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ELECTRONIC RECORDS:
A WORKBOOK FOR ARCHIVISTS

INTERNATIONAL COUNCIL ON ARCHIVES
COMMITTEE ON CURRENT RECORDS
IN AN ELECTRONIC ENVIRONMENT

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Electronic Records: A Workbook for Archivists (ICA Study 16)

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PREFACE

In 1997, the International Council on Archives published the *Guide for Managing Electronic Records from an Archival Perspective*, (hereafter the *Guide*) which was prepared by the Committee on Electronic Records (1993-1996). That *Guide* provides the context for this *Workbook*: our approach has been informed by it. The *Guide* recognised that, worldwide, current records are increasingly produced in an electronic form. Since the publication of the *Guide* use of information technology for business processes and service delivery in private enterprises and public institutions has reached the stage where “the de facto record in many organisations around the world has become electronic.”¹

With the increasing number of electronic records in office systems, including networked environments, there is a growing concern about their maintenance and long-term preservation. In order to preserve electronic records, it is important that archival requirements are incorporated when systems are designed and that records are carefully controlled throughout their life cycle to ensure their ongoing quality and integrity. The *Guide* was designed to “help archival institutions reposition themselves to address the management of archival electronic records”² in the face of increasingly complex technological and organisational challenges.

The first part of the *Guide* describes that context and its impact on recordkeeping. It discusses key concepts, notably ‘record’ and ‘recordkeeping’, and their significance in an electronic environment. It starts by proposing a set of overall policies and strategies for the management of records through the life cycle and concludes with the technological implications of these strategies for archives.

To implement any strategy one needs a set of tools and methods. In the context of electronic records, this means manuals, model requirements, and standards. In the second part of the *Guide*, a first attempt at such an approach was made: it discusses records in a database environment, and the maintenance of availability, accessibility and understandability over the life cycle/continuum stages. This represented work in progress and it was hoped that “the contents of Part II will be expanded over time, and that it will form the basis for the development of a series of recommendations to guide archives at the ‘how to’ level”.³

It is in pursuit of this objective that the ICA’s Committee on Current Records in an Electronic Environment (subsequently referred to as the ICA Committee 2000-2004) has prepared this *Workbook*. It presents tactical approaches to managing records in electronic office systems, including electronic networked environments, and covers all types of electronic records across the life cycle/records continuum. Throughout, the emphasis is on the practical rather than the theoretical.

¹ John McDonald, Archives and Current Records; Towards a Set of Guiding Principles, *Janus*, 1999.1, (Paris, 1999), p. 110.

² International Council on Archives (ICA), *Guide for Managing Electronic Records from an Archival Perspective*, Paris 1997, p. 3.

³ *Ibid*, p3

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This is a work of many hands. A full list of participating Committee members appears at Annex A. Each chapter had one lead author and they are identified below:

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⁴ Kevin Ashley (University of London Computing Centre) worked for the Committee as a consultant rather than as a Committee member.

CHAPTER 1: INTRODUCTION

1.1 Background

The *Workbook* takes its governing principles and aims from the *Guide*, but it draws its terminology and definitions from ISO 15489-1 (Records Management). This International Standard focuses on records management: the archival perspective on some of the concepts is discussed further in Chapter 2, *Basic Concepts and Definitions*. Readers of the *Workbook* are encouraged to begin by studying the *Guide* and ISO 15489-1 and ISO/TR 15489-2.

At the core of this *Workbook* are the four principles first developed by the authors of the *Guide*⁵

- *The archives should facilitate the establishment of policies, procedures, systems, standards and practices designed to assist records creators to create and retain records which are authentic, reliable and preservable;*
- *The archives should be involved in the entire records life cycle (conception, creation, maintenance) to ensure the capture, preservation and continued accessibility of records identified as having archival value;*
- *The archives should manage the review of records in order to identify those of archival value; and*
- *The archives should articulate requirements for preservation and accessibility to ensure that archival records remain available, accessible, and understandable through time.*

Our aim is to provide practical assistance to all those who want to capture, preserve and make available electronic records. We do not claim to have undertaken new research. Rather, we have drawn on a wide range of standards, model requirements, handbooks, guidelines, and other publications, which we commend to readers. This *Workbook* also draws upon our own professional experience and on our contributions to other international projects in the field of archives and records management, in particular the work of ISO/TC46/SC11 and the International Research on Permanent Authentic Records in Electronic Systems (InterPARES). Where there are already publications and standards that cover a subject helpfully, this *Workbook* refers to those works rather than trying to replicate them.

1.2 Scope

The focus of the *Workbook* is on records, which are or should be created in electronic office systems or networked environments (i.e. documents or document-like information, including databases, objects of any form and format that are the results of activities and transactions of organisations and individuals). Hence our focus is on ‘born digital’ records or records which were digitised as part of a business process. Records which were digitised by archives in order to improve preservation and access are not the subject of this *Workbook*, although its recommendations on preservation may also be relevant to them.

⁵ John McDonald, ‘Archives and Current Records’, p. 111.

Records, whether private or public, are subject to legal regulation of one sort or another. The nature of that regulation varies widely from one jurisdiction to another. We note that, but do not attempt to discuss it here.

The *Workbook* gives advice on a technical level, but does not recommend specific software or hardware solutions. The fast changing nature of information technology applications in creating agencies means that any such advice would rapidly be out-of-date. Instead of offering specific solutions, the *Workbook* tries to raise awareness, to stimulate discussion and to contribute to the continuous improvement of archives and records management.

The *Workbook* does not address questions of appraisal in any detail, not least because many of the core principles associated with appraisal are common to all media.

1.3 Audience

The *Workbook* is written from an archival perspective. That is to say, it is addressed to everybody who has an interest in the management and preservation of electronic records with a view to their accessibility over the long-term. Many people engaged in that task will describe themselves as records managers rather than archivists: our work is addressed to them as much as those who call themselves by other professional descriptions. We want to give practical advice, especially to those who are concerned by the challenges of the evolving electronic environment.

The authors are, for the most part, familiar with national government and the approach recommended is particularly relevant to national archives as they come to terms with their new role in the electronic environment. But the analysis will also be relevant to the broader public sector and, indeed, to the private and voluntary sectors.

1.4 Benefits

Electronic records are an everyday and fast evolving feature of modern life. The *Workbook* assists archivists to address the challenges modern information technologies provide for archives. It offers orientation in a rapidly changing environment and tactical approaches to practical problems. Its aim is to help archivists to ensure the preservation of meaningful and viable electronic records for access over time.

In pursuing this aim, the *Workbook* shows

- how to influence electronic records management practices from a strategic perspective (Chapter 3);
- how to integrate recordkeeping functions into new or already existing systems (Chapter 4);
- different options for the preservation of electronic records (Chapter 5);
- how to provide access to electronic records over the short and long-term (Chapter 6); and
- how and where to find further information (Annex B).

The *Workbook* translates the principles of the preceding *Guide* into practice. Readers will be helped to

- take a strategic approach towards electronic records;
- develop archival policies in an electronic environment;
- co-operate in the design, implementation and administration of recordkeeping systems; and
- establish practical procedures for the preservation and accessibility of electronic records over time.

1.5 Framework and content

The core of our approach is set out in Chapters 3-6:

3 *Influencing Strategies in Records Management*

This chapter looks at what needs to be done from a strategic perspective in order to improve records management outcomes. It discusses different aspects of the records management environment, namely: policies, the legal and regulatory environment, partnerships with other organisations, the positioning of archives and resources. It argues that archivists and records managers will not be successful unless they co-operate and work to influence key decision-makers in an organisation.

4 *Implementing Recordkeeping Requirements in Current Systems*

This considers systems whether existing or in the planning stage. It advises readers how best to incorporate recordkeeping requirements into systems.

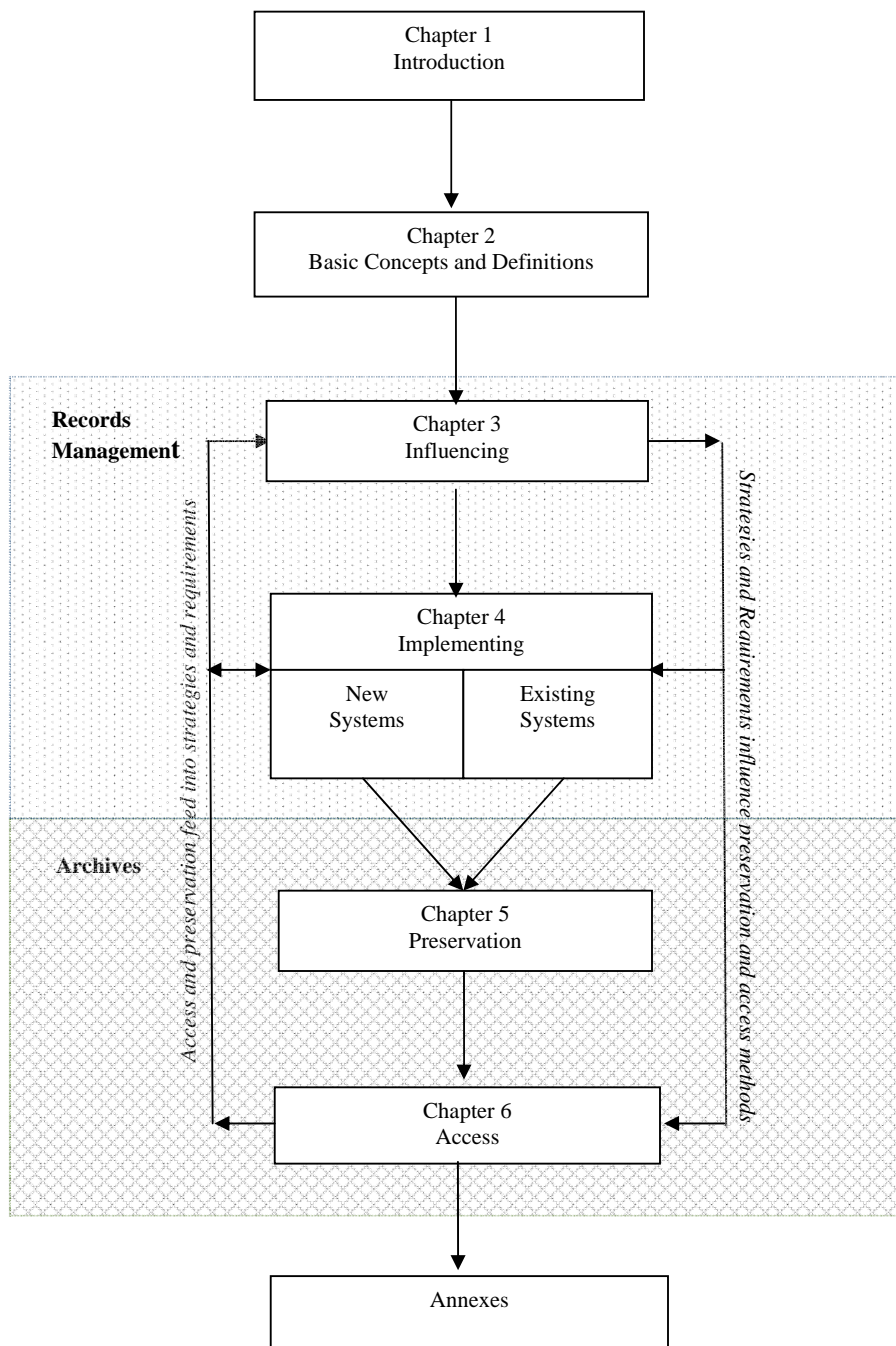
5 *Preservation*

This chapter treats long-term preservation in archives as well as in creating agencies. The merits of a range of techniques, preservation options, and storage choices (e.g. facilities, environment, quality control, formats, media etc.) are considered. The chapter also discusses the preservation of metadata.

6 *Access*

The literature on electronic records perhaps has least to say about the provision of access. By contrast, this chapter addresses the question of user needs, costs and service delivery options. Uniquely it relates access to preservation strategies.

All chapters of the *Workbook* are interrelated and dependent on each other. On the one hand, decisions on preservation methods and access strategies have a strong impact on influencing strategies and on the implementation of recordkeeping requirements; on the other hand, the strategic perspective on recordkeeping and the decisions taken when implementing recordkeeping requirements in information systems will heavily influence the scope of future preservation and access choices.



CHAPTER 2: BASIC CONCEPTS AND DEFINITIONS

2.1 Basic concepts and terminology

In general, the terminology used in this *Workbook* is derived from ISO 15489-1 (Records Management – Part 1: General). But a number of key concepts that are fundamental to the approach adopted in this *Workbook* were drawn from the *Guide* and were developed further by discussions in the ICA Committee 2000-2004. The concepts that are most important for the subsequent chapters are introduced briefly here.

Archival function

The preceding *Guide* defined the concept of archival function as follows:

*The archival function is that group of related activities contributing to, and necessary for accomplishing the goals of safeguarding and preserving archival records, and ensuring that such records are accessible and understandable.*⁶

The archival function exists independently from the archive as an institution. Very often, not only archives are concerned with the archival function. In an electronic environment, the activities related to the archival function start long before the creation of records, with the design of a recordkeeping system. Consequently, different partners can be (and are) involved in carrying out the archival function, “including (but not limited to) records creators, registrars, records managers and archivists.”⁷

Record

In many countries, national legislation defines a record, and these definitions have to be respected and applied in their corresponding legal environment. This *Workbook* is not written from a legal perspective; rather, it presents an archival approach to electronic records. Both *Guide* and *Workbook* are based on the key concepts of record and record-keeping. They apply to all records, regardless of format and medium. In the *Guide*, ‘record’ is defined as

*recorded information produced or received in the initiation, conduct or completion of an institutional or individual activity and that comprises content, context and structure sufficient to provide evidence of the activity.*⁸

This broad concept covers all the different types of records created in an office system. Records can occur in different forms and representations. They are usually represented as logically delimited information objects, for example, as distinct documents. But increasingly we find records in the form of distributed objects, such as relational databases and compound documents.

Records can be classified according to two criteria:

- by their function, i.e. the relation of files to different types of activities and transactions in an office environment. Examples include case files, court files, subject (activity-oriented) files, personnel files, correspondence files, web site documents etc.; and/or

⁶ *Guide for Managing Electronic Records from an Archival Perspective*, p. 25.

⁷ *Ibid.*, p. 25.

⁸ *Ibid.*, p. 22.

- by their form and format. Examples include word processed documents, databases, hypertext documents, images, spreadsheets, e-mails, voice mails, video etc.

A record has to be related to an activity carried out by an organisation or an individual, and “this activity and the function it supports determine the provenance of the record, and the record is evidence of that activity.”⁹ The *Guide* insists that all organisations need to capture and maintain records of their business functions to meet business needs and legal requirements. From that perspective, “the main purpose of records creation and recordkeeping is to provide evidence”¹⁰ for the functioning of an organisation or for the accountability of a corporate body or an individual.

To support business functions and to provide evidence, a record must possess certain characteristics. The *Guide* emphasised two characteristics:

- *authenticity*, defined as “the persistence over time of the original characteristics of the record with respect to context, structure and content”, meaning that a record is what it purports to be; and
- *reliability* as the ability of a record “to serve as reliable evidence”,¹¹ referring to the authority and trustworthiness of records as evidence.

Other sources, including the International Standard on Records Management ISO 15489-1 have also ascertained the significance of these qualities and added two closely related characteristics:

- *integrity*, referring to the fact that a record is complete and unaltered; and
- *usability*, defining the ability to locate, retrieve, present, and interpret a record.¹²

Records that possess these characteristics will have sufficient content, structure and context to provide a complete account of the activities and transactions to which the records relate, and they will reflect decisions, actions, and responsibilities. If such records are maintained in an accessible, understandable and usable manner, they will be able to support business needs and to be used for accountability purposes over time.

Structure

Central to our understanding of a record are two other concepts - structure and context. The concept of structure “is related to how the record is recorded, which includes the use of symbols, layout, format, medium, etc.”¹³ For electronic records, the *Guide* distinguished between physical and logical structure: whereas the physical structure of a traditional record is apparent to the user, it is not in the case of electronic records. The physical structure of an electronic record is variable and dependent on hardware and software; its logical structure (i.e. the relationship between its component parts) renders it intelligible.¹⁴

Context and Metadata

The *Guide* mentioned three aspects of the *context* of a record, noting that these are not necessarily complete:

⁹ Ibid.

¹⁰ Ibid.

¹¹ Ibid.

¹² ISO 15489-1 (Records Management), cl. 7.2.3 and 7.2.4.

¹³ *Guide for Managing Electronic Records from an Archival Perspective*, p. 22.

¹⁴ Ibid, p. 24.

*First, there is the contextual information, contained in the record (for instance, the signature of the executive officer). Second, there is the relationship between a record and other records in the fond. And third, there is the activity in which the record was created.*¹⁵

Contextual information links records to the administrative and functional environment (activities, processes) from which they were created, and to other records. The purpose of this is to provide:

- information which is necessary for a complete and adequate understanding of the records;
- information which is necessary for a complete and adequate understanding of the activities and transactions to which the records relate (e.g. responsibilities, accountability);
- information of processes associated with records (e.g. appraisal, migration, transfer of records etc.);
- information for the efficient management and preservation of records through time; and
- information for efficient retrieval of, and access to, records.

The contextual information also allows for the authenticity, reliability and integrity of the records to be proved. This is of particular importance for electronic records. The business processes and functions and the recordkeeping system of a record-creating organisation are part of the context of its records. Context can be preserved by internal elements of records (e.g. attached documents, annexed information, links, numbers and reference codes) or by external elements (e.g. metadata).

Metadata are a crucial part of contextual information. In the *Guide*, metadata are defined as “data about data”,¹⁶ whereas the International Standard on Records Management explains them specifically in the records management perspective as

*data describing context, content and structure of records and their management through time.*¹⁷

For electronic records the concept embraces all kinds of information, which are needed to make the record understandable and usable (e.g. system documentation which is required when records are migrated to new platforms, transferred to an archive etc.). Metadata can serve different purposes, such as retrieval, usability, authenticity, reliability, maintenance, preservation and appraisal. The *Guide* states that for electronic records, metadata are particularly important, because they establish “the relationship between a record and its functional and administrative context. Thus, electronic records are heavily dependent not only on a well-documented administrative context, but on metadata describing how the information is recorded.”¹⁸

From the point of view of an organisation that creates and manages records, metadata may be considered in two categories:

1. metadata which provide contextual information on the business; and
2. metadata which reflect the management of the record after its capture and storage.

Each of these requires distinct metadata elements.

¹⁵ Ibid, p. 22. Metadata are further discussed later in this *Workbook*. See especially Section 5.3

¹⁶ Ibid, p. 24.

¹⁷ ISO 15489-1 (Records Management), cl. 3.12.

¹⁸ *Guide for Managing Electronic Records from an Archival Perspective*, p. 24.

Electronic recordkeeping systems

Different kinds of electronic office systems are used in records creating and managing organisations. They can focus on information retrieval (e.g. document management systems) or on supporting the business processes of an organisation (e.g. workflow systems). Electronic recordkeeping systems can also include stand-alone, non-networked systems. In a modern office context, however, they are usually embedded in distributed networked environments on different levels. This can start with a distributed client-server environment in an organisation, sharing applications and services by decentralised work stations; continue with the integration of this network into an intranet-environment, at which different organisations can participate (e.g. all government agencies); and end up with an Internet-based information network. Instead of constituting different stages, all three levels of distributed, decentralised networking systems can exist simultaneously and manage information of different levels of sensitivity and security in separate network environments.

Particularly in distributed, decentralised networking environments, it becomes increasingly difficult to identify, capture and maintain authentic and reliable records, especially as changes in organisational structures, processes and communications, and the interaction between technology and organisations, have a profound impact on records management. These trends are also changing the types of records being created, the relationships between electronic records and records in traditional formats, the ways in which records are controlled and managed, and the patterns of access and use.

In order to provide evidence, tools are needed to preserve records and make them available for use. A recordkeeping system should be an instrument that governs records management functions through the entire life cycle/records continuum. The *Guide* described a record-keeping system as:

*an information system that has been developed for the purpose of storing and retrieving records, and is organized to control the specific functions of creating, storing, and accessing records to safeguard their authenticity and reliability*¹⁹.

Recordkeeping systems guarantee the maintenance and preservation of authentic, reliable, and accessible records over time. If systems are to fulfil these requirements then appropriate recordkeeping functions must be implemented throughout the life cycle/records continuum.

