THE MANAGEMENT OF ELECTRONIC RECORDS

By

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To my family

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ABSTRACT

The use of computers to create, store and disseminate information is revolutionising the way information is handled. The speed, processing power and accuracy of the computer improve the quality of office work and make it easier to carry out. However, at the same time, hardware and software dependency, documentation requirements, the ease of altering electronic information and the instability of storage media pose serious problems for records managers and archivists in the management of computer records. For instance, computer-based information systems have a profound impact on the structure and business strategy of organisations. Computerisation, while providing new business opportunities, has caused more centralised management in the structures of many organisations. Moreover, there are legal and social implications with regard to the authenticity of records, the accountability of the organisation and the privacy of individuals.

At present, computer systems on which electronic records are created are replaced or updated frequently. New hardware is introduced constantly and discontinued within five years, while software products tend to be updated within two years. Thus to avoid technological obsolescence, electronic records must be migrated to current versions of software and onto a medium which can be read by current hardware. The diversity of computer systems also requires the application of data exchange

standards to enable the interchange of data between different systems.

In order to be able to tackle the problems, records managers and archivists need to evaluate their traditional professional methods in the light of new technologies. They also need to improve their relationships with each other and with information technology managers. It is essential that policies and procedures for the control and use of records should be developed. Moreover, the roles and responsibilities of the parties involved in the management process must be defined clearly. Records managers and archivists must evaluate their assumptions about organisation theories and management practices and address issues related to the legal and social implications of electronic records. Electronic records with potential archival value must be identified, documented, described and appraised at a very early stage in their life cycle. The timely disposition of computer records without ongoing value is necessary to achieve a cost-effective management programme. Finally, archival programmes must be developed for the acquisition, processing and preservation electronic records.

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LIST OF ACRONYMS AND ABBREVIATIONS

AACR	Anglo-American Cataloguing Rules
ACCIS	Advisory Committee for the Co-ordination of Information Systems
ADA	A programming language developed for use in embedded control systems, e.g. aircraft navigation systems.
ALA	American Library Association
AMC	Archives and Manuscripts Control
ANSI	American National Standards Institute
APP	Application Portability Profile
APPM	Archives, Private Papers and Manuscripts
ASCII	American Standard Code for Information Interchange
ASN.1	Abstract Syntax Notation One
AT&T	American Telephone and Telegraph Company
BCA	Bureau of Canadian Archivists
BPI	Bits Per Inch
BS	British Standards
C	A programming language developed for implementation of the UNIX operating system. It can combine the control and data structures of a modern high-level language with the ability to address hardware specific functions of an assembly language.
CCITT	Consultative Committee on International Telephony and Telegraphy
CCS	Continuous Composite Servo
CD-ROM	Compact Disk Read Only Memory
CGM	Computer Graphics Metafile
CLA	Canadian Library Association
COBOL	Common Business Oriented Language
CPU	Central Processing Unit

CRDF	Computer Readable Data Archive
CULDAT	Canadian Union List of Machine Readable Data Files
DAT	Digital Audio Tape
DBMS	Database Management System
DDC	Dewey Decimal Classification
DDF	Data Descriptive Format
DDL	Data Definition Language
DDR	Data Descriptive Record
DOS	Disk Operating System
DRO	Departmental Record Officer
DSS	Decision Support Systems
DTAM	Document Transfer, Access and Manipulation
EBCDIC	Extended Binary Coded Decimal Interchange Code
ESRC	Economic and Social Research Council
FORMOST	Formal Records Management and Office Systems Technology
FORTRAN	Formula Translation
FTAM	File Transfer, Access and Management
GKS	Graphics Kernel System
IBM	International Business Machines
ICA	International Council on Archives
IEEE	Institute of Electrical and Electronic Engineers
IFLA	International Federation of Library Associations and Institutions
IGES	Initial Graphics Exchange Specification
IMOSA	Information Management and Office System Assessment
IPMS	Inter-Personal Messaging Service
IRD	Information Resource Dictionary

IRDS	Information Resource Directory System
IRM	Information Resource Management
ISBD	International Standard Bibliographic Description
ISO	International Standards Organisation
IT	Information Technology
JANET	Joint Academic Network (U.K.)
LA	Library Association (U.K.)
LAB	Language Application Binding
LAN	Local Area Networks
LC	Library of Congress
MAD	Manual of Archival Description
MARC	Machine Readable Cataloguing
MHS	Message Handling System
MIS	Management Information Systems
MIT	Massachusetts Institute of Technology
MRDF	Machine Readable Data File
MS-DOS	Microsoft Disk Operating System
MTS	Message Transfer System
NAC	National Archives of Canada
NARA	National Archives and Record Administration (USA)
NARS	National Archives and Record Service (USA)
NIST	National Institute of Standards and Technology (USA)
NISTF	National Information Systems Task Force (USA)
NFS	Network File System
OCLC	On-line Computer Library Centre
ODA	Office Document Architecture
ODIF	Office Document Interchange Format
OSCRL	Operating System Command and Response Language

OSI	Open System Interconnection
PAC	Public Archives of Canada (Now National Archives of Canada)
Pascal	Programming language developed to assist the teaching of programming as a systematic discipline
POSIX	Portable Operating System Interface
PRO	Public Record Office (UK)
RAD	Rules of Archival Description
RDA	Remote Data Access
RLG	Research Libraries Group (USA)
RLIN	Research Libraries Information Network (USA)
RTS	Reliable Transfer Service
SAA	System Applications Architecture
SAA	Society of American Archivists
SC	Sub-Committee
SGML	Standard Generalised Mark-up Language
SQL	Structured Query Language
SS	Sampled Servo
SVID	System V Interface Definition
TC	Technical Committee
UNIX	Operating system
ULCC	University of London Computer Centre
VDU	Visual Display Unit
WAN	Wide Area Networks
WG	Working Group
WORM	Write Once Read Many

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CHAPTER ONE: INTRODUCTION

1.1 THE CHALLENGE: MANAGING ELECTRONIC RECORDS

The introduction of computer-based information systems to an organisation's information handling activities has far-reaching implications for the organisation itself, the creators and managers of the information and the people who use the services of the organisations.

Government organisations, which are engaged in conducting public business have many reasons for keeping records effectively. They rely heavily on information to perform their functions. They also need to keep records of their activities to ensure their accountability. They conduct business on the behalf of the public and their records contain information that documents the rights and interests of the public. A government's ability to protect these rights and interests will depend largely on the proper management of records. In addition governments are accountable to the taxpayers and therefore have a responsibility to employ the most cost effective means of managing their records. Thus, it is very important for government organisations to address the issues related to the management of electronic records.

While creating new opportunities for the creators of information, computer-based information systems are posing new challenges for records managers and archivists. These challenges are summarised below.

Computer-based information systems are usually managed by a unit outside the jurisdiction of the records manager. A new group of people, information technology managers, have appeared in the information management arena. Records managers and archivists have felt the need to define their relationship with information technology managers and to re-define their relationship with each other, as managing computer records requires a high degree of co-ordination and co-operation. However, as information technology managers have higher positions and grades, there appears to be a division between paper records and electronic records. Communication has proved difficult for social, psychological and political reasons.

Social problems result from the public perception of the roles of information technology managers and of records managers/archivists and from the way these groups have been educated. Traditionally, the records manager was considered to be a *paper-work manager*, and the archivist was someone interested only in old, dusty files. By contrast, the information technology manager is involved with *hi-tech* machines - computers. Co-operation between the two has seemed impossible. The fact that records managers and archivists do not have adequate knowledge about computer technology and computer records creates a psychological barrier. They tend to be frightened of the unknown and to look upon the information technology manager as someone from a different planet. In turn, the information technology manager's attitude towards them has not helped in overcoming their fear.

The powerful processing capabilities of the computer have had a striking impact on business strategy and management. Organisations have changed, finding new opportunities in different areas. Managerial jobs have become more challenging. The automation of routine tasks and the computer's effects on the decision-making process have had implications for the record-keeping activities of the organisation. These organisational changes have caused records managers and archivists to re-evaluate their perception of what an organisation is.

The organisation is no longer composed of rigid units, neatly positioned according to a hierarchical structure. Hierarchical structures are still in place in many organisations, but there are also non-hierarchical units, such as special committees and inter-departmental units. The functions of the organisation may depend on complex relationships between such units. These structures have a profound effect on the information flow within the organisation and this has to be taken into account when designing an information system for the organisation. Archival functions, such as appraisal, arrangement and description have to be re-defined in this context.

More and more organisational activities are becoming computerised, but little consideration has been given to the management of records resulting from this process. Record-keeping is still not considered as important as are other organisational functions in the management of the organisation.

Yet, organisations must find means of managing their records, particularly their computer records, if they are to operate efficiently. Managing computer records requires a different management approach from that traditionally employed with paper records. For this reason, records managers and archivists must re-evaluate their principles and practices not only as they apply to electronic records but also to paper records. This is essential if they are to achieve an integrated approach to managing electronic and non-electronic records.

1.2 THE NATURE OF ELECTRONIC RECORDS

To face the challenges set by electronic records, records managers and archivists first need to investigate the nature of these records to establish a basis for a strategy for managing them, now and in the future. The main characteristics of electronic information are:

1 It is compact and thus alleviates the storage problems of paper records. Massive amounts of information can be stored on a single magnetic or optical storage media, i.e. 500,000 pages of information can be stored on one 6250 bpi magnetic tape.

2 It is readily accessible provided that system requirements are met. Today's information systems offer quick access to information, in a number of different formats, using automated information retrieval techniques.

3 It is easily manipulated and can be re-analyzed and re-aggregated. Thus electronic information is more effective for research purposes than information residing on paper or other non-electronic media.

4 It can be easily duplicated. Copying electronic information takes a matter of seconds, thus creating a potential for wider distribution.[1]

Despite the advantages of electronic information, there are also many problems involved in the management of electronic records, which are summarised below.

[1] National Historical Publications and Records Commission, Electronic Records Issues: A Report to the Commission, Commission Reports and Papers No.4, Washington, D.C.: 1990, p. 3.

System Dependency

Electronic information is a series of impulses or signals that cannot be recognised by human senses without first being transformed into a readable form by technology. Electronic information is dependent upon hardware, software and documentation, as discussed below.[2]

Hardware consists of the physical components of the information system. It comprises, basically, a processor (central processing unit - CPU), an input device (i.e. a keyboard) and output devices, such as a display unit and printer. All of these are produced and sold in a very competitive market. Every day, new products are introduced and old ones discontinued. A product does not stay on the market for more than five years. This poses serious problems for managers of information. They cannot preserve the machine along with the information solely for the purpose of decoding the information. Rather, what is required is the timely and systematic migration of records to new systems.

Software is the actual computer program on which data is analyzed. Software is also subject to rapid obsolescence. No software stays on the market for more than three years; new versions of leading programs are introduced regularly. Some companies produce new versions

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[2] Ibid.

of their software within three months of the issue of the last version.

The fact that software is vendor-dependent makes it even more difficult for information specialists to cope with the migration of data between heterogeneous systems. All vendor-dependent products are embedded with data exchange facilities which enable the interchange of data between the different versions of the same software, but the transfer of data from one type of software to another using these facilities may result in the loss of vital information.

Data transfer between incompatible systems is a serious concern for the archival community; vendors are also looking into the problem. The only solution at present is for vendors to adopt common data exchange standards which enable the interchange of data between different computer systems. These standards should be built into the programs so that data transfer can be successfully performed.

Documentation is vital to understanding the data. It describes the collection, organisation and presentation of data in a computer system. Without documentation the data is unintelligible. At a minimum, electronic records should be accompanied by a code book, explaining the codes used to represent the data and a record layout showing what is where.

Storage Devices

Electronic information resides on a very fragile medium. Under optimum environmental conditions, paper records can survive without attention for a relatively long time. However, electronic information needs immediate and constant attention from the time it is created. Magnetic tape is widely used by the archival community and is accepted as the most reliable storage medium available at the present time. The life expectancy of a magnetic tape is 10 - 12 years, provided that the correct environmental conditions are met. Another alternative is the optical disc, which, it has been claimed, can have a life of up to 100 years.[3] In the early 1980s, some people believed that it would not last for more than 10 years, however it is evident that the optical disk has out-lived these predictions. It now seems more likely that the optical disk will last for at least 25 to 30 years.

Ease of Alteration and Deletion

Computer records can easily be altered without leaving any evidence that changes have been made. Moreover, massive amounts of information can be deleted with minimal effort. This raises the problem of security.

[3] Ibid., p. 4.

Intentionally or by accident, the memory of an organisation can be wiped out. The ease of alteration and deletion poses a number of challenges for records managers and archivists. These are that:

- the accountability of government, corporate and individual activities is at risk,
- successive drafts are not always available,
- the document's authenticity is in question,
- traditional archival principles, such as provenance and original order, must be re-considered,
- legal issues, such as how to distinguish between the original and the modified version need to be considered,
- the problem of security should be addressed,
- privacy and confidentiality must be taken into account.

1.3 RESPONDING TO THE CHALLENGES

The challenges posed by electronic records require that records managers and archivists re-evaluate archival principles and practices. The following considerations are essential in order to achieve an integrated programme for managing electronic records.

- Inter-disciplinary co-ordination and co-operation is necessary between the archivist, the records manager and the information technology manager.

- A new approach is needed towards archival principles and practices in the light of new technologies.

- Archival terminology should be re-evaluated in the light of emerging information technologies. This is vital to the achievement of co-ordination with information technology professionals, who tend to use the same terminology in different contexts. At present, members of the two professions talk to each other and understand every word of the conversation, but at the end of the day each has a different perception of the subject matter.

- The records manager must be involved in designing computer-based information systems. This will be beneficial to all concerned, as the records manager can help to identify organisational activities that can be computerised. He can also identify organisational records at early stages of their life-cycle.

- Records managers and archivists should be involved in developing data exchange standards at national and international levels. They also should promote the use of these standards in order to ensure the timely migration of data to newer systems, thus making information of enduring value accessible.

- The computer's effect on organisation and management cannot be overlooked. Records managers and archivists need to re-evaluate their perception of what an organisation is in order to manage the records which result from its activities.

- Records managers and archivists need to evaluate their approach to the life-cycle concept, especially when defining their own roles and responsibilities in the different phases of the life-cycle process. Each needs to become involved in the others' areas. The role of the information technology professionals who design and maintain computer-based information systems must also be defined clearly.

- Finally, it is necessary to take an integrated approach to managing all of an organisation's information resources.

1.4 THE OBJECTIVES OF THE STUDY AND THE METHODOLOGY

This study aims to analyze the issues related to the management of electronic records. It examines the past and present experiences of records managers and archivists in managing electronic records and the areas where a new approach is required as basis for how archival and records management programmes can be improved. It also identifies areas outside the archival and records management professions in which archivists and records managers must become involved if they are to understand the complexity of how and why electronic records are to be managed.

In examining these issues, a wide range of sources have been used. These include:

- interviews conducted in Canada, in the U.S.A and in the U.K.,[4] including:
    - records managers from government departments in England and Canada and the United States,
    - records and information managers from large corporations i.e. Shell U.K., British Petroleum U.K. and Barclays Bank Plc,
    - information technology advisers and policy-makers of the Treasury Board of Canada and the Central Computing and Telecommunications Agency (CCTA), U.K.,

[4] A list of all interviews is given in the Appendix.

