Collaborative Research Models: A Review of Australian Initiatives

Sue McKemmish

Abstract

In recent years the Australian recordkeeping community has been involved in a range of research and development projects. Much of the research undertaken has been collaborative, with academic and industry partners, researchers, and practitioners pooling their expertise and experience to address a research agenda which largely grew out of the professional challenges associated with managing electronic records in networked environments. The nurturing of collaborative research and development initiatives has been a key strategy of the recordkeeping community in its efforts to develop policies, standards, systems, and tools for electronic recordkeeping. Increasingly, this collaborative research is becoming more international and multidisciplinary in nature. This article reviews a number of these recent Australian collaborative research initiatives and explores their links to recordkeeping education programs.

The genesis of most recent Australian recordkeeping research and development initiatives lies in the professional challenges associated with managing electronic records in networked environments, including questioning the applicability of traditional theories and practice. The recordkeeping community in Australia has been vitally concerned with the quality of public and corporate recordkeeping in electronic environments. Recordkeeping-related issues of primary concern are the reliability, accessibility, and accountability of online commercial, business, and government activities and services, and the persistence and accessibility of electronic records of continuing value to society, i.e., archives. The initial response to these concerns has been a proactive, collaborative approach to the development of policies and standards that has provided a framework for the programs of individual institutions and organizations.[1] Another integral part of the collaborative effort has been the nurturing of education and research programs, including research and development within the

[1] For further discussion of the strategic response of the Australian recordkeeping community to the challenges presented by electronic recordkeeping, see Barbara Reed, "Electronic Records Management in Australia," *Records Management Journal* 7 (August 1997): 191.

recordkeeping community and reaching out to establish research and development partnerships with related communities of interest, particularly those concerned with descriptive metadata, enterprise knowledge management, and distributed systems technology. The Australian recordkeeping community has also looked to developments in other countries, especially Canada and the United States, drawing on and contributing to the growing international discourse on electronic records.

Developments in the wider research sector, particularly in the way in which research and development is funded and promoted, have opened up a range of opportunities for the recordkeeping community in Australia, as the Australian government has increasingly supported university-industry research partnerships. Examples include the federal government's collaborative grants scheme administered by the Australian Council of Research, the Strategic Partnerships with Industry—Research and Training (SPIRT) scheme, and the federal government's sponsorship of national Cooperative Research Centres (CRCs). A CRC typically involves a number of university and industry partners and is initially funded for a period of seven years. Both the SPIRT and CRC schemes provide funding for research training, including scholarships for master's and Ph.D. students. The collaborative research environment is a particularly stimulating and dynamic place for research students to develop and apply their knowledge and research skills. University research funds are also increasingly being distributed according to formulas that favor projects that involve collaborative research with other institutions and with industry, and provide opportunities for research training. Also, the range of state government initiatives relating to multimedia, information technology infrastructure and the delivery of government services on-line have included research and development opportunities in the information management and recordkeeping fields.

This article reviews a range of recent and emerging Australian collaborative research and development initiatives. These involve the recordkeeping and related communities within the broader context of the recordkeeping community's collaborative activities in response to the challenge of electronic recordkeeping, and its engagement in the international discourse.[2]

Collaborative Research and Development Initiatives in the Recordkeeping Community

In Australia, records continuum thinking and practice brings together a community of records managers and archivists, recordkeeping consultants, recordkeeping educators and researchers, archival institutions, corporate records

[2] The Australian recordkeeping community has also been involved in a range of international research and development initiatives, including the development of the International Standard on Records Management, and the InterPARES project <http://www.interpares.org/>, but this article focuses on national initiatives.

and archives programs, and recordkeeping professional associations under the recordkeeping umbrella, "Records continuum thinking focuses on the unifying purposes shared by all recordkeeping professionals, defined as to do with the delivery of frameworks for accountable recordkeeping regimes that enable access to essential, useable evidence of social and business activity in the business, social and cultural domains."[3]

Initially, the collaborative efforts of this community focused on the development of recordkeeping policies and standards at the national level. Largely undertaken during 1995–97, these efforts resulted in the *Australian Standard Records Management* (AS4390-1996), the Australian Council of Archives' *Common Framework for Electronic Recordkeeping* (1996), and the Australian *Records and Archives Competency Standards* (1997).[4] Representatives from archival institutions, the Australian Society of Archives, the Records Management Association of Australia, and university recordkeeping education programs (specifically, recordkeeping educators and researchers from the Monash University program) were involved in all of these initiatives. The development of both Australian Standard 4390 and the *Records and Archives Competency Standards* engaged the recordkeeping community with the standards movement in Australia and a number of related communities of interest. Through their initial and continuing involvement in the standards movement, the recordkeeping community has aimed to influence corporate recordkeeping behavior as well as recordkeeping education and training, and to ensure that the recordkeeping profession secured control over the definition of recordkeeping best practice and core competencies. The *Competency Standards* have been adopted by both the Australian Society of Archivists and the Records Management Association of Australia as the basis for the recognition of recordkeeping education programs, and thus have a significant impact on shaping these programs and on curriculum development.

