACR* (Chicago: American Library Association, 1985).

Gavrel, Katherine and John McDonald, *Appraisal Guidelines in the Machine Readable Archives Division* (Ottawa: Public Archives of Canada, 1981).

Hackman, Larry J., *Many Happy Returns: Advocacy and the Development of Archives* (Chicago: Society of American Archivists, 2011).

Hedstrom, Margaret, *Electronic Records Management Program Strategies* (Pittsburgh: Archives & Museum Informatics, 1993).

Howell, Alan, *Preserving Digital Information: Challenges and Solutions* (Melbourne: 2001), http://www.alanhowell.com.au/Papers/DigitalPreservationWorkshop/J0516-070412pdiManual%20copy.pdf (accessed November 10, 2011).

Naugler, Harold, *The Archival Appraisal of Machine-Readable Records: A RAMP Study With Guidelines* (Paris: UNESCO, 1984).

Nesmith, Tom, ed., *Canadian Archival Studies and the Rediscovery of Provenance* (Metuchen, NJ and London: The Scarecrow Press, 1993).

ARTICLES AND CHAPTERS

Alldredge, E. O., "Inventorying Magnetic-Media Records," *American Archivist* 35 (October 1972), 337-345.

Bantin, Phillip, "Developing a Strategy for Managing Electronic Records: The Findings of the Indiana University Electronic Records Project," *American Archivist* 61, 2 (Fall 1998), 328-364.

---, "The Indiana University Electronic Records Project: Lessons Learned," *Information Management Journal* 35, 1 (January 2001), 16-24.

Barry, Rick, "Keeping Records in Changing Organizations," in Terry Cook, ed., *Controlling the Past*: *Documenting Society and Institutions – Essays in Honor of Helen Willa Samuels* (Chicago: Society of American Archivists, 2011), 195-216.

Barthel, Brea, and Teresa M. Harrison, "Wielding New Media in Web 2.0: Exploring the History of Engagement with the Collaborative Construction of Media Products," *New Media Society* 11, 1-2 (February/March 2009), 155-178.

Bearman, David, "The Implications of *Armstrong v. Executive of the President* for the Archival Management of Electronic Records," *American Archivist* 56, 4 (Fall 1993), 674-689.

---, "Record-keeping Systems," *Archivaria* 36 (Autumn 1993), 16-36.

---, and Wendy Duff, "Grounding Archival Description in the Functional Requirements for Evidence," *Archivaria* 41 (Spring 1996), 275-303.

---, and Richard Lytle, "The Power of the Principle of Provenance," *Archivaria* 21 (Winter 1985-1986), 14-27.

Blais, Gabrielle and David Enns, "From Paper Archives to People Archives: Public Programming in the Management of Archives," *Archivaria* 31 (Winter 1990-1991), 101-113.

Brown, Thomas Elton, "Myth or Reality: Is There a Generation Gap Among Electronic Records Archivists," *Archivaria* 41 (Spring 1996), 234-243.

---, "The Society of American Archivists Confronts the Computer," *American Archivist* 47, 4 (Fall 1984), 366-382.

Cook, Terry, "Byte-ing Off What You Can Chew: Electronic Records Strategies for Small Archival Institutions," *Archifacts* (April 2004), 1-20.

---, "Easy to Byte, Harder to Chew: The Second Generation of Electronic Records Archives," *Archivaria* 33 (Winter 1991-1992), 202-216.

---, "From Information to Knowledge: An Intellectual Paradigm for Archives," *Archivaria* 19 (Winter 1984/1985), 29-49.

---, "The Impact of David Bearman on Modern Archival Thinking: An Essay of Personal Reflection and Critique," *Archives and Museum Informatics* 11, 1 (March 1997), 15-37.

---, and Eldon Frost, "The Electronic Records Archival Program at the National Archives of Canada: Evolution and Critical Factors of Success," *Archives and Museum Informatics Technical Report No. 18* (1991), 38-47.

Cox, Richard, "Employing Records Professionals in the Information Age," *Information Management Journal* 34, 1 (January 2000), 18-33.

---, "More than Diplomatic: Functional Requirements for Evidence in Recordkeeping," *Records Management Journal* 7, 1 (April 1997), 31-57.