- archivists from England, Canada and the United States,
- a legal expert in the U.K.

- published and other unpublished sources, which include:

  - archival and records management literature,
  - unpublished reports on electronic records management activities in various archival and governmental institutions in Canada, the United States and England,
  - literature of other professions engaged with information handling activities, such as information systems management, information resource management, business administration and so on,
  - sociological studies related to organisation theory and management practices and studies dealing with the social effects of computer-based information systems,
  - technical studies covering data exchange issues between computer systems,
  - legal reports related to the admissibility of computer records.

1.5 ORGANISATION OF THE STUDY

The thesis is divided into eleven chapters. Each chapter deals with a distinct issue or a set of related issues. However, inevitably there are inter-relationships between issues discussed in different chapters, and each chapter is analyzed within the context of the others through the use of cross-references.

Chapter One gives a general overview of the issues involved and a general introduction to the study.

Chapter Two deals with issues concerning co-ordination and co-operation between records managers, archivists and other information management professionals and examines archival principles and practices as applied to electronic records. It evaluates the life-cycle concept as presently understood whereby distinct roles are assigned to records managers and archivists at different stages of the record life-cycle. It considers the importance of re-evaluating the life-cycle concept in relation to the management of electronic records and of defining a role for information technology managers in the life-cycle process. It also explores the ongoing validity of archival principles and practices, such as the principle of provenance and the concepts of original order and original record, and the need to re-define them.

Chapter Three examines the theory of organisation and its development over the last hundred years when organisations have been transformed from close-rigid systems to an open-flexible environment. It stresses the importance of re-examining organisation theory to enable records managers to construct record-keeping systems according to the information requirements of the organisation and archivists to record the activities of the organisation in terms of its structure and functions.

Chapter Three looks at the striking effects of the computer on organisations' structure and management. It stresses the importance of understanding the implications of computer-based systems for the organisation as a basis for managing computer records. Chapter Three also places the management of electronic records within the framework of information management. It looks at the design and implementation of organisational information systems and their far-reaching implications for the management and business strategy of the organisation. Finally, it reviews the factors which influence information systems, such as legal requirements, information technology and the structure and size of the organisation, in terms of their profound effect on the creation and use of information.

Chapter Four deals with the technical aspects of electronic records. It explores the implications of the fact that there is no permanent relationship between the media and the information contained and evaluates optical and magnetic storage devices in relation to preservation and maintenance requirements. The chapter also examines the necessity for adopting data exchange standards to enable the interchange of data between incompatible computer systems and different media and the need to incorporate these standards at the design stage of an information system. Finally, it examines security issues of computer systems particularly in relation to unauthorised access and technical and natural disasters.

Chapter Five deals with issues related to the legal and social implications of electronic records. The first part of this chapter looks at the legal admissibility and authenticity of electronic records and who is liable for computer malfunctions. The second part is devoted to social issues, such as privacy, freedom of information and transborder data flow.

Chapter Six examines the first stage of the life-cycle process and in terms of the problems encountered in identifying and controlling the creation of electronic records. Comparisons are made with paper-based information systems to highlight the differences and similarities between the management approaches required.

Chapter Seven deals with the appraisal and retention of electronic records. It considers the need for archivists to analyze the technical aspects of electronic records, as well as their content. Issues relating to the retention of electronic records are also examined.

Chapter Eight covers issues relating to the control and use of electronic records within the creating agency and the archives. It discusses the documentation and description of electronic records and examines access and storage issues. The responsibilities of the different parties involved in the management of electronic records are also defined.

Chapter Nine examines disposal practices and the implications for the archives and the creating agency. It considers technical and management issues involved in the disposition of electronic records in terms of destruction, transfer to an archive or presentation to interested bodies, such as data libraries.

Chapter Ten deals with the archival management of electronic records. It considers the activities that should be undertaken by the archives while the records are in their active stage and after the records are transferred to the archives. It reviews work done over the last twenty five years or so, in a number of national archives around the world, notably Canada, Sweden and the United States, on questions relating to the acquisition and maintenance of electronic records.

Chapter Eleven concludes the study by reviewing the findings and by drawing attention to areas that need further investigation.

CHAPTER TWO: ARCHIVE ADMINISTRATION, RECORDS MANAGEMENT AND THE MANAGEMENT OF ELECTRONIC RECORDS

2.1 LIFE-CYCLE MANAGEMENT OF ELECTRONIC RECORDS

2.1.1 The Role of the Archivist and the Records Manager in the Life-cycle Process

The question of who has overall responsibility for the management of records has no easy or straightforward answer. Before the introduction of computers to information handling activities, it was relatively easy to identify who was responsible for what, provided that the organisation was aware of the necessity for records management.

Traditionally, it was the responsibility of the records manager to manage the organisation's records while they were active. Then the archivist took over the responsibility for historically valuable records selected for permanent preservation. The semi-active stage of the records, however, has always been a grey area in terms of responsibility for the records. It is quite common in many countries to find that semi-active records have been dumped in records rooms or in the basement of a building, exposed to environmental hazards, because no one accepts responsibility for them.

2.1.2 Archivists and Electronic Records

Archivists, who are concerned with long-term preservation, have gradually realised that computer generated records are not just simple numeric files or intermediary records used to produce paper records. When computers were introduced in the 1950s, they were used primarily to process numerical data. This was not considered archival material, particularly as computer records were not intelligible without special equipment. The processed data was stored on magnetic tapes, usually temporarily, until the aggregated data was printed out. The final output of valuable information was in paper form. In the 1970's, however, computers became smaller, while their processing capacity increased dramatically. By the 1980s micro-computers had become standard office equipment. In a way the computer was considered almost as a sophisticated typewriter. Archivists later realised that this was a misconception. As the use of computers in information handling activities increased and electronic records began to replace some of the paper records which archivists handled, it became clear that the archivist had to take more responsibility for the management of these records.

This realisation grew over three decades. The nature of electronic records changed dramatically during this period. Today electronic records are no longer just simple numerical files created by statistical applications. Rather, they are sophisticated, complex and compound. Increasingly, they comprise text, voice, video graphics, images and data.

The complex technology used in computers, the associated means of telecommunication and the increasing sophistication in software development have taken place so rapidly that archivists do not really feel comfortable working with electronic records. Nor are they trained to do so. Some archivists began to realise in the 1960s that they would have to change their attitudes. Notably in 1964, at the International Congress on Archives in Brussels, a number of archivists from different countries reported their intentions to use computers in their archival work. This was an important step forward in dealing with electronic records. Now archivists themselves began to produce electronic records as a result of computer applications in archives.

Archivists can no longer avoid the mounting problems associated with computer records. They have begun to understand that computers are not used only for processing purposes, but also to create and store information in electronic form which has archival value. Moreover, they are aware that electronic records are not always available also in paper form. Often the electronic form of information is the sole copy.

2.1.3 Records Managers and Electronic Records

Initially, it appeared that computer records were not the records manager's responsibility because computer systems were introduced and maintained by computer specialists and used for specific projects. Records managers were not aware of what was being created or received by the organisation in electronic form. Gradually, they realised that it was necessary for them to be involved in planning computer-based information systems in order to ensure the accountability of the organisation and the protection of computer records for future use.

The main problem was that records managers did not know what information was being created and maintained in electronic form. Information processing activities were taking place in different places within the organisation but records managers were not consulted on filing, classifying, retrieving, or preserving electronic records. This failure to manage electronic records has had serious consequences. In many organisations very few records have survived from the early years of computerisation.

One of the problems contributing to this situation has been the attitude of senior managers. Until recently, they have not considered the organisation's record-keeping requirements in the computerisation process. Computerisation has been viewed in the context of specific objectives, rather than as the electronic means of systematically organising the organisation's memory. Senior management has tended to believe that the technology could solve the problems of electronic record-keeping, rather than attempting to manage the technology. In most cases no policy has been defined for the management and preservation of electronic records.

2.1.4 Users and Electronic Records

Most computer-based systems tend to use electronic filing. Usually, the user is left to classify and file the document however he deems appropriate. Each person develops his own idiosyncratic classification system thus making it difficult for others to retrieve the files. When the person leaves his job, the information he has created goes with him.

In fact, the information belongs to the organisation and every authorised person should be able to understand the classification system and use the information to achieve organisational objectives. The concept of information as a corporate resource is not one that is familiar to most IT people. For this reason, computer systems are not designed to accommodate classification systems which would allow users to share the information. Rarely are there policies or provisions for retaining information in the system. The space on the system is not infinitely expandable, so old information is deleted to make room for new.

Some computer systems provide facilities to enable retention on a personal basis. In this case, the user, generally the creator of the information, assigns a retention period for a particular piece of information according to his personal needs. This takes no account the organisation's needs. The involvement of the records manager and the archivist at this stage is absolutely essential if the information requirements of the organisation are to be met and valuable information is to be preserved for the future.

Many aspects of this broad evaluation of the problems facing information managers are developed more fully in other chapters. The immediate conclusion that can be drawn is that records managers and archivists must become involved with the management of electronic records if they are to ensure the safe keeping of information and the maintenance of organisational accountability.

2.2 THE RELATIONSHIP BETWEEN RECORDS MANAGERS AND ARCHIVISTS AND ITS IMPLICATIONS FOR THE MANAGEMENT OF ELECTRONIC RECORDS

2.2.1 Overview

Archivists and record managers have long argued over the parameters of their relationship. However, developments in computer and associated telecommunications technologies now require that they come to terms not only with each other, but also with other professionals, such as computer specialists, analysts and programmers. In order to establish a basis for cooperation between records managers and archivists, it is useful to look at their relationships in the past. How have they perceived each other historically and, perhaps more importantly, how have they perceived themselves?

Over the years, records managers and archivists have debated their place within the organisations and societies they serve. Archivists have promoted themselves on the one hand as scholars, engaged in recording the administrative history of the government and other organisations, and on the other hand as keepers of the national heritage of their countries. In either case, to a large degree, they have associated themselves with historians. They have also been, and they still are to some extent, perceived as historians by the public, due to the historical nature of archives.

Contrary to this, records managers have tried to distance themselves from being associated with historians, although they are involved with the same information as archivists in earlier stages of the life-cycle process. Rather, they have wanted to be considered as business administrators. Their argument has validity. They manage organisational information. The records or information management programmes they undertake must be geared to organisational objectives, goals and needs. They manage information for as long as it is useful to the organisation and cost effective to keep.

The history of records management as a profession goes back to the 1940s, when it originated in the United States. The objective was to develop government-wide principles and practices in the filing, selection and disposition of records to facilitate the transfer of non-current records to the National Archives.[1]

Records management thus was developed as a profession by archivists, on the grounds that the more efficiently records are managed, the less problematic they are when transferred to the archives. At this early stage, there was a recognition that the archivist should take some

[1] Brooks, P.C., "Current Aspects of Records Administration: the Archivist's Concern in Records Administration", The American Archivist, 6 (July 1943), p. 160.

responsibility for current and semi-current records; there seemed to be no intention to create a new profession. Subsequent statements made by archivists make it is clear that they have continued to view records management as an archival programme.

2.2.2 The Relationship Between Records Managers and Archivists

Archivists often have engaged in debate about the role of records managers. All the arguments have revolved around "who is working for whom?" For instance, when Jay Atherton evaluated the relationships between records managers and archivists, he asserted that:

> Many archivists have considered (and many continue to consider) records management as merely an element of archives. For them, the ultimate purpose of records management is the permanent preservation of historically valuable material in an archives.[2]

What do records managers have to say about this? In his paper, Atherton quotes Ira Penn, who defends the records manager's view:

> That responsibility for records management policy making was placed in the National Archives and Records Service indicates a complete lack of understanding of records management function. That the rules governing the creation,

[2] Atherton, J., "From Life Cycle to Continuum: Some Thoughts of the Records Management-Archives Relationship", Archivaria, 21 (Winter 1985-86), p. 44.

> maintenance and use, and disposition of Federal records are included in the Federal Property Management Regulations...shows an appalling unawareness of the fact that it is the information in the records that is important, and not the medium in which the information is contained...But functionally, archives is a part of records management. Archival preservation is but one of the elements of the disposition phase of the records life-cycle, and yet archives had agency status while records management was but an office within that agency. The entire arrangement was a textbook case of functional misalignment. The tail was wagging the dog.[3]

Some archivists have believed that by getting involved in management practices, the archival profession was moving away from its objectives and that archivists would pay a heavy price for this. I.P. Schiller wrote:

> Among American archivists the cost has been the abandonment of tradition of scholarship and research, desertion of historiography, and renunciation of a broad intellectual comprehension of the records, particularly an understanding of how they relate to the world of reality beyond the walls of the repository. The professional archivist is atrophying. At one time, he was coming to be recognised, on a coequal status, as a research partner of the historian, the economist, the administrator and the scientist. It was considered of primary importance that the archivist should be able to render documents, however complex and specialised, available and usable. Now it appears to be sufficient to house the records safely, to mechanise reference service on the documents, and to keep storage and maintenance cost down to a minimum by means of wholesale records destruction.[4]

[3] Ibid., p. 46.

[4] Schiller, I.P., "The Archival Profession in Eclipse", <u>The American Archivist</u>, 11 (July 1948), pp. 227-230.

Another archivist observed that:

> ...an archivist is a records manager who has specialised or that a records manager is an archivist who has become a general practitioner. Whatever the difference is, there is a need for closer relationship between the two...[5]

Another wrote:

> There are some who contend that because the archivist serves the scholar and the records manager the administrator, the two functions require different disciplines and therefore cannot be fulfilled by the same person. We do not believe that is uniformly true. Certainly, if it is true, then most of the business world will remain outside the sphere of archival influence. Few companies, if any, can reasonably maintain two separate positions, one for the archivist and one for the records manager. If we are going to have general archival and records management consciousness in business, it must be in conjunction with the ability of the archivist or the records manager to serve the combined need.[6]

Still others have been very clear about the difference between a records manager and an archivist. For instance Brown notes:

> The archivist serves the needs of the scholar, and posterity, whereas, the records manager serves the needs of business which is usually profit motivated and which is interested only in information that contributes to or protects that profit or the goals of the organisation. To put it another way, the records manager is basically a business administrator and the archivist is

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[5] Hammitt, J.J., "Government Archives and Records Management", The American Archivist, April 1965, 28(2), p. 219.

[6] Shiff, R.A., "The Archivist's Role in Records Management", The American Archivist, 19 (April 1956), p. 120.

basically a historian.[7]

This argument, which started soon after the establishment of records management in the 1940s, still continues today. The important issue is the degree to which records managers and archivists can cooperate. However, this tends to be overshadowed by the question "who is working for whom?" In the context of managing electronic records, this unresolved problem has major consequences.