The collaborative effort involved has also contributed to building and shaping the recordkeeping community itself. Each of the initiatives outlined has built on and extended the work that preceded it, and improving the national policy and standards framework is seen as an ongoing process.

[3] Sue McKemmish, "Yesterday, Today and Tomorrow: A Continuum of Responsibility," in *Preserving Yesterday, Managing Today and Challenging Tomorrow: Proceedings 14th National Convention RMAA, 1997* (Perth: Records Management Association of Australia, 1997): 19; also available at <http://www.sims.monash.edu.au/rcrg/publications/recordscontinuum/smckp2.html>; also published in *Naar een nieuw paradigma in de archivistiek* (edited by P. J. Horsman, F. C. J. Ketelaar, T. H. P. M. Thomassen), Jaarboek 1999 (Gravenhage: Stichting Archiefpublicaties, 1999).

[4] AS 4390.1-1996 *Australian Standard: Records Management,* (Homebush: Standards Australia, 1996), for details of availability see <http://www.standards.org.au/>. For more information on the development of AS 4390 see David O. Stephens and David Roberts, "From Australia: The World's First National Standard for Records Management," *Records Management Quarterly* 30 (Oct. 1996): 3–8: David Roberts, "The New Australian Records Management Standard," *Annual Meeting of NAGARA 19 July 1997* (Sacramento, 1997); available through <http://www.records.nsw.gov.au/>; Australian Council of Archives, *Common Framework for Electronic Recordkeeping* (ACA, 1996) available at <http://www.naa.gov.au/recordkeeping/er/manage_er/append_1.html>, and *Records and Archives Competency Standards November 1997* (National Finance and Industry Training Advisory Body Ltd., Australian National Training Authority, 1997).

In a parallel and interconnected development, individual archival organizations have been developing electronic recordkeeping policies, standards, system design methodologies, and implementation strategies for their jurisdictions. The National Archives of Australia and the State Records Authority of New South Wales, and more recently the Public Record Office of Victoria, have taken a pioneering role, often working in close cooperation. Milestones in this area include the following key policy documents: *Documenting the Future: Policy and Strategy for Electronic Recordkeeping in the New South Wales Public Sector* (July 1995),[5] *Managing Electronic Records: A Shared Responsibility* (1995), and *Keeping Electronic Records* (1995)[6] and *Keeping Electronic Records Forever.*[7] More recently, more specific standards, policies, and guidelines have been issued in these jurisdictions. In New South Wales, for example, there are the:

- Standard on Full and Accurate Recordkeeping;
- Standard on Records Management Programs;
- Managing the Message: Guidelines on Electronic Messages as Records;
- Guidelines for Managing Electronic Documents and Directories; and the
- Manual for Design and Implementation of Recordkeeping Systems.[8]

And the National Archives of Australia has just launched a suite of standards, policies, and guidelines under the e-permanence initiative.[9] Such standards and guidelines are explicitly set within the broader standards and policy frameworks of the recordkeeping community.[10] Records continuum thinking has also provided the framework for the continuing development of recordkeeping education and professional development programs. All university programs in Australia integrate the teaching of records management and archival administration, and seek recognition from both the Australian Society of Archivists and the Records Management Association of Australia. The associations are currently moving towards establishing joint recognition arrangements, as part of a major initiative

[5] Records Management Office, Archives Authority of New South Wales, *Documenting the Future: Policy and Strategy for Electronic Recordkeeping in the New South Wales Public Sector* (AA NSW, July 1995), authored by David Roberts; available at <http://www.records.nsw.gov.au/> in the NSW Public Sector area.

[6] Australian Archives, *Managing Electronic Records: A Shared Responsibility* (Canberra: AA, 1995), authored by Keith Parrott and Greg O'Shea; and *Keeping Electronic Records* (Canberra: AA, 1995), authored by Greg O'Shea; respectively available at <http://www.naa.gov.au> and <http://www.naa.gov.au/recordkeeping/er/manage_er/summary.html>.

[7] *Keeping Electronic Records Forever: Records Management Vision Development* (Public Record Office Victoria and Ernst & Young, 1996); available at <http://www.prov.vic.gov.au/vers/kerf.htm>.

[8] State Archives Authority of New South Wales via the New South Wales Public Sector area: <http://www.records.nsw.gov.au/> *Government Recordkeeping Manual,* the *Standard on Full and Accurate Records,* the *Manual for Design and Implementation of Recordkeeping Systems (DIRKS),* and policies on Electronic Recordkeeping and Electronic Messages.

[9] For detailed information about the e-permanence recordkeeping standard initiative, see <http://www.naa.gov.au/recordkeeping/>.