¹⁹ Ibid., p.23

CHAPTER 3: INFLUENCING

3.1 Aims

This chapter aims to:

- provide a basic checklist of strategic issues archivists should address when seeking to influence their organisations on electronic records issues;
- describe the basic records management issues that an archival programme should address and suggest tactics for doing so;
- suggest approaches to implementing an archival electronic records programme;
- identify those technical and skill resources necessary to carry out the programme; and
- provide archivists with resources to intervene effectively to promote good recordkeeping.

3.2 Abstract

Archivists have as their mission the preservation of records of continuing value and the provision of access to those records. However, that does not mean that archivists should remain on the sidelines until the time arrives when an organisation feels that it no longer needs the records. It has been an axiom of archival science that good archives are based on records that are created and managed well by the creating organisation. Although this was true in paper, it is even more important in the electronic era where lack of planning can doom electronic records to an early grave. It is also axiomatic that archivists must be involved early in the life cycle/continuum of records if they are to have an impact.

This chapter looks at what needs to be done from a strategic perspective to improve the management of records prior to transfer to archival control. It focuses on different areas of the recordkeeping environment, including policy, the legal and regulatory environment, partnerships with other organisations, the positioning of archival institutions and resources. The benefit of early interventions to influence records management strategies is also addressed.

In brief, archivists must work within their organisations to ensure that:

- authentic and reliable records documenting organisational activities are created; and
- the integrity and usefulness of those records identified for archival retention are maintained until the records are transferred to the archive.

To focus the approach taken here, we look primarily at national government and at the role of national archive institutions in the electronic environment. But the discussion will also have relevance to private and voluntary sector archives, and to archives in other parts of the public sector.

3.3 Key Issues

The core of this chapter describes the environment in which archivists will typically find themselves as they begin to deal with electronic records. The chapter is arranged hierar-

chically to allow for a systematic deductive journey from archival principles to an actual programme. The steps are as follows:

- identifying archival and recordkeeping principles;
- determining strategic considerations;
- selecting implementation issues;
- addressing technical issues; and
- developing appropriate skill sets.

Each section will contain both general guidelines and specific suggestions.

Identifying Archival and Recordkeeping Principles

An archival electronic records programme must be solidly grounded in archival principles. The four principles articulated by the former ICA Committee and cited in Chapter 1 form the basis for the approach discussed here. But in order to influence the creation and management of records in government, archivists need to supplement these four principles with additional ones focused specifically on recordkeeping and records management. Fortunately, the ISO Standard 15489-1 enumerates the areas of common concern and establishes the agenda for common action between records managers and archivists. The ISO standard provides the following three principles for records management programmes:²⁰

- *Records are created, received and used in the conduct of business activity. To support the continuing conduct of business, comply with the regulatory environment, and provide necessary accountability, organisations should create and maintain authentic, reliable, and usable records, and protect the integrity of those records for as long as required;*²¹
- *Rules for creating and capturing records and metadata should be incorporated into the procedures governing all business processes for which there is a requirement for evidence of that activity; and*
- *Business continuity planning and contingency measures should ensure that records that are vital to the continued functioning of the organisation are identified as part of risk analysis and are protected and recoverable when needed.*

ISO 15489-1 serves as an internationally recognised framework for developing a records management programme.²² The Standard can serve as the basis for promoting recordkeeping whether or not a country has an existing tradition of records management as a separate discipline. The value of the ISO Standard is that it can be implemented in a variety of environments. The records management programme described in the ISO Standard will form an excellent foundation for the creation and maintenance of good archival records. Specifically:

- records that are created to meet the requirements in Section 7 of the ISO standard will serve archival purposes well;
- the characteristics of a good recordkeeping system are common ground for developing systems that meet both current recordkeeping and archival needs; and

²⁰ ISO Standard 15489-1:2001(E), Section 7.1.

²¹ The standard itself provides additional detail as to how this should be done.

²² The ISO Standard specifically excludes the management of archival records from its scope. However the document itself draws heavily on established archival (particularly electronic archives) thinking. It therefore provides an excellent foundation for archival cooperation with records management programmes.

- the system capabilities discussed in the Standard (Section 8.3) will provide sufficient basis for creating and maintaining records that meet archival needs as well as those of creating organisations.

Determining Strategic Considerations

Archivists who want to be involved in electronic records need to remember four basic tenets that are critical to their success. These will form the basis of their strategic vision:

- the key to a successful programme is having a clear strategic vision, a realistic understanding of the programme's abilities, and the flexibility to adjust to changing priorities and customer needs;
- to succeed, archivists must be opportunistic and interventionist;
- archivists must add value and provide services to their customers;
- neither archival nor records management concerns will stand well on their own as separate business priorities. Instead, they should be understood and promoted as essential if organisations are to attain their wider goals: public authorities and companies cannot operate effectively without records and records management and archival processes are essential to achieving those goals.

Developing a Strategic Vision

A strategic vision for electronic records must take into account two perspectives: the archival vision of what it hopes to accomplish and the reality of the organisational context.

The strategic vision should be rooted in the archival and records management principles presented in **Identifying archival and recordkeeping principles** above. However, the archives' current and planned capabilities and the organisational situation in which the archives operates will determine the short to mid-range goals that archives should promote and the approach it should take in attempting to influence decision-makers. The archival and recordkeeping principles articulated above may not all be attainable in the short-term and archivists need to think clearly about making incremental improvements while maintaining a constant direction.

Governmental Perspective

Archivists working in national government must work within the strategic direction taken by the administration they serve. The starting point is to understand those of the government's objectives, which affect or are affected by recordkeeping. Archives can then place themselves and their services in the context of those objectives. Common long-term strategic policy goals might include improving citizen service through electronic government, increasing the level of citizen confidence in the government through better accountability, facilitating citizen access to government information, or improving the information infrastructure. In the area of information technology common governmental goals include improving data and information management practices, making cost effective use of technology, improving the level of technology support to government decision-makers and employees, and making electronic services more available to the citizen.

Any or all of these initiatives would benefit from the application of archival and recordkeeping principles, but this may not be understood readily by decision-makers. How and where archivists try to influence recordkeeping policy and practice will depend on a number of factors, including:

- Government's organisational infrastructure: is the decision making process heavily centralised or are individual government organisations relatively independent?
- Government's technical infrastructure: does the government aspire to a single infrastructure or a decentralised infrastructure where each organisation is free(r) to do what it wants to meet its own needs? The more government embraces a standard infrastructure, the easier it will be for archivists to assist the government in developing strong recordkeeping.
- What is the level of readiness for and interest in recordkeeping on the part of the government and organisations within it? If government has a history of attentiveness to recordkeeping, archivists will have a firm foundation on which to build and can use that to build their influence.
- How developed are records management programmes within government and its organisations?

In governments where the structure is heavily centralised and information technology is centrally purchased and administered, archivists may choose to work through central policy and acquisition organisations to influence governmental decisions that will improve the level of recordkeeping within government. If the government is less centralised, archivists will necessarily have to work through individual influential organisations in a bottom-up approach, creating showcase successes that can be built upon in future initiatives. While the two approaches are not necessarily mutually exclusive, archivists will need to assess which one will provide the most results with the resources available to the archives.

Archival Perspective

In developing its approach to influencing how governments create and manage electronic records, the archives should evaluate the following basic questions about itself:

Orientation:

- How does the archives plan to position itself within the government? Possible roles might be as trusted third party custodians of records, as a service agency, or in an oversight or audit capacity. These roles are not mutually exclusive, and will depend to some extent on the opportunities available to the archives.
- In the near term, who is the principal customer for the archives (e.g. the central governmental administration, individual organisations within government, IT units within organisations, or operational units in organisations)? Although archivists may want to have the central administration of government as their major customer, they may find that the operational units within organisations may be the customers most willing to work with them.
- What is the near-term goal(s) for the archives? One or more of the following could serve as near-term goals: saving important records; building a basis of support for archival ideas within government; strengthening the legal basis for the archives' involvement with electronic records; facilitating specific recordkeeping initiatives such as e-government; or moving the government from the level of data or information management to recordkeeping.
- Do the archives want to provide custodial services for archival electronic records, either through in-house capabilities or through contracts with commercial or other providers? The ability to provide these services will allow the archives greater flexibility in determining its role within government, because the absence of such capabilities will limit the role the archives can play.

*Staffing:*²³

- Are the archival staff able to influence government decision-makers and provide assistance to government in the development of policies, procedures, and other structural improvements to support electronic records management. If so, this will allow the archives to undertake an active programme to influence government from a top-down perspective.
- Are staff in a position to (and able to) assist government organisations in resolving specific archival electronic records problems? These might include helping organisations to determine appropriate documentation (e.g. metadata) for electronic records or decide on their proper retention.
- Are staff able to assist government organisations in resolving technical problems related to records management and archives such as the selection of the best software for recordkeeping functions or determining how best to migrate records from one platform to another?

The goals enumerated above do not have to be attained at the beginning of a government's transition to electronic recordkeeping. In many cases they will be achieved only over an extended period of time as governments learn from hard experience the value of good records management.

Selecting Implementation Issues

Recordkeeping is essential to all governmental activities. However, many managers do not see the documentation they create as 'recordkeeping', nor do they consciously connect recordkeeping with records management and archives. Records managers and archivists face a three-step process to bring records management and archives to the attention of government managers. They should:

1. help managers make the connection between the business they do, the documentation they keep, and recordkeeping;
2. explain to them the roles of archivists and records managers and the expertise and assistance that the professions have to offer; and
3. incorporate records management and archives into the organisations' work rather than have it as a stand-alone function.

These points suggest two important lessons. First, records management and the archival agenda are more palatable to managers if presented in terms of advantages rather than requirements. Few records management or archival programmes have strong enforcement powers. Archivists and records managers do better if they present themselves as resources that will help managers do their jobs better rather than auditors who are checking for compliance.²⁴ Second, records management and archival concerns can be incorporated into the existing priorities of business managers. The objective should be to secure managers' recognition that records problems have to be resolved if they are to succeed in their role.

There is no single 'approved' approach to implementation. What follows are some suggestions about how archivists could go about implementation within government.

²³ For more information on staffing, see Section 3.4 (Skills) below.

²⁴ This is not to say that archivists and records managers should not evaluate compliance with statutes and regulations. Audits are a useful tool and may be the only message some managers will hear. However, the most successful records management programmes do not lead with the compliance argument.

Legal and Regulatory Environments

This section assumes that the archive has a legal standing within the government. It is also desirable that records management should have legal recognition. Both should be sufficient to support the principles articulated above, the *Guide* and ISO 15489-1. If that is not the case, developing that legal framework should be an early priority.

In designing a legal framework for electronic recordkeeping a number of core principles suggest themselves:

- *clear definition of a record*: both the *Guide* and the ISO standard provide definitions that can form the basis of a definition of government records;
- *accountability for recordkeeping*: laws should require that government officials maintain records of their activities to allow for accountability;
- *appropriate access to government records*: access by stakeholders and constituent groups is a powerful tool for promoting recordkeeping. While sensitive records may need to be protected from disclosure for a period of time, archivists and records managers should cooperate to ensure that eventual disclosure of such records is assured if they are part of archival holdings; and
- *protection of personal privacy*: records managers must protect the privacy of individuals, but archivists and records managers should work together to ensure that laws protecting privacy do not lead to the permanent closing or destruction of records of archival value.

The ISO Records Management Standard identifies five levels in the regulatory environment: statutes and governmental regulations; mandatory standards of practice; voluntary codes of best practice; voluntary codes of conduct and ethics; and community expectations.²⁵ Archivists should attempt to introduce archival and records management principles into any or all of these levels of the regulatory environment, drawing upon the many models that currently are available through publications and web sites. While statutory authority may appear to be the most dependable sources of support, building support for voluntary standards may be equally effective and easier to accomplish.

Policies and Responsibilities

In this context, policies are defined as mandatory practices within a specific individual organisation or group of related governmental organisations (e.g. bureaux within a single department). Archivists should work with decision-makers to ensure that the organisation has the necessary policies in place to support both its records management and archival programmes. This can be achieved either through work with central decision-makers within an organisation or by helping individual programme managers solve recordkeeping problems that can then serve as a stimulus for broader organisational change. Depending on the situation in which the archives finds itself, it may be more effective to work bilaterally with specific organisations that produce particularly important records, rather than first trying to develop a government-wide policy on electronic records. Small successes can provide the platform for bigger steps forward.

Policies may be organisation-wide or based around a function or component. The key to effective records management (and archival) policy is that it should be tied closely to the business process that creates the records and which the records must document. Hence policies may exist on a variety of levels, from the level of the organisation itself (e.g. what is a record, what standards must be employed when purchasing/developing electronic systems?), to the sub-organisational level (e.g. what data standards must be em-

²⁵ ISO Standard 15489-1, Section 5.

ployed?), to the level of the individual system (e.g. how will the system ensure integrity, access and privacy requirements?).

Archivists must take particular care to intervene in the following aspects of policy formulation:

- the development of a policy for the management of the life cycle of records;
- the specification of roles and responsibilities in the management of records identified for archival retention; and
- the determination of penalties for the destruction, alteration, etc., of records identified for archival retention.

Developing Recordkeeping Systems

Policies provide the framework for archival involvement in the creation and management of current records, but implementation is at the recordkeeping system level. ISO Standard 15489 contains an extensive list of policy issues and suggested requirements that archivists can use as a basis for cooperation with records managers in promoting good records management as the basis for the creation and preservation of sound archival records. Within the policy framework of ISO 15489, archivists should focus on a number of life cycle/continuum issues:

- the development of new systems so that they can identify those which will create records of archival value and ensure that those systems will support their preservation and continued accessibility;
- the operation of systems in which archivists need to monitor systems management to ensure that all parts of the archival record (e.g. the records themselves, related metadata, and documentation of how the system operated) are properly maintained and so that no changes are made to the system that would affect the archival quality of the records;
- decisions concerning modification, upgrading, migration, and other changes to the system (e.g. changing hardware or software platforms) could affect the authenticity and integrity of the records, the ability of the system to preserve the records, and the ability of the archives or the creating organisation to provide for long-term accessibility to the records; and
- decisions to discontinue systems containing archival records or to remove archival records from those systems.

Partnerships

When working from the bottom upwards it is critical to forge successful partnerships. These may arise from a range of problems (e.g. from the appraisal of a backlog of records or from the need to migrate data successfully). The benefits of this sort of co-operation can be experienced on three levels: ensuring the preservation of archival records, developing a success story that can lead to future partnerships, and/or developing a tool that can be used in other situations.

Although time consuming, this micro-level involvement has proved to be an effective way of ensuring that authentic archival records are created and preserved. An example of a successful bottom-up approach was the archival community's work with the U.S. Department of Defense (DoD) to develop a records management standard (DoD Standard 5015.2). This has set requirements for any records management software purchased by DoD agencies. Even though this standard does not have a formal mandate beyond the DoD, it has become a virtual industry standard used by software manufacturers in product development.

Archivists should always seek to balance this approach with a more macro-level involvement with those government organisations that have government-wide responsibilities. Examples include organisations responsible for information policy, information technology standards, government-wide information architecture, access to government information, public management standards, and government audit.

Cooperation with such organisations can yield a range of benefits. First, they can provide archivists with top-down support that can make the bottom-up system-by-system work more effective. Secondly, these organisations can provide the policy foundation that gives archivists the leverage they may need to achieve initial cooperation from individual government organisations or systems managers. Thirdly, experience has shown that if archival requirements are bundled with those of other organisations (e.g. in general information system development policy) they reach a larger audience and have a better chance of being implemented.

To be successful at the macro-level, archivists will need to be able not only to articulate their requirements, but also to explain what they can bring to the table that will be of value to prospective partners. Potential contributions will vary according to specific circumstances, but the following are some of the ideas used successfully by archivists in other situations:

- archivists take the broad view of how the entire government documents its activities. This overall view is a potential resource for policy makers and others;
- archivists have pioneered many of the concepts now of interest to the records management and information technology communities such as authentic and reliable records;
- archivists can be the trusted third party serving as the custodian of records which are needed by the government, but are no longer required for active business; and
- archivists are experts in identifying the long-term value of records and the usefulness of records to others besides their creators.

3.4 Addressing Technical Issues

In considering technical issues, we will look first at government-wide issues and then at the archival dimensions of technical questions.

Government-wide issues

Archivists should attempt to influence governments to improve recordkeeping in respect of technology implementation. Archival and recordkeeping principles support good data and information management and vice versa.²⁶ Archivists should be aware that many governments will not be ready to address true electronic recordkeeping. However, they may be interested in archival input to improve data and information management. For example, data managers will look to archivists to help them resolve a traditional archival and records management issue – which records need to be retained and for how long? Archivists can perform a valuable service by helping government organisations develop retention and disposition plans for their major electronic systems.

²⁶ For an introduction to the relationships see Dagmar Parer, and Keith Parrott, "Management Practices in the Electronic Records Environment" *Archives and Manuscripts*, Volume 22 (May 1994): 106-22.

Archivists would do well to make common cause with those technological managers who support government-wide standards for interoperability of systems, standardisation of data management, and similar initiatives. Some common issues for intensive archival activity include the following:

- *Information sharing*: everyone benefits when governments support information sharing among departments and with external groups. Information sharing leads to the development of common standards for electronic records, and better documentation of systems. Information sharing supports common data definitions and standards and document interchange standards, all of which support improved records and archival management.
- *Document transportability*: a major electronic records issue for archivists is the management and preservation of documents created in office automation applications (e.g. word processing, electronic mail, etc.). This has more recently become an issue for information technology specialists, primarily because of the advantages for document exchange throughout the government. One of the promising approaches is the content mark-up approach (e.g. using eXtensible Markup Language (XML)). Archivists should support such initiatives because the mark-up approach offers advantages both for recordkeeping and for archival preservation.
- *Common information architecture*: requirements in law or regulation require common approaches to electronic signatures, communications and the like. In short any common architecture components are better than none. Architecture developers need to be made aware that recordkeeping is an essential component of information management and that recordkeeping will require additional 'overhead' to ensure authentic and reliable records. Developing an architecture that enables and simplifies this will facilitate electronic recordkeeping.
- *Standard software packages*: government-wide regulations which support the development of common software suites, electronic mail systems, and other common infrastructure components, will offer benefits to records managers and archivists.
- *Document conversion*: archivists have long provided standards for conversion of documents to microform. They should be just as actively involved in developing standards for document conversion and the identification of metadata for management of government documents.
- *Records preservation*: in a paper-based world, archivists physically preserved records, and were regarded as experts in the preservation of records. Others within government will still look to archivists for input on this issue and discussion of preservation options is an opportunity for archivists to influence a range of recordkeeping issues.
- *Systems development guidelines*: to ensure recordkeeping, records managers (and archivists) need to be involved in the development of electronic recordkeeping systems, either directly or indirectly through regulations and policies, which require incorporation of recordkeeping requirements.

Archival Issues

Archivists must determine whether to undertake a custodial function for electronic records and, if so, whether to do it in-house or to contract for the service.

To be useful players in the preservation of electronic records, archivists must have the capability, however provided, to preserve archival records. A non-custodial approach may have merit if the creating organisation has both the will and the ability to provide for the long-term preservation of its electronic records. However there are few examples

of government organisations that will go to the expense and effort to preserve and make available electronic records that they are no longer using on a regular basis. But through whichever route archivists must be in a position to provide for preservation and access if only as a last resort, because that last resort will come sooner or later.

The choice between in-house and contracted services will depend on the particular circumstances the archives faces. To make a thorough analysis of the choice, it would be necessary to have firm data on the volume of records to be preserved, the types of data, potential access requests, as well as the ability of the archives to recruit and retain staff to handle the preservation. Initially, contracted services may be easier to obtain and less expensive. But any costings need to be made over the long-term if they are to be meaningful, and if government is to make a strategic response to the challenge of electronic records.

Developing Appropriate Skills Sets

Archivists need to think in terms of four basic skill sets: archival, electronic records, technical, and 'soft'. The first three sets of skills are necessary to give the programme credibility; the final is needed to be effective in influencing governmental partners and customers and in promoting the archival agenda. There is no predetermined ratio between skills within this mix, and much will depend on which skill sets are available for hire or whether the archives has staff who are willing and able to learn the necessary skills. But we should be clear that archives will not succeed in their mission unless they have access to each skill set. A technically competent archive, which cannot influence partners, to take one example, will fail.