Even while this debate has continued in America, within the last two decades, the National Archives and Records Administration (NARA) has been transformed from being a passive recipient of historical records to a dynamic organisation taking a more active role in the management of current and semi-current records. Today, NARA runs a number of intermediate federal records centres around the country, providing storage and reference services for government agencies. It also provides services to improve records management programmes in federal agencies by undertaking training programmes and publishing literature to educate federal employees about records and information management. NARA also takes an active role in the appraisal and disposition of public records by preparing records schedules in consultation with

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[7] Brown, G., "The Archivist and the Records Manager: a Record Manager's Viewpoint", Records Management Quarterly, 5 (January 1971), p. 21.

federal agencies.[8]

In Canada and England the situation is slightly different. In Canada, records managers and archivists responsible for government records have been required to co-operate by the Treasury Board of Canada. The Treasury Board enforces government-wide information management policies to control the information handling activities of government departments. The Treasury Board also has the power to enforce government-wide standards in the design and implementation of information systems since departments have to have its approval to be able to get finance for their records management programmes. The Treasury Board requires that the departments involve the National Archives in the identification and retention of the public records.[9]

In England, the civil service tradition that no government department can have power over another has prevented the establishment of a coordinating body similar to that in Canada. Co-operation between records managers and archivists has been on an informal basis. The Public Record Office (PRO) participates in the appraisal process through the appointment of inspecting officers who are assigned to work with specific government departments.

[8] National Archives and Records Administration, Annual Report for the Year Ended September 30, 1988, pp. 15-25.

[9] Policy statement issued by the Treasury Board of Canada Secretariat, Information Management Division, Administrative Policy Branch, "Information Management Policy, 1987" and "Management of Government Information Holdings, 1989".

Their main duty is to identify records to be transferred to the PRO.

In these three different cultures, the greatest cooperation between records managers and archivists takes place in Canada. It is also clear that they have the most effective programmes for dealing with electronic records.

2.2.3 Developments in Records Management

Over the years, the lack of communication between records managers and archivists is caused by archivists' and administrators' perception of records management. Archivists considered records management as part of archive administration at the early stages of records life-cycle. Administrators viewed records management not as an organisational function, but rather a utility to manage their paperwork. However, records management has moved on from being just "paperwork management" as it was in the 1940s. In the past, such a definition of records management has limited the records manager to a junior position in the administrative structure of the organisation, with low status and little recognition. Now records management is approaching a position where records managers are awarded higher posts within the organisation, enabling them to contribute to the decision-making process.

It is also important to recognise that records managers are not just there to take care of historically valuable records for archivists, although this was the intention in the 1940s.

While records management has been shaped according to changes in the organisation and its environment, archives administration has been slow to catch up with these changes. Archivists need to review their perception of the modern organisation and records management and to communicate, and if necessary compromise, if they are to be in a position to manage electronic records.

2.3 ARCHIVAL PRACTICES AND PRINCIPLES AS APPLIED TO ELECTRONIC RECORDS

2.3.1 Overview

If electronic records are to be managed successfully it is essential not only that the relationship between archivists and records managers should be improved and clarified, but that archival and records management practices and principles be reconsidered. This is not a straightforward process. On the one hand, the experience of many years has produced well thought-out and tested principles and practices for managing conventional records. On the other hand, these same practices and principles create dilemmas when applied to unconventional records.

Over the last three decades, information handling activities have evolved rapidly. However, the roles of records managers and archivists have tended to remain conventional. For the most part, they have not kept pace with the technology which has revolutionised the way information is processed and used.

This section evaluates archival principles as applied to electronic records. Chapter Ten examines the application of archival practices, such as appraisal, arrangement and description, permanent preservation, to electronic records.

2.3.2 The Life-Cycle Concept and Electronic Records

Records managers and archivists have practised life-cycle management of records for some time. Basically, this involves the application of a series of interrelated professional procedures as the records pass through three distinct and separate stages: active, semi-active and inactive. Normally, records managers are responsible for the creation or reception of the records by the organisation and for their maintenance, use and appraisal. When records become inactive the archives take over the responsibility for their selection, description and arrangement, preservation and classification. Despite the fact that records managers prepare retention and disposal schedules and carry out some form of appraisal, the final selection of records for permanent retention is not usually carried out until the records become inactive. Therefore this function is performed mainly by the archivist.

As has been shown, there have long been arguments between records managers and archivists about their roles in the life-cycle process, even before the necessity of managing electronic records became apparent. Is the life-cycle concept itself an obstacle for records managers and archivists, preventing them from getting involved in each others areas? Does it prevent both parties using their unique skills to the best advantage? Or is it simply artificial distinction between the roles of the archivist and the records manager that prevents co-operation between the two?

It is necessary to re-evaluate the life-cycle concept if records managers and archivists are to co-operate effectively with regard to electronic records. Atherton describes the life-cycle concept as a "useful means of promoting a sense of order" and a "systematic approach to the overall management of recorded information". He also finds the life-cycle concept convenient as a means of clarifying roles and responsibilities in large bureaucracies by "delineating carefully the records management and archival functions". However, he points out that strict devotion to its principles prevents co-ordination and co-operation between records managers and archivists and undermines the interrelated and intertwined functions of records management and archival administration.[10] He questions the adequacy of the life-cycle concept by asking:

> Does the archivist really have no role to play in serving the creator of the record, in determining the disposal periods, or developing classification systems? Does the records manager have no responsibility in identifying permanently valuable records or serving researchers? [11]

Figure 1 illustrates the life-cycle process, as it is usually practised by the records management and archival community.

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[10] Atherton, op. cit., p. 47.

[11] Ibid.

	Active stage	Semi-active stage	Inactive stage
Creation/ Reception	RM		
Filing & Classification	RM		
Maintenance & Use in Offices	RM		
Scheduling/ First Review	RM ARC		
Disposition	RM		
Transfer to Records Centre	RM		
Maintenance & Use in Record Centre		RM, ARC	
Appraisal/ Second Review		ARC	
Transfer to Archives		ARC	
Acquisition			ARC
Arrangement & Description			ARC
Maintenance & Use in the Archives			ARC

Figure 1: Traditional application of the life-cycle concept

In fact, the life-cycle process does not assign specific roles and responsibilities for records managers and archivists. It is a flexible concept and does not dictate strict guidelines. It only establishes that records should be managed in phases. In each phase there is a function to be carried out. The execution of these functions is not designated to a particular professional, but to the professional who would be most suitable and qualified to perform the task.

As the traditional application of the life-cycle concept deals mainly with physical entities, the life-cycle concept initially appears to be inadequate for managing electronic records. However, as long as the records manager and the archivist can be flexible in performing record-keeping functions and yet specific in developing their record-keeping procedures, the life-cycle concept can be a useful basis for managing electronic records as will be demonstrated later in this section.

Questions regarding the validity of the life-cycle concept have been asked more frequently since computer-based information systems began to supplement paper-based systems. When electronic records are involved, the roles of records managers and archivists become less distinct, due to the nature of electronic records. Valuable electronic records need to be identified and appraised at a very early stage so that the necessary precautions can be taken for their long term preservation. This involves evaluating the migration requirements of electronic information to newer technologies, preserving the system documentation and controlling the media on which electronic information reside. The difficulties inherent in applying the life-cycle concept to the management of electronic records are evaluated below.

The life-cycle process traditionally is interpreted as starting from the creation or the reception of the record by the organisation. However, the life-cycle process of electronic records should start at the design stage of computer-based information systems. Decisions concerning the retention and disposal of records, classification of records and the flow of information within the system must be taken at this stage.

Usually computer-based systems have in-built facilities for managing the records within the system itself. Records management functions such as retention and classification can be programmed into the system and are carried out automatically. Sometimes these functions can be invisible to the user and to the system manager. Records management procedures, which provide the means of verifying the authenticity of records and the functions of the organisation, become machine dependent.

The life-cycle management of records does not define a role for IT professionals, despite the fact that computer-based systems are introduced and maintained by such people. Nevertheless, the life-cycle concept can be used as a multi-disciplinary platform to manage electronic records within the system, bringing together all parties in the management process. Co-ordination and co-operation between records managers and archivists is no longer a courtesy but a necessity, and improving relationships with IT people is a must.

The term "life-cycle" causes some confusion, as it has a completely different meaning in IT terminology from that understood by records managers and archivists. The term is used by IT people to refer to the distinctive stages of software development such as specification, design, implementation, testing, monitoring and maintenance. When communicating with IT people, the archivist and the records manager need to make clear what they mean. The same care should be expected from the IT people.

It is very difficult, if indeed possible, to determine the active, semi-active or inactive stages of electronic records. With paper-based systems, it is the frequency at which the records are used that determines whether a record is active, semi-active or inactive. When a record ceases to have administrative value, it becomes semi-active and is transferred to low-cost storage. However, with electronic records the semi-active stage virtually disappears. Electronic records are stored in off-site premises, similar to the record centres used for paper records, mainly to provide a safe backup copy of records. This does not necessarily mean that records are semi-active or inactive. It is very important that the archivist receives a copy of the record as early as possible, because electronic records will not survive thirty years or more unattended. This means if the life-cycle process is defined by frequency of use, then it is possible that electronic records could exist in active, semi-active and inactive stages at the same time.

Atherton's study concludes that the life-cycle concept is indeed an obstacle. He suggests that it should be replaced with "a simpler and more unified system consisting of four rather than eight stages".[12] He explains his continuum model thus:

> The first two stages would be the same as those in the traditional model: creation or receipt of the record and its classification within some predetermined system. I then suggest a significant change in the order. Scheduling of the information, joined with presumed later

[12] The eight stages are, according to the author, creation or receipt of information in the form of records; classification of the records or their information in some logical system; maintenance and use of records; and their disposition through destruction or transfer to an archives, in records management phase, and selection/acquisition of the records by an archives; description of the records in inventories, finding aids, and the like; preservation of the records or, perhaps the information in the records; and reference and use of the information by researchers and scholars, in archives. Ibid., p. 44.

> application of schedules, becomes a separate third stage. The final element, then maintenance and use of information - whether it be in the creating office, an inactive storage area, or an archives. All four stages are interrelated, forming a continuum in which both records managers and archivists are involved, to varying degrees, in the ongoing management of recorded information.[13]

Atherton's interpretation of the management process helps to illustrate the flexibility required. His views of the life-cycle concept is that it is overly rigid. However, as mentioned earlier, it is not the inadequacy of the concept that creates problems but the perceptions of records managers and archivists. Atherton also evaluated the life-cycle concept as applied to electronic records as follows:

> ...the impact of the computer on the life-cycle has been striking, for with electronic data the stages in the life-cycle cannot be separated. The nature and volatility of recorded data will not permit it. Creation, for example, is an ongoing process rather than an event in time. The record thus created is probably going to be altered a number of times during its period of administrative use. While most office automation systems may give the appearance of emulating a paper system, the data certainly is not processed in the same fashion. Data base management systems completely separate elements in a record, allowing the user to bring them together, perhaps altered, in any useful combination. Scheduling of data assumes a different perspective. Obviously, the archivist cannot wait, but must be involved even prior to the actual creation of the record. Finally, application of schedules becomes a continuous process, built into the system itself, because of the fluidity and continuity of the creation and re-creation of data.[14]

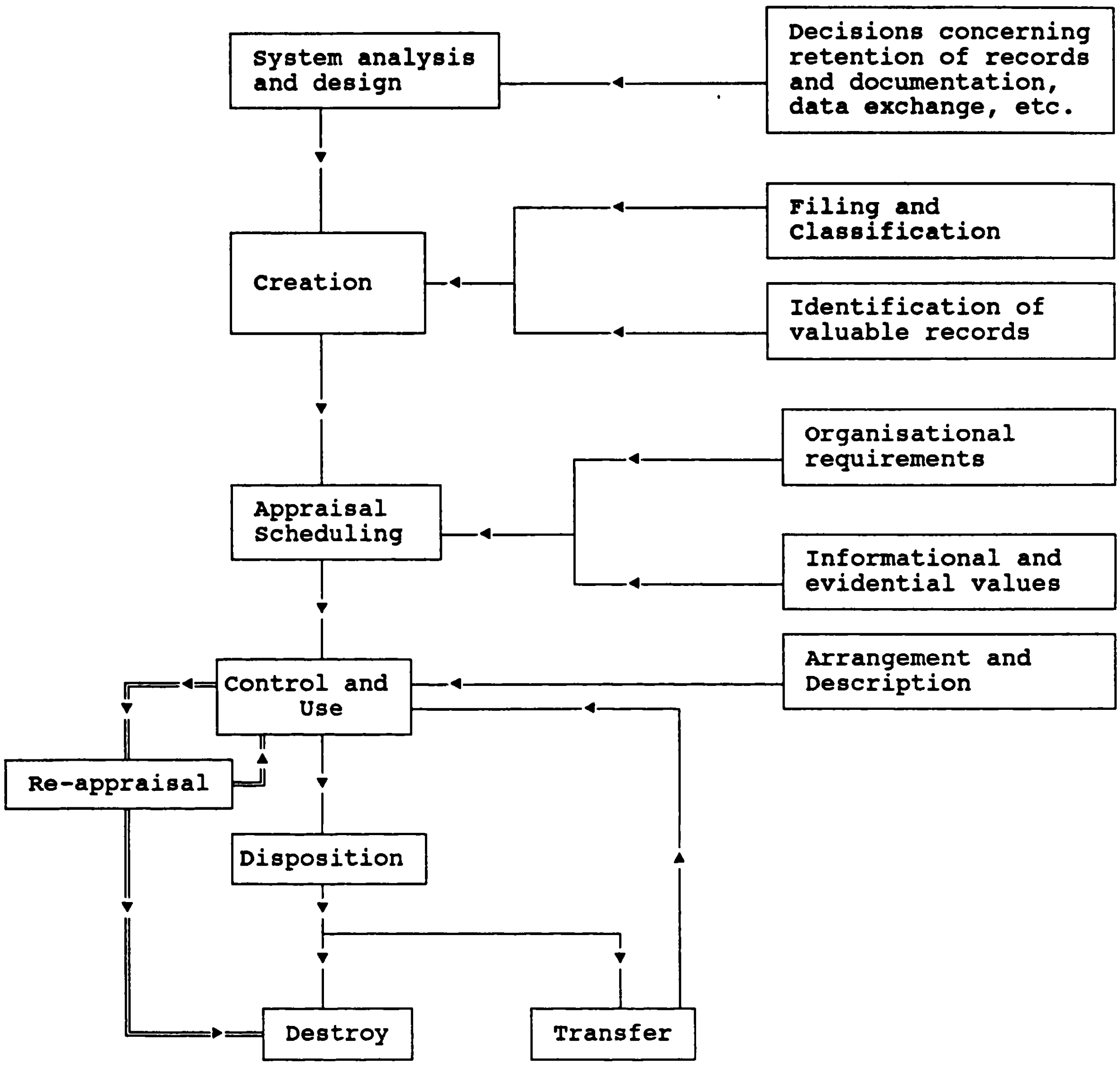
[13] Ibid., p. 49.

[14] Ibid., p. 47.

It is clear that the life-cycle management of records, regardless of their medium, should be reconsidered to accommodate technological changes that affect the way information is handled. In particular, the roles and responsibilities of the people involved in managing electronic records throughout their life-cycle should be clearly defined. The records management and archival functions listed in Figure 1 need to be seen as aspects of one management function and better co-operation amongst the parties concerned is essential.