---, "Re-discovering the Archival Mission: The Recordkeeping Functional Requirements Project at the University of Pittsburgh," *Archives and Museum Informatics* 8, 4 (1994), 279-300.

---, "Unpleasant Things: Teaching Advocacy in Archival Education Programs," *Interactions: UCLA Journal of Education and Information Studies* 5, 1 (2009), 1-16.

---, "Why Records are Important in the Information Age," *Records Management Quarterly* 32, 1 (January 1998), 36-52.

---, and Wendy Duff, "Warrant and the Definition of Electronic Records: Questions Arising from the Pittsburgh Project," *Archives and Museum Informatics* 11, 3-4 (1997), 223-231.

Cunningham, Adrian, "Good Digital Records Just Don't 'Happen': Embedding Digital Recordskeeping as an Organic Component of Business Processes and Systems," *Archivaria* 71 (Spring 2011), 21-34.

Currall, James, and Peter McKinney, "Investing in Value: A Perspective on Digital Preservation," *D-Lib Magazine* 12, 4 (April 2006), 1-13.

---, and Michael Moss, "We Are Archivists, But Are We OK?," *Records Management Journal* 18, 1 (2008), 69-91.

---, Claire Johnson, and Peter McKinney, "The World is All Grown Digital…How Shall A Man Persuade Management What to Do in Such Times?," *International Journal of Digital Curation* 1, 2 (2007), 12-28.

Dollar, Charles, "Appraising Machine-Readable Records," *American Archivist* 41, 4 (October 1978), 423-430.

---, "Archivists and Records Managers in the Information Age," *Archivaria* 36 (Autumn 1993), 37-52.

Downing, Lynette, "Implementing EDMS: Putting People First," *Information Management Journal* 40, 4 (July/August 2006), 44-50.

Duff, Wendy, "Ensuring the Preservation of Reliable Evidence: A Research Project Funded by the NHPRC," *Archivaria* 42 (Fall 1996), 28-45.

---, "Increasing the Acceptance of Functional Requirements for Electronic Evidence," *Archives and Museum Informatics* 10, 4 (December 1996), 326-351.

Duranti, Luciana, "The Impact of Digital Technology on Archival Science," *Archival Science* 1, 1 (2001), 39-55.

---, "The InterPARES 2 Project (2002-2007): An Overview," *Archivaria* 64 (Fall 2007), 113-121.

---, and Heather MacNeil, "The Protection of the Integrity of Electronic Records: An Overview of the UBC-MAS Research Project," *Archivaria* 42 (Fall 1996), 46-67.

Eastwood, Terry, "Building Archival Skills and Knowledge in the Digital Age," *Archival Science* 6, 2 (2006), 163-170.

---, "Educating Archivists about Information Technology," *American Archivist* 56, 3 (Summer 1993), 458-466.

Fishbein, Meyer, "Appraising Information in Machine Language Form," *American Archivist* 35, 1 (July/October 1972), 35-43.

Gavrel, Katherine, "Scheduling and Archival Appraisal: An Integrated Approach to EDP Records," *Archivist/l'Archiviste* 13, 4 (July/August 1986), 6-7.

Gilliland, Anne, "Electronic Records Management," *Annual Review of Information Science and Technology* 39 (2005), 219-253.

---, "Testing our Truths: Delineating the Parameters of the Authentic Archival Electronic Record," *American Archivist* 65, 2 (Fall-Winter 2002), 196-215.

Heazlewood, Justine, and Ross Gibbs, "Electronic Records: Problem Solved? A Report on the Public Record Office Victoria's Electronic Records Strategy," *Archives and Manuscripts* 27, 1 (May 1999), 96-113.

Hedstrom, Margaret, "Applications of the Pittsburgh Functional Requirements for Evidence in Recordkeeping: A Review of Testing and Implementation," *Archives and Manuscripts* 25, 1 (1997), 84-87.

---, "Building Record Keeping Systems: Archivists are Not Alone on the Wild Frontier," *Archivaria* 44 (Fall 1997), 44-71.

---, "Understanding Electronic Incunabula: A Framework for Research on Electronic Records," *American Archivist* 54, 1 (Spring 1991), 334-355.