Archival Skills

Fundamental to all work with electronic records is the knowledge of basic archival and records management principles and techniques. The partners and customers within government will expect that archivists have these skills and that they can apply them to the questions and problems the government faces. Many of these challenges are the same as those governments faced in pre-electronic times: what constitutes sufficient documentation of business activities, how can that documentation be created and maintained most effectively and efficiently, when can records be destroyed, and what needs to be preserved? Unless archives can mobilise the basic archival and records management skills they will lack credibility in government. That means that archives staff must be able to assist government in developing policies and government-wide practices that form the basis of the government's approach to electronic records and they must have the ability to apply them to solve specific problems. These are separate (though related) skills, and archives must have both. These abilities should be acquired or developed in-house.

Electronic Records Skills

Archives and their staff must be able to understand the fundamental archival principles and practices and how those principles are changed, reformulated, and/or expanded to deal with electronic records. What does this mean in practice? Examples include the ability to:

- understand and articulate what it means to undertake electronic recordkeeping;
- understand and articulate what it means to preserve electronic records over time, including preserving each of the components of electronic records (e.g. data, software, documentation), and successfully migrating records to new platforms;
- to determine system requirements for electronic recordkeeping and preservation of electronic records; and

- to walk programme staff through the process of determining what is and should be an archival record in an electronic context.

Again, these skills are best acquired or developed in-house.

Technical Skills

The archival and records management skills described above will allow archivists to explain what needs to be done to create and manage electronic records. In other words this capability enables them to participate in determining system requirements. However, those skills are not necessarily sufficient to provide guidance on how to meet the requirements. That requires technical skills in the areas of systems design, data management and software development.

Typically archivists may be asked what software would be best for meeting recordkeeping requirements. The ability to match requirements to appropriate software solutions is a valuable skill to have either in-house or on a contractual basis. However, providing this type of assistance is far too labour intensive for any archives except on a very limited basis for specific projects. Archives management would be better served to find some way to leverage archival expertise so that archives staff do not have to participate directly in systems development activities. One approach would be to train systems developers in records management principles so that they are able to develop effective recordkeeping solutions for their government clients. Another would be to develop checklists or tool kits that would walk organisations through the process of developing recordkeeping requirements and identifying possible solutions. Several archives have developed such tools, and development or refinement of such approaches could be effected by archival staff augmented by specialists brought in on a short-term basis for their specific expertise.

Management and People Skills

Recent surveys of archives managers indicate that management and people skills are critical to the archives' ability to influence government and its government partners. The most sought after skills include the following:

- visioning skills: the ability to see the big picture, to understand the strategic direction of government as a whole and individual organisations, and explain how archival and records management principles support government action;
- communications skills: the ability to present the archival perspective orally in briefings and training or in writing as policy, requirements, or guidance;
- negotiation skills: the ability to negotiate with partners to achieve win-win solutions that move the archival and organisational goals forwards;
- consulting skills: abilities to work with customer organisations as consultants to solve their problems as well as meet archival objectives; and
- political and tactical skills: the ability to judge how best to influence government and with whom one should work to secure an archives' objectives.

Typically, many national archives have weaknesses in these 'soft skills'. Their staff may not have worked elsewhere in government, particularly at a senior level. It may be necessary to buy-in these skills through targeted recruitments or secondments from elsewhere in government. Not to do so leaves the archives exposed to failure.

3.5 Readiness Assessment

The question of readiness is not whether an archive is ready to begin work in electronic records; one is never fully ready. Rather, the question is *what* the archives is ready to

attempt. Any assessment needs to consider two aspects in making this determination: government's readiness to adopt electronic recordkeeping and the archives' readiness to assist them. No matter where the government is on the readiness continuum, there are things that the archives can do to promote the archival mission.

Government Readiness

Government in general may not be ready for full electronic recordkeeping. That is to say it may not be ready to create records that have authenticity, reliability, integrity and usefulness. The government might find those issues far too remote because it is still wrestling with more basic issues of how to provide *any* information over time. Archivists need to meet government organisations where they are and help them resolve the issues they face.

The two stages prior to electronic recordkeeping are data management and information management. Archivists can provide useful services in both and, in doing so, promote the archival mission:

- *Data management:* Archivists can help government and individual organisations deal with basic data management issues (e.g. data migration, system documentation, and understanding the record components needed to be able to access and use data over time). Simply convincing government organisations that data constitute government records is a major hurdle for archivists. Archives can provide services in preservation, working through what needs to be retained and what is disposable from the perspective of the business process and with a view to good recordkeeping.
- *Information management:* archivists should assist government organisations struggling with information management by supporting government initiatives promoting information sharing, securing information, information quality, maintaining understandability, document transportability and interoperability.
- *Recordkeeping:* for governments that are ready to implement electronic recordkeeping, Section 8 of the ISO records management standard provides the basic guidelines for developing electronic recordkeeping systems. See also Chapter 4 below.

Archives' readiness

Any archival readiness assessment should focus on determining what the needs and opportunities are that the government faces and whether the archives has the resources necessary to respond effectively. The archival resources include both staff skills and the institutional infrastructure necessary to assist government in addressing the problems they face and/or promoting the archival perspective within government.

3.6 Next Steps

Archival managers should begin the process of addressing electronic records by taking the following steps:

- adopt ISO Standard 15489-1 as the basis for records management within government and promote it across government;
- resolve the questions about government's recordkeeping strategy to provide a framework for developing a tactical plan for influencing government recordkeeping;
- identify the tactical issues the archive needs to address and develop an action plan with milestones to chart progress towards the goals;

- develop technical capabilities to meet the tactical and strategic objectives;
- assess and then develop necessary skill sets; and
- conduct pilots to test capabilities, and to develop experience and to *learn*.

3.7 Readiness Scenarios

This section considers the three contexts, which, archivists may typically encounter:

- recently established archival institutions;
- established archival institutions that have not begun to address electronic records; and
- archival institutions which have a fledgling electronic records programme that needs to advance.

Each has different requirements and each offers different opportunities. This section will look briefly at how archivists might respond positively in each of those situations using the measures set out in **Next Steps** above and the approach discussed in the rest of this chapter.

Recently Established Archival Institutions

Many archivists have found that when they are just getting started (or just getting started working with records creating organisations) electronic records can provide them with leverage, which paper records would not. Rightly or wrongly, many records creators think they know how to manage paper records and would be wary of outside interference. By contrast, most clearly appreciate they do not know how to manage electronic records and they appreciate any assistance they can get. The good news for the archivist new to the field is that in many cases the assistance records creators are seeking is not electronic records specific. They typically need assistance in determining records retention periods, preserving valuable records, and improving how they create and manage records generally.

Assuming that the archives have sufficient statutory authority to be involved in electronic records, the new archival institution has little choice but to get on with the task. There will never be a perfect time to get involved in electronic records and so the best advice is to simply get started. There are advantages in this situation. Most records systems include records in both paper and electronic form and so there will not be the need to choose between the media. The archives will simply be seen as the institution that offers answers to recordkeeping issues. Internally there will be no pre-existing patterns to break down and staff will start from the beginning working in records systems.

Obviously, when one is getting started one will need to take the opportunities offered. However, if you are given a choice (or there are no opportunities and you have to create ones) focus on one or two systems of records of obvious archival value in any medium. If the records systems are established and working well involve the archives in planning for the long-term preservation of the records as they exist. If the systems are under development, seek to involve oneself in the systems development process to influence records creation.

A successful pilot project will offer a number of benefits. It will provide a success story one can leverage within government to get additional opportunities and resources, training and experience for the staff. And lessons learned can be used to lobby for additional regulatory and statutory authority in recordkeeping issues.

Established Archival Institutions new to Electronic Records Management

If an archival institution is already recognised as a participant in the management of paper records, the biggest challenge may well be finding a way to move customers and staff beyond a successful paper-based programme to include electronic records. This will involve changing attitudes within the government as a whole and the archival institution itself. Both customers and staff may be comfortable in seeing the archives as the institution that deals with paper records, and this stereotype will need to be challenged.

A recommended first step is to begin the process of reorienting the staff to look at electronic records issues as well as dealing with paper records. This will involve both training and leadership. This may be challenging but it is absolutely necessary. The parallel initiative must be to educate existing customers within government that the archive now deals in all records, not just old paper. This is best done by providing examples of how their records are changing and of how the archives is simply expanding its mission to keep pace with the changes in government generally.

While a pilot that assists a specific government bureau in managing its records is always useful, the established archives should think more broadly about a pilot or project that will benefit existing customers. One possibility would be new regulations that help address a common problem such as electronic signatures, preservation of scanned images or another technology-related challenge that records creators must deal with on a day-to-day basis. Products might range from a training programme on how to manage electronic records, a checklist for developing new records systems, or guidance in selecting software or imaging systems.

While this may seem overly ambitious for an archival institution that is just entering the electronic age, many good products in these areas already exist and are available from other governments and then frequently downloadable from their web sites. Typically such products will need to be tailored for each context. The archive thus becomes the retailer of electronic records guidance, not the creator. At the same time, archive staff can learn from the project and become comfortable providing assistance on common electronic records issues, combining their established understanding of their customers' business processes and their familiarity with proven approaches to archival problems developed by their colleagues in the archival community. But lessons learned from other environments need to be adapted if they are to work in other contexts.

Archival Institutions with a Fledgling Electronic Records Programme

If the archival institution has an active electronic records programme, the question is how to go further. Three options are set out below:

- develop a three to five year plan for a systematic analysis of the systems within government and the appropriate archival actions with respect to those systems;
- develop a three to five year plan that tracks the government's IT investment plan so that the archives' guidance and/or policy is in step with the government's IT investments and can assist the government in deploying those IT investments; and
- invest in participation in international archival research and development projects. For existing programmes, participation in international archival ventures may be the easiest way to remain (or become) current in electronic records developments that can be applied in one's home institution.

3.8 Evaluation

There are a number of key indicators one might adopt to determine whether an archive is becoming more influential in meeting its electronic records objectives. They are best considered in two categories, according to the approach followed:

- *Top-down indicators*
Does the archives have sufficient legal authority to support its desired role in electronic recordkeeping?
Has the archives been invited to participate in government-wide policy development where this is appropriate?
Do government organisations use the policy, guidance or other tools the archives has developed?
- *Bottom-up indicators*
Are the partners in joint efforts satisfied with the archives' assistance?
Did the partnerships meet the archives' expectations?
Have the partnerships produced products that can be used by other organisations, thereby leveraging the effort put into developing them?
Did the partnerships spawn other partnerships with other organisations so that the circle of customers and potential allies has grown?
- *Common measures*
Have the skill sets of the staff improved to the point that they can attempt more difficult assignments?
Has the infrastructure to support the programme been equal to the task?

3.9 Summary

This chapter has illustrated the scale of the challenge facing archives and archivists in the digital age. To succeed in their mission they must re-imagine themselves and their relationships to record-creating organisations. This challenge is not optional: unless they develop solutions to the electronic recordkeeping needs of their clients, they will lose influence and relevance. But if they respond strategically, repositioning themselves institutionally and professionally, their prospects are good. To do that they must acquire new skills – and learn to work with others who have the range of skills needed to manage electronic records. Above all, they must learn how to influence record creators: in the digital era it is simply unsatisfactory to hope to manage records from late in the lifecycle/continuum. Passive, or deferred, records management leads only to irrelevance.

CHAPTER 4: IMPLEMENTING RECORDKEEPING REQUIREMENTS

4.1 Aims

This chapter:

- describes the issues archivists are facing when addressing requirements in new or existing information systems;
- helps archivists to identify the archival requirements for current recordkeeping systems in a given context; and
- provides a framework for action by archivists.

4.2 Scope

Chapter 3 stressed the importance of archivists' intervening in the conception and implementation of recordkeeping systems in order to ensure that all archival records, which a system will create, are preservable as authentic, reliable, and usable records. Archivists should focus especially on those recordkeeping systems that are thought to be creating records of archival value. They should monitor these systems through their life cycle and participate in all major decisions concerning the systems to ensure that archival records keep their essential characteristics until they are transferred to the control of an archival authority.

Archivists' interests in current recordkeeping systems focus not only on the preservability of archival records, but also on their quality, that is to say their enduring authenticity and understandability. Accordingly this chapter will not make an explicit difference between archival and recordkeeping requirements. But it will maintain the archival perspective, dealing only summarily with issues, which are exclusively of importance to records managers.

In this chapter 'records' are defined from two different perspectives. In general terms, records are all recorded information created or received while carrying out the organisation's business. But more precisely, records may be defined as information, which is formally determined according to the rules of the organisation to be the records of the respective business process.²⁷

The chapter is mainly structured by analogy to the design and implementation steps the ISO 15489 Standard describes in *Part 1: General* (clause 8.4) and in *Part 2: Guidelines* (clause 3.2). ISO is currently preparing a set of technical reports to provide practical guidance from the records management perspective.²⁸ We will not repeat the guidance given by the Standard, but instead will focus only on specific archival concerns.

There are a number of other good methodologies available. For example, the National Archives of Australia publishes on its website the very useful DIRKS-Manual, which is structured according to the design and implementation steps in ISO 15489.

²⁷ In some jurisdictions the second definition may not be legally valid.

²⁸ One of these technical reports is already in the last phase of the standardization process: ISO 23081 Information and documentation – Records Management Processes – Metadata for Records. Part 1: Principles

4.3 Setting the scene

Commonly, information and communications technologies and associated records management regimes and organisational cultures are already in place when archivists arrive and try to impose their requirements. They generally face a situation where many different systems and practices create and manage current records; and a lot of them will have been designed and built with little input from archivists.

The range of existing systems can vary from simple office tools like e-mail and word-processing to legacy applications based on older database technology or, in some cases, integrated document management systems. Moreover, there are already a great number of organisations using websites on the Internet, geographical information systems (GIS) and expert systems to support their business processes, and so they are creating records or parts of records within them.

This environment can be daunting for the archivist. Any action must be preceded by a clear-sighted discussion of the practicalities and the principles involved. Building new systems and establishing action plans for the strengthening of existing systems is only possible if records management and archival requirements are known and if there is a clear understanding of which elements in a system can meet these requirements.

Archivists are not automatically involved in the design of new systems. Considerable effort is needed if they are to be informed about new projects in time and if they are to find effective ways to be involved in the design process in order to be able to address the requirements from the beginning (see also **3 Influencing** and **4.5** below). The role of archives and archivists can vary from supervision to advisory or active involvement in the design and implementation of recordkeeping applications. The precise nature of the role depends not only on the willingness of the archivists but also on the respective legal or organisational environment, which can empower or obstruct them.

At the same time archivists need to, have the time and skills if they are to succeed. As this chapter will show, considerable effort is needed to ensure that archival requirements are properly implemented in recordkeeping systems. Archivists must have both the resources *and* authority to do the job. Failure to provide either will result in deficiencies in recordkeeping, which may not become clear until much later.

4.4 Steps to be taken

This section describes generically (by analogy to ISO 15489-2 clause 3.2) a systematic approach to implementing recordkeeping and archival requirements in an environment where new information systems are planned or existing systems have to be preserved. Depending on the institutional circumstances and on the nature of work that has already been undertaken, the actions may be arranged in another order than proposed here.

In describing the different steps we do not suggest that archivists should do all this work themselves. On the contrary, records managers and system designers should undertake most of the tasks. But we will highlight the actions for which archival input is critical.

Step One: Preliminary investigation

The purpose of this step is to generate basic information about the legal, administrative and economic environment of a particular organisation and to give a general view of the strengths and weaknesses of the records and archive management (cf. ISO 15489-2 clause 3.2.2). Most of the information needed here can be obtained through studying existing documents (e.g. the laws which are relevant to the organisation, business plans, strategies, charters, company or management reports, market studies, and internal organisational regulations).

Archivists should ensure that the archival concerns are addressed in this overview. In particular they should take note of:

- archival legislation; and
- the perspectives of stakeholders who are concerned about the long-term preservation of records.

This phase is easily overlooked but will have benefits for archivists in informing their appraisal and descriptive work; it is essential if records are to be comprehensible over the long-term.

Step Two: Analysis of business activities

This step provides a hierarchically structured view and description of the functions, activities and transactions of an organisation (cf. ISO 15489-2 clause 3.2.3). Analysis needs to go as deep as is necessary to show the stages in the business processes where records are regularly created or received in the normal course of business. Only in doing this, will it be possible to determine subsequently which documents and data must be captured as records.

Many of the same documents used in the previous step will be relevant to this one. In addition, any document containing organisational rules, charts and process descriptions should be collected and included in the analysis. The information in these documents should be verified by means of interviews with staff at all levels because they often do not reflect correctly the reality of how the organisation works.

This step provides a useful framework for organising records (i.e. for classifying them). The functions, activities and transactions of an organisation can be arranged as a hierarchy, which can be used as the logical structure of the records repository. It may be seen as the only reasonable or ‘natural’ way to organise records because they are products of business processes (see also ISO 15489-2 clause 4.2.2.1).

For archivists, an appropriate classification scheme is especially important because it can serve as the main finding aid once records have been archived. It is essential that archivists confirm that classification schemes are comprehensible over the long-term. For example, abbreviations and acronyms, which are frequently used in classification schemes, are often no longer understandable after a couple of years. An easy way for archivists to verify long-term understandability is simply to try themselves to understand accurately the scheme. If they succeed, as non-specialists in the respective business field, there is a good chance that the scheme will still be understandable in fifty years or more.

Step Three: Identification of requirements for records

This step aims to define clearly:

- which records an organisation should capture and maintain;
- why the organisation should capture the records;
- how long the records need to be maintained; and
- what other characteristics of records are required and should be implemented.

These decisions must be based on a careful analysis of the organisation’s environment and its business needs if they are to be compliant with the regulatory and economic environment identified in the first step. This approach is described in ISO 15489-2 clauses 3.2.4 and 4.2.4.2. The Australian DIRKS-Manual gives further detailed guidelines and examples.

This step is independent of the form of the records or the media on which they are kept: it focuses only on the activities and transactions. Laws and regulations in some countries

do not yet fully include electronic records. Archivists need to verify carefully the legal context of their organisation and, where necessary, they should seek legal advice. In the last few years many countries have adapted their legal framework to admit electronic records as evidence. However, they often leave it to the litigant to prove the authenticity and integrity of the electronic records submitted to court.

For accountability reasons, it will be necessary to maintain records of most business processes, at least for a limited time. Archivists must verify that those records that should be captured have sufficient contextual information and are understandable in the long-term.

As part of this step, answers to the following questions should be sought:

- *Must all documents created or received in particular transactions be kept as records?* To answer this one must first identify and distinguish between transactions, and in doing so one must determine which produce records. For example, in a policy context, do the initial document (the trigger of the case) and the final document (e.g. the decision) fulfil the recordkeeping requirements? The previous steps as described here and in ISO 15489 should provide the basis for answering this question. Beside specific legal requirements there are other criteria to consider:
 - the discretionary powers of the case workers. For example, if there is a business process with a very formal step-by-step procedure where the individual case worker or the organisation as a whole have negligible discretion, then only the initial request, the final decision and the set of rules to be followed in the particular process need to be kept;
 - the risk of litigation. Where the risk of being taken to court for a certain decision or action is considerable, records may give evidence of the complete chain of action taken in a case;
 - the impact of the activities and transactions on people, the economy, the environment or society. If the impact is high, accountability and transparency expectations from external communities will also be high and therefore the need to keep evidence of these activities might extend beyond any legal obligations.
- *What versions of documents must be kept and preserved? What changes in a document must be kept with identification of the author and the time of the changes?* Archivists can help to identify appropriate criteria, including:
 - Internal assignment and distribution of responsibility. If responsibility and accountability within an organisation are dispersed, records should give evidence of who contributed to the writing of important documents and what amendments were made; and
 - Information about the decision-making process. Different versions of important documents can reveal the decision-making process by showing which variants have been examined and why a specific variant was chosen.

Answers to these questions should be documented systematically together with the reasoning behind them; they will be needed in the implementation phase and will result in business rules and in-built functionalities of the electronic recordkeeping system. These answers are also important for audit or litigation, where they may be required to demonstrate which records are not kept regularly and why they are not kept.

This step should also comprise the determination of retention periods for records. It is important that archivists analyse carefully retention requirements. If records have to be maintained and preserved over longer periods this has a significant impact on the design

of a records system. Advice on how to analyse retention requirements and how to determine retention periods is given in ISO 15489-2 clause 4.2.4.3 and DIRKS Manual Step C: Identification of recordkeeping requirements. Archivists should carry out a parallel archival appraisal in order to make sure that the long-term perspective is addressed in their decisions (see also **Chapter 5**).