Figure 2 shows the records management and archival functions involved in managing electronic records. The life-cycle of electronic records starts at the system design stage. Decisions involving system documentation; record creation; update and use; data interchange; and legal issues should be taken at this stage. Records managers and archivists should be involved in this process and should build in procedures to identify, appraise and schedule and dispose of the records.

Figure 2 contains two sets of boxes and two different lines showing the relationships between the boxes. The boxes in the right column show the record life-cycle process. The flow shown with single lines signifies the phases in records management and the flow with double lines shows the phases in the archives. The boxes on the left show the factors to be considered in each phase.



Legend:

——— : Life-cycle of records in offices.

═══ : Life-cycle of records in archives.

Figure 2: Life-cycle management of electronic records

2.3.3 The Principle of Provenance

Today the archival community faces two basic problems as regards the principle of provenance. The first is its application to modern organisational structures. This issue will be discussed in Chapter 3. The second problem is its validity as applied to electronic records. Before examining the principle of provenance in relation to electronic records, it is useful to consider its application to traditional records.

The principle of provenance is unique to the archival profession. It was introduced in Europe in the 1830s. It became known to North American archivists in the late 1890s. Over a century and a half it has remained one of the fundamental principles of the profession. The Dictionary of Archival Terminology describes the principle of provenance as:

> the basic principle that records/archives of the same provenance must not be intermingled with those of any other provenance; frequently referred as 'respect des fonds'; also extended to include the registry principle [which means]...that archives of a single provenance should retain the arrangement established by the creating agency, institution, or organisation in order to preserve existing relationships and reference numbers...[15]

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[15] Walne, Peter, ed. Dictionary of Archival Terminology, 1984, p. 130, 143.

The definition could go further to indicate that the principle of provenance forms the basis for all archival practices, including the arrangement, description, and retrieval of records.

Schellenberg's definition of provenance emphasises its use in the arrangement of records. He maintains:

> that records should be arranged so as to show their source in an organic body or an organic activity. It relates two kinds of records unit: archival group and series.[16]

Bearman and Lytle define the meaning and scope of provenance as follows:

> The key to the archivists' contribution to information management lies in their unique perspective provided by the principle of provenance as it concerns organisational activity, especially how organisations create, use, and discard information. Despite the insights provided by provenance, however, archivists have not exploited its potential for retrieval in traditional archival applications, and have not even attempted its wider application to the management of all information within their organisations.[17]

The description of the provenance of a record should include contextual information about how it was created, by whom, why, for what purpose and to whom it was addressed.

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[16] Schellenberg, T.R., The Management of Archives, 1965, p. 90.

[17] Ibid., p. 14.

This is captured in the administrative history of the creating organisation, as well as in the description of the record.

Provenance is also the basis of archival retrieval. Lytle, who explored the use of provenance in relation to the retrieval of records, asserted:

> The provenance or P Method is the traditional method of archival retrieval based on principles of archives administration and reference practices of archivists. Subject retrieval in P Method proceeds by linking subject queries with provenance information contained in the administrative histories or biographies, thereby producing leads to files which are searched by using internal structures. Information in the pure or theoretically defined P Method derives only from what is known about the file - the activities of the creating person or organisation and structure or organising principles of the file itself.[18]

Archivists have not fully explored the principle of provenance in terms of its implementations for handling conventional records. The principle of provenance determines the arrangements of records as a unit originating from the same department, rather than activities of organisational units and inter-relationships between them. As far as electronic records are concerned, the concept of provenance continues to be of central significance, but it is complicated to apply for two main

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[18] Lytle, R.H., "Intellectual Access to Archives: I. Provenance and Content Indexing Method of Subject Retrieval", American Archivist, 43 (Winter 1980), pp. 64-75.

reasons.

The first reason is that it is very difficult, if at all possible, to capture contextual information about electronic records. Even with a very well designed classification system, the file name and reference number, which usually define the context, have to be expressed in a very limited conventional manner. For example, in a DOS environment file titles are limited to eight characters, with a three character extension. External and internal labels can be attached to the document and the use of sub-directories can help to go some way towards eliminating this deficiency. However, such titles are still very limited as a means of recording information about the record. Provenance information about a particular file or file series can be captured more effectively in a separate "dictionary system" which describes the data in the file and the processes involved in creating and using the data. This subject is elaborated in Chapter Four.

The second reason is that with local and wide area networks (LAN and WAN), it is difficult to determine the creators of records. In a network environment, whether it is local or wide area, users share the information available in the network and use its facilities. Networks enable users in an electronic office environment to use the facilities of office support systems, electronic mail and database systems.

For example, a user logs into a database and constructs a document using the information stored in the database. The document thus constructed is no more than a tiny portion of the original record, but it is unique in the sense that it reflects a certain organisational activity or function. The archivist cannot capture contextual information about such a record in the traditional way. Theoretically, dictionary systems provide a useful means of capturing such data in distributed systems. However, this is not practised anywhere.

2.3.4 The Concept of Original Record

Organisations need to keep records of their transactions in order to be accountable for their actions. In paper-based systems, the proof of a transaction and the authenticity of that transaction are provided by the form and content of the document. These attributes also give the document legal and official status.

Traditionally, a record is a physical entity and its provenance makes it possible to distinguish an original record from a copy. The provenance is determined by such things as signatures and letter heads which help to determine the creating office, recipient and subject matter. The physical nature and content of a document are inseparable.

With electronic records, it is very difficult to determine whether a record is an original or a copy. Electronic records are not physical entities. They reside in the computer's memory or in a secondary storage medium as signals. Only when they are displayed on a monitor or printed out do they become intelligible to humans, and they can be displayed or printed out in a variety of formats. The question, of course, is whether what the user sees on the monitor or prints out can be considered as the original. The relationship between the physical form and the content is nonexistent.

Moreover, electronic records are very easy to alter without leaving any trace unless the necessary steps are taken to maintain their integrity. The main reason for employing computer-based systems in the office is that the manipulation power of the computer makes it attractive for processing data and which can be easily modified. The question that needs to be asked is when is the modification of the record legally and morally acceptable? This depends upon the nature of the record. If, for example, the record is part of a database which is updated periodically, such action is justifiable. However, if the record is communicated to another person in the conduct of an organisational activity, it documents an organisational activity. Any changes would raise questions of organisational accountability. Therefore, the organisation's record-keeping procedures should show the use of the record and the modifications made to it.

With regard to distributed databases the question of the original record becomes more complicated. Database management systems (DBMS) allow users to construct a record from bits and pieces of a database, creating what might be considered a record itself. Such a record does provide information but it is difficult to capture the context of the record and the evidence it provides of the activities of the organisation. Dollar examines the original record concept and asserts:

> The limitations of the concept of original record for electronic records are more evident in relational databases, geographic information systems, and hypermedia where bits and pieces of information may be selected from an organisation wide database and incorporated into an electronic document sent to someone. This electronic document represents only a partial view of the database. In fact, it may exist only as a set of retrieval instructions that a computer generated in response to the person generating the document. In all likelihood, if recipient of this document accesses the same document then only the retrieval instructions that the creator generated are received. Ordinarily, the system uses these retrieval instructions to reconstitute the bits and pieces into an electronic document when the recipient asks that it be displayed. But what is the original record? The entire database? The particular database view? The set of retrieval instructions that produced this view of the database (a virtual document)? Clearly, the traditional concept of original records is not useful in dealing with electronic records.[19]

[19] Dollar, C.M., "The Impact of Information Technologies on Archival Principles and Practices: Some Considerations", 1990,

Thus it is clear that the original record concept as traditionally understood cannot be applied to electronic records. As the physical form of the document is nonexistent, the creation of the electronic record becomes an ongoing process. Archivists need to re-consider their perception of original records.

2.3.5 The Concept of Original Order

The concept of original order is usually considered in relation to the original record. It basically states that the archivist should preserve the original order of records as a means of capturing contextual information. Original order demonstrates the decision-making process. The way the records are arranged in files or the way the files arranged in sequence shows the pattern of the events leading to a decision on a particular subject. For a researcher, this information is as important as the content of the file.

In an electronic environment the original order concept as it has been understood becomes meaningless. First, the storage of information on the computer's memory obscures the logical relationships between records. The computer writes the data on the storage medium at random wherever space is available. Second, the paperless office continues to be a utopian idea and will be so in the foreseeable future. An organisation's records will rarely all be on one media. A file will include some paper or non-electronic documents in a folder and some electronic documents on a tape or in the computer system memory. Each type of media requires different maintenance and storage facilities.

2.4 EVALUATION OF ARCHIVAL TERMINOLOGY

Archival terminology has evolved over the centuries. Archivists have borrowed terms from other disciplines or created new ones as the need arose. Some of the terms used today have changed their meanings over the centuries due to changes in society and the long history of the profession. Occasionally, a concept well known to archivists in Europe has been adopted by North American archivists, using a different term. Some terms have been directly translated from one language to another. As a result, communication among archivists has never been easy.[20]

However, modern archivists have a more complicated problem than just communicating with fellow archivists. As mentioned earlier, dealing with electronic records requires co-ordination and co-operation with IT people. This is not an easy task. Along with social and cultural barriers between the two professions, the terminology they use clashes. The same term used by archivists and IT people

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[20] Bailey, C.A., "Archival Theory and Machine Readable Records: Some Problems and Issues", unpublished master's thesis, University of British Columbia, 1988. pp. 5-25.

can be confusing or may even have entirely different meanings.

The term *archives* is one of them. For an archivist it means:

> - Non-current records preserved, with or without selection, by those responsible for their creation or by their successors in function for their own use or by an appropriate archives because of their archival value.
> - An institution responsible for the acquisition, preservation and communication of archives...
> - A building or part of a building in which archives are preserved and made available for consultation...[21]

The first meaning of the term causes double confusion. First, the term archives in computer terminology has a different meaning. It usually means making a backup copy of the current record for safety purposes.[22] However, it does not imply that the file or record is non-current. Assuming that the current copy of the document in the system is damaged because of a malfunction or power failure, then the archived copy of the file can be re-loaded on to the computer and re-activated. Thus the life-cycle of the file is reversed.

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[21] Walne, op. cit., p. 25.

[22] Dictionary of Computing, p. 18.

There is further confusion when the term *archives* is used interchangeably with *records*. The use of the term *records* by archivists and computer people does not pose a real problem when it is used to describe recorded information. The Dictionary of Archival Terminology gives the meaning of the term as referred to by the two professions.

> - Recorded information (document) regardless of form or medium created, received and maintained by an agency, institution, organisation or individual in pursuance of its legal obligations or in the transaction of business.
> - ...a unit of data forming the basic elements of a file and consisting in turn of a number of inter-related data fields.[23]

There are three common elements in the way the two professions use the term. First, a record forms the basic element of a file, although this is not clear from the definition given for the archival use of the term. Secondly, a record consists of data elements. In an electronic environment, each data element must be clearly identified to enable the information to be processed. However, conventional records also comprise separate data elements, for example sections and paragraphs. Finally, a record documents an official transaction. Again this is not explicit in the definition given for the use of the

[23] Walne, op. cit., p. 137.

term in data processing. Thus provided the context in which the term *record* is used is clear, the definitions are complementary.

The problem arises when *record* is used interchangeably with the term *archives*. These terms are not usually inter-changed in English-speaking countries, but in most other languages only one term is used to mean records and archives.

Another confusing term used by archivists and IT people is the term *file*. The Dictionary of Archival Terminology again gives two meanings of the term as used by different professionals.

> - An organised unit (folder, volume, etc.) of documents grouped together either for current use or in the process of archival arrangement.
> - In machine readable records/archives, two or more records of identical layout treated as a unit...[24]

As far as the physical storage of records in a file is concerned, there is not a great deal of difference between the two definitions. Both imply the storage of related documents, or records, as a unit. However, the arrangement of records in an electronic file and in a paper file are entirely different.

[24] Ibid., p. 73.

In paper-based systems, the relationship between the documents forming a file is physical and permanent. Documents are arranged in a file chronologically or in any other systematic way. In an electronic environment, however, the relationships between records are determined by indexes, and the manipulation power of the computer makes it possible to change them easily. For instance, a data file may consist of employee records with names, addresses, ages and other personal information. One can easily generate different files with different arrangements, for example alphabetically by name and address or chronologically by age.

The concept of the file is further complicated by the fact that the information contained in each file generated from the original file can be altered easily. As a result, archivists must alter their perception of a file in the electronic environment.

The terms discussed above are only a few of those that cause confusion. Terminology should be of major concern to records managers and archivists if they are to deal effectively with electronic records.[25]

[25] For comparative definitions of all the terms used by information technology professionals, records managers and archivists see Advisory Committee for the Co-ordination of Information Systems (ACCIS), Management of Electronic Records: Issues and Guidelines, 1990, pp. 136-187.

CHAPTER THREE: ORGANISATION, INFORMATION AND THE COMPUTER

3.1 INTRODUCTION

The introduction of computers to offices has dramatically changed the way the office works. It has affected relationships between different management levels. At the lower level of the organisation, employees' jobs have had to be re-evaluated. Routine tasks of middle management have been computerised, eliminating some jobs at this level. The remaining middle management jobs have become more challenging, as the middle level managers are involved with more strategic decision-making activities. At the top level, the computer has provided the means for more centralised management even in large and complex organisations. The computer has also affected the way in which information is handled. The top management's access to information has improved and become more efficient. Quick and accurate information has improved the decision-making process.

The design of effective information systems depends on a clear understanding of the organisation, which has a dynamic nature and is influenced by social, economic and political changes in society. It is essential for records managers and archivists to understand the nature and culture of the organisation in order to have a clear understanding of the information it creates. A good theoretical background in organisation and management can assist a great deal in performing records management and archival functions.

Archivists and records managers have tended to view organisations as static units. Yet the classical theory of organisation, which influenced archival administration in the late nineteenth and early twentieth century, is no longer valid for dealing with modern organisations.

3.2 THE EVOLUTION OF THE ORGANISATION THEORY

Organisation theory has changed to a great extent over the last hundred years. Its evolution is described by Thomas Peters and Robert Waterman, Jr. in four stages. These stages are: rational-close systems, social-close systems, rational-open systems and social-open systems.[1]

Early organisation theorists considered organisations to be rational-closed systems. Rational was used to mean that little emphasis was given to the social and psychological side of decision-making. An organisation had pre-determined objectives which were met by the rational acts of the manager. Closed was used to mean that external effects had little impact on the internal workings of the

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[1] Peters, T.J. and Waterman, R.H., <u>In Search of Excellence</u>, 1980, p. 93.

organisation.

The founders of late nineteenth and early twentieth century organisation theory were Max Weber and Frederick Taylor. Weber's organisation theory had a profound impact on subsequent studies in this field. A German sociologist, he defined the organisation as a bureaucracy. Rationality was of central importance. He put it thus:

> Bureaucratic adminstration means fundamentally the exercise of control on the basis of knowledge. This is the feature of it which makes it specifically rational.[2]

Weber's bureaucracy had the following characteristics:

1 **Formalisation:** The actions of the individuals within the organisation are controlled by rules and procedures.