Hendry, Julia, "Review of Hackman, Larry J., *Many Happy Returns: Advocacy and the Development of Archives*," *Archivaria* 74 (Fall 2012), 219-221.

Horton, Robert, "A Cautionary Tale About Laws, Records, and Technology: Making a Case for Electronic Records Management," in Terry Cook, ed., *Controlling the Past: Documenting Society and Institutions – Essays in Honor of Helen Willa Samuels* (Chicago: Society of American Archivists, 2011), 171-193.

Kesner, Richard, "Automated Information Management: Is There a Role for the Archivist in the Office of the Future?," *Archivaria* 19 (Winter 1984/1985), 162-172.

Macguire, Rachael, "Lessons Learned from Implementing an Electronic Records Management System," *Records Management Journal* 15, 3 (2005), 150-157.

McKemmish, Sue, "Placing Records Continuum Theory and Practice," *Archival Science* 1, 4 (December 2001), 333-359.

McDonald, John, "Archives and Cooperation in the Information Age," *Archivaria* 35 (Spring 1993), 110-118.

---, "Managing Information in an Office Systems Environment: The IMOSA Project," *American Archivist* 58, 2 (Spring 1995), 142-153.

---, "Managing Records in the Modern Office: Taming the Wild Frontier," *Archivaria* 39 (Spring 1995), 70-79.

---, "Scheduling Data in Systems: Three PAC Pilot Projects," *Archivaria* 20 (Summer 1985), 241-244.

Pearce-Moses, Richard, "Janus in Cyberspace: Archives on the Threshold of the Digital Era," *American Archivist* 70 (Spring/Summer 2007), 13-22.

Pember, Margaret, "Sorting out the Standards: What Every Records and Information Professional Should Know," *Records Management Journal* 16, 1 (2006), 21-33.

Pietrzyk, Kamilla, "Preservation Digital Narratives in an Age of Present-mindedness," *Converge: The International Journal of Research into New Media Technologies* 18, 2 (May 2012), 127-133.

Reid, Gordon, "The Challenge of Making Archives Relevant to Local Authorities," *Records Management Journal* 20, 2 (2010), 226-243.

Sandford, Gregory, "Travelling in a Hellenic World: An Odyssey from Oral History and Documentation to Strategy to Continuing Issues and Integrated Recordkeeping," in Terry Cook, ed., *Controlling the Past*: *Documenting Society and Institutions – Essays in Honor of Helen Willa Samuels* (Chicago: Society of American Archivists, 2011), 51-68.

Shepherd, Elizabeth, "Why Are Records in the Public Sector Organizational Assets?," *Records Management Journal* 16, 1 (2006), 6-12.

Stapleton, Adam, "Cross-Town Traffic: A Case for Recordkeeping to Learn from its Information Security Cognate," *Archifacts* (April 2006), 1-25.

Swartz, Nikki, "Revising *DoD 5015.2*, the de facto RM Software Standard," *Information Management Journal* 42, 4 (July/August 2008), 26-28.

Taylor, Hugh, "Information Ecology and the Archives of the 1980s," *Archivaria* 18 (Summer 1984), 25-37.

---, "Information Retrieval and the Training of the Archivist," *Canadian Archivist* 2, 3 (1972), 30-35.

Taylor-Vaisey, Bob, "Archivist-Historians Ignore Information Revolution," *Archivaria* 19 (Winter 1984/1985), 305-308.

Thibodeau, Kenneth, "Machine Readable Archives and Future History," *Computers and the Humanities* 10, 2 (March-April 1976), 89-92.

Upward, Frank, "Structuring the Records Continuum Part One: Post-custodial Principles and Properties," *Archives and Manuscripts* 24, 2 (November 1996), 268-285.

---, "Structuring the Records Continuum Part Two: Structuration Theory and Recordkeeping," *Archives and Manuscripts* 25, 1 (May 1997), 10-35.

Wallot, Jean-Pierre, "Limited Identities for a Common Identity: Archivists in the 21st Century," *Archivaria* 41 (Spring 1996), 6-30.

GOVERNMENT RESEARCH PROGRAMS, PUBLICATIONS, AND REPORTS

Archives of New Zealand, *Government Digital Archives Program*, http://archives.govt.nz/advice/government-digital-archive-programme (accessed November 4, 2011).