[10] For a discussion of the strategy involved see David Roberts, "Building a Recordkeeping Regime Across Government," in *Preserving Yesterday, Managing Today and Challenging Tomorrow: Proceedings 14th National Convention RMAA, 1997,* (Perth: Records Management Association of Australia, 1997); available though the Publications area at <http://www.records.nsw.gov.au>.

to work even more closely together. There have also been significant educational alliances between university recordkeeping education programs, major archival institutions, and the professional associations. These alliances have resulted in initiatives like the Monash Records Management and Archives Skills Training Program that delivered postgraduate standard professional education to the staff of the National Archives of Australia, and the University of New South Wales-State Records Authority electronic recordkeeping programs. Joint sponsorship of professional development and educational programs has enabled international colleagues to visit Australia and share their knowledge and experience with Australian recordkeeping professionals and students.

Most of these endeavours have been underpinned by concepts of records and recordkeeping, which are inclusive of records of continuing value (archives) and archiving. These concepts have been articulated in the writings of records continuum theorists and practitioners, and are increasingly being used as a basis for official definitions of records in Australia. For example, in AS 4390 records are defined as "recorded information, in any form, including data in computer systems, created or received and maintained by an organization or person in the transaction of business or the conduct of affairs and kept as evidence of such activity" while archives are defined as "those records that are appraised as having continuing value."[11] Recordkeeping includes:

a) The creation of records in the course of business activity and the means to ensure the creation of adequate records.
b) The design, establishment and operation of recordkeeping systems.
c) The management of records used in business (traditionally regarded as the domain of records management) and as archives (traditionally regarded as the domain of archives administration).[12]

Over the past decade, recordkeeping educators, researchers, and practitioners in Australia have also engaged in the international discourse that has reconceptualized traditional theory and "reinvented" records and archives practice. The policy development and standard setting initiatives described above took place in the context of this discourse.[13] They also drew on the outcomes of early electronic

[11] AS 4390, Part 1: General, pp. 6–7.

[12] AS 4390, Part 1: General, pp. 6–7.

[13] For samples of the discourse see David Bearman, *Electronic Evidence: Strategies for Managing Records in Contemporary Organizations* (Pittsburgh: Archives and Museum Informatics, 1994); Terry Cook, "Electronic Records, Paper Minds: The Revolution in Information Management and Archives in the Post-Custodial and Post-Modern Era," *Archives and Manuscript,* 22 (November 1994): 300–329; Terry Cook, "It's 10 O'Clock: Do You Know Where Your Data Are?" *Technology Review* 98 (January 1995): 48–53; Luciana Duranti, "Reliability and Authenticity: The Concepts and Their Implications," *Archivaria* 39 (Spring 1995): 5–10; Luciana Duranti and Heather MacNeil, "The Protection of Electronic Records: An Overview of the UBC-MAS Research," *Archivaria* 42 (Fall 1996): 46–67; *Electronic Records Management Program Strategies*, edited by Margaret Hedstrom (Pittsburgh: Archives and Museum Informatics, 1993); and John McDonald, "Managing Records in the Modern Office: Taming the Wild Frontier," Archivaria 39 (Spring 1995): 70–79. This discourse is analyzed in detail in Terry Cook, "What is Past is Prologue: A History of Archival Ideas Since 1898, and the Future Paradigm Shift," *Archivaria* 43 (Spring 1997): 38–39.

recordkeeping research, in particular the University of Pittsburgh's "Functional Requirements for Evidence in Recordkeeping Project".[14]

Australian recordkeeping researchers have generated theories and models about recordkeeping that are being applied and tested by practitioners in rapidly emerging and changing information environments, and are being used as pedagogical tools in recordkeeping education and professional development programs. Although such research has continued to draw on the theories, models, and methods of the disciplines of archival science, history, and law, it has also looked to sociology and information science. The focus of much of this theory and model building has been on fundamental questions about the role of recordkeeping in society, the recordkeeping-accountability nexus, and the nature of records as evidence of social and organizational activity.[15] Frank Upward's exploration of records continuum theory and his development of the records continuum model have been particularly significant. His theory and model building has drawn on the early records continuum approaches of the Commonwealth Archives Office (forerunner of the National Archives of Australia) and on the theories of sociologists, especially the structuration theory of Anthony Giddens.[16] Through both their writings and their direct engagement in the initiatives themselves, records continuum theorists have provided the conceptual frames of reference for the development of policies, strategies, standards, and tools for the management of electronic records.

Metadata Research and Development Initiatives

The 1998–99 SPIRT Recordkeeping Metadata project, Recordkeeping Metadata Standards for Managing and Accessing Information Resources in Networked Environments Over Time for Government, Commerce, Social and

[14] The "Functional Requirements for Evidence in Recordkeeping Project" report can be viewed at <http://www.sis.pitt.edu/~nhprc/prog1.html>. Citations to many related papers, e.g. by David Bearman, Richard Cox and Wendy Duff, can be found at <http://www.sis.pitt.edu/~nhprc/bibl-do.html>.