ISO 15489-1 (clause 7.2) mentions four main characteristics of records: authenticity, reliability, integrity, and usability. However, the Standard provides little advice as to how a recordkeeping system should be built so that it maintains these characteristics. Before assessing existing systems in the next step, a more detailed understanding of which elements constitute these characteristics is needed:

- Reliability, authenticity and integrity are ensured if:
 - state-of-the-art security measures are implemented in the electronic recordkeeping system;
 - secure access control is reliably provided;
 - records have an identifier which is unique, at least within the same system;
 - metadata provide information related to each particular record (i.e. about who did what when);
 - required metadata elements are created, as far as possible, through automatic procedures;
 - records and their metadata can be protected from further changes where needed;
 - metadata show comprehensively what happened with the record from the point of creation onwards; and
 - metadata ensure the link between the record and the business transaction within which it was created, as well as the link between related records (i.e. the records of the same business case).
- Reliability of records and records systems is ensured if:
 - records are captured in an automatic, or at least routine, procedure;
 - the record is captured immediately or shortly after the action which gave rise to it; and
 - audit trails are left, and these are verified regularly in order to detect irregularities in the functioning of the system; they should be accessible in a way which enables the retrieval of elements of all data related to a particular record or transaction.
- Preservability of records is ensured if:
 - metadata indicate name and version of the data format of each record, and the identification of the software with which it was created and last changed. Additionally, the metadata must record any changes in format;
 - record formats are monitored regularly (i.e. at least every time before new versions of software are loaded in the system) in order to prepare and perform controlled conversion procedures for those which are not any longer fully compatible with new software;
 - all record data can be exported through an efficient automatic or semi-automatic procedure in open preservation formats²⁹ without losing essential characteristics of content, structure and context; and

²⁹ Open formats are those whose specification is made fully available by the owners or vendors of the format for the public. Most common office formats are not fully disclosed.

- records and their context are understandable without any specific information that is not explicit in the system. This usually means that detailed systems documentation must be kept.

The identification of requirements is a lengthy task but an essential one. It delivers two notable benefits:

- it provides, together with the outcome of the previous steps, the necessary information for retention planning and archival appraisal (see Chapter 5 below); and
- a sound analysis of complex business processes which might reveal that at some point(s) parallel records are created in different parts of the organisation. Business analysis can show which of the departments or authorities performs the central coordination of all cases in a particular activity. This department is likely to have all essential records in their files (often called the master-files); other participating departments or authorities do not need to maintain records of these cases.

Step Four: Archival appraisal

The purpose of archival appraisal is to decide which records should be preserved for the long-term (i.e. longer than the life-time of the system in which they are created). As the term appraisal indicates, it should reveal the value of the records for future purposes and retention decisions should be based on that value.

There is already a broad range of literature about archival appraisal, and this *Workbook* does not attempt a detailed analysis of appraisal criteria and methods. But it is worth noting a couple of points which are important with respect to electronic records.

When building new systems it is essential to know before the design and implementation phase whether the records that will be created within the system have archival value. If they do not, many specific preservation requirements do not need to be addressed in the design of the system. Systems that do not create archival records should not detain archivists further.

Making appraisal decisions is much more difficult when dealing with existing systems. Any assessment of these systems should be based on an analysis of business functions and activities; appraisal should be based primarily on the same analysis. One approach would include:

- appraising anticipated records based on an analysis of functions, activities and transactions and their potential to create records. This approach is commonly called macro-appraisal. Electronic records are in principle media independent, and appraisal should refer to the same criteria as for paper records. Records of functions which are appraised previously as having archival value in their paper format are likely to be archival records in their digital format as well; and
- verifying and, if necessary, revising the appraisal decisions. Some existing systems have poor recordkeeping functionalities and this reduces the quality of their records to a degree where there may be little sense in archiving them. Other existing systems may create records in a format that is not preservable and conversion into an archival format may not be possible or affordable for the archives.

Verify carefully the links between archival records and records designated for disposal because newer information systems contain a great deal of linked information and the

authenticity and usability of archival records can be reduced significantly if linked information is deleted. This risk of losing essential links and the amount of work needed to do appraisal on a micro-level within a given records system illustrates why approval is best done at systems level. The amount of data to archive is only a secondary consideration. More important is the intellectual cost and the technical investment in conversion and maintenance. Costs in digital preservation are related primarily to the number of types and formats of records and not to the total number of records.

Step Five: Assessment of existing systems

This step considers how to assess existing systems against core recordkeeping requirements and how best to take decisions on their long-term value.

Archives with no proactive role in the management of current records usually get to know about existing electronic records systems only when they are at the end of their life cycle or, even worse, when the systems are no longer in use and only a quantity of data remains. In this case, it is very difficult to extract records of a valuable quality, or it may be impossible or too costly to do so. To avoid this archivists should establish systematic procedures to get information on existing and planned systems.

There are several ways of finding out about existing information systems, which include:

- conducting surveys among IT-managers. The information needed may be sought by means of a questionnaire. Surveys should be repeated from time-to-time because their results are soon out-of-date. It is good practice in systems management to establish and maintain a portfolio of all applications in an organisation. IT-managers use portfolios of all IT-systems under their responsibility as a means for coordination and control. These are potentially valuable for the archivist. In practice, however, IT-managers often struggle to maintain complete and current portfolios;
- obtaining from other authorities concerned with information systems lists of electronic information systems. Many administrations now have formal approval procedures for new systems;
- building partnerships. If an organisation does not have an effective overview of existing electronic systems and applications it is likely that the authorities mentioned above will be interested in developing such an overview. Hence the archivist may be able to find partners to build up a common portfolio of all current and planned systems and establish a procedure for the continuous or periodic notification of new project plans. Practical experience indicates that compiling a comprehensive list in larger organisations is extremely difficult, but this should not be a reason for neglecting the task.

At this stage it is not necessary to differentiate between types of records or systems. But it is important to include all information systems and not exclude certain types like websites or expert systems; they may all create and store information that potentially constitutes records or part of records.

The purpose of identifying existing and planned systems is not only to find out about their nature but also to collect information about them that is needed to inform the subsequent steps. The following questions might be helpful in obtaining the right information:

- Who are the responsible organisations and persons?
- What functions, activities and transactions are supported by the system?
- Which of these transactions are captured by records?

- Are there other systems that support the same activities and transactions? What are the interrelationships between different systems used in carrying out the same business process? Which parts of the records are on paper and which are electronic? Special attention should be given to the fact that most electronic systems today are still closely related to paper-based systems.
- Are all transactions, which are supported by the system, carried out completely within the system? If not, which particular transactions or which particular steps within a transaction are carried out in the system and which are carried out beyond the system's border? Where no integrated recordkeeping system exists, it is likely that transactions of the same type are in one case creating paper records and in the other electronic records.
- Which business rules guide the capture, maintenance and access of the records created by transactions supported by the system?
- How are these records captured, maintained and accessed?
- How are the requirements for authenticity, reliability and preservability met?

The simplest way for archivists to get this information is to send a comprehensive questionnaire to the owners and administrators of the system. However, questionnaires are not a cure-all. The recipients need to be encouraged to complete them, and they will often need assistance to do so to a high quality.

Another way to get the information needed is to ask system administrators for their systems documentation (if it exists). Good practice in systems engineering and project management dictates that a set of reports are usually written in the course of the conception, development and maintenance of systems. These reports often contain much of the information needed to appraise and assess the system. Collecting and studying these reports consumes a lot of time and requires sufficient technical knowledge. But basic technical knowledge is essential for archivists because these materials may also be important parts of the archival record and essential for ensuring the comprehensibility and authenticity of the records produced by the system.

A sound assessment cannot be based solely on written documentation; it should be accompanied by an inspection of the system because written documents usually reflect only the planned and not the real state. Information systems are changing constantly. Written documentation can inspire wrong decisions if the critical elements are not verified in the living system.

Preservability and preservation costs assume a particular importance when dealing with electronic systems:

- existing systems may contain records that are not preservable because they are in a proprietary format (i.e. a format which is not published by the manufacturer) or because the efforts to convert them to a preservable form without losing essential information are too costly;
- preservability is likely to change over time. Records that seem to be preservable at a given point in time can become non-preservable later when parts of the system, which are essential for conversion and migration, become obsolescent and/or faulty. On the other hand, records that seem not to be preservable today may become so when new software is developed that allows easy and accurate conversion to open formats; and
- older systems often lack adequate documentation. Although they are still running and are maintained, nobody knows exactly how they work and why some data are produced. If the records are important they may, nevertheless, be

identified for preservation hoping that at some time in the future additional documentation will be found or in-depth analysis of the existing documentation and data will reveal the missing information.

Step Six: Strategies for recordkeeping and design of recordkeeping systems

The preceding steps provide the basis for strategic planning: the requirements for recordkeeping show where the organisation should be and the assessment of existing systems shows where the organisation is. Strategies should be determined which show how the gap between the two should be closed. Strategies comprise policies, standards, tools and procedures that should be adopted by the organisation. Strategic decisions should cover the whole domain of recordkeeping and archiving. A separate strategy for electronic records is not adequate if the organisation relies in part on paper records.

Strategies should contain:

- a comprehensive policy determining the main purposes of recordkeeping and archiving in the organisation in relation to the requirements;
- responsibilities for proper recordkeeping and archiving;
- the organisation's principal decisions about how the intended recordkeeping and archiving should be carried out. In particular organisations need to decide to what degree recordkeeping should be electronic or remain paper-based;
- a preservation strategy which determines how records with long-term value must be preserved; and
- resource planning for recordkeeping.

The successful implementation of recordkeeping in an organisation depends as much on effective change management as it does on technology. Organisational behaviours have to change. To succeed:

- involve all internal stakeholders in the whole process, and from the beginning;
- provide good information about the objectives and benefits of good recordkeeping and archiving to all persons concerned;
- give practical aspects the highest priority. User satisfaction is essential; and
- focus on training needs.

Step Seven: Ensuring short-term preservation

The recordkeeping system must be able to maintain records as long as they are needed and in the form in which they are needed. For example, the business may require:

- records in a form that allows copies of the record document to be fully edited and changed; or
- records in a form that allows appropriate presentation on a screen or on print outs on paper.

As long as the records can be kept in the originating system (i.e. the system in which they have been created or received and recorded) there are no special measures to be taken. But as soon as the system is changed, replaced or data moved out of the system to a remote storage device the maintenance of records must be carefully monitored.

Long-term preservation is defined in this workbook as being longer than the lifetime of the system in which the record is created or received and recorded. Long-term preservation is addressed in **Chapter 5**.

In the remainder of this section we will deal with preservation within, or in close relationship to, the originating system.

Changes during system maintenance

Commonly, large information systems, which are often critical for on-going business, do not run more than a couple of days without maintenance. A great range of problems may occur, caused by:

- changes of components in the hardware and software environment, in which the system is embedded or to which it is networked;
- user mistakes;
- overload with processing requests or data; and
- errors in the original software code which only turn up during operational use.

Additionally, users may want the system to be adapted to new business requirements. That means that most IT applications are changing constantly; some changes may endanger the integrity of older records. New releases of software components may not interpret properly certain parts of documents. For example, embedded graphics or annotations or changes in the underlying data structure can break important links between documents and metadata.

Therefore, archivists and records managers need to monitor the system maintenance closely and verify whether modifications in the application affect the requirements for recordkeeping and archiving. At the same time they need to take account of updates of the system documentation because many patches of a system may have been made in emergency situations where nobody has time to provide proper documentation of what has been changed.

Changes in the system may harm the consistency of existing records within that system and even more of records on off-line storage devices.

Information security

The risk of unauthorised access and modification, and of unintentional alteration or damage caused by system failure or human error, is especially acute in systems which create, capture and maintain business records.

ISO 15489-2 (clause 4.2.5.2) provides a list of steps to follow in order to establish a sound security regime. IT specialists should implement the security requirements using state-of-the-art technology while minimising inconvenience to users.

Special care must be given to information security issues if records are stored on a remote device from which they can be accessed through other systems or if they are stored in a place where they can be physically damaged by changes in the environment. The use of instruments constantly measuring and recording these variables is recommended and provides an early warning of risk.

Disaster prevention

In addition to the common disaster prevention measures for paper records a couple of points merit particular attention for electronic records:

- even minor disasters usually cause the complete loss of digital data: they are stored at a high density and are mostly concentrated in a relatively small space. While many paper records can be saved in the case of fire, digital storage media

will become completely unreadable if subject to a relatively modest increase in temperature; and

- even remote events can harm electronic storage media. Nuclear or non-nuclear electromagnetic pulses (NEMP) can make magnetic media unreadable. And collapsing power supplies can make electronic media unreadable.

Measures against these threats include:

- securing the rooms where electronic records are stored; and
- making regular back ups of data.

In all cases, archivists are advised to seek specialist help in implementing these precautions.

If records are mission critical, there might be need to have a second system in the remote storage area, which is able to read and display the back up records. An output on microfilm may in some cases be sufficient to guarantee usability in the case of a disaster. Although it is cheaper in the short-term to make microfilm copies of viable records and buy a microfilm reader this approach often causes extra work in producing finding aids and linking documents and metadata to make records retrievable. Electronic records systems are not reducible to a two-dimensional medium without losses of linkage and functionality. Hence the choice of microfilm as a back up needs careful consideration in each case.

Monitoring file formats and planning migration

File formats in a system should be monitored and verified on a regular basis. If such a control is not ensured and conversion does not occur over time information loss is likely.

Two options are possible:

- converting files to every new software-version in order to keep all formats up-to-date. Multiple conversions like this may nevertheless cause losses of certain characteristics of the files if the conversion processes are not properly verified; and
- converting archival records and exporting them to an open preservation format. This may be the most promising option for long-term purposes. To keep these records available, accessible and preservable they must be integrated into an archives system. If archives do not yet have such a system they can mandate a third party to preserve the records and keep them accessible. This third party may, in some cases, be the government's computing authority. A third party solution also requires a good control regime and records also need to be inspected on a regular basis.

Converting archival data to preservation formats needs to be undertaken with care as many data are dependent on other data in the system. If these relationships are disrupted they can lose authenticity and integrity before they are archived. A common example is the font of text documents, which is defined outside the document. If records are to be converted from a word processing format to another format like a TIFF image the definitions of the fonts used must be available on the system if an accurate conversion is to be effected.

Keeping records alive at system closure

Systems may come to the end of their life and records cannot be migrated to the succeeding system because the new system uses other data formats and data structures which do not allow migration without critical loss of information. Alternatively there may be no succeeding system because of changes in the function and activities of the organisation.

If the retention schedule does not allow for the destruction of the records, there are only two possibilities to keep the records accessible and usable:

- migrate them to an archival system designed for long-term preservation (see **Chapter 5**); or
- keep the system running for the time the records are needed.

The second strategy is only suitable for short-term preservation because:

- keeping old systems alive can be costly if software licenses have to be paid continuously and if the corresponding hardware must be maintained; and
- the system can abruptly stop working when a hardware component fails and no replacement can be found because of technological obsolescence and market changes.

Emulation may be a solution to hardware obsolescence. The emulator-software makes it possible to run old software on newer hardware platforms. This can be risky because hardware platforms change over time; the emulator software will need to be adapted with each change and the maintenance and use of old software applications requires knowledge that is likely to disappear the longer the application is kept running.

4.5 Readiness Assessment

The readiness of archives to address the implementation of recordkeeping and archival requirements can be assessed by considering the following factors:

- Does the regulatory environment allow archivists to involve themselves in the keeping of current records?
- Is a preservation strategy elaborated that can guide decisions about the preserveability of records in current systems?
- Are appropriate funding and resources available?
- Are appropriate knowledge and trained personnel available in the organisation?
- Is the necessary technological infrastructure available (internally or externally; in the organisation or via partnerships or outsourcing)?
- Are regular contacts between the archive and the records creating organisations established and is the archive involved with records management programmes?
- Has the archives developed a step-by-step methodology to guide their intervention?

The key message is that an archive should not wait for perfect conditions before choosing to become involved. Such conditions will not arise of their own accord: it is better to make a start and to build capacity over time.

4.6 Summary

This chapter has focussed on the disciplines needed to implement recordkeeping requirements successfully. They are most readily seen – and have been described here – with regard to new systems. But we recognise that many archivists are not faced with the choice of planning new systems. Rather they are faced, day in and day out, with difficult judgements about the functionality of systems which may have been designed with little regard to recordkeeping. The approach set out here is also designed to help with those judgements. The disciplines described here are based in records management theory which is neither new nor novel. They have been developed to meet new challenges, but the generic approach is one which is readily accessible and need not deter archivists who are new to electronic records management.

CHAPTER 5: LONG-TERM PRESERVATION

5.1 Aims

This chapter will:

- explain, in practical terms, what it means to preserve records;
- describe the various mechanisms currently used to preserve electronic records;
- outline the nature and function of metadata in the preservation process; and
- identify the skills required to preserve electronic records.

5.2 Scope

This chapter of the *Workbook* covers approaches to the long-term preservation of electronic records. Long-term is defined within the chapter as being longer than the lifetime of the system (hardware and software), which created the records – typically five years at current rates of technical change. It assumes that some means of identifying what records should be preserved is already in place. It makes no assumptions about the purpose for which records are to be preserved, or what type of access is to be provided to them.

5.3 Preservation requirements and implications

Before considering specific technical solutions to the long-term preservation of electronic records, it is important to reflect on what one is trying to achieve by preserving them. Our aim, in general, is the same for electronic records as it is for records held on paper or other traditional materials. But the special characteristics of electronic records, and in particular their relative fragility and susceptibility to change, mean that some aspects of the preservation task assume greater importance and urgency. Preservation is not an end in itself; we preserve things for a purpose, and sometimes for a number of purposes.

The assumption is made in this chapter that the primary reason for preserving records is for their evidential value: to demonstrate that actions were taken or not taken, that decisions were made or not, as the case may be. Evidence as used here does not relate purely to formal legal processes.

We also assume another possible purpose for the preservation of records – the reuse of the records themselves or the information that they contain. This is of particular relevance because reuse of electronic information is typically far easier than it is with information on paper, particularly when we are dealing with large quantities of data or documents. Our preservation actions should not put barriers in the way of such reuse. But we must also take care not to infringe any legal barriers to unrestricted reuse of information.

One might ask why we are worried about the reasons for preservation. By examining the practical steps we need to take, it should become clear the end purpose can dictate what actions should be taken and what actions institutions can afford *not* to take. There is no suggestion, for instance, of attempting to preserve the behaviour and appearance of old computer software and hardware as a museum might want to do. Because of this, any step taken which alters the appearance of a record, but which still preserves its principal characteristics, its evidential value and the information within it can be considered adequate for our purpose.

We are not talking exclusively about the *permanent* preservation of electronic records, but rather about their long-term preservation. This *includes* permanent preservation, as might be appropriate for records selected by a body such as a national archive. But it also includes preservation for fixed periods which greatly exceed the lifetime of the software and hardware used to create the records, such as personnel records which might need to be retained for 75 or 100 years from their creation or such other period as law may provide. It also includes preservation for indefinite, but not infinite, time periods which can be expected to exceed 5 years, such as building records which will be retained for at least as long as the life of the building to which they refer.

The common characteristic is that the preservation period is greatly in excess of the expected hardware, software and media lifetime, and is usually longer than the period for which we can make firm predictions about technological change. The uncertainty this introduces is a key influence on the strategies institutions need to adopt to ensure effective preservation.

The remainder of this section considers the requirements, which arise from the combination of:

- the reason(s) we are preserving electronic records; and
- the nature of electronic records themselves.

It also considers some of the implications, which arise from those requirements, such as the need for the creation and preservation of record metadata.

Basic requirements

To achieve our preservation purposes, records must be:

- authentic;
- complete;
- accessible and understandable;
- processable; and
- potentially reusable.

For each of these requirements, institutions should be able to reassure themselves and demonstrate to others that they have been met. There is also the desire to meet these requirements with the minimum of effort and the least disruption to the normal processes involved in creating and using the records as part of normal business. This chapter considers each of the essential characteristics in turn.

Authenticity

To show a record is **authentic** we simply need to be able to demonstrate that the record is what it claims to be. This is not the same as demonstrating the truth or accuracy of all the information, which the record contains. For an electronic record, there is the need to show that the record was created or received at the time which we claim for it, that the process which created it (whether a human being or an automated process) was the one we claim for it, that the record is truly part of the system which it claims to form part of, and that its contents have not been altered in any way since it became part of the record-keeping system.

For example, consider an e-mail received from outside the organisation which has been kept as part of a record system. The received e-mail has many similarities to a paper letter received in the post. Strong assertions can be made about some aspects of the e-mail

and the letter. We can say when we received them, who they were delivered to, and whether they received a reply. On the paper letter, this may be done with official stamps applied in the post room or correspondence logbooks, or a variety of other means. For the e-mail, the system may have added information to the e-mail headers as it was received and may also have logs of its arrival in the system and its delivery to its final recipient.