Department of Defense, United States of America, *Department of Defense Discovery Metadata Specification (DDMS)*, http://metadata.ces.mil/mdr/irs/DDMS/ (accessed November 10, 2011).

European Union, European Commission, MoReq2, *MoReq2 Specification* (Luxembourg: 2008), http://ec.europa.eu/transparency/archival_policy/moreq/doc/moreq2_spec.pdf (accessed July 4, 2012).

Library and Archives Canada, *Digital Initiatives at LAC,* http://www.collectionscanada.gc.ca/digital-initiatives/index-e.html (accessed November 4, 2011).

National Library of Australia, *PADI Project*, http://www.nla.gov.au/padi/about.html (accessed November 10, 2011).

Library of Congress, United States of America, *Digital Preservation*, http://digitalpreservation.gov/ (accessed November 4, 2011).

---, *Digital Preservation Courses and Workshops*, http://digitalpreservation.gov/education/courses/ (accessed November 3, 2011).

---, *Findings From a Library of Congress Survey on Digital Preservation Training* (Washington: 2010), http://www.digitapreservation.gov/news/2011/20110113news_dp_training_survey.html (accessed November 3, 2011).

---, *METS: An Overview and Tutorial* (Washington: 2011), http://www.loc.gov/standards/mets/METSOverview.v2.html (accessed November 10, 2011).

---, *The Signal*, http://blogs.loc.gov/digitalpreservation (accessed November 3, 2011).

National Archives, United Kingdom, *Digital Preservation*, http://www.nationalarchives.gov.uk/information-management/projects-and-work/digital-preservation.htm (accessed November 4, 2011).

---, *Selecting File Formats for Long-Term Preservation* (Surrey: 2008), www.nationalarchives.gov.uk/documents/selecting-file-formats.pdf (accessed November 4, 2011).

National Archives and Records Administration, United States of America, *Electronic Records Archives*, http://www.archives.gov/era/ (accessed November 4, 2011).

National Archives of Australia, *E-Preservation*, http://www.naa.gov.au/records%2Dmanagement/agency/preserve/e%2Dpreservation/

---, *Implementing an EDRMS – Lessons from Agencies* (Canberra: 2011),
http://www.naa.gov.au/Images/EDRMS%20ten%20lessons%20publication%20-
%20April%202011_tcm16-47290.pdf (accessed November 3, 2011).

---, *Implementing an EDRMS – Information for Senior Management* (Canberra:
2011),
http://www.naa.gov.au/Images/EDRMS%20senior%20management%20publication%
20-%20April%202011_tcm16-47285.pdf (accessed November 3, 2011).

National Archives of Canada, *The IMOSA Project: An Initial Analysis of Document
Management and Retrieval Systems* (Ottawa: 1992).

---, *The IMOSA Project: Functional Requirements for a Corporate Information
Management* (Ottawa: 1992).

---, *The IMOSA Project: Information Management and Office Systems Advancement
– Overview* (Ottawa: 1991).

---, *The IMOSA Project: Information Management and Office Systems Advancement
– Phase 1 Report* (Ottawa: 1991).

Public Record Office of Victoria (Australia), Victorian Electronic Records Strategy
(VERS), *PROV Standard Management of Electronic Records PROS 99/007 V
Version 2* (Melbourne: 2002), http://210.8.122.120/vers/standard/pef/99-7_ver2-0.pdf
(accessed November 10, 2011).

Treasury Board Secretariat of Canada, *Directive on Recordkeeping* (Ottawa: 2009),
http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?section=text&id=16552 (accessed August
10, 2012).

**NON-GOVERNMENT RESEARCH PROGRAMS, PUBLICATIONS, AND
REPORTS**

Association of Canadian Archivists, *Workshops and Institutes*,
http://archivists.ca/content/workshops-institutes (accessed November 12, 2011).

CASPAR, *The CASPAR Project*, http://www.casparpreserves.eu/caspar-project.html
(accessed October 24, 2011).

Center for Research Libraries and Online Computer Library Center, *Trustworthy
Repositories Audit & Certification: Criteria and Checklist* (Chicago: 2007),
http://www.crl.edu/sites/default/files/attachments/pages/trac_0.pdf (accessed
November 12, 2011).