[15] For example, see Glenda Acland, "Managing the Record Rather than the Relic," *Archives and Manuscripts,* 20, no. 1 (May 1992): 57–63; Archives Authority of New South Wales, *Records and Recordkeeping: Introducing New Concepts* (November 1995), available on the State Records Authority New South Wales web site: <http://www.records.nsw.gov.au> available via the New South Wales Public Sector's *Government Recordkeeping Manual and Records and Recordkeeping* link; Sue McKemmish and Frank Upward, eds, *Archival Documents: Providing Accountability Through Recordkeeping* (Clayton, Victoria: Ancora Press, 1993). Greg O'Shea and David Roberts, "Living in a Digital World: Recognizing the Electronic and Post-Custodial Realities," *Archives and Manuscripts* 24 (November 1996): 286–311; Steve Stuckey, "Keepers of the Flame? The Custodial Role of Australian Archives—Its History and Its Future," in *The Records Continuum: Ian Maclean and Australian Archives First Fifty Years,* edited by Sue McKemmish and Michael Piggott (Clayton: Ancora Press in association with Australian Archives, 1994): 35–48; Frank Upward and Sue McKemmish, "Somewhere Beyond Custody," *Archives and Manuscripts* 22 (May 1994): 138–49.

[16] Frank Upward, "In Search of the Continuum: Ian Maclean's 'Australian Experience' Essays on Recordkeeping," in *The Records Continuum: Ian Maclean and Australian Archives First Fifty Years,* 110–30; Frank Upward, "Structuring the Records Continuum: Part 1," *Archives and Manuscripts* 24 (November 1996): 268–85; Frank Upward, "Structuring the Records Continuum: Part 2 Structuration Theory and Recordkeeping," *Archives and Manuscripts* 25 (May 1997): 10–35.

Cultural Purposes, is an example of a collaborative research initiative which was funded through the Australian Research Council's SPIRT Grants Scheme, and included scholarship funding for research training.[17] It involved collaboration between Monash University and University of New South Wales faculty and their industry partners, the National Archives of Australia, the State Records Authority of New South Wales, the Queensland State Archives, the Records Management Association of Australia, and the Australian Council of Archives, a collaboration which, in part, grew out of the earlier collaborative efforts described above. It also involved computing science researchers from a CRC, the Distributed Systems Technology Centre (DSTC). And its research findings were linked to the broader agenda of the metadata research community.

The SPIRT Recordkeeping Metadata project used analysis of current and historical literary warrants and best practice, including AS 4390, to identify and map recordkeeping metadata requirements and to specify a standardized set of recordkeeping metadata. It also contributed to further theory and model building in the field through its conceptual modeling of records in their business context, and its high-level logical models of the Recordkeeping Metadata Schema, its major deliverable.[18] This high-level schema provides:

- a standardized set of structured recordkeeping metadata elements;
- a framework for reading or mapping metadata sets in ways which can enable their semantic interoperability by establishing equivalences and correspondences that can provide the basis for semi-automated translation between metadata schemas; and
- a classification of recordkeeping metadata according to functionality or purpose.

The schema also provides a framework for developing and specifying recordkeeping metadata standards. For example, the National Archives of

[17] For background information on the project and its evolution, see Sue McKemmish, Adrian Cunningham and Dagmar Parer, "Metadata Mania: Use of Metadata for Electronic Recordkeeping and Online Resource Discovery" in *Place, Interface and Cyberspace: Archives at the Edge, Proceedings of the 1998 Conference of the Australian Society of Archivists, Fremantle 6–8 August 1998* (Canberra: Australian Society of Archivists, 1999): 129–44; and Sue McKemmish and Glenda Acland "Accessing Essential Evidence on the Web: Towards an Australian Recordkeeping Metadata Standard," *AusWeb99 Conference Proceedings,* available at <http://ausweb.scu.edu.au/aw99/papers/mckemmish>. For details of project outcomes and updates, visit the project web site at <http://www.sims.monash.edu.au/rcrg/research/spirt/index.html> and see the following articles: Sue McKemmish, Glenda Acland and Barbara Reed, "Towards a Framework for Standardizing Recordkeeping Metadata: The Australian Recordkeeping Metadata Schema," *Records Management Journal 9* (December 1999): 177–202; and Sue McKemmish, Glenda Acland, Nigel Ward, and Barbara Reed, "Describing Records in Context in the Continuum: The Australian Recordkeeping Metadata Schema," *Archivaria* 48 (Fall 1999): 3–43.

[18] Schema is used to mean the semantic and structural definition of the metadata used to describe recordkeeping entities. A schema describes the names of metadata elements, how they are structured, their meaning, etc. The metadata community also refers to a metadata schema as a metadata set or specification.