But in both cases there is little that can be said about other aspects of the message. We cannot be sure when it was written, although both the e-mail and the paper letter will probably carry a date of authorship. Unless special steps are taken to ensure security of communications, we cannot be confident about the identity or location of the sender, or of the integrity of the message contents (i.e. have they been amended or supplemented by a third part en route?). Finally, we can almost never attest to the accuracy of the message contents. For both paper and electronic systems these drawbacks do not alter the usefulness of the record. We keep the message, knowing it was received at this time, read by this person, contained this information and claimed to come from this source. If the identity of the sender or integrity of the contents were matters of particular concern to us, we may have means in the world of paper and electronic records to ensure this: both are likely to involve cryptography or identifiable signatures. To establish the **authenticity** of the record, we need only demonstrate that we have preserved what we knew about it when we received it.

It is worth noting that the authenticity of a record can usually be demonstrated without any knowledge of its contents (or even any means to access them).

Completeness

Completeness is typically used as a characteristic of a set of records rather than an individual item within the records, although it can apply to both. For a set of records to be **complete** we must be confident that no items have been added or removed from the set other than in accordance with the rules established for that set. This is a similar requirement to the **authenticity** requirement for a single item.

Completeness is not simply a matter of saying everything is still there because there may be very good reasons why some things are no longer there. It also involves saying nothing is there which should not be there. Let us consider e-mail again. We may have a policy that dictates how long different emails should be retained. At various times the recordkeeping system will contain different messages, and over time the number of messages within it will reduce. As long as we can demonstrate that the messages removed were removed in accordance with organisational policy, and that no messages appear which were not originally present, then we have demonstrated completeness.

Accessibility/understandability

Our complete and authentic collections are of no use if we cannot access them, or if we cannot make sense of their contents. Hence we impose a further requirement that the records are **accessible** and **understandable**. By **accessible** we mean that we still have some technology, both hardware and software, that allows us to locate records of interest and then translate them into a form which human senses can deal with, such as marks on paper or words on a screen. By **understandable** we mean that we can make sense of the record and the meaning it is intended to convey. This understanding may require assistance or support of other information, which is also part of the record system, it is not an absolute requirement that each record makes sense in isolation.

Records can be **accessible** even if we no longer have the hardware or software initially used to produce them. All that is required is that we have something, which can still be used to make them readable by people, even if the record does not have all the properties of the software that created them. For instance, documents will have been created with a programme which allowed them to be altered and viewed in a variety of ways; we may provide long-term access to them using a programme, which only allows us to view the documents, and only in one form. This still provides access to the records. But if all we have is the original digital medium, such as a floppy disk or a CD, and not any software or hardware, which allows us to access the contents of that medium, the records are not accessible. Similarly, if an original recordkeeping system depended on a sophisticated access mechanism, which allowed records to be sorted and located by properties such as date, title and author, it will be necessary to replicate something of that access mechanism in order to preserve the records in the system. A collection of thousands of files without any means of identifying which is which, other than reading them, is not, in any meaningful sense, **accessible**.

Records may be **understandable** in themselves if they are accessible – many documents and e-mails will fall into this category, assuming that the language in which they are written is one we can read. But other types of record may require additional information to be understandable. For instance, we may have records which document a survey of agricultural land in which a coding scheme was used to indicate the grade of land or the type of soil present on each plot. The coding system may assign a single letter or digit to each type of land or soil. Clearly, the records which contain these codes are not themselves understandable since the codes carry no intrinsic meaning. But if we also preserve the coding system with the records, then the records become understandable. Indeed, it would be correct to say that the coding system *is part of* the record, but in many computer systems it may not be part of the electronic system. It may exist only as a paper document, or only as part of instructions for those using the system. So to ensure the record is preserved in a form that we can understand, we must:

- ensure that the computer-based record is preserved in a processable form; **and**
- ensure that the paper documents for the coding system, or the information which they contain, are preserved in an accessible form; **and**
- ensure that the link between the record and the information on the coding system is preserved.

Processable

For records to be considered **processable** we must be able to manipulate, select and display them using criteria appropriate to their preservation purpose. This may mean using facilities similar or identical to those, which existed in the original record creating system. But in many cases, the system in which the records were created may have functions which are not required for the types of access which we will need in the long-term. Again, the example of word-processor files is useful. A collection of preserved word-processed documents only needs to provide means to locate documents of relevance and to view their contents via a screen, a printed copy, or some other suitable means. It does not need to preserve the ability to edit them or to carry out other actions which the original word processor software may have permitted.

Potentially reusable

Records are **potentially reusable** if it is possible to extract information from the record or otherwise allow the record to interact with modern information processing systems. This is a more rigorous requirement than those of accessibility or processability. Those requirements could conceivably be met by keeping the original hardware and software in

which the records were created active for as long as access to the records is required. This would allow the records to be accessed and processed. But if the older computer system does not have any means of exchanging information with newer computer systems, the records are effectively trapped within it. They are not, therefore, potentially reusable.

This requirement for reusability differs from the others in that it can be argued that for some purposes it is not necessary to allow for potential reuse of records. If we have met all our obligations through satisfying the other requirements, then reusability can be ignored. But in many cases it is desirable to aim for reusability even if no specific future use can be foreseen. By doing so, one has also usually ensured the record's accessibility and comprehensibility.

Technological development and changes

Technological change is an inescapable reality when dealing with computer systems. The pace of change is rapid compared to other areas of human progress in information recording and processing. The changes are driven by market forces which are often far from our requirements for long-term, stable access to authentic, unchanging information. It can therefore be a challenge to satisfy our requirements using a set of tools which will change even as we are considering how to employ them.

Our aim is to achieve the requirements stated above whilst all the mechanisms used to create, protect, manipulate, access and display the records change, and to be able to demonstrate that the records have retained essential attributes throughout that time.

The changes can take a number of forms. New application software is the most obvious. New software may simply be an updated version of existing software, or it may be a completely new package which has been adopted because it is cheaper or better than the old package, or because it offers greater compatibility with software being used elsewhere in an organisation. It is not always easy to tell the difference between updated software and new software, and it is not always useful to know. Version 3 of package X may simply be version 2 of package X with a small, well-defined set of new features. Or it may be a completely rewritten programme which happens to have the same name and which performs many, but not all, of the same functions.

Changes can also occur in the hardware used to run applications and make permanent copies of our records. Sometimes these changes have little relevance, as equipment suppliers strive to ensure that new equipment is compatible in as many ways as possible with the old, ensuring that old software continues to run and old media can continue to be accessed. But this compatibility does not persist forever. Each new generation of computer can typically handle the things that were new with the previous generation of computer. But they cannot necessarily handle the devices from three or more generations back. The changes that have greatest impact are those that involve changes in media types and attachment technologies. The shift from 5.25" to 3.5" floppy disks took place some years ago, and although it is still technically possible to attach a device to read 5.25" disks to a modern PC one would not choose to create or access records using such devices. The only reason we can still get them today, barely 20 years after their invention, is because their use was once so widespread. Other less widely used recording media of a similar age would present far greater challenges to access today (e.g. punch cards).

Changes also occur in the logical structures used to record information – what is usually referred to as the file format. Sometimes these changes come about as a direct result of changes in application software. Where they do, even if the newer software is capable of reading files in the older format, some inaccuracies may occur in the transformation and it can be difficult to confirm that all files will be transformed without error unless one has good knowledge of both the file formats and the software used to write and read them.

File format changes can also be driven upon us by external influences. It may be easier to manage our records, for instance, if they are all in a single format. Hence if newer records arrive in a different format from older records, this may prove an incentive to convert the older records to a newer format. Alternatively, there may be need to do so because the older format is no longer supported even for reading by current systems because no software has created files in that format for many years.

How important these changes are and how difficult it can be for us to deal with them depends on how much warning we have of them and how much we know about what the change involves. It is worth remembering that although many of the problems referred to can be overcome with sufficient ingenuity and technical knowledge, it can be very expensive to do so. Most archivists usually wish to avoid the heroic efforts that are necessary to recover information from 20-year-old recording media.

One of the most common conclusions reached by those involved in record preservation is that some form of migration is necessary to ensure the long-term survival of records. Other techniques do exist, some of which are the subject of intensive research, but migration is the technique in which there is most practical experience. Migration involves both copying records periodically to newer recording media, of the same type or of different types (this is known as ‘refreshing’) and moving information from one file format to another, more contemporary file format.

Relationship to the original system (i.e. the records creation system)

In a small number of cases it may be feasible to preserve records within the system that created them or its successors. These may even be essential when the original business purpose which the records served remains necessary and the records must continue to be accessed from within the same environment as other, more contemporary records. When this is true, the organisation should ensure that the periodic reimplementation of the system which will inevitably occur faithfully migrates information in older records to the newer formats, or that the system is capable of processing information in all the formats in which it has ever been created.

But in most cases organisations should preserve records independently of the systems that created them. This can be for a number of reasons:

- the systems will not exist for as long as the records;
- the systems will change function to the extent that old records can no longer be kept within them;
- performance reasons dictate that no more than a given number of records can be held within the system;
- authenticity cannot be assured within the creating system; and
- there is a need for access to the records which cannot be met by the system which created them (for instance, access by the general public to records created within a secure government system).

Some of these reasons are likely to provide greater control over when records need to be moved out of original systems. Decommissioning of record-creating systems is typically something which is planned some time in advance. As long as those responsible for long-term preservation are part of the overall planning process, sufficient time should be given to allow for an orderly transfer of records to the system needed for long-term preservation.

Other reasons for transfer can be very sudden. Performance problems are a frequent cause of sudden, unplanned transfers. The performance change may not be gradual and it may occur when the amount of information goes over a critical limit. Analysis of the system can usually indicate when this will occur and in an ideal world one will plan for these eventualities by monitoring the amount of information in the system and performing a planned extraction shortly before a critical limit is reached. But experience shows that this is the exception rather than the rule.

Sudden transfers are to be avoided if at all possible. They may lead to loss of information, loss of contextual metadata or loss of authenticity. It can also prove very difficult for the receiving organisation to deal with large volumes of records which it was not expecting.

Three tasks should be performed in order to preserve records outside the systems that created them. First, organisations should preserve the records themselves, whether they be individual documents, e-mail messages, or images. Second, it is important to preserve the contextual information that accompanies records (i.e. the recordkeeping metadata). This may range from indices of the documents through code lists and fixity information such as checksums or mechanisms for verifying digital signatures within the documents.

Finally, the relationship between the metadata and the documents (or other electronic records) themselves should be preserved. If there is a list of dates, titles and authors, the system should have an unequivocal way of linking that list to the electronic objects to which it refers. But the metadata may be less obvious and the relationship to the records less certain unless efforts are put in place to make them so. It is not uncommon for databases, for instance, to employ coding systems for some elements of information and for those coding systems to have altered during the lifetime of the system. Organisations may have a set of documents detailing each of the coding systems, but without clear information on when each was employed it is difficult to know how to interpret a particular coded record in the database.

But if organisations preserve the original objects in a form which is accessible to current computer users and in a way that ensures the authenticity of each individual object, and if they preserve the metadata which list each object and describe them, then they have achieved our aims of authenticity, completeness, accessibility and understandability. If the metadata and documents themselves can be processed by the new system together, then processability and, potentially, reusability have also been achieved.

Relationship to the access system

The system in which we preserve records, and the formats that we preserve them in, are not necessarily those which we will use to provide access. Separation of the two systems is often required when the community of users who may access the records is much larger, and different in nature or location, from those who created the records. Separation of access from preservation also allows the choice of file formats and software systems for

preservation, which are likely to be long-lived without needing to compromise our choice because of short-term requirements of the user community.

For instance, the TIFF file format has been recognised as the ideal choice for the preservation of digital still images since the early 1990s and it is likely that it will continue to be ideal for at least the next 10 years. Throughout this time, it has never been considered the ideal format in which to provide digital still images to most end users. There are a variety of reasons for this:

- colour images in TIFF files are very large, and hence slow and costly to transfer over network links;
- many users lack software which enables them to deal easily with TIFF images; and
- some end-user formats allow those who own the rights in the images more control over what the end user can do with the images than does TIFF.

The formats in which images have been provided to users of image archives have changed every few years in response to changes in fashion, technology and user demand and are likely to continue to change. These changes do not necessarily lead to changes in the methods used to preserve the images.

There are other advantages to constructing separate systems for preservation and access. In many cases, there is no need to provide access for part or all of the period during which we preserve things, or the access we need to provide is only to a small group of specialists (such as the archivists responsible for the records' safe custody.) By designing a preservation system which does not incorporate user access, but which has clear interfaces which permit user access systems to interact with it, savings can be made in terms of cost and complexity in the preservation system. Additionally, the system may more easily be adjusted to changing requirements for access in the future.

'Access' to electronic records once meant providing a means to print them; it has meant providing a machine-readable copy on tape or floppy disk; providing interactive access via the worldwide web; or providing access to users with a mobile telephone or other hand-held device. More mechanisms are likely to emerge in future. A properly designed preservation system will permit any and all of these to be dealt with without requiring any changes to the mechanisms or formats used to preserve the records.

Chapter 6 discusses access systems and their requirements in more detail.

The types and functions of metadata

We will focus here on three sources of metadata: recordkeeping metadata, archival metadata and technical metadata.

Recordkeeping metadata

Recordkeeping metadata are those which originated with the records themselves or within the organisation which created them. They might include elements such as author, date of creation, title, sensitivity and keywords. Recordkeeping metadata generally exist because they were necessary for the original purpose for which the records were created.

Archival metadata

Archival metadata are those which are added to help manage the records after they were originally created. This may be done by the original organisation as part of mechanisms for management of non-current records or by the eventual recipient such as a national

archive. Archival metadata might include such elements as last review date or originating organisation name.

Technical metadata

Technical metadata are those which are necessary for understanding and processing the records. Some may be considered recordkeeping metadata, since they come from the original system. Other aspects may be archival metadata, in that they are added as part of the long-term preservation process.

Examples of technical metadata include file format and date of last format migration. Technical metadata are often identified as metadata which the end-user need not be aware of as they are only used by other computer programmes to manage the records and preserve them. This is usually true but some users may need to have access to technical metadata. This may be particularly relevant if it comes to light (for instance) that a particular version of software which had been in use in the originating organisation some years ago was flawed. Some users would then want to know which records might be affected by that flaw.

5.4 Preservation methods

There are a number of approaches, both technical and organisational, to the preservation of electronic records. This section discusses these approaches and outlines the issue that might influence the choice of approach.

Different types of record will lend themselves more to one or other approach. The first section outlines in broad terms the different types of record that current computer systems are likely to create. The second and third sections consider the ways in which records can be preserved. Finally, in the fourth and fifth sections we make observations about bitstream preservation and about migration to new storage media.

The preferred preservation method will be influenced by:

- types of record creators and recordkeeping systems;
- the role of the archives in relation to records creation agencies and functions;
- legislation;
- the archives' skills and technical infrastructure; and
- the types and levels of user services planned (see **Chapter 6**).

Some of these will be absolute influences. Legislation, for instance, may mandate where certain records are preserved. Some influences will be relative and will allow for a degree of value judgement. The archives' skills and technical infrastructure is one instance of this. Such influences also need to be re-assessed periodically as changes in circumstances may warrant a change in approach.

Relevant types of electronic records

This *Workbook* does not attempt to present a complete taxonomy of the types of electronic file or object that can exist. Rather, we list some of the more common ones which may be found in current recordkeeping systems.

Office documents, such as memoranda, reports, presentations and e-mail, are all close analogues of record types which exist in the world of paper. Many of the principles by which they will be tracked will be similar, and it is relatively straightforward to assess which elements of the record need to be preserved to ensure we meet the requirements

stated earlier in this chapter. Note that for these, as for any other record type which comprises a collection of what can otherwise be treated as independent computer files, we will have a set of metadata which turns those separate files into a record collection, with order, provenance and other essential information. That metadata set will itself constitute a form of database, albeit a small and often relatively simple database. Preserving the metadata often requires the same techniques as would be used to preserve a database.

Databases are another extremely common application which generate records requiring long-term preservation action. They are often equivalent to some forms of paper record system such as registers, particular instance records, logbooks or catalogues. But the power of computers usually means that databases are far more complex systems than ever would have been created with paper, with many more information types within them and complex inter-relationships between those information types.

Websites and the documents within them are also worth special consideration. In many respects they are similar to any office document collection, but they are often more rapidly changing, and there is also explicit linkage and relationships to be maintained between the documents. Many websites also contain elements of interactivity with their readers which more traditional document types rarely display and websites also often involve elements, which are driven by databases rather than document collections.

Computers are used increasingly to create and manage collections of maps, drawings, photographs, sound and moving images, any of which may constitute a record collection. For the purposes of this document, all of these will have the same generic properties as the office document collection: they will constitute a set of individual files to which individual actions in relation to formats, authenticity and the like can be applied; and will be associated with a set of metadata which forms a structured database for the whole collection. These turn a set of files and information into a set of records.

Preservation methods in the creating environment

In some cases, preservation can effectively be carried out in the original environment and even in the original record-creating system. This will typically be true if all of the following conditions are met:

- the original system needs to be kept functioning for a primary business purpose;
- the original system meets the needs of those who are entitled to access the records; and
- the original system is able to retain all the records we wish to preserve without compromising its functionality or performance in meeting its primary business need.

It may be possible to use the original system for preservation alone even if the second condition is not fully met. To do so, one would have to build a compliant access system (compliant, that is, with user needs) which can extract records from the original system. This is a particular illustration of a general principle that the systems that we use to preserve records are not necessarily those that we use to provide access to them.

When it is possible, there are certain advantages to retaining records within the original system. There is no need to invest in mechanisms to extract and potentially transform the records into some other format in order to preserve them; and one does not have to incur the additional expense of constructing and administering a separate preservation system. Furthermore, organisations can be far more confident of the authenticity of the preserved records since they have not undergone any potentially damaging processes of translation.

Lastly, organisations can see the context and systems used to create the records. This may provide greater insight into the records, their creators and the interaction between them.

There are also disadvantages to this method. Over a very long period, the original system is unlikely to be retained in exactly the same form. Typically, changes in technology and changing business requirements may mean that the system slowly evolves in a way which may not be obvious in the short-term but which over longer periods may have an impact on the older records within it. Word processing packages are upgraded to newer versions; databases undergo alterations to the record structures within them as fields are added and removed, and the functions and interpretations of fields are changed. Unless careful attention is paid to the impact of these changes on older records problems may result, and the problems may not be noticed until it is too late to deal with them.

This will happen very easily unless the older records are being used for the conduct of current business. If the older records are only being retained for archival purposes, the checks which will be made to test that the new system functions properly may not involve any use of older records. This can be dealt with by ensuring that any testing methodology used as part of system upgrades has tests involving archival records built into it. One should also test periodically that older records can be accessed and rendered in a meaningful way.

Another disadvantage of this approach concerns access. Although we have said it is a prerequisite that the original system meets our needs for access for it to be used for preservation, this assumes that access requirements will not change. If they do, we may find that we need a radical change in how the records are preserved because the original record-creating system cannot meet our new access requirements.

In some cases, enabling a system to deal with very old records eventually makes it difficult to maintain and upgrade. At this point, it will be more cost-effective for the organisation to create separate mechanisms for older records and allow the system to deal only with current records. One should ensure that periodic monitoring of maintenance processes takes this into account. If at some point the system cannot cope with old records and current records, one may be faced with a sudden and urgent requirement to remove the archival records from the system and create a preservation system to store them in; doing this in response to a crisis, rather than as part of a planned process, will inevitably be more costly and riskier.

Some of these objections can be dealt with in a slight variant of this approach. We may choose to use the original software which created the records but in a separate computing environment (that is, typically, on separate hardware) from that which is being used to manage current records. This gives us almost all of the advantages of this method but can deal with some of the disadvantages, such as those related to performance. To do this, mechanisms are needed to identify and extract archival records from the current system, and there is the additional cost of running two systems.

A further option is to use a technique known as emulation, in which newer computer systems are provided with software that allows them to mimic (i.e. emulate) older hardware or software systems. Using this technique, a modern and presumably relatively inexpensive and easily maintainable computer can continue to run old software applications designed for quite different computers. We must, of course, continue to preserve the original software application in a form and on media which can be read by these

modern computers. Emulation is still being tested but it has already been demonstrated to be a practical solution in certain contexts.