Consultative Committee for Space Data Systems, *Reference Model for an Open Archival Information System* (Rome: 2009), http://public.ccsds.org/publications/archive/650x0b1.pdf (accessed November 4, 2011).

---, *Reference Model for an Open Archival Information System – Recommended Practice* (Washington: 2012), http://public.ccsds.org/publications/archive/650x0m2.pdf (accessed March 4, 2012).

Data Documentation Initiative, *What is DDI?*, http://www.ddialliance.org/what (accessed November 4, 2011).

Digital Curation Centre, *Digital Curation Blog*, http://digitalcuration.blogspot.com/ (accessed November 3, 2011).

---, *Digital Curation Standards: ISO 23081*, www.dcc.ac.uk/resources/standards/diffuse/show?standard_id=78 (accessed November 4, 2011).

---, *Glossary*, http://www.dcc.ac.uk/digital-curation/glossary (accessed November 4, 2011).

---, *Standards Watch Papers: ISO 15489* (Aberystwyth: 2007), http://www.dcc.ac.uk/resources/briefing-papers/standards-watch-papers/iso-15489 (accessed November 5, 2011).

Digital Preservation Coalition, *Preservation Management of Digital Material* (Heslington: 2008), http://www.dpconline.org/advice/preservationhandbook (accessed November 7, 2011).

Dublin Core Metadata Initiative, http://dublincore.org/ (accessed November 10, 2011).

Harvard University, *File Formats and Guidelines* (Cambridge: 2008), http://hul.harvard.edu/ois/digpres/guidance.html (accessed November 4, 2011).

International Organization for Standardization, *How are ISO Standards Developed?,* http://www.iso.org/iso/standards_development/processes_and_procedures/how_are_s tandards_developed.htm (accessed February 24, 2012).

InterPARES 1, *Authenticity Task Force Report* (Vancouver: 1997), http://interpares.org/book/interpares_book_d_part1.pdf (accessed October 22, 2011).

---, *How to Preserve Authentic Electronic Records* (Vancouver: 1997), http://www.interpares.org/book/interpares_book_o_app06.pdf (accessed October 23, 2011).

---, *Requirements for Assessing and Maintaining the Authenticity of Electronic Records*, (Vancouver: 1997), http://interpares.org/book/interpares_book_k_app02.pdf (accessed October 22, 2011).

InterPARES 2, http://www.interpares.org/ip2/ip2_dissemination.cfm?proj=ip2 (accessed October 26, 2011).

InterPARES 3, *Welcome to the InterPARES 3 Project*, http://www.interpares.org/ip3/ip3_index.cfm (accessed October 23, 2011).

Joint Information System Committee, *Beginner's Guide to Digital Preservation*, http://blogs.ukoln.ac.uk/jisc-bgdp/ (accessed November 4, 2011).

Northeast Document Conservation Center, *Planning for Digital Preservation: A Self-Assessment Tool*, http://www.nedcc.org/resources/digital/downloads/DigitalPreservationSelfAssessmentfinal.pdf (accessed August 25, 2012).

OCLC Research Library Partnership, *Demystifying Born Digital*, http://www.oclc.org/research/activities/borndigital.html (last accessed September 20, 2012).

Open Planet Foundation, *Open Planet Foundation Blog*, http://www.openplanetsfoundation.org/blog?page=1 (accessed November 3, 2011).

PLANETS Project, http://www.planets-project.eu/ (accessed November 10, 2011).

Research Libraries Group and Online Computer Library Center, *Trusted Digital Repositories: Attributes and Responsibilities* (Mountain View, California: 2002), http://www.oclc.org/programs/ourwork/past/trustedrep/repositories.pdf (accessed November 11, 2011).

Society of American Archivists, *Continuing Professional Education Catalog*, http://www2.archivists.org/prof-education/course-catalog (accessed November 12, 2011).

UNESCO, *Guidelines for the Preservation of Digital Heritage* (Canberra: 2003), unesdoc.unesco.org/images/0013/001300/130071e.pdf (accessed December 5, 2011).