Australia's *Recordkeeping Metadata Standard for Commonwealth Agencies 1999*[19] was developed by the SPIRT project's major industry partner in tandem with the SPIRT Schema. Essentially a sub-set of the Recordkeeping Metadata Schema, it is designed for implementation by Commonwealth government agencies in electronic systems which create and manage records.

The main SPIRT project deliverable in turn is feeding back into the ongoing standard-setting process of the recordkeeping community. The joint Australian Society of Archivists/Australian Council of Archives Committee on Descriptive Standards has endorsed the SPIRT Recordkeeping Metadata Schema as a framework for the Committee's future work on the development of domain-specific recordkeeping metadata and archival descriptive standards. The Standards Australia Committee responsible for *AS 4390 Australian Standard: Records Management* recently adopted a proposal to develop the SPIRT Recordkeeping Metadata Schema into a framework Australian Standard for Recordkeeping Metadata. In another SPIRT-related initiative, the Descriptive Standards Committee has also proposed a codification of the Australian series system, which is currently implemented in archival control systems in non-standard ways by the National Archives of Australia, most State Archives and many small archives.[20]

The SPIRT Recordkeeping Metadata research project built on earlier theory and model building, standards development and research findings. It was undertaken in the context of records continuum thinking and practice in Australia, with particular reference to Frank Upward's records continuum model,[21] Barbara Reed's writing on records metadata,[22] and Chris Hurley's writings on archival description, the Australian series system, and the functional context of recordkeeping.[23] Thus recordkeeping metadata was defined to

[19] The National Archives of Australia schema is a minimalist set of metadata designed to be attributed to all Commonwealth records in current records systems. The set has a number of common elements with the Australian Government Locator Service set—and the stated intention to be compatible with AGLS, as well as meeting the requirements of the Australian Records Management Standard, AS 4390.

[20] The Committee has also proposed to Standards Australia that this codification be developed into an Australian National Standard within the framework provided by the Record Keeping Metadata Schema.

[21] For example see Acland, "Managing the Record Rather than the Relic," 57–63; Archives Authority of NSW, *Records and Recordkeeping: Introducing New Concepts;* McKemmish and Upward, eds, *Archival Documents: Providing Accountability Through Recordkeeping;* O'Shea and Roberts, "Living in a Digital World: Recognizing the Electronic and Post-Custodial Realities", 286–311; Stuckey, "Keepers of the Flame? The Custodial Role of Australian Archives—Its History and Its Future," and Upward and McKemmish, "Somewhere Beyond Custody," 138–49.

[22] Barbara Reed, "Metadata: Core Record or Core Business," *Archives and Manuscripts,* 25 (November 1997): 218–41, available at <http://www.sims.monash.edu.au/rcrg/publications/recordscontinuum/brep1.html>.

[23] See, for example, these three articles by Chris Hurley: "The Making and Keeping of Records: (1) What Are Finding Aids For?" *Archives and Manuscripts* 26 (May 1998): 57–77; "What, If Anything, Is A Function?" *Archives and Manuscripts* 21 (November 1993): 208–20; and "Ambient Functions: Abandoned Children to Zoos," *Archivaria* 40 (Fall 1995): 21–39.

include all standardized information that identifies, authenticates, describes, manages and makes accessible *through time and space* documents created in the context of social and business activity. The decision to adopt the particular concept of recordkeeping metadata used by the Project is bound up with the way description is defined in Australian records continuum thinking. Records continuum approaches are based on establishing an integrated regime of management processes for the whole of the records existence. In the records continuum *description* is therefore defined as a series of iterative recordkeeping processes that capture and inextricably link authoritative metadata to documents created in the context of social and business activity from the time of their creation and throughout their life span. A fundamental premise of the Project is that it is possible to identify, categorize, label, and present in a formal, standardized way the metadata that supports recordkeeping through time and space—regardless of where, when or how that metadata is captured.[24]

The project also drew on David Bearman's insights into recordkeeping systems, records as metadata-encapsulated objects, and item-level control, as well as his pioneering work on the Business Acceptable Communications model.[25] The Australian series system, with its emphasis on describing both context and records entities, and the complex, dynamic relationships between them, was another key aspect of the frame of reference for the project,[26] while the conceptual models of the project built on and extended Peter Scott's revolutionary approach to archival description.[27]

The SPIRT project was also influenced by the international discourse on electronic recordkeeping and archival description, in particular by Terry Cook's exploration of the concept of the archival *fonds* and insights into the "conceptual relationships between creating structures, their animating functions and the resulting records,"[28] Margaret Hedstrom's writings on electronic

[24] McKemmish, Acland, Ward and Reed, "Describing Records in Context in the Continuum: the Australian Recordkeeping Metadata Schema."