All of these approaches can also suffer from the problem that they will eventually fail to meet our requirement that records be reusable. Eventually, older systems will not provide adequate mechanisms to interchange information with newer systems and at that point we may have to change our approach if the reusability of our records is one of the motives for preserving them.

Preservation methods in archives and other custodial institutions

Generally, the option of using the original system to preserve and provide access to our records is not available. There is a need to implement a specific system to preserve the records and mechanisms to move the records from the system which creates them to the system which will preserve them. This mechanism may also have to delete, or mark in some other way, the records thus exported from the creating system. Whether the records exist in only one system (the creating system or the preserving system) or potentially exist in both simultaneously is driven by business need. It is legitimate for records to exist in both places if, for instance, there is a business need to retain them in the original system, but that system is incapable of providing public access to the archival records it holds. By contrast, it is not legitimate to retain records in the original system if the primary need for them no longer exists, they contain personal or confidential information and they are being preserved only for future historical interest and/or legislation forbids their retention once the original need for them no longer exists.

In general, there is also the need to adopt a format for the preserved records (and their metadata), which is independent of any particular software system or hardware. Ideally, the format chosen will be defined by an international or national standard. Failing this, it should be defined by a standard that is publicly available and not subject to patent or licensing restrictions. Either of these will ensure that we are not dependent on any one supplier of hardware or software to ensure continued access to the records. Formats defined by such standards are usually well supported by many software suppliers. Even if we reach a stage where no commercially available software exists which can process our preserved files, the existence of the standards document means that we can create software afresh to read, render, process and reformat the files. If the standard comes from a recognised standards body, we can be confident that copies of the standard will be available from copyright libraries and similar bodies effectively in perpetuity. If it comes from a less formal body, it may be prudent to retain and preserve a copy of the standards document alongside the records.

The format we choose should be:

- (a) able to represent all information and relationships between information in the original record that we regard as significant;
- (b) defined by an international, national or publicly available standard;
- (c) proven in terms of longevity or widespread adoption;
- (d) directly usable for access purposes, or be capable of being transformed into formats which are thus usable;
- (e) independent of any particular software or hardware environment;
- (f) capable of automated conversion from original formats to preservation formats, with automated detection and reporting of conversion problems or errors where applicable; and
- (g) (optionally) capable of automated conversion from our preservation format to the format used in the original or current record-creating systems.

Unfortunately not all types of information have file formats which meet all of these requirements today. At the time of writing, geographical information systems (GIS) are one example. Although open file formats have been developed in the past and a new, more advanced open GIS format is undergoing active development, tools are generally not available to translate from proprietary formats in which GIS records are created into the open formats in which we would like to store them. Thus, we cannot satisfy requirement (f). Tools do exist, however, to perform the reverse function – translating from open formats to proprietary formats. Thus, if one can construct a tool to convert GIS information into an open format, the format satisfies all our other requirements.

Some of the requirements are worthy of further clarification. Requirement (a) is intended to allow some flexibility in what we store and how we store it. It recognises that the original file may have some properties which are not intrinsic to the record we are trying to preserve and that a preservation format which cannot represent them still allows us to preserve the record, even if it is not preserving everything in the original computer file. For a text document such as this, for instance, the words and the order in which they appear is of significance, and usually matters such as pagination and section numbering are also important, particularly if internal or external cross-references may exist to specific sections or pages of the document. The exact font or type size used is not usually so relevant, although stylistic variation such as the use of bold, italic or underlined text is often material to the meaning. Exactly which properties are significant needs to be assessed depending on the type of record and the information within it. We usually seek to show that the conversion process we employ preserves all significant properties by definition, or at least is able to warn us if it encounters a document where it cannot do so (second part of requirement (f)).

Requirement (f) ensures that we can take records from their original system into archival custody with the minimum of manual effort, and ensures that a robust exception reporting system exists which alerts us to any problems that require human intervention to resolve. Having an automated system, or at least a well-defined process and workflow, improves the auditability of the preservation process and helps to demonstrate the integrity of the end result. We can focus our efforts on the process and the tools used within it, rather than on proving the qualities of each preserved object.

Requirement (g) is noted as optional since in many cases it is not necessary. It is only a requirement if we foresee a need to move records back and forth between preservation in archival custody and use in the original record creating system. Even if we foresee this need, requirement (g) only becomes significant if the original record-creating system cannot import records using the access formats which requirement (d) says we need. If the creating system can use these formats to input records, then (g) is satisfied. This requirement may be difficult to meet if we have chosen a preservation format which discards some part of the original information content which we deemed not worthy of preservation. An example arises with word-processor file formats. The numbering of sections, pages, tables and figures is usually automated, with the word processor automatically renumbering everything as material is added and removed during the process of editing. Further, many word processors will extend this renumbering to the use of references within the text to other page or section numbers, or to the numbers of figures and tables. They do this by specially marking references to figures, distinguishing (for instance) the use of the words 'figure 3' from a reference of the form 'figure <n>' where '<n>' currently happens to be '3', but may later become 2 or 4. We may choose a preservation format that loses this special linkage, on the reasonable presumption that our preserved documents no longer need to be edited and so no longer require such function-

ality. But if the document is to be reused in its original system, and editing results in changes to table numbers or page numbers, the loss of the automatic renumbering of references to those pages and tables significantly reduces the usefulness of our preserved record within its original system.

Bitstream preservation

All of the methods of preservation we have discussed depend ultimately on our ability to carry out what is known as bitstream preservation. This is the ability to take a particular sequence of digital information, represented as a sequence of 1 and 0, and preserve it exactly without regard to its meaning or content. When preserving records we are at any one time usually dealing with a collection of bitstreams.

To ensure bitstreams are correctly preserved, we carry out a few basic actions and make one assumption: every bitstream has some unique identifier which does not alter during the time which we are preserving it and which can be used to retrieve it from the preservation system. To ensure completeness we must be able to demonstrate that we have every bitstream that we have been entrusted with, and that we do not possess any bitstreams which we have not been entrusted with. Doing this usually requires that we maintain some list of bitstream identifiers separate from the system in which they are preserved and usually with access controls that ensure no one person can simultaneously affect the information in both systems. Periodically we can compare the information in both systems.

We must also ensure that we can read every bitstream without error. This is typically done by periodic checks, which may be automated or manual. Once every six months to 2 years is a typical frequency for such checks. For small record collections on media such as CD, it is sufficient to ensure that all files on the CD can be copied to another medium (which may be temporary disk) without system-detected error. This would take only a few minutes of staff time every few months. To guard against hardware error, it is recommended that these checks are carried out on a system other than that which was used to write the media. (Some types of failure can result in media that can only be read in the tape or disk drive which created them).

Finally we must ensure that the bitstreams are unaltered. This is unusually done by a cryptographic technique to create a checksum, a small piece of information of fixed size, independent of the size of the bitstream but dependent on the contents of the bitstream. The checksum should have the property that it is difficult for any accidental or deliberate alteration of the file to take place without the checksum being altered. Checksums should be computed when files are taken in to archival storage and stored separately from the preserved files. Periodically files are re-read, their checksums re-computed, and compared with those computed when they were originally acquired. Any alteration is indicative of systems failure or deliberate human tampering, either of which needs to be investigated. A widely used checksum is the one known as MD-5, which is relatively straightforward to compute on any system, relatively strong cryptographically and not burdened by any patent restrictions. But continuing advances in computing power mean that these decisions should be reviewed approximately every 5 years.

Whenever we alter the format of our preserved files, we are altering the bitstreams and hence the actions above need to be carried out again as if the file was newly acquired for preservation.

Migration to new storage media

One further technique is used to protect against the fact that no computer storage medium is permanent, and most are subject to rapid degradation compared with paper. We should plan periodically to copy our files to new storage media, either of the same type as before or of a different type, more appropriate to current technology patterns. This process is known as 'migration.' In the past, we might have copied files from 5.25" floppy disks to 3.5" disks or to CD, or from 800 bpi ½" magnetic tape to 3480 tape cartridge. It is impossible to predict the medium to which copies will be made in future; all that is known is that there will be a need to do so. Most computer storage media last for periods of about 5 years - longer for some types under ideal storage conditions; but shorter for many types in conditions which are far from the ideal temperature, humidity or ambient light levels. Creating multiple copies of each of the preserved files and storing these copies at multiple locations helps to protect information. Digital copies, unlike copies of paper records, are potentially perfect and they are relatively cheap to produce. The protection institutions achieve through the use of multiple copies can mean that they can reduce the frequency of some of the other tests and processes referred to in this section.

5.5 Skills

The skills and knowledge required to ensure the long-term preservation of records are likely to come from a variety of people and are often split between the organisation responsible for creating the records and that which is responsible for preserving them. This is not materially different from the situation with traditional, paper records. Institutions depend on records having been created and managed by people with at least basic skills in record management, classification schemes, and the application of retention and disposal schedules; they rely on the archive which retains them having people who understand the organisations which created the records, who can describe them and make them accessible to their readers. Equally, the archive must have people with the necessary skills in preservation and conservation to ensure that the records are managed well and stored in conditions which will ensure their long-term survival.

Little is different with electronic records. Institutions may find that the necessary skills are spread through a greater number of people. For instance, the record-creating organisation is still required to have the basic skills to ensure that retention and disposal schedules are developed and applied to electronic records. But to apply the schedules effectively, and to audit that they have been applied, may require the advice or cooperation of someone with an understanding of the software and hardware systems in which the records exist. Such understanding can typically be found in people described as systems analysts. It is also important to recognise that although the systems analysts can help devise the necessary means of ensuring that schedules are applied correctly, they are unlikely to have the records management skills necessary to develop the schedules in the first place.

To ensure effective long-term preservation, institutions need people who understand the organisation and context in which the original records are created, just as we do with any other records. People with knowledge of file formats, and the use to which those formats are put, are also required. This knowledge rarely needs to be very technical. Most organisations use a small number of common file formats which are also used by organisations worldwide. Guidelines should be developed with appropriate expert input on how to deal with the most common file formats. Such guidelines already exist for digital images and digital audio files, as well as for a number of textual file formats. Therefore, it

is sufficient that most organisations have someone who is capable of assessing which guidelines are applicable to the organisation and of understanding how to apply them.

If the organisation has to deal with unique or obscure file formats for which no guidelines exist, or for which existing guidelines do not provide sufficient practical advice, it will be necessary to have a greater level of technical skills available to develop the necessary tools to preserve the records and to be able to test and validate those tools. Someone other than the author of the tools should ideally carry out the test and validation steps. Hence the organisation must have access to at least two people, or groups of people, with the necessary technical skills. It may be possible to ask another archival institution to help with the validation of tools one has developed in-house, or to use external consultancy. Alternatively, the tools can be developed by external software specialists and validated and tested using in-house expertise.

Archival institutions which have a duty to advise other organisations on how to create records will want to acquire skills in the design and use of common business applications so as to be able to provide appropriate advice. This may relate to the best use of e-mail applications for business purposes, or may be more technically oriented. For example, it might involve advising on configuring a particular database application to ensure it preserves auditable transaction records.

Organisations which are already actively involved in the management and preservation of electronic records have typically found that IT skills (in systems management and/or software development) and archival skills are both required, and that each specialist needs to have some basic understanding of the role of the other. Software engineers do not need to become qualified archivists, and archivists do not need to become systems programmers. Each, however, needs to be able to find a common language to discuss what they do and what each needs from the other. Mechanisms, which ensure that this dialogue is continuous and natural, have been shown to be most beneficial. In those organisations where the management of archives is organisationally and physically distant from those responsible for IT systems, communication tends to be both infrequent and ineffective and characterised by either fear or hostility. Conversely, if mechanisms are developed which allow for formal and informal communication to occur between these groups at all levels of responsibility, common cause is often found, problems arise less frequently and are solved more rapidly when they do arise. In short, there is a premium on team working and communication skills.

5.6 Summary

This chapter has addressed the practicalities of preserving electronic records. Any preservation technique must be consistent with the core requirements of authenticity; completeness; accessibility and understandability; processability; and potential reusability. Consideration of requirements does not lead us to advocate any one preservation technique as the solution which archives should adopt. It would be foolish to do so, not least at a time when solutions continue to evolve rapidly. Indeed one of the principal considerations in planning for preservation is how we best allow for future change. This chapter has shown the need to plan in the light of that contingency. But equally it has argued that the prospect of future change should not deter archivists from taking action now. The surest means of beginning to acquire experience and expertise in the field is to act – rather than to watch others.

CHAPTER 6: ACCESS

6.1 Aims and objectives

The provision of access may be regarded as the ultimate objective of recordkeeping. Records are created, kept and preserved to make them available for those who need them and are entitled to access and use them.

This chapter gives practical guidance on how to provide access to electronic records over the short and the long-term, with special emphasis on the latter. The following issues will be addressed:

- provision of access over the short-term (in the creating agency): user needs, access options and access controls related to creating organisation and other users;
- provision of access over the long-term (after transfer to an archives and/or through technological changes): access options dependent on preservation strategies and methods, and the need for metadata;
- developing user services over the long-term: types of users and user needs, types and levels of user services, service options and the limits of archives' function, and costs; and
- assessing readiness, developing actions plans, and evaluating progress.

6.2 Scope

Functions for the provision of access are, as a necessity, implemented in electronic records management systems. Access options and access control functions in such systems are primarily designed to meet the requirements and needs of the record creator's organisation. But external users may sometimes be entitled to access electronic records at the creating stage, either directly in the system, or indirectly through off-line services or information systems, which are made specifically for external use.

Access options and the access control functions of records management systems are not the responsibility of an archivist. But there are many reasons why they are of interest from an archival point of view. These functions document the user options related to the records and their metadata within the creating organisation. They also provide an archive with ideas about how to design and implement user services for those records over the long-term. Furthermore, the original system's access control functions may be a prerequisite for an archive providing on-line access to the records before all information in the system is public.

In order to make electronic records accessible over the long-term, provision must be made for access functionality within the preservation programmes and systems of an archive (or other organisations which preserve records over the long-term). But experience so far shows that these functions do not necessarily include the tools needed for efficient retrieval and use. Electronic records are sometimes preserved and stored in a format that is not particularly suitable for efficient retrieval, and processed by software that is not specifically designed for meeting user needs. Consequently, it happens that the access to electronic records is more limited and less flexible than for similar paper records, or that specific software development is needed to make the records available in a way that is convenient for the user.

On the other hand, if the records are prepared for, and processed by, appropriate software, the retrieval and user options may be more efficient and flexible than would be the case with paper records. The potential is enormous and user demands will probably increase rapidly as more and more records become electronic, as software tools become more and more powerful and as new generations of potential users have their expectations of archives raised by their greater familiarity with the potential of information technology.

The options and costs of providing adequate access to records and of developing advanced user services are heavily dependent on the methods of records preservation. This has to be taken into account when developing such methods.³⁰ Requirements relating to access and user services should be implemented within the preservation systems and their essential processes. One of the principal topics of this chapter is the identification of those requirements.

This chapter will also discuss different types of access and user services, the need to limit access in accordance with privacy rules and other security regulations, and the provision of services relevant to different kinds of users. Finally we will consider where the boundaries of the archival function should be drawn with regard to electronic user services, and who is going to pay for the most advanced services. User needs, practical/technical solutions and costs must be balanced against each other.

6.3 Access and use over the short-term

The short-term is here defined as the period when the records still are part of, or connected to, a system where records are created, and which is actively used by the records creator in carrying out business functions, including:

- either the original records system where the records were created, or a system to which they are converted as part of the creator's business needs; and
- a records system which includes recordkeeping functions and normally also other records management functions.

Access options and user needs

Access options and on-line user services over the short-term will primarily be designed to meet the requirements and needs of the record creator's organisation (i.e. the management, executive officers, records managers and other staff).³¹

These options will, in general, also satisfy the needs of secondary users (e.g. journalists, researchers and other external users) if they are allowed to access the system on-line (see **Access Control** below for information on security risks and control requirements related to on-line services for external users). Accordingly, there should normally be no need for on-line user services specifically designed for secondary users.

However, access options for secondary users are more often restricted to off-line services, or based on information systems, which are designed specifically for external use. In such cases the needs of external users must be analysed separately, related to the policy of the creating organisation and to legal requirements, not least those relating to pri-

³⁰ See Chapter 5 on preservation methods.

³¹ See *Model Requirements for the Management of Electronic Records*, Marc Fresco and Martin Waldron (London, 2001) for an example of functional requirements for searching, retrieval and rendering in an electronic records management system.

vacy and freedom of information. This kind of user service will not be discussed further here, not least because it will probably be similar to, or a subset of, the user services developed in an archive (see 6.5 below).

Access control

The definition and implementation of access rights and restrictions is discussed in the ISO standard on records management.³²

If the records creator provides on-line user services for external users, the system's access control functions and the creating organisation's access control procedures become crucial. Giving external users direct access to the records system is fundamentally different from providing them with electronic registry lists or even an electronic copy of records. On-line access to the system means that the external user can access every item of information that is not restricted.³³ To manage this, the creating organisation needs to:

- define external users as specific types of users in the records system with access restrictions in accordance with the organisation's policies and with any legal requirements;
- implement system functions which control access both to the records and their metadata according to the defined restrictions; and
- implement and practise business procedures which ensure that access restrictions are in force with regard to every relevant piece of information as soon as it is made available for users of the system.

This kind of access control is relevant for as long as parts of the information are not public, which normally will be long after the time the records were created. Hence it is important to include the access control information (i.e. metadata) and functionality of the creating system when the records are transferred to an archive or other custodian for long-term preservation and use (see **Access control requirements and options** below).

6.4 Provision of access over the long-term

The use of electronic records over the long-term requires preservation of authentic, accessible and understandable records through repeated technological changes. This requirement implies that records are stored with the metadata needed to describe the context of their creation and use; that the original links between records and metadata are preserved; and that the records, their metadata and the information on relations between them can be accessed and utilised by software running on the technology available at any time in the future.

Access options related to preservation methods

A range of different strategies and methods may be used to preserve electronic records through technological changes. All of the approaches, which are in practical use, include some kind of migration of records and of the coherent metadata to new platforms, which are adjusted to the new technological standards.³⁴ The options for providing access to the records and developing adequate user services, and the costs of these actions will depend on the preservation methods used (e.g. storage formats, data structures, adaptation of

³² See especially ISO 15489-1, sections 7.2.5 and 8.3.6. ISO/TR 15489-2, sections 4.2.5 and 4.3.4.

³³ Complex organisations will have to address the same type of challenges in relation to internal access control. Staff in one part of an organisation may be subject to the same access restrictions as external users with regard to records created in other parts of the organisation.

³⁴ See discussion in Chapter 5.

available software requirements). In this section we will discuss the implications of four preservation methods for accessibility and for the costs of providing access.

Method A

Records are kept in their original context over the long-term (i.e. the creating organisation keeps them in the original system for as long as it runs, and whenever technology changes the whole system, including records and metadata are converted to the new platform). Non-archival records are destroyed according to retention schedules.

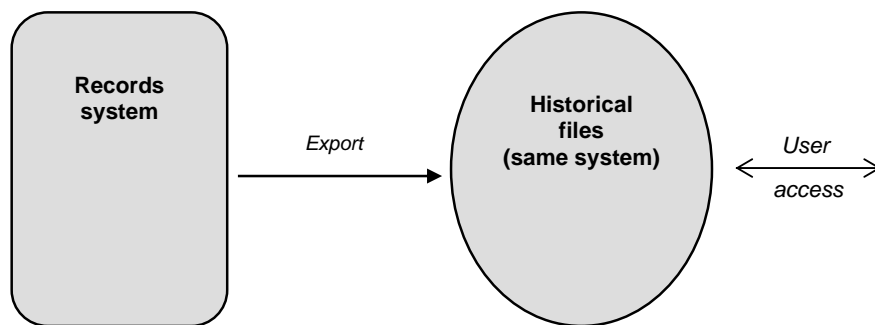
Environment: The records creator needs the records over the long-term to carry out his/her business functions. The environment will be the same as that described in 6.3 above.

Access options and costs: Access options will be broadly the same over the long-term as in the original records system subject to changes in the organisation's needs and priorities over time (see 6.3 above). The costs of maintaining the records' accessibility over the long-term are determined by the needs of the record creator, and thus are part of the costs relative to the functions of the creating organisation.

Method B

Non-active archival records and their metadata are copied to historical files in the format of the original records system, and deleted from current files. The historical files are either managed by the creating organisation or transferred to a custodial institution. As technological changes take place, the files are converted to new software, which is either the next version of that which ran on the original system or another system with similar functionality for information retrieval.