University of London Computer Centre, *Digital Archives Blog*, http://dablog.ulcc.ac.uk/ (accessed November 4, 2011).

CONFERENCE PRESENTATIONS

Giguere, Mark, "Metadata-Enhanced Electronic Records," *Second IEEE Metadata Conference*, (Silver Springs, Maryland: 1997).

Fraser, Sheila, "Notes for an address by Sheila Fraser, FCA, Auditor General of Canada 28 May 2004, Montreal, Quebec," *Ethics and Accountability in the Archival Sphere: The 29th Annual Conference of the Association of Canadian Archivists* (Montreal: 2004), http://www.oag-bvg.gc.ca/internet/English/sp_20040528_e_23862.html (accessed August 20, 2012).

Sawyer, Donald, Lou Reich, David Giaretta, Patrick Mazal, Claude Huc, Michel Nonon-Latapie, and Nestor Peccia, "The Open Archival Information System (OAIS) Reference Model and its Usage," *SpaceOps 2002 Abstracts, Papers, and Presentations* (Houston: 2002), http://www.aiaa.org/Spaceops2002Archive/papers/SpaceOps02-P-T5-39.pdf (accessed November 4, 2011).

Strodl, Stephan, Christoph Becker, Robert Neumayer, and Andreas Raubner, "How to Choose a Digital Preservation Strategy: Evaluation a Preservation Planning Procedure," *Proceedings of the ACM IEEE Joint Conference on Digital Libraries (JCDL'07)* (Vancouver: 2007), http://www.ifs.tuwien.ac.at/~strodl/paper/FP060-strodl.pdf (accessed November 10, 2011).

SURVEYS, QUESTIONNAIRES, AND INTERVIEWS

Barry, Rick, *Report on the Society and Archives Survey*, http://www.mybestdocs.com/barry-r-soc-arc-surv-report-030129toc.htm (accessed March 3, 2012).

Cohasset Associates, *Electronic Records Management Survey: Call for Sustainable Capabilities* (2009), http://www.cohasset.com/retrievePDF.php?id=10 (accessed March 3, 2012).

Elves, Daniel, "Advocating Electronic Records: Archival and Records Management Promotion of New Approaches to Long-Term Digital Preservation*"* (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 2012). Using the Surveygizmo.com online software program, I released three long-term digital preservation advocacy-focused surveys in fall 2011, which were completed by fifty-four archivists and records managers. I then followed-up the survey results by interviewing ten Manitoba-based archivists and records managers in the spring of 2012. The findings of the surveys and targeted interviews can be found in the main body of the thesis, while copies of the survey and interview questions can be found in the appendices.

Digital Curator Vocational Education Europe Project, *Survey on Training Opportunities in Digital Curation*, http://www.surveygizmo.com/s3/477850/Survey-on-training-opportunities-in-digital-curation (accessed November 3, 2011).

Digital Preservation Coalition, *Mind the Gap: Assessing Digital Preservation Needs in the UK*, http://www.dpconline.org/advocacy/mind-the-gap (accessed November 3, 2011).

THESES

Fiebelkorn, Guillermo, "Why Does It Take So Long? Implementing Electronic Records Programs at Universities," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 2012).

Krahn, Konrad, "Looking Under the Hood: Unravelling the Content, Structure, and Context of Functional Requirements for Electronic Recordkeeping Systems," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 2012).

SOFTWARE PROGRAMS

Archivematica, http://archivematica.org (accessed February 24, 2012).

Dspace, http://www.dspace.org (accessed November 10, 2011).

LOCKSS Project, http://www.lockss.org/lockss/home (accessed November 10, 2011).

National Archives of Australia, *Digital Preservation Software Platform*, http://dpsp.sourceforge.net/ (accessed November 4, 2011).

SECONDARY SOURCES

BOOKS

Aspray, William, *Computing Before Computers* (Ames, IA, Iowa State University Press, 1990).

Ceruzzi, Paul, *A History of Modern Computing* (Cambridge: The MIT Press, 2003).

Campbell-Kelly, Martin, and William Aspray, *Computer: A History of the Information Machine* (Boulder: Westview Press, 2004).

Downing, Douglas, Michael A. Covington, and Melody Covington, *Dictionary of Computer and Internet Terms* (New York: Barron's Educational Services, 2009).