[25] See, in particular, these articles by David Bearman: "Record-Keeping Systems," *Archivaria* 36 (Autumn 1993): 16–37; "Documenting Documentation," *Archivaria* 34 (Summer 1992): 33–49; "Item Level Control and Electronic Recordkeeping," *Archives and Museum Informatics* 10 (1996): 195–245; and (with Ken Sochats) "Metadata Requirements for Evidence;" available at <http://www.sis.pitt.edu/~nhprc/BACartic.html>.

[26] For more information about the Australian Series System, see, McKemmish and Piggott, *The Records Continuum: Ian Maclean and Australian Archives First Fifty Years.* Of particular interest in this volume are the papers by Mark Wagland and Russell Kelly, "The Series System—A Revolution in Archival Control," 131–49; Chris Hurley, "The Australian (Series) System: An Exposition," 150–72; and Sue McKemmish, "Are Records Ever Actual?" 187–203.

[27] Peter Scott, "The Record Group Concept: A Case for Abandonment," *American Archivist* 29 (October 1966): 493–504.

[28] Terry Cook, "The Concept of the Archival Fonds: Theory, Description, and Provenance in the Post-Custodial Era," in *The Archival Fonds: From Theory to Practice,* edited by Terry Eastwood (Ottawa: Bureau of Canadian Archivists, 1992), 38; see also Terry Cook, "Electronic Records, Paper Minds."

recordkeeping,[29] and Wendy Duff's work on literary warrant.[30] The Project also used the research outcomes of the University of Pittsburgh's "Functional Requirements for Evidence in Recordkeeping Project"[31] and the University of British Columbia's "Protection of the Integrity of Electronic Records Project."[32]

In terms of its links to the broader metadata research agenda, the SPIRT Recordkeeping Metadata Schema has been developed using conventions and protocols that are evolving in the Dublin Core (DC)[33] and Australian Government Locator Service (AGLS)[34] communities. The main industry partner in the SPIRT Recordkeeping Metadata project, the National Archives of Australia, is the lead agency in the AGLS initiative, SPIRT researchers Sue McKemmish and Barbara Reed are members of the Intragovernmental Working Group which oversees the continuing development of the AGLS metadata schema, and Australian AGLS and recordkeeping metadata developers are members of the Dublin Core community.

Another important connection between the broader metadata research agenda and the SPIRT project has been the formal modeling of recordkeeping examples and the metadata set itself (i.e., metamodeling). Two formal modeling techniques were employed—the Resource Description Framework (RDF) and Object Role Modeling (ORM).[35] Further research on the formal modeling of the relationships between metadata schemas is also proposed. "Currently, RDF allows simple identification of external schemas used in a metadata description. This is not sufficient for recordkeeping description, where external metadata

[29] See, for example, Margaret Hedstrom, "Building Record-Keeping Systems: Archivists are not Alone on the Wild Frontier," *Archivaria* (1998): 44–71.

[30] Wendy Duff, "Harnessing the Power of Warrant," *American Archivist* 61 (Spring 1998): 88–105.

[31] University of Pittsburgh, School of Information Sciences, "Functional Requirements for Evidence in Recordkeeping;" available at <http://www.sis.pitt.edu/~nhprc/>.

[32] University of British Columbia, School of Library, Archival and Information Studies, "The Preservation of the Integrity of Electronic Records Project;" available at http://www.slais.ubc.ca/users/duranti/; see also Luciana Duranti and Heather MacNeil, "The Protection of Electronic Records".

[33] The minimalist Dublin Core metadata set is a generic resource discovery metadata schema designed for implementation in web-based environments. For further details of the Dublin Core initiative, see <http://purl.oclc.org/metadata/dublin_core/>; and Stuart Weibel, "The State of the Dublin Core Metadata Initiative April 1999," *D-Lib Magazine* 5 (April 1999), available at <http://www.dlib.org/dlib/april99/04weibe1.html>.

[34] The Dublin Core–derived Australian Government Locator Service metadata standard is primarily concerned with describing government services and information resources for discovery and retrieval purposes, although its further development aims to facilitate the transaction of government business online. For more information on the Australian Government Locator Service initiative, see *Australian Government Locator Service (AGLS) Manual for Users, Version 1.1: 1999-06-09* (Canberra: Office of Government Online and National Archives of Australia, 1999), available at <http://www.naa.gov.au/recordkeeping/gov_online/agls/user_manual/intro.html>.