2 **Specialisation:** The work in the organisation is divided among individuals and departments as clear-cut, distinct and well-defined tasks, according to the individuals' competence to carry out an organisational function. These individuals are given the necessary authority to perform the required functions.

3 **Hierarchy:** A vertical span of control is adopted. The structure of the organisation resembles a

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[2] Weber, Max, "The Essentials of Bureaucratic Organisations: an Ideal Type Construction", in Reader in Bureaucracy, 1952, p. 26.

pyramid, each lower level being under the control of a higher one. However, hierarchical control does not mean dictatorship. There is a right of appeal within the parameters of the hierarchy.

4 **Staff Appraisal by Merit:** The selection and promotion of staff is based on formal qualifications and experience. In Weber's ideal bureaucracy, only people who have technical skills or qualifications are to be appointed to "official positions".

5 **Ownership of the Products of the Organisation:** There should be a complete separation of personal and organisational property or resources. Administrators do not own the resources of the office. The use of the organisation's property or resources should be within the sphere of the office.

6 **Impersonal Rewards and Reprimands:** Rewards and disciplinary actions are based on standard procedures.

7 **Documentation of Actions of the Office:** All the actions of the office should be formulated and recorded. This applies to all preliminary discussions, proposals, final decisions, etc. Only the actions of the organisation and the documentation of those actions together constitute an "office".

8 **Separation of Careers and Private Lives:** Individuals' personal lives should not get in the way of working lives. In return, the organisation should not interfere with the private lives of the individuals.[3]

Weber's ideal bureaucracy was discussed by many sociologists and formed the basis of management theories developed over the last hundred years. Frederick Taylor put Weber's ideal bureaucracy to the test. The organisation theory developed by Weber and tested by Taylor later became known as the Weber-Taylor School. The teaching of the school was that the problems inherent in managing large groups of people would be solved by matching authority and responsibility, by maximising spans of control and by dividing roles and responsibilities.[4]

Weber's ideal bureaucracy was also tested in the University of Aston, Birmingham, U.K. Forty-six organisations of different sizes were taken as a sample and the study reported that:

> An organisation that scores high on specialisation, standardisation and formalisation ... would have gone a long way in the regulation of the work of its employees... The intended behaviour of employees has been structured by the

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[3] Ibid., pp. 18-24 and also Pugh, D.S. [et al], "A Conceptual Scheme for Organisational Analysis", Administrative Science Quarterly, 1963-64, pp. 289-315.

[4] Peters and Waterman, op. cit., p. 92.

> specification of the specialised roles, the procedures they are to follow in carrying out their roles, and the documentation of what they have to do.[5]

During the second era in the evolution of organisation theory there was a shift in the theory and practice regulating the relationships between employers and employees. The organisation was viewed as a social group and human psychology took greater priority. The leading theorist of this era, Douglas McGregor, asserted in his book, The Human Side of Enterprise:

> This volume is an attempt to substantiate the thesis that the human side of enterprise is "all of a piece" - that theoretical assumptions management holds about controlling its human resources determine the whole character of the enterprise. They determine also the quality of its successive generations of management.[6]

McGregor argued that the classical organisational theory was not adequate to meet the requirements of modern organisations, as the classical view of organisation was based on the structure and requirements of the military and the Catholic Church. His criticism was directed at the rigid structures of organisations and the long chain of command formulated by Weber. He also saw a shortfall in the classical organisation theory, as it ignored the political, social and economic factors that shape the

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[5] Pugh, op. cit., pp. 289-315.

[6] McGregor, D., The Human Side of Enterprise, 1960, pp. vi-vii.

organisation and influence management practice.[7]

McGregor formulated his ideas as "Theory X and Y".

Theory X assumes that:

1. the average human has an inherent dislike of work and will avoid it if he can,

2. because of this human characteristic of dislike of work, most people must be coerced, controlled, directed, and threatened with punishment to get them to put forth adequate effort toward the achievement of organisational objectives,

3. the average human being prefers to be directed, wishes to avoid responsibility, has relatively little ambition, wants security above all.

By contrast to Theory X, Theory Y assumes that:

1. the expenditure of physical and mental effort in work is as natural as play or rest. The average human being does not inherently dislike work,

2. external control and threat of punishment are not the only means for bringing about effort toward organisational objectives. Man will exercise self-direction and self-control in the service of objectives to which he is committed,

3. commitment to objectives is a function of the rewards associated with their achievements. The most significant of such rewards, e.g., the satisfaction of ego and self-actualization needs, can be direct products of effort directed toward organisational objectives,

4. the average human being learns, under the proper conditions, not only to accept but to seek responsibility,

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[7] Ibid., pp. 16-18.

5. the capacity to exercise a relatively high degree of imagination, ingenuity and creativity in the solution of organisational problems is widely, not narrowly, distributed in the population,

6. under the conditions of modern industrial life, the intellectual potentialities of the average human being are only partially utilized.[8]

McGregor's analysis was considered to be a landmark in the evolution of the organisation theory and caught the attention of some modern management analysts. Ouchi has formulated his Theory Z based on McGregor's ideas. Theory Z adapts the Japanese management style to American culture. It emphasises the importance of providing opportunities for long-term employment, promotion, specialisation, decision-making by agreement, individual responsibility, informal control by explicit measures, and the concern for the employees with the organisation.[9]

The third era in the evolution of organisation theory witnessed a change in the attitudes of theorists and managers towards the environment of the organisation. They now viewed external effects on the organisation as more important than the internal structure of the organisation. Earlier theories had considered the organisation as a closed-system, paying no special attention to the

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[8] Ibid., pp. 33-57.

[9] Quoted in Handy, C.B., Understanding Organisations, 1987, p. 295. See also Ouchi, W., Theory Z. How American Business Can Meet the Japanese Challenge, 1981.

environment in which the organisation operated. Most of the studies in this area had concentrated on the internal workings of the organisation. The shift in emphasis resulted in a number of studies relating to the organisational environment. Alfred Chandler was the first to study external effects on the internal workings of the organisation. His theory was further investigated by two Harvard professors, Paul Lawrence and Jay Lorsch, who reached the same conclusions.

Basically, this theory stated that organisational structures were shaped by market pressures and the companies which managed to adjust their internal workings accordingly were more successful. Chandler, Lawrence and Lorsch did not share McGregor's trust in the individual and put less emphasis on the individual's ability to affect the fate of the organisation. This meant a shift forward from closed systems to open systems, but a backward shift from social systems to rational systems.[10]

The latest step in the evolution of organisation theory was the recognition of the dual importance of external effects on the organisation, alongside the individual's ability to influence its structure.[11] The success of modern organisations depends on their ability to

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[10] Peters and Waterman, op. cit., pp.99-100 and also Lawrence, P. and Lorsch, J., Organisation and Environment, 1967.

[11] Ibid.

observe the changes in the environment, which is shaped by the competitive market forces, legal requirements, technology, etc. and to adapt to these changes positively.

3.3 THE ORGANISATION AND ITS ENVIRONMENT

The factors influencing the design of information systems are the size, structure and functions of the organisation; its decision-making requirements; the level of centralisation of the management; the use of information technology; the requirements of internal and external users; and the rules and regulation governing the use and retention of the information. These influences shape the nature of the information system that is to be introduced into the organisation.

The major factors that affect the structure of the organisation are its history and ownership, size, technology, goals and objectives and the external environment as well as the people who work for it.[12] These factors influence the management culture of the organisation, which in turn has a direct effect on the design of information systems. A detailed examination of the factors influencing the structure of the organisation is beyond the objectives of this thesis. However, the impact of information technology on the structure of the organisation is a concern to records managers and

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[12] Handy, op. cit., p.197.

archivists.

3.4 THE EFFECTS OF THE COMPUTER ON ORGANISATIONS

The effects of the computer on an organisation can best be explained by the way it affects the nature of the managerial job. The management style of the organisation and the nature of the managerial function define the culture of the organisation. The structure of the organisation, the level of centralisation in management, the flow of information between different management levels and the relationship with the environment are determined by management decisions.

The information processing power of the computer has affected the nature and content of managerial jobs in three important ways. The speed of the computer has changed the nature of the decision-making process, while its accuracy has increased the reliability of the decision-making process. Its ability to perform complex analyses has broadened the scope of the manager's job. These effects are analyzed in more detail below.

1 **Speed:** The computer's ability to perform millions of operations or calculations within seconds has obvious effects on management. Database management systems, for example, can store a number of details about a person, an event, a

phenomenon, etc. and show the relationships between them. When required, the data can be summarised and reported quickly. Information that might be impossible or at least very time consuming to obtain with manual systems can be available in a matter of seconds. This information can be used by the manager in a variety of formats. The manager's decision-making process thus becomes faster. Furthermore, some routine managerial jobs can be computerised, giving the manager more time to turn his attention to other areas. Decision support systems can also help the manager to forecast future events based on past experiences.

2 **Accuracy:** Modern computer hardware is very reliable, if properly programmed. Computer errors are mainly caused by a software failure or incorrect input, that is by human error.

3 **Ability to Analyze Complex Problems:** The speed and reliability of computers enable managers to analyze problems using "if then" questions. The computer can determine the solution to a wide range of problems. It can analyze changes in the nature of the problem or situation in a short time, giving the manager alternative solutions for different circumstances. Decision support, forecasting and financial analysis systems provide managers with the possibility of making

realistic predictions, thus giving them more control over future events and helping them avoid the unexpected.

All these advantages associated with computers also have an impact on organisational structure. The issue of whether computerisation facilitates centralised or decentralised management has been debated by many management analysts. Centralised management means that decisions are made as high as possible in the organisational hierarchy. Under decentralised management middle and lower management are given more incentives to make decisions and to participate in planning and goal-setting for the organisation. The computer can facilitate either management style. This is illustrated by an analysis of the management functions and the role of middle management in an organisation and the degree to which these functions can be computerised.

All managers are concerned with planning and forecasting, organising, staffing, directing and controlling. The difference between top and middle management is only the level of their participation in these functions. The middle manager's role is to support the upper level managers and to carry out routine planning and organising functions. Top level managers are engaged in more strategic decision-making activities. If the routine functions of middle management can be computerised, which in fact they can be to a great extent, the role of middle management is bound to change. Some argue that the computer will make middle managers' jobs more challenging. Since their routine jobs can be carried out by the computer, they can take up more responsibility in strategic decision-making activities. There may be a significant decrease in the number of managers needed by the organisation, but those who remain will have more power in decision-making.[13]

Some analysts foresee that the introduction of computers will eventually lead to the disappearance of middle management. John Cornell, executive director of the Office Technology Research Group in the U.S.A., notes that:

> We made the layers because we couldn't move information fast enough. If information becomes available instantaneously, then we have to ask why you need all those layers. If the answer is, "Maybe we don't" then the impact will be on the middle management.[14]

Office automation consultant Amy D. Kohl reports on a number of companies whose management pyramid has flattened after computerisation.[15]

> Rigid hierarchical structures have begun to crumble at the best managed companies. Replacing

[13] Brabb, G.J., Business Data Processing, 1982, pp. 472-474.

[14] Ibid.

[15] Ibid.

> them are leaner, more fluid organisations with fewer levels of management and more direct lines of communication between the top and the bottom. Instead of relying on entrenched specialist bureaucracies, companies are pulling together a few key managers on an ad hoc basis to solve the immediate problems...[16]

3.5 IMPLICATIONS OF ORGANISATIONAL CHANGE FOR THE RECORDS MANAGEMENT AND ARCHIVAL PROFESSION

As demonstrated above, modern organisations have become increasingly dynamic. Their structures become more complex as the organisations grow. Rigid rules governing the inter-personal relationships within the organisation have been replaced by more flexibility. Organisational procedures and regulations are developed to improve the effectiveness and efficiency of employees, thus increasing productivity.

Records managers and archivists must understand the structure of an organisation if they are to deal with the information it creates and uses. Records managers must base the design of the information systems they introduce on the structure of the organisation and the flow of information within it. The archivist, who arranges and describes the records to reflect the activities of the organisation, also needs to study the structure of the organisation.

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[16] "The Shrinking of Middle Management", Business Week, April 25, 1983, pp. 54-56.

There has been little research on the archival application of organisation theory. Michael Lutzker studied Max Weber's concept of bureaucratic organisation and its implications for the appraisal of records.[17] He argues that in order to determine the evidential value of records archivists must understand the organisation's structure and its internal workings and he raises some further questions:

> ...the archivist who is aware of an institution's inner workings is bound to have a clearer insight into its documentary records. In all likelihood this will aid the difficult process of appraisal. But might it mean something more than that? Is it possible that the archivist's role might expand beyond that of keeper of the institutional memory? Could he or she be an appropriate person to suggest how bureaucratic conflict might be mediated, how institutional goals might be clarified, indeed in what ways a dysfunctioning structure might be improved?...[18]

Bearman and Lytle have also discussed this issue in conjunction with the application of the organisation theory to the principle of provenance.[19] They suggest that the classical organisation theory, which has influenced the archival perception of the organisation, is not adequate to deal with modern organisations. The view it presents of mono-hierarchical organisation structures is no longer

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[17] Lutzker, M.A., "Max Weber and the Analysis of Modern Bureaucratic Organisation: Notes Toward a Theory of Appraisal", American Archivist, Spring 1982, 45(2), pp. 119-130.

[18] Ibid., p. 130.

[19] Bearman and Lytle, op. cit., pp. 14-27.

valid for multi-national corporations, inter-governmental units, regulatory organisations and federal programmes administered by state, provincial and local governments which in fact have poly-hierarchical structures.[20]

Records managers and archivists do need to re-examine their assumptions about organisations. This is especially important when dealing with electronic records, since computers do have an impact on the structure of the organisation. Even though an organisation may resemble an hierarchical structure electronic records tend to be created and used as a result of non-hierarchical relationships. For example, top managers can access the electronic information directly without going through middle management level, or do routine planning and organising without needing a middle manager. Thus a traditional hierarchical approach will not be sufficient to describe the flow and use of electronic records.

Lutzker's and Bearman and Lytle's studies demonstrate the importance of organisation theory to archival and records management functions. In fact, all the functions of records management and archive administration should be performed according to a sound and valid understanding of the organisation that creates and uses the records. For instance, records managers should develop filing systems which reflect the structure of the organisation and the

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[20] Ibid., pp. 16-19.

information flow between the units within it. These systems should reflect the functions of the individual units and their relationships with each other. Such systems not only enhance the efficiency of the organisation. They make the archivist's task straightforward.

Records managers' and archivists' mutual need to understand the nature of organisation should form a platform for co-operation and co-ordination between them. It will enable them to better understand the organisation and the nature of its records and assist them in developing more effective methods of managing records throughout their life-cycle.