Ifrah, Georges, *The Universal History of Computing: From the Abacus to the Quantum Computer* (New York: John Wiley & Sons, Inc., 2001).

Lee, Christopher A., ed., *I, Digital: Personal Digital Collections in the Digital Era* (Chicago: Society of American Archivists, 2011).

Levy, David, *Scrolling Forward: Making Sense of Documents in the Digital Age* (New York: Arcade Publishing, 2001).

Mahoney, Michael Sean, *Histories of Computing* (Harvard: Harvard University Press, 2011).

O'Regan, Gerard, *A Brief History of Computing* (London: Springer Verlag, 2008).

ARTICLES AND CHAPTERS

Abbate, Janet, "Getting Small: A Short History of the Personal Computer," *IEEE Annals of the History of Computing* 87, 9 (September 1999), 1695-1698.

Baldwin, Betsey, "Confronting Computers: Debates about Computers at the Public Archives of Canada During the 1960s," *Archivaria* 62 (Fall 2006), 159-178.

Bak, Greg, "Continuous Classification: Capturing Dynamic Relationships among Information Resources," *Archival Science* 12, 3 (2012), 287-318.

---, and Pam Armstrong, "Points of Convergence: Seamless Long-term Access to Archival Records at Library and Archives Canada," *Archival Science* 8, 4 (2008), 279-293.

Bergin, Thomas, "The Origins of Word Processing Software for Personal Computers: 1976-1985," *IEEE Annals of the History of Computing* 28, 4 (October-December 2006), 32-47.

Bromley, Allan G., "Charles Babbage's Analytical Engine, 1838," *IEEE Annals of the History of Computing* 20, 4 (April-June, 1998), 29-45.

Chase, George C, "History of Mechanical Computing Machinery," *IEEE Annals of the History of Computing* 2, 3 (July-September 1980) 198-226.

Cortada, James, "Commercial Applications of the Digital Computer in American Corporations, 1945-1995," *IEEE Annals of the History of Computing* 18, 2 (Summer 1996), 16-27.

---, "The ENIAC's Influence on Business Computing, 1940s-1950s," *IEEE Annals of the History of Computing* 28, 2 (April-June 2006), 26-28.

Cunningham, Adrian, "Waiting for the Ghost Train: Strategies for Managing Electronic Personal Records Before it is Too Late," in Lee, Christopher A., ed., *I, Digital: Personal Digital Collections in the Digital Era* (Chicago: Society of American Archivists, 2011), 78-89.

Grad, Burton, "The Creation and Demise of VisiCalc," *IEEE Annals of the History of Computing* 29, 3 (July-September 2007), 20-31.

Marcus, Mitchell, and Atushi Akera, "Exploring the Architecture of an Early Machine: The Historical Relevance of the ENIAC Machine Architecture," *IEEE Annals of the History of Computing* 18, 1 (Spring 1996), 17-24.

Millar, Laura, "Discharging our Debt: The Evolution of the Total Archives Concept in English Canada," *Archivaria* 46 (Fall 1998), 103-146.

Paquet, Lucie, "Appraisal, Acquisition, and Control of Personal Electronic Records: From Myth to Reality," *Archives and Manuscripts* 28, 2 (November 2000), 71-91.

Williams, Robert V., "The Use of Punched Cards in US Libraries and Documentation Centers 1936-1965," *IEEE Annals of the History of Computing* 24, 2 (April 2002), 16-33.

THESES

Bass, Jordan, "Getting Personal: Confronting the Challenges of Archiving Personal Records in a Digital Age," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 2012).

Horky, David, "Archival Perspectives on the Evolution and Organizational Impact of E-mail System Technologies," (Master's Thesis: University of Manitoba, Department of History, Archival Studies, 1998).

WEB SITES

ARCAN-L, *Info Page*, http://www.mailman.srv.ualberta.ca/mailman/listinfo/arcan-l (accessed November 10, 2011).

Association for Manitoba Archives, http://www.mbarchives.ca (accessed July10, 2012).

RECMGMT-L, *RECMGMT-L List*, http://lists.ufl.edu/cgi-bin/wa?A0=RECMGMT-L (accessed December 6, 2011).