[35] For more information on the RDF, see the W3C RDF homepage at http://www.w3.org/RDF and the following article: Eric Miller, "An Introduction to the Resource Description Framework," *D-Lib Magazine* (May 1998) available at <http://www.dlib.org/dlib/may98/miller/05miller.html>. For more information about ORM, see T. Halpin, *Conceptual Schema & Relational Database Design*, 2nd edition (Sidney: Prentice Hall Australia, 1995).

schemas may also need to be described in terms of their period of validity, authority and so on. These requirements will be fed back into the ongoing research of the metadata modeling community."[36]

Victorian Electronic Records Strategy (VERS)

The Victorian Electronic Records Strategy (VERS) project, funded through a state government multimedia fund, is another research and development initiative that has involved extensive collaboration, in this case between researchers, practitioners, and users. Like the SPIRT project, it also illustrates how recent collaborative research initiatives in Australia have drawn on the international and national discourse on electronic recordkeeping, as well as the research findings of earlier projects.

The main players in this project were the Public Record Office of Victoria; its client agencies (particularly the Victorian Department of Infrastructure); Ernst & Young, business process analysts; and Commonwealth Scientific and Industrial Research Organisation (CSIRO), computing science researchers.[37] Their work drew on the theoretical frameworks and understandings about the nature of electronic records that came out of earlier research and development initiatives, and the Pittsburgh project's functional requirements for evidence in recordkeeping.

The VERS project developed a prototype of an electronic records system that captures records and their contextual metadata into a long-term format. The records' structure is expressed using XML (eXtensible Markup Language) and the document content is encoded using Adobe System's Portable Document Format (PDF). Contextual metadata is also stored in database tables in XML in order to facilitate records discovery. Although the "static" records approach of the VERS project envisages an entirely different implementation environment than the Business Acceptable Communications Model, the metadata set included in the prototype system is based on the BAC metadata specification.[38] The VERS project also has some extensions "to support additional metadata fields of specific interest in the Australian context such as the Australian Government Locator Service (AGLS) metadata."[39] Standards for

[36] McKemmish, Acland, Ward and Reed, "Describing Records in Context in the Continuum: the Australian Recordkeeping Metadata Schema,".

[37] Public Record Office of Victoria, *Victorian Electronic Records Strategy: Final Report* (Melbourne: Public Record Office of Victoria, 1998); Justine Heazlewood, et al., "Electronic Records: Problem Solved?" *Archives and Manuscripts* 27 (May 1999): 96–113; see also the Victorian Electronic Records Strategy web site at <http://www.prov.vic.gov.au/vers/>.

[38] University of Pittsburgh, School of Information Sciences, "Metadata Specifications Derived from the Functional Requirements: A Reference Model for Business Acceptable Communications;" available at <http://www.sis.pitt.edu/~nhprc/meta96.html>.

[39] Heazlewood, "Electronic Records: Problem Solved?" 102.

electronic recordkeeping for the Victorian government are now being developed based on recommendations coming out of the final report of the VERS project.

Enterprise Information Research Group, Monash University

The newly formed Enterprise Information Research Group (EIRG), based at the School of Information Management and Systems in the Faculty of Information Technology at Monash University, provides an example of recordkeeping researchers, student researchers, and their industry partners collaborating with researchers and students from other disciplines on a broader research agenda. The EIRG's main objectives relate to:

- improving enterprise and interpersonal information flow and recorded memory through the development of Information Management and Systems theory, models, methods, and tools for the analysis, design, development, use, and management of information systems, services, and products
- improving how people create, manage, categorize, seek, obtain, evaluate, and use information; and
- breaking down barriers to satisfying the information needs of people and their use of information and information technologies.[40]

EIRG brings together researchers, research students, and industry partners from the areas of decision support systems, knowledge management, information and telecommunications needs, and recordkeeping, aiming to promote synergy and innovative research alliances in these areas. The scope of enterprise information is defined broadly to encompass communicative interactions between people acting individually or collaboratively in complex and dynamic information ecologies. The EIRG's research focuses on enterprise knowledge management, e-government, e-business, electronic recordkeeping, and information needs. It uses, builds on, and extends the collaborative research, research publication, and research training endeavors of the School of Information Management and Systems' existing research groups, including the Records Continuum Research Group.

EIRG has attracted a large Monash University research grant to build a research and research-training infrastructure, including funding for research degree scholarships. The grant will support further growth under

[40] School of Information Management and Systems, Monash University, "Enterprise Information Research Group (EIRG)," Proposal Document prepared by EIRG Director Associate Professor Sue Mckemmish and EIRG Deputy Director Dr. Frada Burstein, July 1999.

the EIRG umbrella, in particular, the establishment of enterprise knowledge management as a significant new area of research strength at Monash. Knowledge management here refers to all forms of information, encompassing information-as-evidence (records), information-as-knowledge, and information-as-infotainment, and the new initiative will address the need for a comprehensive approach to enterprise knowledge management in information communities.[41]

Distributed Systems Technology Centre

On a much larger scale, the Distributed Systems Technology Centre (DSTC) provides an umbrella for research projects that are concerned with developing the technical infrastructure for the distributed enterprises of the future. The DSTC is a joint venture supported by the Australian Government's Cooperative Research Centres Program with twenty-four participating organizations, including universities, research institutes, and industry partners in the domains of government on-line services, defense, health, education, telecommunications, and finance. The challenges in these domains in relation to exploiting the information economy form the core business drivers of the research and development program of DSTC:

> Such groups require access to pervasive network resources and the capacity to deliver reliable and innovative services and information. Secure, robust information systems that leverage existing investments in business systems are critical to the growth, service capacity and competitive position of the enterprise and government agencies. . . .DSTC is researching and developing the key technologies required to support organizations in this new and confronting business environment. These include:
>
> Knowledge and digital resource management
> Organisational systems and security
> Workflow and collaboration
> Enterprise modeling
> Component software and system engineering[42]

The Records Continuum Research Group at Monash University, made up of faculty, research associates, and research students of the recordkeeping education program and its industry partners, the State Records Authority of New South Wales, and the National Archives of Australia, work closely with the

[41] School of Information Management and Systems, Monash University, "Knowledge Management Program for Information Communities," Strategic Monash University Research Fund Application prepred by Dr. Frada Burstein, Associate Professor Sue McKemmish, and Dr. Kirsty Williamson, November 1999.

[42] "About DSTC" on the DSTC website at <http://www.dstc.edu.au>.

DSTC on a number of initiatives, in particular in its knowledge and digital resource management program. Computing science researchers from this program are extensively involved in the Dublin Core and Australian Government Locator Service metadata initiatives, as well as the SPIRT Recordkeeping Metadata project.

A new project within DSTC, the Information Ecology project, has a significant recordkeeping component. The overall objectives of the project are:

- to explore the ecology of the information environment in terms of the relationships between people, enterprises, enterprise structures, enterprise business activities, external and internal mandates, the relationships between enterprises, enterprise information (as knowledge and as evidence), and physical and virtual spaces;
- to conduct theoretical and practical research on context sensitive ways to satisfy the broadly defined information needs of people and enterprises in complex, dynamic information environments;
- to study the central notion of "context" as a way of improving:
  - people-computer interaction, and
  - representation and sharing of knowledge in distributed enterprises.
- to support distributed knowledge-oriented enterprise by:
  - improving the effectiveness of knowledge workers; and
  - enhancing on-line business, information provision, and electronic business through improved accessibility, reliability, authenticity, transparency, and accountability of their business activities and services, and of the information about them.

Records-related components will explore recordkeeping in distributed enterprises in order to:

- contribute to the further development of recordkeeping metadata standards to improve the sharing of records between enterprises and applications;
- use records as sources of enterprise information in knowledge management;
- improve the capacity of electronic records to facilitate electronic business;
- develop prototype systems to implement recordkeeping metadata standards; and
- develop prototypes of systems that build records from event notifications and workflows.

It is also envisaged that there will be recordkeeping input into other components of the Information Ecology project. These include a study of social information which aims to produce representations of personal and group context, the use of personal and group context to enhance information presentation, and the construction of personal and group context from computer-mediated interactions. Another component relating to informatics aims to adapt

and synergize existing theories into a theoretical foundation amenable to practical application. Potential theories to be investigated include logic, information science, Giddens' structuration theory, and information sociologics, including theories of evolutionary knowledge and memory.[43] As with other projects within the DSTC, research training money is a significant component of the funding provided.

Conclusion

The Australian initiatives reviewed above provide interesting models for collaborative research. They are characterized by their multidisciplinary nature, the engagement of academic, industry, and professional communities, their relationships to broader research and professional agendas, the way they build on and extend pre-existing networks, and the interconnections between research, research training, education programs, and the development of best practice.

The initiatives described have been able to capitalize on shifting research paradigms in Australia, and exemplify the kinds of projects that attract research funding in the current environment. They have successfully pooled the expertise and experience of academic and industry partners, researchers, research students, and practitioners to address research agendas that have largely grown out of industry and professional challenges in the recordkeeping arena, particularly those associated with managing electronic records in networked environments. In turn, collaborative research initiatives have been nurtured and supported as an important development strategy by industry and professional groups. Particularly noteworthy has been both the inclusion of researchers from other disciplines in recordkeeping research projects, and the inclusion of recordkeeping research in broader research agendas, especially in the areas of descriptive metadata schemas, registries and tools in global networks, enterprise knowledge management, and distributed systems technology infrastructures for the distributed enterprises of the future.

Recordkeeping research partnerships have built on a strong track record of collaboration by records managers and archivists, recordkeeping consultants, recordkeeping educators and researchers, archival institutions, corporate records and archives programs, and recordkeeping professional associations. These collaborative efforts have focused on the areas of policy and standards development at the national level, and have nurtured professional educational and development programs. Recordkeeping research has in turn contributed to the further development of best practice, and has provided a richer environment for professional education and development programs, and research training.

[43] "DSTC Project Proposal: Information Ecology," prepared by Peter Bruza, Tim Mansfield, and Nigel Ward, August 1999.