3.6 ORGANISATION AND INFORMATION

3.6.1 Managing Information

Any type of organisation, regardless of the business it handles, needs information to perform activities or in support of those activities. There are many definitions of information. However, information is essentially something that informs, or has the potential to inform, and is a manageable entity. Managing information is, therefore, the process of defining, in a systematic way, the information necessary to accomplish identified organisational missions, goals and objectives and managing information resources effectively and economically to meet defined information needs.[21]

The cost of handling information varies in relation to how much the organisation is information-dependent. It is estimated that 90 per cent of all office work is concerned with handling paperwork and information and that between 40 to 60 per cent of administrative budgets are spent on information handling activities. It is also estimated that 60 per cent of the money spent on information activities is wasted due to mismanagement.[22] The following are examples of information mismanagement:

- collection of unnecessary information,
- retention of information longer than necessary,
- inaccessibility of useful information,
- wider dissemination of information than necessary,
- collection of the same information by different people for the same organisation,
- duplicated storage of the same information,
- inefficient methods used in information handling

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[21] Saunders, W., "Information Holdings - the Environment Canada Approach", unpublished paper presented to the Treasury Board of Canada, Office Systems Standards Working Group, Management of Government Information Holdings Working Committee, 20 February 1990, [n.p.].

[22] "The Development of Information and Records Management", Records Management Information, January 1987(1), p. 2.

activities.[23]

This is only a selection of the information management problems which face the records management and archival community. There is no single solution. The factors which cause this situation are complex, but not impossible to address. The main ones are listed and then examined below.

- information is not recognised as a resource,
- lack of top management involvement with information activities,
- the absence of policies regarding the collection, processing, storage and dissemination of information.[24]

Recognition of Information as a Resource: Although information has the same properties as other resources, top management has not yet understood and perceived information as a resource comparable with personnel and finance. The major characteristics of information as a resource in an organisation are:

- it is essential to every aspect of business,
- its collection, storage, processing, etc. incurs cost (often hidden).
- it belongs to the organisation as a whole.[25]

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[23] Central Computing and Telecommunication Agency (CCTA), Managing Information as a Resource, 1990, pp. 1-6.

[24] Ibid.

[25] Ibid.

The definition of information given earlier identifies two basic characteristics of information as a resource. One of them is that it informs or has the potential to inform, which means that it is employed in every aspect of the organisation's business, from policy making to the routine day-to-day activities.

Information costs money. As already mentioned, a major part of most organisations' administrative budget is spent on information handling activities. By using information effectively organisations could save vast sums of money. It is also a source in that it is the basis for generating income.

Information belongs to the organisation as a whole. Most creators and users of information do not understand this. When they create their own information or filing systems, they often do so in such a way that only they can understand them. This makes it difficult for the people who manage information to keep track of it and make it available for corporate use.

Involvement of Top Management: A second impediment to information management is the lack of top management involvement with the information activities in the organisation. Managers tend to take information for granted. Yet, to have good information management practices it is necessary to have recognition and encouragement from top management. Management support will be repaid in term of benefits to the organisation. Proper information management will:

- support decision making through effective and efficient information sources,
- meet the operational requirements of the organisation,
- protect the legal/financial interests of the organisation and the public,
- preserve corporate memory.[26]

Formulating Information Management Policies: Management support must be formalised by policy. The absence of organisational policy on information handling activities, such as collection/creation, processing, storage, dissemination, etc, prevents cost-effective and coordinated management of information.

3.6.2 Information Management Policy

A number of general considerations should be kept in mind when preparing an information management policy. Not all of the points that follow apply in all cases.

The starting point is to make a policy statement which addresses the objective and scope of the policy, that is, what it intends to achieve and which organisational units it covers. This will help to ensure that the policy is

[26] Ibid.

understood, accepted and implemented. This statement should:

- be presented in clear, plain (and comprehensible) language,
- cover all aspects of information handling activities, including contingencies,
- address all the issues and problems related to the different life-cycle stages of information,
- be accompanied by guidelines, giving detailed and clear instructions on how to implement the policy.

The policy should:

- cover all the information holdings, regardless of their form or medium,
- make different provisions for different types of media (i.e. electronic, paper, photographic, etc.), with respect to the different characteristics of the media,
- encourage, or if necessary dictate, the integration of information handling activities,
- adopt a function or subject oriented approach rather than a media-based approach.[27]

The policy should make reference to other policies, regulations and laws which should be taken into account

[27] The "Management of Government Information Holdings", a policy paper issued by the Treasury Board of Canada, Administrative Policy Branch, 1989, is taken as a model for these general points.

when interpreting it. These include the privacy and access to information act or the freedom of information act, the national library and archives act, security policies and records management policies.[28]

3.7 ORGANISATIONAL INFORMATION SYSTEMS

3.7.1 Overview

A variety of disciplines are concerned with managing information, including business management, information and computer science, information technology, library science, archives and records management. Each of these disciplines is concerned with information handling activities in one way or another. For instance, business managers are concerned with the current and semi-current stages of information but overlook the need to archive inactive information. Other disciplines only have an interest in specific types or forms of information.

As a result of this wide, but varied interest in information handling activities, a number of terms, sometimes with conflicting meanings, has emerged. The following is a short list of such terms:

[28] The implications of these laws are further discussed in Chapter Five.

- data processing
- data management
- decision support systems
- information and decision system
- information management
- information processing systems
- information resource management
- information system
- management information systems

On the one hand, these terms can have the same meaning and can be used interchangeably by a particular discipline. On the other hand, they can refer to different information handling activities when used by different disciplines. There is an untapped potential for inter-disciplinary co-ordination in managing information. Such co-ordination is essential to managing today's large and complex organisations and meet their information needs.

The term "organisational information systems" refers to all information holdings, regardless of the media, and to the management of all information handling activities. This is not a new term. It has been used by a number of people from different professions, often interchangeably with such terms as management information systems (MIS), information resource management (IRM) and information and decision system or decision support systems (DSS). The similarities and differences between these terms as different professions use them are set out below.

Management Information Systems (MIS)

There is no commonly accepted definition of MIS, but there is a variety of definitions reflecting the authors' opinions of what seems to be the most important element. These include:

- The combination of human and computer-based resources that result in the collection, storage, retrieval, communication and use of data for the purpose of efficient management of operations and for business planning.[29]
- An integrated user machine system for providing information to support operations, management and decision-making functions in an organisation. The system utilizes computer hardware and software; manual procedures; models for analysis, planning, control decision making; and a database.[30]
- The information technology (IT) and non-IT based systems which support business needs.[31]

Some of these definitions may seem more comprehensive than others, but they have elements in common. Such elements are:

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[29] Lucey, T., Management Information Systems, 1987, p. 1.

[30] Davies, G.B. and Olson, M.H., Management Information Systems: Conceptual Foundations, Structure and Development, 1985, p. 6.

[31] CCTA, Guidelines for Directing Information Systems Strategy, p. 2.

- MIS is suitable for any type of organisation,
- it deals with information handling activities,
- it manifests the support of business functions,
- it deals with the design of either manual or computer-based systems.

MIS is concerned with the design and implementation of cost-effective information systems, either manual or computerised, shaped according to business goals and objectives. Since the 1950s, when computers were first introduced to the business world at transaction level, i.e. for payroll, accounting, etc., MIS has become almost exclusive to computer-based systems.

Information Resource Management (IRM)

IRM is defined as the strategies, tactics and techniques of managing information as an asset. Information should be treated with the same care and attention as other key assets such as finance, personnel and material. The term denotes a slightly different approach to information from MIS, whereby information is a corporate resource and should be managed accordingly. Although information is broadly defined, the term IRM is usually applied to computer-based information systems. Basically IRM is not much different from MIS, except that it is more organisationally oriented.[32]

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[32] Davis and Olson, op. cit., p 12.

Decision Support Systems (DSS)

DSS is a computer-based system which supports decision-making activities in relation to structured and semi-structured problems, such as financial analysis project management systems.[33]

Organisational Information Systems

These incorporate all the properties of the terms defined above but are defined in broader terms. Their scope covers a range of additional issues:

- the legal aspects of information,
- the life cycle approach to information,
- the co-ordination of disciplines concerned with information handling activities,
- the long-term preservation of information,
- the provision and use of standards related to computer-based information systems.

3.7.2 Strategic Planning of Information Systems

No one information system can meet the needs of all organisations, as each organisation has its own specific requirements. Thus, designing an information system for an

[33] Ibid., p. 11.

organisation requires a detailed study of the organisation, its management, the technology it uses and its legal record-keeping requirements. A strategic plan is required to provide a conceptual picture of the proposed information system and its supporting infrastructure. Strategic planning should involve the following stages:

- supporting the current information systems in the department,
- determining the future information needs of the organisation,
- establishing priorities,
- working towards the ultimate objective of the strategic plan.[34]

Planning for information systems must take into account the supporting infrastructure of the system. To set up a system which will further the business objectives of an organisation, strategic planning should take full account of:

- the aims and objectives of the business,
- the information requirements of the business,
- the systems needed to provide the information,
- the technology to support the information systems,

[34] CCTA, Guidelines for Directing Information Systems Strategy, p. 3.

- the policies and plans to develop and implement the information systems,
- the resources needed to establish the information systems required.[35]

Once the plan is in place, a detailed study should be made of the environment in which the information system will be used. Finally, the proposed system should be developed according to the information requirements of the organisation.

3.7.3 The Information System and Its Environment

An information system will operate in an organisational environment. This environment is influenced by a number of factors which need to be taken into consideration in designing the system. These factors are summarised in Figure 3 and are discussed below.

[35] Ibid.

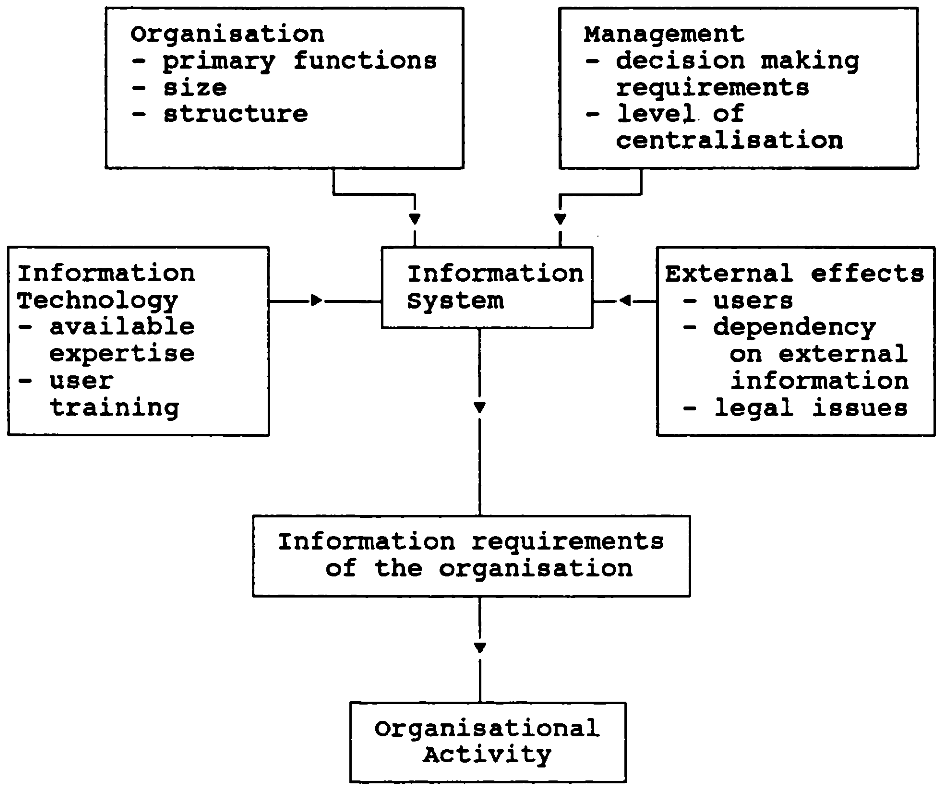

Figure 3: Factors affecting the design of an information system

The Organisation

Information system design must take account of the primary function, size and structure of an organisation.[36] For instance, the primary function of agencies within a government is to run the country. The size of these agencies is usually very large and their structure consists of the arrangement of the component departments, divisions, sections, etc. and the relationships between them.

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[36] Lucey, op. cit., pp. 202-220.

Management

The system design also should take account of decision-making requirements and the level of centralisation. Decision-making usually takes place at top and middle management levels of the organisation where quick access to the information is required.

The chain of command affects the information system. It can be short or long, depending on the structure of the organisation. Organisation theorists suggest that there are two types of organisational structures, *tall* and *flat* structured organisations.[37]

Tall structured organisations are usually large in size and are composed of many departments, divisions, sections, etc. They tend to be based on distributed management with central control. Flat structured organisations, however, have a short chain of command and are more centralised in structure and management control, as illustrated in Figure 4.

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[37] Ibid.

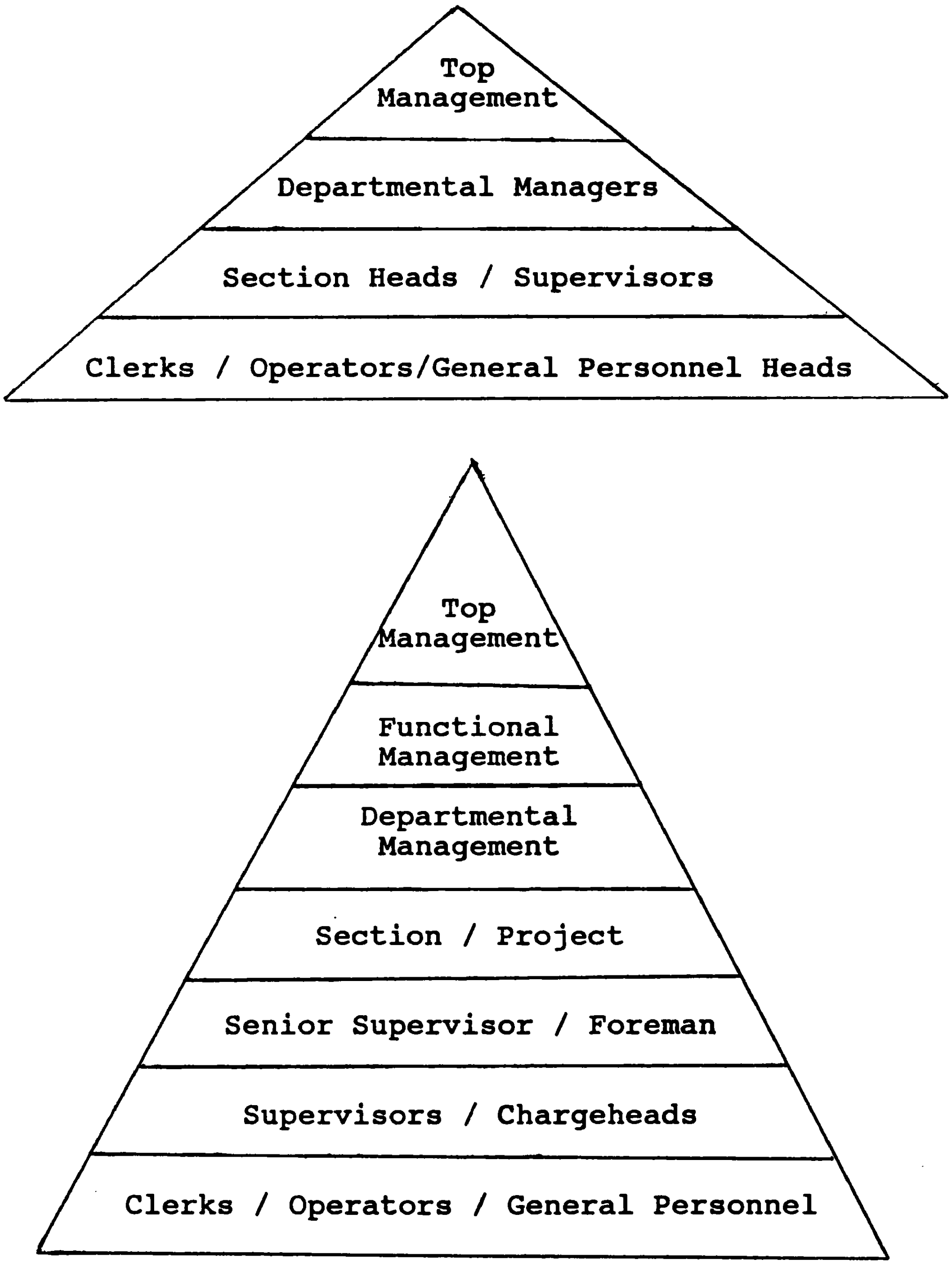

Figure 4: Flat and Tall Organisations.[38]

[38] Ibid., pp. 79-80

The degree of centralisation or decentralisation of the organisation, in physical or managerial terms, also affects the information system. This largely depends on the structure (flat or tall) of the organisation. Tall organisations are usually decentralised both physically and managerially. However, a decentralised organisation may still be managed centrally. In this respect, organisations can be centralised or decentralised, both physically and managerially, or they may be managed through a combination of centralisation and decentralisation.