Figure 1



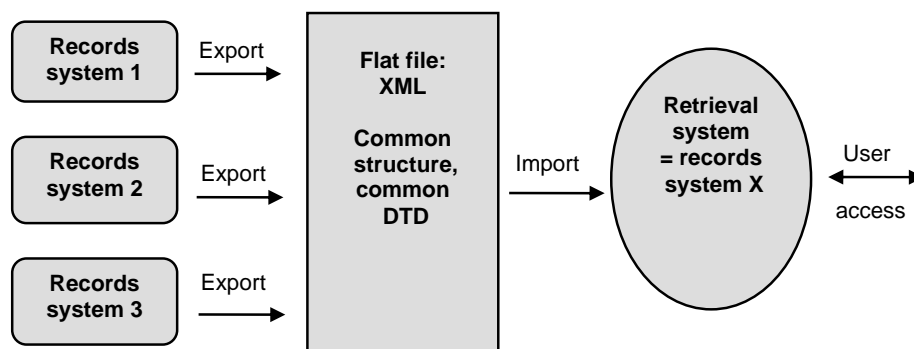
Environment: Historical files remain in the custody of the records creator's organisation or are transferred to an archive or other institution whose services are specially designed for this specific type of system and/or records.

Access options and costs: The records are well prepared for high level access and the method provides a good basis for advanced user services (see 6.5). There are significant costs related to the records' accessibility, but these can be reduced if the conversion to new software can be carried out as part of the conversion of current files (by or in cooperation with the creating organisation).

Method C

This approach can be applied as an alternative to Method B, or when records from different systems are of a common type and conform to common formats and structures. Non-active groups of archival records and their metadata are copied to historical files and stored in a format independent of any specific software (i.e. flat files). But the formats and data structure of the flat files are specified and related to these specific types of records, and there are specified functions for automatic import back to the original records system or to similar systems, which have implemented these import functions. The flat files need to be converted only when changes in technology make this format inaccessible, or when this method becomes inconvenient compared to others.

Figure 2



Environment: The environment can be the same as with Method B, or it can be an archive or other custodial institution which preserves records of similar types from different creators and records systems. The prerequisite is that the records and their metadata may be represented in a common structure in the flat files.³⁵

Access options and costs: The records are well prepared for high level access and the method offers a good basis for advanced user services (see 6.5 below). But this depends on the implementation of appropriate import functions. Costs are normally lower than with Method B for keeping the records accessible over the long-term.

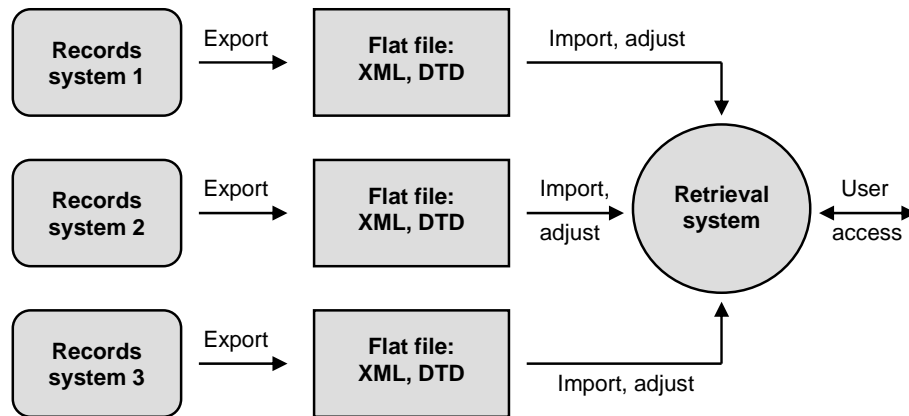
Method D

Non-active groups of records and metadata are copied to historical files and stored in a format independent of any specific software (flat files). The flat files are stored in a format like XML, with a coherent DTD, and thus the flat files document their own data structure. Based on this documentation the records and their metadata can be imported into other records systems or other information systems to provide access to the records.

Environment: This is a general solution for all types of records and systems.

³⁵ Scenario: all the agencies of a city administration are instructed to use office systems which conform to specified standards on formats and data structures of the records and metadata they create. This will enable the municipal archives of the city to apply Method C for preserving those records, regardless of how many different systems are being used.

Figure 3



Access options and costs: Access options will depend on the custodial institution's ability to import records into an adequate information system and on the functionality of this system with regard to information retrieval and other user services. Costs of systems development will normally be higher than for Method C, but modern software offers powerful tools for developing import functions and user services. Efficient combinations of Methods C and D are possible if the creating record systems are standardised.

Metadata requirements

Metadata³⁶ are needed to make the records accessible, to facilitate their efficient retrieval (e.g. search criteria), to present the records in their true context (i.e. the administrative and business context of their creation) and to proving their authenticity. Categories of metadata of relevance to access functionality are:

Technical Metadata

- *Information on formats, structures and links of preserved records.* These are needed to access the records, and to import records into systems for efficient retrieval and user services. The technical metadata will have to be updated at every migration to new technical platforms.
- *Systems documentation of the original system.* Parts of the systems documentation will normally be a necessary supplement to the technical metadata already mentioned. It also forms part of the business context of the creating organisation (see next bullet below)

Recordkeeping Metadata

- *Records management metadata produced in the creating organisation, (i.e. contextual information on business processes, relations between records etc. Examples include registries and registry-like information, logs from work-flow systems etc.).* These are needed for retrieval (i.e. search criteria), for understanding the records in their true context and for authenticity reasons.
- *Information which explains structures, codes etc. in the records and their metadata (i.e. metadata about metadata).* These are needed to understand the content of both records and metadata.

³⁶ See previous chapters for the definition of metadata and their role in records creation and preservation.

Archival Metadata

- *Descriptive metadata produced by the archive for the intellectual and physical control of the records within the archival institution.* Such metadata are needed to identify and retrieve systems of interest, and for contextual information (e.g. information on the functions of the creating agencies).

A challenge for the future is to integrate the different types of metadata and the records in a coherent structure so that the records (embedded in their creation metadata) can be accessed on-line from an archival description system based on ISAD(G) and ISAAR(CPF). This kind of comprehensive solution would be a powerful tool in facilitating access to electronic records and making information retrieval more efficient. But such solutions are not a prerequisite for developing advanced user services.

Access control requirements and options

When an archive or other custodial institution plans to provide on-line access to electronic records, either all the records and the other information in the system must be public, or access control functions must be implemented to protect records and information, which are not public. If the archive inherits the access control functions and metadata from the original system of the creating agency it will have powerful tools available and these may be a prerequisite for the implementation of such functions. The alternative would be to implement such functions from scratch, which in most cases would prove too expensive.

If the access control functions of the creating system are carried out by means of privacy codes connected to single records, files and classification schemes, these codes can easily be transferred to the custodial institution with the records as part of the creation metadata. For retrieval purposes records and metadata should be imported into an information system (see preservation Methods C and D above), and access to all information (including the records) can then be controlled by the same privacy codes as in the creating system. Users must be authorised for specific privacy codes in order to retrieve restricted information. Users who do not have this authorisation will be restricted to information that is available to the general public.

6.5 Developing user services

Having established satisfactory accessibility to the transferred records and having implemented the necessary access control functions (if such functions are needed), the next step by the archive or other custodial institution would commonly be to develop and implement user services. There are as many options for the development of user services for electronic records, as there are different types of users and user needs. Hence the custodial institution will have to analyse its environment and define its policies in order to develop relevant and adequate user services. The options are quite different from user services for traditional records, and so the analysis undertaken will itself be quite different.³⁷

The analysis should comprise the following elements:

- identifying different categories of potential users and understanding their needs;

³⁷ However, digitizing paper records by scanning gives most of the same options for user services as with electronic records.

- defining potential user services, their type and level, and relating them to user needs; and
- determining the costs related to different types and levels of user services and deciding who is liable to meet those costs.

Based on such an analysis the custodial institution should develop a user service strategy, balancing user needs, levels of services and costs. Implementing this strategy, comprising software, service procedures and organisational infrastructure, will produce the tools needed to offer user services within the context of the policies operated by the custodial organisation.

Users and their needs

The identification of users of electronic records over the long-term is necessarily speculative. We can be confident that they will be diverse and that their needs will differ. Users may include:

- government and municipal administrations needing records for reasons of corporate memory or accountability;
- prosecuting authorities and lawyers who need records as evidence for their clients and cases;
- scholars carrying out research based on historical sources;
- teachers using historical sources in their teaching;
- students;
- those who are working on cultural projects – including employees of cultural institutions;
- journalists;
- genealogists; and
- people who need records as evidence of their rights, or to document events which have a direct bearing on them personally.

This list does not pretend to be comprehensive, but it gives some flavour of the wide range of users interested in electronic records over the long-term. Some categories of users may also have legally defined rights to access electronic records.

But there are likely to be two main types of user needs. The first one is for records as *evidence* of events and actions in the past. The second one is for the *information* that can be drawn from the records and/or the metadata surrounding them. In this last case the user might be interested in having the information edited as one might with statistics drawn from a database.

We will consider these categories in turn:

- *Records as evidence of events and actions in the past.* This may be relevant to all types of users identified above. What the users need is an effective system for retrieval of records (i.e. a system that offers relevant search criteria and efficient methods of presenting the records). Additionally it is crucial that records are authentic and that the user can be confident that they are so.
- *Information drawn from records and their metadata.* This may be relevant to any users undertaking research based on records as historical sources. The retrieval methods can be the same as for records, but for this purpose it can also be useful to search for information across provenances, using, for example, subject search criteria and free text searching. Moreover, the users will have a wide range of preferences with respect to the presentation of the retrieved informa-

tion. Some of them will want an electronic copy of the information they have retrieved, so that they can edit it themselves.

Types and levels of user services

The user services should, of course, be adapted to the needs of the potential users. On the other hand, the scope for developing user services will also depend on the preservation methods that are in use (see **Access options related to preservation methods** above) and the technical solutions related to them. Additionally, costs may limit the development of the more advanced types of user services (see **Strategies balancing user needs, service levels and costs** below).

The potential for the provision of user services for electronic records is enormous, and accordingly there will be a number of different types and levels of such services. This section will categorise them and discuss their properties:

Simple information retrieval based on flat files

When records and their metadata are stored in flat files (i.e. sequentially recorded in a format independent of specific software) the level of accessibility and user services will depend on the software available to import them into a system designed for information retrieval (Methods C and D above). If this import cannot be carried out, the user services must be based on information retrieval applied directly to the flat files. This kind of retrieval will normally be limited and the user service accordingly rather primitive. Moreover, the cost will often be high because separate action is needed to fulfil each request and in many cases dedicated software may have to be developed.

But if the information in flat files is recorded in a format that conforms to modern standards like XML, the options for information retrieval are significantly greater. The use of such standards therefore enables more adequate and cost effective user services.

Copies of flat files, preferably in a standardized format like XML, can be given to users who want to edit the information for their own purposes if they have the skills needed to retrieve information in this form. This approach might be attractive to some researchers and to teachers using information from historical sources.

Retrieval within an information system or records system

When applying preservation Methods C and D, records are transferred to a custodial institution as flat files. They may then be imported into an information or records system for effective and efficient retrieval. This kind of information retrieval will be of value both to those who are retrieving records for evidential purposes and to those who are looking for specific types of information which can be drawn from the records and their metadata.

The information retrieval will probably be most effective with Method C, because the data structure in such cases is more standardised and the search criteria can be adapted to that standard.³⁸ On the other hand, Method C requires that the data structure is standardised from the records creation stage (i.e. within the creating systems). This means that Method C can only be applied when standardisation is included in the design of the record creating systems, and when the information contained in these systems is suitable for standardisation. Accordingly, an archive or other custodial institution which is managing electronic records from different, non-standardised systems, will have to apply

³⁸ This applies even more to Methods A and B which are more directly related to the records creation system and its successors.

Method D in any event (preferably in addition to applying Method C for records and systems which are standardised).

Records and information retrieval within a modern information system ordinarily represents a cost effective service suitable for most users. It also provides the basis for the active dissemination of records and for services specially designed for certain types of users.

Active dissemination of records and related information

The user services described above are carried out on demand by the users. In other words the retrieval happens when users visit the custodial institution to get the information and documentation they need. But electronic records are also very suitable for active dissemination. By means of the Internet and the worldwide web electronic records and/or information drawn from the records and their metadata can be made available anywhere throughout the world at any time. The options and systems of information retrieval can be the same as described above, or the information may be edited and prepared for specific purposes, and categories of users as described below.

Active dissemination of records using the web gives archival and other custodial institutions an opportunity to present their holdings in a number of different and new ways and, not least, to make them more readily accessible to user groups who do not frequently visit the archives. This opportunity is also relevant to digitised paper-based records and information. It is even more convenient for electronic records, which do not need to be converted to be disseminated over the web. As we have seen above, adequate methods and systems are needed to retrieve the records and the information in a way that meets the demands of modern society.

Editing and adapting information for specific purposes

We have already noted that users engaged in research on historical sources may want copies of records to extract, edit and/or link information in new ways adapted for their research purposes. Examples of such arrangements include OCR-reading (optical character recognition) of information stored in a bit map format³⁹ in order to prepare it for free text search or deriving statistics from an edited version of the original data.

This kind of editing and adaptation can also be carried out by a custodial institution preparing the information for specific purposes and types of users. This modified information can, in addition to the records themselves, be disseminated by the Internet as a service. This may prove to be an especially valuable approach where users repeatedly seek the same information. The possibilities opened up by this form of editing are almost limitless: institutional creativity, access restrictions and cost may be the only practical constraints.

Precautions

When preparing electronic records for access and dissemination there are two simple precautions that must be kept in mind:

³⁹ Bit map is the storage format you get when scanning a document. This means that the document is stored as a picture, and that the text is not searchable. OCR-reading (optical character recognition) is a method of transforming the picture to an ordinary text format, so that searching (free text search) can be carried out in the text.

- the records and their metadata must be preserved in authentic form as long as they are kept. Their integrity must not be endangered. Any editing of the information must be based on *copies* of the records; and
- most electronic records have been created in recent years and so many contain personal information which remains sensitive. This and the legislation governing access will probably prove to be one of the most significant restrictions on access for some years to come.

Costs

The costs associated with the different types of user services will depend on a wide range of factors. In addition to the type of service in question, costs are dependent on the users' demands and skills and on the infrastructure of the custodial institution (i.e. organisation, systems and skills). Each service, or proposed service, needs to be costed within its own institutional context.

But some general observations can be made. In most cases the most expensive issue for a user service will be the development of new software and new data structures and the associated investment needed (i.e. new procedures and new skills). The more that user services can be built upon common systems, structures and procedures, the less expensive they will be. Therefore, standardisation is important if we are to lower costs, or to expand services without increasing the costs sharply.

For a custodial institution the most efficient way of saving money on electronic records management is standardising the records systems and structures from the creation stage (see Method C above). The extent of possible standardisation will, of course, vary; it is dependent on the nature of the records creators and of the records they create, and on the relationship between the custodial institution and the creators. As a general rule some standardisation is better than none.

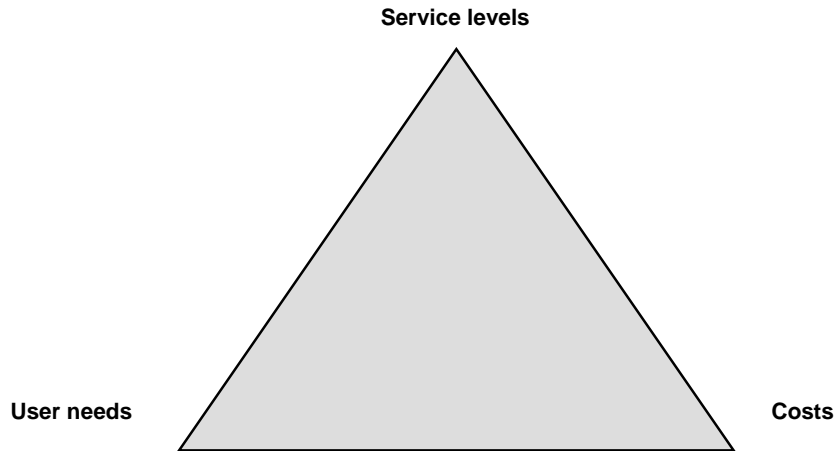
If creating systems cannot be standardised, one should at least have the records and their metadata transferred in formats that conform to modern standards (e.g. XML for structured information). This will contribute to lowering the costs of developing adequate and modern tools for user services (see Method D above).

It is also clear that the development of dedicated user services, including editing and adapting information for specific purposes and users, will be costly. In such cases there is also an important question about the liability for these costs. Where are the boundaries of the archives' function? Are dedicated and expensive user services for electronic records a custodial institution function, or should this kind of activity be regarded as a service for which the users have to pay? This question must be addressed within the public service policies of any institution which plans to develop these access services. Different jurisdictions will resolve these questions in different ways.

Strategies balancing user needs, service levels and costs

When developing strategies for user services the custodial institution will have to balance the types and levels of services it plans to offer, against the needs of existing and potential users and the costs related to the different services. In short, they need to triangulate between three points.

Figure 4



Archives should not refrain from introducing costs into the equation: they are an unavoidable issue when developing access services for the future. Closely associated with the overall cost is the question of whether users will fund all or part of the total. The development of electronic access services will lead many archives to consider afresh their long-standing policies on charging. There is no one right answer. Each has to make its own judgement in the light of its financial, political and social context. The only general point which may be made is that the question of cost cannot be ignored.

6.6 Summary

The literature on electronic records management tends to focus on the technological and organisational issues to be overcome if records are to be created and preserved successfully. That may be understandable because archivists now face these challenges on a daily basis. But this chapter has argued that this emphasis is misplaced: we need to plan now for future access needs. To that end, the chapter has evaluated four contrasting approaches to electronic access.

The conclusion of this Chapter is telling. In considering access to electronic records, archives will have to weigh costs, user needs and service levels. It is a judgement with which archives will be long familiar. Indeed, there is much in the management of electronic records which is familiar. Earlier approaches do need to be refined and archives (and archivists) do need to learn new ways of working. But one of the underlying messages of this *Workbook* is that it *is* possible to make progress, even from unpromising starts. Perpetual contemplation of the problem will only make it seem more daunting. Electronic records call for a vigorous, proactive response from archives. If this *Workbook* has shown how archives might begin to make that response it will have achieved its purpose.

ANNEX A

Members of the ICA Committee On Current Records in an Electronic Environment

From 2000 to 2004, the following individuals were participating members of the Committee (for all or part of the period):

Kimberly Barata (UK; project co-ordinator)
Jacques Bogaarts (Netherlands)
Niklaus Bütikofer (Switzerland)
Paola Carrucci (Italy)
Maria Luisa Condé (Spain)
Simon Davis (Australia)
Catherine Dhérent (France; Committee Secretary)
Ivar Fonnes (Norway)
Cecilia Henriques (Portugal)
Lyle Hereth (USA)
Hans Hofman (Netherlands)
Elizabeth Honer (UK)
Andrew McDonald (UK; Committee Chair)
Mike Miller (USA)
Miroslav Novak (Slovenia)
Joël Poivre (France; Committee Secretary)
Carolien Schönfeld (Netherlands)
Andrea Süchting-Hänger (Germany)
Bjarni Thordarson (Iceland)
Juhani Tikkanen (Finland)
Karel Velle (Belgium)
Michael Wettengel (Germany)
Mahfuzah Yusuf (Malaysia)

ANNEX B

Further Reading

Introduction

There is an abundance of materials available on the subject of managing electronic records. The national archives of many countries have now provided extensive guidance on the topic. Moreover, academic bodies and other public and private sector organisations also produce articles and instructional materials on managing electronic records. Most of these resources are available freely on the World Wide Web.

This Annex provides up to five citations to useful guidance relevant to each chapter. To provide a more exhaustive bibliography would result in a document that would be too long to be used readily and it could never aspire to be comprehensive, not least because the literature is growing so quickly. Instead, it was decided that a limited number of citations would be more helpful to readers of this *Workbook*. The criteria for selection were that materials must be written in English, provide practical (i.e. not theoretical) guidance and be widely accessible throughout the world. Most of the citations provided refer to materials produced by national archives. References are made at the end of the Annex to selected online journals and sites where more extensive bibliographies on the subject can be found. In addition, a list of selected support services and networks is also provided.

The universal resource locators (URLs) were correct at the time of publication (2004), but they might change over time. Abstracts are reproduced from publications to give a flavour of the texts.