Three main management layers in an organisation each have different information requirements which need to be considered in information system design.

- Managers at the strategic level are interested in where the organisation is going and how it can assist in decision making.
- Middle level managers are engaged with organising work to achieve long-term strategies as defined by the top management. Their interest in the information system lies in planning tools and forecasting applications to estimate the effectiveness of particular tactics.
- Managers or supervisors at the operational level keep the business up and running.

Information Technology

Computer and associated telecommunications technologies are increasingly important to organisational efficiency. Especially in the last two decades, developments in the capabilities, speed and compactness of computers and the sophistication of software have made computers so attractive that many organisations throughout the world have become computer dependent. This is illustrated by a survey undertaken by the University of Minnesota Management Research Centre on the impact of computers in different types and sizes of organisation. The survey showed a decline in organisational operations after computer failure from 96% to 9% in 10.5 days.[39]

Today, computers are used in most areas of office operations, particularly in data processing, office automation systems and structured or semi-structured decision support systems. These main areas of computer applications are interrelated, and it is difficult to draw boundaries between them. Figure 5 shows the use of these information technology applications and the relationship between them. The three main applications are described below.

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[39] Aasgaard, D.O. [et. al], "An Evaluation of Data Processing "Machine Room" Loss and Selected Recovery Strategies", University of Minnesota, Management Information Research Centre WP-79-04, p. 70.

Decision Support Systems

- Expert Systems
- Spread Sheets
- Data Analysis

Office Support Systems	Transaction/Data Processing
- Word Processing - Communications (E-mail) - Electronic filing	- Day-to-day Processing Transactions - Public Relations Enquiries/Answers

Figure 5: Information Technology Applications

<u>Transaction/Data Processing</u>: Data processing is mainly used in day-to-day transactions, public inquiry systems and housekeeping records systems. The level of management involvement is low. The value of records is minimal and retention requirements are short term.

<u>Office Support Systems</u>: These systems may include one or more applications, such as word processing, electronic filing, electronic mail and data storage and retrieval. Records created within these systems have mid-term or long-term value and reflect the activities of the organisation. Therefore, these records concern the records manager and the archivist.

Decision Support Systems: The main applications of decision support systems are data analysis, spreadsheets and expert systems. The information is fed into the system by data processing and office support systems applications. These systems are mainly used in formulating policies and strategic decision-making. Therefore, records created in these systems will have high informational and evidential value and are likely to be preserved for long periods.

External Effects

An organisation's information system is affected by external influences. These include external users of information systems and the organisation's dependency on external information. External users employ the services provided by the organisation and the information it maintains. The legal obligations with which the organisation has to comply also have an external effect. Legal responsibility and accountability are discussed in Chapter Five.

3.7.4 Information System Analysis and Design

Records manager and archivist must understand how information systems analysts work. Analysts' techniques can be of great help in solving record-keeping problems. In return, an analyst can learn a great deal from records managers and archivists in terms of organising information and evaluating the functions of an organisation.

Information system analysis and design should be based on an understanding of what is needed from the system and a knowledge of the organisation's information needs. This process should include the following stages, which are listed below and then defined:

- adopting a methodology,
- analyzing the organisation, its environment and its information requirements,
- defining the parameters of the system,
- developing of the system,
- testing and monitoring the system.

Methodology

There are a number of standard methodologies for analyzing and designing information systems. The following is a brief description of three methodologies:

The Learmoth-Burchett Structured Development Methodology (LSDM)[40] defines techniques for modelling data, diagramming data flow, describing functions and outlining the processes involved in the system. These techniques follow systematic stages:

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[40] Burchett, R., "Data Analysis and the LBMS Structured Development Methodology", Information Technology Training, 3, 2 May 1985.

- a step by step approach to preparing comprehensive check-lists and guidelines,
- integrating these techniques into the overall method framework so the analyst knows how the products of one stage or technique can be used in the subsequent stage or technique,
- preparing system documentation as an integral part of the development cycle.[41]

The Jackson System Development (JSD) Methodology[42] sets out four steps for the creation of the required system and two steps for its implementation of the system. It defines the computer process for each organisational activity and these processes are linked together to make the whole system.

The Soft Systems Methodology (SSM)[43] concentrates on human activity (the soft system) as opposed to technology (hard system). This method defines three steps for analyzing and designing the system. The first step is to create a "rich picture" of the problem. The second step involves defining the purpose and parameters of the system which will solve the problem. The last step is to build "conceptual models" of sub-systems and integrate them into

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[41] Ibid.

[42] Jackson, M., System Development, 1983.

[43] Checkland, P.B., Systems Thinking, Systems Practice, 1981.

the system.

Analyzing the Organisation

In analyzing the organisation, its environment and information requirements, the analyst should aim to:

- perceive undefined organisational functions, organise them into logical organisational divisions and synthesize solutions,
- gather relevant facts, sometimes from conflicting sources,
- understand the organisation, its environment and the requirements of the users.[44]

The analyst should also be able to answer the questions of the different parties involved in developing the system or who will be affected by it. The questions may include, for instance:

Manager:	How is this computer system expected to further the aims and objectives of the organisation?
Trade Unions:	How can it be fitted into the working lives of people?
User:	How can I best relate to the

[44] Wood-Harper, A.T., Antill, L. and Avison, D.E., Information Systems Definition: a Multi-view Approach, 1985, pp. 19-22.

	computer in terms of operating and getting output?
Records Manager:	What information processing functions will be performed?
IT Person:	What are the technical specifications of the system which will meet organisational objectives and requirements of users?[45]

The analyst should also be aware of the policy implications of the system and its possible effects on business strategy. The management should be made aware of the policies needed to ensure that the system functions, bearing in mind the record keeping requirements of the organisation.

Defining the Parameters of the System

As defined above, an information system is a collection of interrelated sub-systems (explained below) which helps to achieve organisational objectives. There are a number of elements that should be taken into account to ensure that it serves its purpose and addresses user-related issues. These elements are:

[45] Ibid., pp. 8-10.

- functional elements: functions of the system and its effect on the decision-making process,
- social effects: relationships between departments,
- political effects: people's interests, industrial relations, career structures,
- technical elements: system configurations according to business requirements,
- cost-effectiveness: justification of the outcome.[46]

An initial investigation should be carried out to define the system's parameters. This should involve compiling information about the problem, participants in the project, requirements of the organisation and the resources to be allocated to the project.[47]

After this initial investigation, the parameters of the system should be examined in greater detail. This will involve preparing a high-level description of the proposed system, the time-scale and manpower requirements, the cost benefits or risks involved and the feasibility of the project from technical, human and operational viewpoints. The description should indicate the level of difficulty of the project and the expected of the results.[48]

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[46] Ibid., pp. 3-15.

[47] Ibid., p. 6.

[48] Ibid.

The next step in the definition phase is to define the sub-systems that the system should incorporate. These are described below.

Human activity sub-system: The analyst should compile information about the organisation and its activities. This involves interviewing all the parties involved, drawing up a picture of the activities, tasks, etc., of the organisation and showing the relationships between organisational units. He also needs to identify major difficulties, potential conflicts and other relevant issues which will have an effect on the information system.

Information modelling sub-system: The analyst identifies what the organisation is attempting to do and the information required to do it. He describes the functions of the organisation and determines the events which trigger these functions.

Record-keeping requirements sub-system: Here the analyst needs to determine what records the organisation needs, how long they should be kept and what documentation is required.

Socio-technical sub-system: The analyst considers the effects the information system will have on the employees in terms of redundancies, skilled personnel required to operate it and changes in job descriptions.

Human-computer interface sub-system: The analyst will determine how easy the system will be to use, how quickly users can get help and how much training will be necessary.

Developing the System

Once the information system is in place, it should be developed according to the requirements of the organisation. As each organisation will have particular requirements, but in broad terms the system should comprise the following components:

- the application system: performs functions,
- the information retrieval system: responds to inquiries, prepare reports,
- the database system: stores data,
- the maintenance system: updates, appends, etc.,
- the control system: checks errors,
- the recovery system: restores the system after a malfunction or error,
- the monitoring system: keeps track of the system and user activities.

Testing and Monitoring the System

The final stage in system analysis and design is to test the system and monitor its success. In order to do this, it is necessary to set up acceptance criteria to measure the performance of the system. The criteria will be drawn from the objectives of the system and testing should show whether the system meets its objectives.[49]

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[49] Ibid., pp. 33-154.

4.1 INTRODUCTION

Electronic data resides on magnetic, optical or other type of media in the form of electronic signals which are transformed into human readable form. Electronic information is created and maintained in a variety of hardware and software environments.

Computer-based information systems are dependent on a number of operating system environments and proprietary[1] software products and they are maintained on a variety of computer configurations. Both software and hardware products are short-lived. New products are introduced on a daily basis and old ones are discontinued.

This ever-changing information technology has important implications for records managers and archivists. The records manager needs to ensure the accessibility of information and the organisation's accountability by continually migrating information to newer systems. At the same time, he needs to preserve the functionality and integrity of the information. The archivist acquires records created under the control of various systems. This information must be accessible across time and systems and

[1] Specific to a particular vendor and carrying unique characteristics, such as user interface, programming language, etc.

at the same time the evidential value of the records must be preserved. Records managers and archivists must acquire a degree of understanding about computer and telecommunication technologies on which electronic records are dependent. They must also become involved in developments in data exchange standards. Otherwise information will be lost. For the records manager this means the loss of organisational memory and for the archivist it is the loss of an institution's or a nation's memory.

The aim of this chapter is to provide an overview of the issues involved in data exchange between heterogeneous systems. Storage media for electronic records will be compared. Furthermore, technical problems relating to the security of computer systems, access to and use of electronic information and preservation will be evaluated.

4.2 HARDWARE CONSIDERATIONS

4.2.1 Overview

The term "hardware" refers to the computer equipment required to create, manipulate and store electronic data. The preservation of electronic data depends on the availability of hardware which is compatible with the system on which the data was originally created and manipulated. Electronic data is stored on a number of different media, produced by using a number of different technologies. The suitability of storage media for long term preservation of electronic data is discussed below.

4.2.2 Machine Dependency

Electronic data is machine dependent. Without a computer, the data cannot be accessed. In addition, electronic data can be dependent on a specific type or make of computer. Many archivists still believe that if they want to preserve electronic records they must acquire the computer hardware with them. This is no longer the case. The exchange of data between heterogenous systems is possible as demonstrated by the experiences of the National Archives of Canada, the National Archives and Records Administration in the U.S.A. and the Economic and Social Research Council Data Archive in the U.K. Upon acquisition, electronic data is converted into a standard format that can be read and manipulated by the archives' computer system.[2] However, it may not be possible to preserve the data format.[3]

[2] The processing of electronic data is discussed in greater detail in Chapter Ten.

[3] This issue is further discussed in sections 4.3 and 4.4.

4.2.3 Storage Media

Storage media for electronic data are of concern to archivists, records managers and information technology managers as well as computer manufacturers. Archivists are searching for a stable, standard medium for the long term preservation of electronic records, while the computer industry has been hard at work manufacturing and marketing new products on a daily basis. The media are getting more compact, and their density and life expectancy are increasing.

Although optical storage technologies have been on the market for ten years, magnetic tape has been, and still is, the primary storage medium for archival preservation as it has been on the market longer than optical storage media. However, optical disks promise to provide a longer life expectancy, a larger capacity and improved access to the data stored and are of increasing interest to archivists. A number of projects have been undertaken by archival repositories around the world to test the suitability of optical media for archival preservation. Magnetic and optical storage media are evaluated below and newer products now coming on to the market also are assessed.

Magnetic Tape

Magnetic tape is the most commonly used storage medium. It is a continuous plastic strip covered with magnetic oxide onto which data is recorded as magnetised spots. Although the dimensions of magnetic tape vary from one system to another, the most widely used type is a 10.5 inch reel tape, consisting of 2400 feet of 0.5 inch tape. The recording density also varies. This could be 800, 1600, or 6250 bpi (bits per inch). Magnetic tapes of other densities also exist.

Data is recorded onto tape on a magnetic tape deck. The deck consists of a drive mechanism capable of driving two tapes at a very high speed. While tape is wound from one reel to another, it passes a read/write head which either reads the data from the tape or writes onto the tape. When the data is recorded onto the tape, it is written in tracks. Each track contains one character code. The tape can be either seven or nine track, but nowadays seven track tapes are rarely produced. The nine track tape is used to store the data in binary codes. Eight of the tracks are used to record character codes. The ninth one is used for checking errors on the tape and is called the parity bit.

The data written onto the tape is grouped as blocks, each of which contains a logical record. Blocks are separated by a inter-block gap, which is a small area left uncoded. The data blocks are recorded sequentially on the tape.

Magnetic tape technology uses a fixed header to read the tape while it runs through the header. This has an effect on the access time. To retrieve a particular record, all the blocks on the tape have to be read from one end to the other. By comparison, magnetic disk technology, which uses a movable read/write header, is very fast.[4]

Optical Disks

Optical disk technology has been developed over the last two decades and has become more widely available in the 1980s. Optical storage refers to the use of laser technology in recording data onto the storage medium. The data is recorded by burning a series of microscopic holes with a laser beam into a thin metallic film on the surface of a plastic disk. Optical disks are produced in a number of sizes which essentially determine the capacity of the disk.

[4] Technical aspects of magnetic tape are further elaborated in Chandor, A., A Dictionary of Computers, 1977, pp. 256-259, Hedstorm, M., Archives and Manuscripts: Machine-Readable Records, 1984, pp. 28-32 and Orilia, L. S., Introduction to Business Data Processing, 1982, pp. 469-482.