Lastly, it is worth noting two studies that describe well the state of electronic recordkeeping in Europe and the United States at the time this *Workbook* was being written:

Schürer, Kevin. Better Access to electronic information for the citizen: The relationship between public administration and archives services concerning electronic documents and records management. (Luxembourg: Official Publications of the European Communities, 2001). Commissioned by the European Commission, Secretariat-General.

This study describes well the state of electronic recordkeeping in national archives in the European Union member states. Since 1996, progress in the management of electronic records in a number of European national archives has been limited. Fundamental legal issues still need to be resolved in some countries, in particular where they relate to the conflicting (but necessary) tension between the need for openness and for secrecy. In many member states insufficient resources and lack of training for staff also contribute to archives' inability to put in place adequate provisions for preserving and managing access to digital records. 'What the archival map of Europe clearly shows is that archival provision for electronic records across Europe is both varied and polarised.' These are key findings of a study carried out by the University of Essex in 1999. The study was conducted on behalf of the European Commission's Directorate-General for the Information Society, Unit E/4, with funding provided by the European Commission's Information Society Promotion Office (ISPO).

United States General Accounting Office (GAO). Information Management: Challenges in Managing and Preserving Electronic Records. Report to Congressional Requestors (GAO-02-586). (Washington, DC: GAO, June 2002). <http://www.gao.gov/new.items/d02586.pdf>

US federal agencies are producing vast and rapidly growing volumes of electronic records. The difficulties of managing, preserving and providing access to these records represent challenges for the US National Archives and Records Administration (NARA). GAO was requested to determine the status and adequacy of NARA's response to these challenges and review NARA's efforts to acquire an advanced electronic records archiving system, which will be based on new technologies that are still subject to research (i.e. the Electronic Records Archive (ERA) project). In the report, the GOA recommends that the Archivist of the US develop documented strategies to raise awareness of the importance of records management programmes and to conduct systematic inspections of these programmes. To reduce risks, the GAO recommends that the Archivist reassess the sched-

ule for acquiring the new archival system so that the agency can complete key planning tasks and address IT management weaknesses. The appendices include a useful introduction to digital preservation strategies.

Chapter 1: Introduction

ICA Committee on Electronic Records. Guide for Managing Electronic Records from an Archival Perspective. February 1997. http://www.ica.org/biblio/cer/guide_eng.html

The *Guide* was designed to help archival institutions reposition themselves to address the management of archival electronic records. Part I begins with an overview of the technological, organisational and legal trends that are having an impact on the ability of organisations, including archives, to keep and manage records that are in electronic form. It continues with a discussion of key concepts such as "record" and "recordkeeping" describing how these are impacted upon in the electronic environment, and then proposes strategies for accomplishing the life cycle management of electronic records. Part I concludes by describing - from the legal, organisational, human resources and technological perspectives - the implications for archives of repositioning themselves to manage archival electronic records. Over time, implementing the proposed strategies will require the crafting of tactics, including standards, which can be recommended for adoption by archives. Part II of the *Guide* represents a first attempt by Committee members to articulate such a tactical approach.

International Standards Organisation (ISO) 15489-1:2000(E) – Records Management & ISO/TR 15489-2 <http://www.standards.org.au>

This records management standard provides the benchmark for records management internationally. The ISO standard specifically excludes the management of archival records from its scope. However, the document draws heavily on established archival thinking.

Chapter 2: Basic concepts and definitions

The terminology used in this chapter is derived broadly from ISO 15489-1 (Records Management – Part 1: General). See citation above.

A number of key concepts that are fundamental for the discussions and recommendations in this chapter were drawn from the *Guide for Managing Electronic Records from an Archival Perspective*. See citation above.

Chapter 3: Influencing Strategies

National Archives of Australia, National Library of Australia, National Office for the Information Economy. Keeping Government Publications Online: a guide for Commonwealth agencies. (Australia: July 2002). <http://www.nla.gov.au/guidelines/govpubs.html>

Explains how collaboration between agencies, the National Library of Australia and the National Archives of Australia will help to ensure that online Commonwealth Government publications remain accessible. Provides advice on steps that agencies are required or recommended to take, definitions of publications and records, and the roles of the three bodies seeking to work with agencies.

The National Archives⁴⁰. Corporate Policy on Electronic Records. (United Kingdom, Sept. 2000). <http://www.pro.gov.uk/recordsmanagement/erecords/rm-corp-pol.pdf>

The guidance on developing a policy on electronic records is aimed at departmental record officers working in central government departments. It is designed to ensure that a policy can be developed in a clearly defined manner and be put easily into operation. The guidance provided sets out the generic principles that should apply to the management of electronic records across organisations.

⁴⁰ Formerly the UK Public Record Office.

The National Archives. e-records: route map and milestones to achieve electronic records management by 2004 (PRO).

<http://www.pro.gov.uk/recordsmanagement/erecords/route-map7.pdf>

The Route Map and Milestones provide a logical framework for where and how to begin implementing electronic records management as part of a records management programme. The milestones are practical and include the following targets for bringing existing records under control and designing e-records into e-business: developing a corporate policy on electronic records; determining a strategy for electronic records management in e-business plans; creating an inventory of existing electronic records; identifying the requirements for electronic records management in business plans; developing appraisal and preservation plans. With respect to integrating electronic records into policy and planning the Route Map specifies the following milestones: writing a strategic plan for corporate electronic records management; specifying detailed requirements for corporate electronic records management; agreeing an implementation plan; implementing facilities and procedures for the management, control and preservation of all new electronic records.

The National Archives. Human Resources in Records Management. (United Kingdom, 1999).

<http://www.pro.gov.uk/recordsmanagement/standards/humanres.PDF>

Records Managers, their staff and all who are concerned with the management of information need to develop particular knowledge and skills to meet the challenges of managing records in a modern office environment. This guidance consists of three distinct, yet interrelated, elements: a competence framework, job and person specifications, and training and development materials.

Chapter 4: Implementing recordkeeping**National Archives of Australia. Digital Recordkeeping: Guidelines for Creating, Managing and Preserving Digital Records <http://www.naa.gov.au/recordkeeping/er/guidelines.html>**

Develops the approach recommended in the DIRKS manual (see below) and gives the current (2004) perspectives of the National Archives of Australia on a wide range of recordkeeping issues. Includes a digital recordkeeping self-assessment checklist.

Fresco, Marc and Martin Waldron. Model Requirements for the Management of Electronic Records (MoReq). (London: Cornwell Affiliates plc, 2001).

<http://www.IPSO.cec.be/ida>, <http://www.dlmforum.eu.org>, <http://www.cornwell.co.uk/moreq>

The MoReq Specification is a model specification of requirements for Electronic Records Management Systems (ERMS). It was designed to be easily used, and to be applicable throughout Europe. The 'Model Requirements for the Management of Electronic Records' (MoReq) is a generic specification for computerized systems to manage electronic records. It can be used to design, select and audit systems for managing electronic records. MoReq was developed by Cornwell Affiliates plc for the European Commission's Interchange of Data between Administrations (IDA) initiative. There are separate chapters covering classification schemes, controls and security, retention and disposal, capturing records, referencing, searching, retrieval and rendering, and administrative functions. Other functions, such as the management of non-electronic records, workflow, electronic signatures, encryption and electronic watermarks are also noted. In addition, the specification covers non-functional requirements such as ease of use, scalability and technical standards. One chapter addresses metadata requirements.

Standards Australia. Work Process Analysis (AS5090) – Technical Report

<http://www.standards.com.au>

A technical report providing guidance on undertaking work process analysis for recordkeeping purposes.

**State Records Authority of New South Wales and the National Archives of Australia
DIRKS: A Strategic Approach to Managing Business Information**

<http://www.naa.gov.au/recordkeeping/dirks/dirksman/dirks.html>

This manual provides Australian government agencies with practical guidance on the design and implementation of best practice recordkeeping systems in accordance with the eight-step method-

ology recommended in Australian Standard AS 4390 1996, Records Management. The primary audience for this manual is government agency records management project teams and consultants.

State Records Authority of New South Wales. Desktop Management: Guidelines for Managing Electronic Documents and Directories. (Australia: NSW, May 2002).

<http://www.records.nsw.gov.au/publicsector/rk/manual.htm>

This publication, accessible through the State Records NSW website, forms part of the Government Recordkeeping Manual. The purpose of this document is to foster better electronic record-keeping practices in the New South Wales public sector by providing guidance on the management of electronic documents. These guidelines are intended to be used by agencies to establish their own internal guidelines for the management of electronic documents. They provide practical guidance on a range of issues including the assignment of roles and responsibilities and integrating document management with recordkeeping systems.

The National Archives. Electronic Records Toolkits. (United Kingdom, Sept. 2000).

<http://www.pro.gov.uk/recordsmanagement/standards/default.htm#3>, and

<http://www.pro.gov.uk/recordsmanagement/erecords/2002reqs/default.htm>

Electronic records management is a key underpinning element in the UK Government modernisation programme. The UK National Archives makes available electronic records toolkits on topics that include: compiling an inventory of electronic record collections and the management of electronic records on websites and intranets.

Chapter 5: Long-term preservation

Arkivverket – Riksarkivet Og Statsarkivene. NOARK- 4 English Version

<http://www.riksarkivet.no/arkivverket/lover/elarkiv/noark-4/english.html>

NOARK is a specification of functional requirements for electronic recordkeeping systems used in public administration in Norway. Version 4 of the NOARK standard was released by the National Archives of Norway in 1999.

Beagrie, Neil and Maggie Jones. Preservation Management of Digital Materials: A Handbook. For Resource: The Council for Museums, Archives and Libraries, UK. (London: The British Library, 2001). <http://www.dpconline.org/graphics/handbook/index.html>

ISBN: 0 7123 0886 5

Digital information is increasingly important to our culture, knowledge base and economy. This handbook provides an internationally authoritative and practical guide to the subject of managing digital resources over time and the issues in sustaining access to them. The handbook was compiled by staff from the JICS Digital Preservation Focus and the Arts and Humanities Data Service, both based in the United Kingdom. Included in the workbook are sections containing definitions and issues, institutional strategies, organisational activities and media and formats. Examples of good practice and research initiatives from around the world are provided, and extensive use is made of decision trees and checklists to assist users in considering issues further.

CAMILEON <http://www.si.umich.edu/CAMILEON/>

The *Creative Archiving at Michigan & Leeds: Emulating the Old on the New* (CAMiLEON) project is developing and evaluating a range of technical strategies for the long-term preservation of digital materials. User evaluation studies and a preservation cost analysis are providing answers as to when and where these strategies will be used. The project is a joint undertaking between the Universities of Michigan (USA) and Leeds (UK) and is funded by the Joint Information Systems Committee of the Higher and Further Education Councils (JISC) and National Science Foundation (NSF) in the USA. The only limitation of this study is the emphasis on emulation as a solution. Emulation refers to emulating obsolete systems on future unknown computer platforms in order to make it possible to retrieve, display, and use digital documents with their original software. An alternative approach is to migrate electronic records on to new systems and platforms as the originals become obsolete. Thus CAMiLEON may provide findings on only part of the range of options available to preserve digital materials for the long-term.

Public Records Office Victoria. Victoria Electronic Records Strategy (VERS)**<http://www.prov.vic.gov.au/vers/published/publens.htm>**

The Public Record Office Victoria began the Victorian Electronic Records Strategy in 1995 as a project to examine issues related to the long-term preservation of the electronic records of the Victorian government. From the beginning it was recognised that the existing solutions offered by industry and the archival community were unsatisfactory for the maintenance of electronic records for the very long-term (that is for more than 100 years). Victorian Electronic Records Strategy (VERS) is a framework of standards, guidance and implementation projects. VERS has as its aim the reliable and authentic archiving of electronic records created or managed by the Victorian government in Australia. The VERS Standards is an integral component of the strategy and outlines the functions that an archival or recordkeeping system should perform in preserving records over a long period, the metadata required and the long-term format of records. VERS offers clear and accessible toolkits that contain step-by-step guides to implementation that might be helpful in training.

Testbed Digitale Bewaring <http://www.digitaleduurzaamheid.nl/>

Commissioned by the Ministry of the Interior and Kingdom Relations and the States Archives' Service, the Digital Preservation Testbed was established in 2001. The goal of the Testbed is to ensure the lasting accessibility and reliability of government information in the digital era, now and in the future. How can you preserve e-mails that contain important agreements? If asked by Parliament, can an employee find and retrieve important records created and saved by someone else? Is a digital permit still readable after ten years? The Digital Preservation Testbed is researching the answers to these questions for all Dutch government organisations in an effort to overcome these problems and help to build the digital government. The Testbed is experimenting with digital information in a unique E-lab to determine the best methods of long-term preservation, not just now, but also over ten, twenty or hundred years. In addition to general project information the site contains papers and publications on topics including XML for digital preservation and XML implementation options for e-mail.

US Department of Defense (US DoD). DoD 5015.2-STD: Design Criteria Standard for Electronic Records Management Software Applications (Revised). (Washington, DC: US DoD, June 2002) <http://jtc.fhu.disa.mil/recmgt>

US Department of Defense Records Management Applications standard that defines the basic requirements based on operational, legislative and legal needs that must be met by records management application (RMA) products acquired by the Department of Defense (DoD) and its Components. It also defines requirements for RMAs managing classified records. This version is made available to provide information to vendors, developers, and users.

Forthcoming**The Association for Information Management Professionals, Conversion and Migration Criteria in Recordkeeping Systems****<http://www.arma.org/publications/standards/workingprogress.cfm>**

The ARMA, the Association of Records Managers and Administrators, Standards Development Committee, has established a task force to work on the development of this proposed standard. It will address fundamental policy, procedural, and technical issues associated with conversion and migration from one records keeping system to another regardless of record format, so that these systems will ensure the context, content, and structure of authentic records.

Chapter 6: Access**Brown, Adrian. English Heritage Centre for Archaeology, Digital Archiving Programme: Digital Archiving Strategy (2000) <http://www.english-heritage.org.uk/>**

A comprehensive strategy for managing the Centre for Archaeology's digital archives represents the first stage in a wider programme to implement best-practice preservation procedures and broaden access to the collections.

City Archives of Antwerp. DAVID: Digitale Archivering in Vlaamse Instellingen en Diensten (Digital Archiving in Flemish Institutions and Administrations).

<http://www.antwerpen.be/david/>

The DAVID Project is a collaboration of the City of Antwerp Archives and ICRI to research digital durability in a governmental environment. It seeks to develop good practice in archiving electoral and population data, e-mails and websites.

Pardo, Theresa A, Sharon S. Dawes, and Anthony M. Cresswell. Opening Gateways: A Practical Guide for Designing Electronic Records Access Programs. (Albany, NY: Centre for Technology in Government, December 2000).

<http://www.ctg.albany.edu/resources/abstract/abgateways.html>

All kinds of people use government information. For scientific researchers to land developers to newspaper reporters, government information is a necessity. And, increasingly, that information is being created and stored electronically. This Center for Technology in Government guide is designed to help government agencies develop affordable, manageable and effective electronic records access programmes. 'Opening Gateways' details four tools that guide users through the assessment, diagnosis, design and cost estimation phases of programme development. A hypothetical case example demonstrates the practical application of the tools. Note that access in this context is not restricted to archival records, but has a strong records management perspective.

Other design and metadata requirements cited in support of the chapters above will have relevance to access issues, for example, Chapter 8 of the MoReq specifications (see citation under Chapter 4 above).

Selected bibliographies and online journals

Ariadne <http://www.ariadne.ac.uk/issue28/>

Ariadne is published every three months by the UK Office for Library Networking (UKOLN).

Arts and Humanities Data Service Newsletter (AHDS) <http://ahds.ac.uk/newsletters.htm>

A quarterly, web-based publication containing features on projects, services, and digital resources of interest to humanities scholars. The newsletter attempts to address issues of strategic and topical concern, such as digital resource preservation, methods for locating networked information resources, and models for supporting computer-assisted humanities research and teaching.

Council on Library and Information Resources (CLIR) Reports

<http://www.clir.org/pubs/reports/reports.html>

This resource provides abstracts and links to CLIR reports which discuss a range of preservation and digitisation issues, and is updated regularly.

Cultivate Interactive <http://www.cultivate-int.org/>

Cultivate Interactive is a pan-European Web magazine which is funded under the European Commission's DIGICULT programme. It is a mechanism for promotion and discussion of DIGICULT projects and is also a discussion platform for the broader digital culture community. Cultivate Interactive is aimed at the European cultural heritage community including IT staff, information professionals, researchers, managers, policy makers, libraries, museums, archives, galleries and non-profit making organisations.

DigiCULT.Info Newsletter <http://www.digicult.info/pages/publications.php>

This newsletter from Salzburg Research provides a regular look at selected technology areas affecting the cultural domain. It also summarises the progress of the DigiCULT Forum.

Digital Asset Management Systems for the Cultural and Scientific Heritage Sector
http://www.digicult.info/downloads/thematic_issue_2_021204_low_resolution.pdf

This is the second of three thematic issue papers from the Preservation and Enhancement of Cultural Heritage Unit of the Information Society Directorate General of the European Commission. The journal includes papers that argue the need for Digital Asset Management Systems (DAMS) to

create renewable resources that can be managed through their entire life cycle, as well as listing system benefits and shortcoming of DAMS in the cultural heritage community. System designers, curators, digital collection managers and exponents of digitisation consider the role of the systems in the different sectors and highlight differing understandings and expectations.

e-Culture: a newsletter on cultural content and digital heritage

<http://www.cordis.lu/ist/ka3/digicult/en/newsletter.html>

A newsletter of the Information Society Technologies (IST) Programme of the European Commission. Includes updates of IST activities, project reports and news of associated events and websites.

GRIP: Gateway for Resources and Information on Preservation

<http://www.knaw.nl/ecpa/grip/>

GRIP was launched by the Nationaal Archief (the National Archives of the Netherlands) and the European Commission on Preservation and Access (ECPA) in October 2002. It is an Internet gateway which provides an introduction to many aspects of preservation. Resources selected for inclusion in GRIP are intended to be of interest to a wide audience, including preservation professionals, collection managers, policy makers, librarians, archivists, museum curators, audiovisual specialists and information technologists.

International Association for Social Science Information Service and Technology (IASSIST)

Quarterly <http://www.iassistdata.org/publications/iq/>

IASSIST quarterly reports on activities related to the production, acquisition, preservation, processing, distribution and use of machine-readable data.

JISC Technology and Standards Watch Reports

<http://www.jisc.ac.uk/techwatch/reports/index.html>

The aim of the JISC Technology and Standards Watch exercise is to keep track of developments in information and communications technology that could have significant impact on the teaching and learning functions of tertiary education institutes, and on the operation and management of institutes themselves. A further aim is to inform the wider community of these developments.

Journal of Digital Information (JoDI) <http://jodi.ecs.soton.ac.uk/>

A peer-reviewed web journal supported by the British Computer Society and Oxford University Press.

PADI - Preserving Access to Digital Information <http://www.nla.gov.au/padi/>

PADI is a subject gateway to digital preservation resources. This site is highly recommended as providing comprehensive links to relevant resources.

Preserving & Accessing Networked Documentary Resources of Australia

(PANDORA) Archive <http://pandora.nla.gov.au/index.html>

An archive of online publications.

Research Libraries Group (RLG) DigiNews <http://www.rlg.ac.uk/preserv/diginews/>

A bimonthly web-based newsletter intended to: focus on issues of particular interest and value to managers of digital initiatives with a preservation component or rationale; provide guidance and pointers to relevant projects to improve our awareness of evolving practices in image conversion and digital archiving; announce publications that will help staff attain a deeper understanding of digital issues.

Selected support services and networks

AIIM International: web site of the Enterprise Content Management Association

<http://www.aiim.org/>

Arts and Humanities Data Service (AHDS), UK

<http://ahds.ac.uk/guides.htm>

Center for Technology in Government (CTG), USA
<http://www.ctg.albany.edu/>

Coalition for Networked Information (CNI)
<http://www.ninch.cni.org/>

Distributed National Electronic Resource (DNER) - Digital Preservation Coalition
<http://www.jisc.ac.uk/dner/>; <http://www.dpconline.org/>

DLM Forum (*Données Lisibles par Machine* = machine-readable data)
http://europa.eu.int/historical_archives/dlm_forum/

Dublin Core Metadata Initiative
<http://purl.oclc.org/dc/>

Electronic Resources for Preservation and Access Network (ERPANET)
<http://www.erpanet.org/>

European Commission on Preservation and Access (ECPA)
<http://www.knaw>