Optical disks can be grouped in two categories, according to their use and applications in information processing. The first type is the CD-ROM (Compact Disk Read Only Memory) from which data can be read but not modified. Its main application is electronic publishing. A large number of databases has been published on CD-ROM.[5]

The second type of optical storage, which has potentially wider archival use, is WORM (Write Once Read Many) disks. WORM disks exist in 3.5, 5.25, 12 and 14 inch sizes and their capacity ranges from 115 megabytes to 6.8 gigabytes.[6] WORM disk systems applications include the conversion of paper files to processable and transmittable digital documents. At present this is a costly exercise, but as the capacity of WORM disks increases and prices decrease, it may prove to be the most cost effective and efficient way of storing vital records. Moreover, it is possible to achieve on-line access to the information for a longer period of time than is possible with magnetic disk technology.

WORM disks are likely to replace microforms. They have all the advantages of microfilm or micro-fiche and

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[5] There is extensive literature on the use CD-ROM applications in electronic publishing. See for example Cinnamon, B., "Optical Disk Applications", IMC Journal, July-August 1988, p. 19.

[6] Artlip, P.M., "Different Optical Disk Formats Co-exist to Provide End-User Applications Flexibility", IMC Journal, March-April 1988, pp. 13-15.

more. WORM disk systems can be accessed remotely and transmitted. The speed of access is much faster than with paper-based systems or micro-graphics systems, and paper documents and computer files can be linked and accessed simultaneously.[7]

Electronic data storage technology will inevitably continue to evolve. While the size of the media is getting smaller, the capacity is increasing dramatically. At the same time new techniques, such as the holographic data storage technique, are being developed to increase the speed of storing data and retrieving it from storage media.

Flash Memory, Digital Audio Tape (DAT) and hybrid storage systems, such as magneto-optical storage are likely to develop as alternatives to optical and magnetic devices. In the absence of international standards on storage media archivists must be especially cautious about these storage media. However, studies are underway to set standards for electronic data storage systems. At present different standards exist for formatting magnetic and optical devices. For example, for 5.25" WORM disks ANSI X3B11 a formatting scheme called *Continuous Composite Servo* (CCS) is specified . The ISO DIS 10089 has adopted the ANSI standard and defines another, called *Sampled Servo* (SS).

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[7] Grigsby, M., "The Integration and use of Write Once Optical Information Systems", IMC Journal, July-August 1987, pp. 9-13.

4.3 SOFTWARE DEPENDENCY

Electronic data created under the control of proprietary software cannot be easily transferred to a standard format or to any other vendor dependent format. Even when transfer is achieved, the format of the data is likely to be lost, if not completely at least partially. Therefore, software dependency can be a serious barrier to the preservation and future use of electronic records.

The problem of the software dependency of electronic records has proven to be the most difficult hurdle to overcome. The data is most useful when retrieved under the software package with which it was originally created. However, it is neither practical nor possible to keep the software with the records. Firstly, software is released to the licensee under a leasing agreement. The use of the software by anyone other than the licensee would be a breach of the copyright law. Secondly, the archives cannot purchase every software package needed to access the data in its electronic collection.

This means that the data should be translated into a standard format. Transferring data to a standard format may lead to some contextual information being lost. Almost every software package has different user interfaces, different query languages and different file creation and editing procedures. Some of these procedures may have logical or hierarchical relationships with the text itself. If a file with these kinds of attributes is transferred to a standard format, its distinguishing marks, such as highlights in the text or logical footnotes will be lost.

Database management systems include query languages, which provide facilities for storing, retrieving, updating and deleting records and show the way the database was constructed and used. Query language attributes may also be lost when a database is transferred into a standard format.

Almost all software suppliers build data migration facilities into their products. This enables users to retrieve data even when the software becomes obsolete. However, it is more difficult to exchange data between heterogeneous systems than between different releases of a software product from a single vendor. Every supplier processes data in a different way and the relationship between the data and its format is handled differently. Different types of software are embedded with a different user interfaces and/or different query languages.

Data exchange standards provide vendor independent data exchange between heterogeneous systems. Records managers and archivists should explore these standards fully to ensure the preservation of information with continuing value.

4.4 DATA EXCHANGE STANDARDS

4.4.1 Background

Data exchange standards have been the concern of many software vendors, user groups and standards organisations at national and international levels. As a result, a number of standards have been developed for the exchange of data between heterogeneous systems. These can be grouped into three categories. The first group consists of the standards developed by the International Standards Organisation within the open system environment, known as the *Open System Interconnection (OSI) Reference Model*. The second group is the *Application Portability Profile (APP)*, developed by the National Institute of Standards and Technology in the United States. The third group comprises individual standards related to the exchange of data which have been developed outside the OSI and APP. These standards include some of the American National Standards Institute (ANSI) standards, the Consultative Committee on International Telephony and Telegraphy (CCITT) recommendations and industry standards. The sections which follow provide an overview of standards developed within the OSI and APP environment and some other important data exchange standards.

4.4.2 The Open System Interconnection (OSI) Reference Model

The need for data exchange was recognised by software vendors and user groups in the mid-1970s. From a user's point of view, it is important that work can be begun on one computer system and if necessary continued on a different one. This is known as an "open system environment" in which heterogeneous systems can exchange data without losing the format. The OSI Reference Model was accepted as an international standard by the International Standards Organisation (ISO) in 1979 (ISO 7498) and standards have been subsequently developed.

The OSI Reference Model defines a set of rules for the communication of data from one system to another. These rules are formulated into seven layers of protocol. The bottom four layers collectively transmit the data through communication systems and define hardware requirements, communication links and transport facilities of the OSI Reference Model. The top three layers ensure the transmission of data through the system, define the representations of data between applications and translate data and interfaces between systems. Each layer uses the services provided by the lower levels and provides services to the higher levels. The data is coded for transmission while it goes through the layers from top to bottom. At the receiving end the data is decoded from bottom to top.[8] Figures 6 and 7 show the interconnection in non-OSI and OSI environments. Figure 8 shows the OSI layers of protocol.

Figure 6 illustrates the data exchange between different computer systems. In the top row different computer systems are identified as A, B, C and D. Each system has a particular way of creating and manipulating data. As a result, in the second row electronic data is created with different formats. The interchange of data and its format between different systems (row three) depends on the data exchange facilities embedded in the system. System A has facilities to interchange data. Its specific data format can be translated and used by the other three systems (row four). By contrast, system D has no facilities for translating its format to other systems, so its data cannot be interchanged with other systems. However, it can manipulate data created by a different system and translated into its own data format.

Figure 7 illustrates the data exchange in an OSI environment in which each system is provided with standard data exchange facilities, even though each has a different way of creating and manipulating data.

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[8] Dollar, C. M. and Weir, Jr., T. E., "Archival Administration, Records Management, and Computer data Exchange Standards: An Intersection of Practices", draft paper, p. 7.

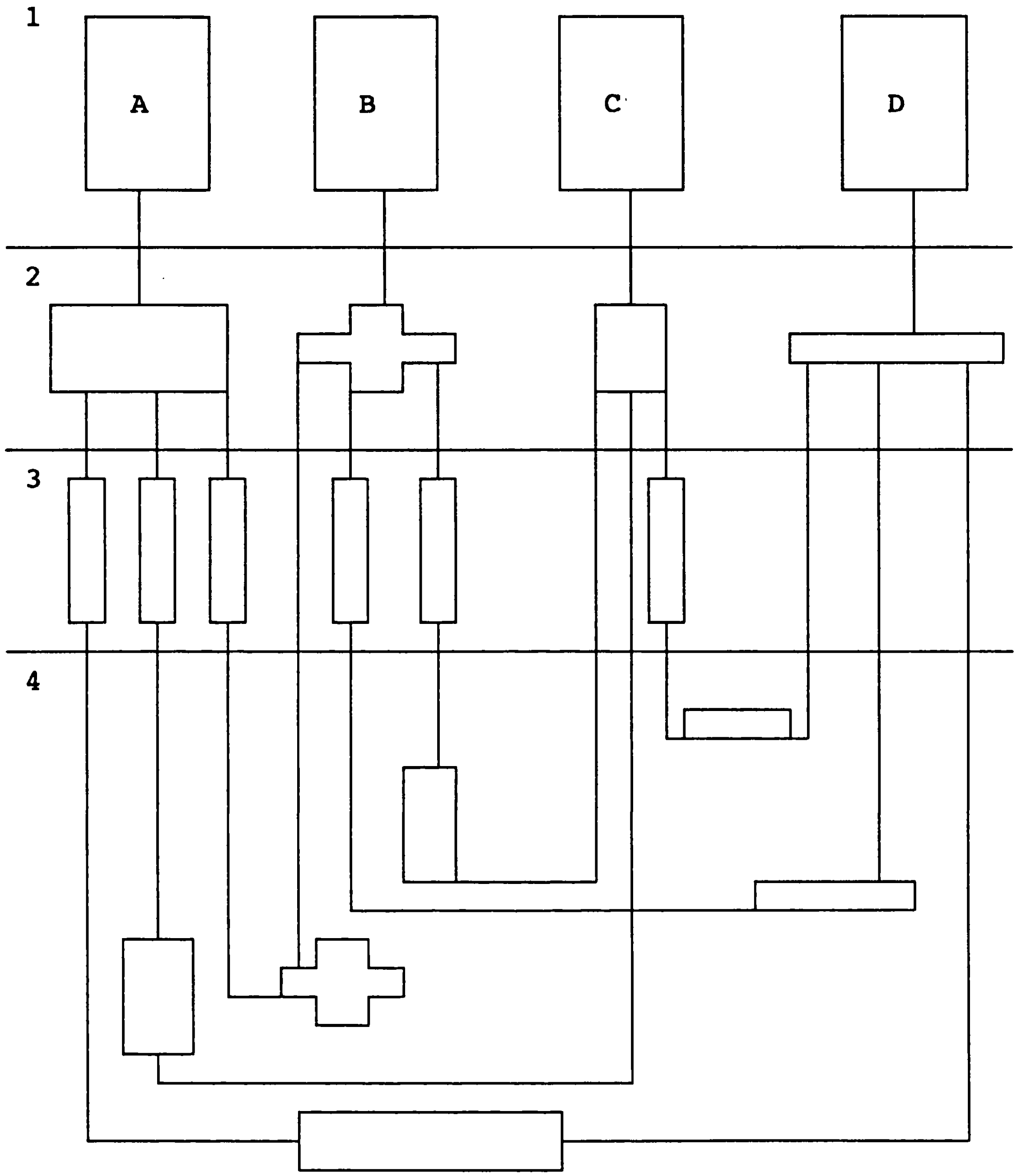

Figure 6: Data exchange in non-OSI environment

1. Computer systems
2. Electronic data created under different systems
3. Exchange facilities provided by the system
4. Exchange of data[9]

[9] Adopted from Catley, B., "Information Technology Standards Relating to Office Systems", Society of Canadian Office Automation Professionals, 1989.

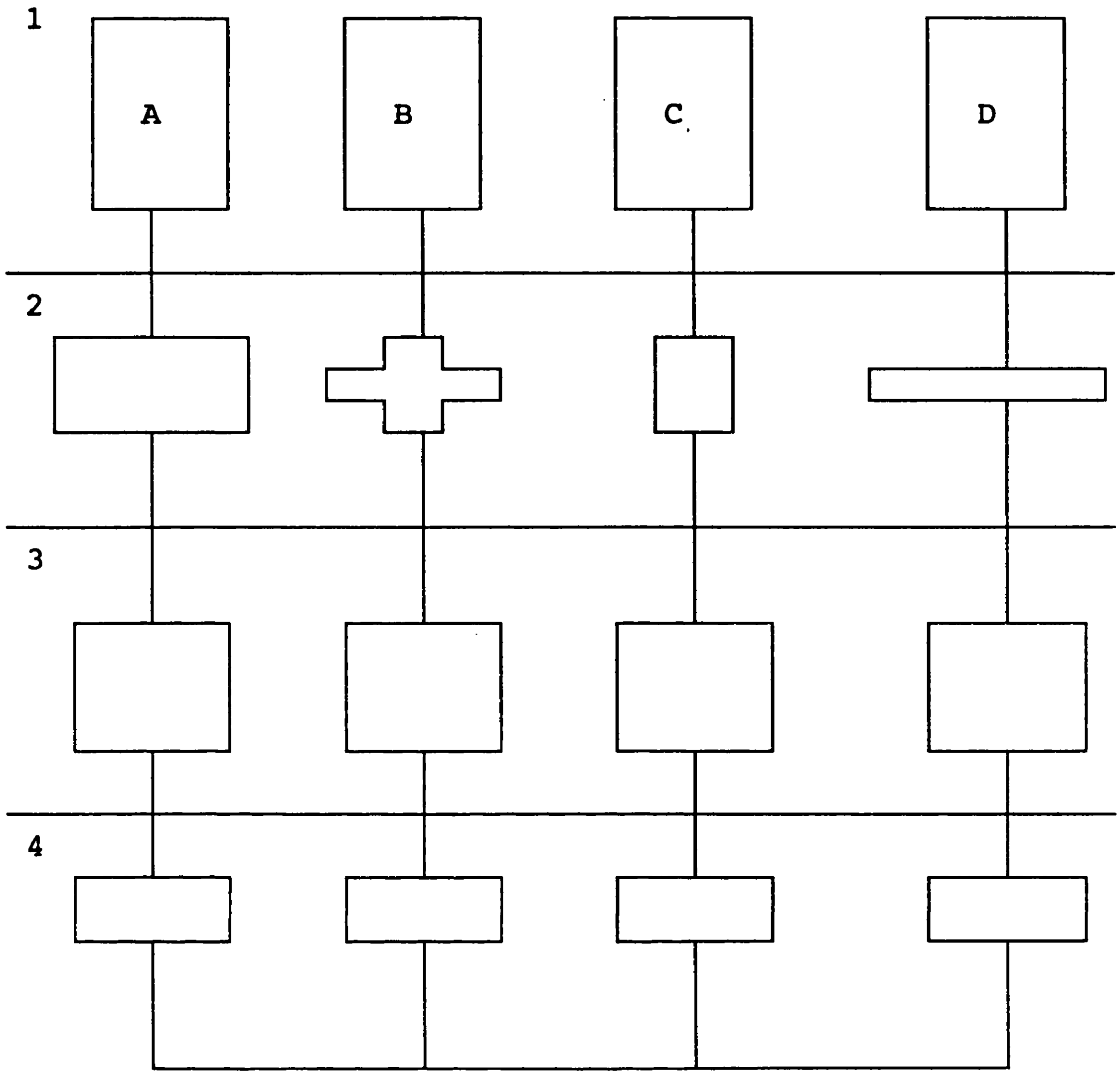

Figure 7: Data exchange in OSI environment

1. Computer systems
2. Electronic data created under different systems
3. Exchange facilities provided by the system
4. Exchange of data [10]

[10] Ibid.

User Program	Application Program (not part of OSI)	User Program
7 Application Layer	Provides a window between application processes in order to exchange meaningful information	7 Application Layer
6 Presentation Layer	Provides for representation of information that is communicated between or referred to by application processes. (ISO 8822)	6 Presentation Layer
5 Session Layer	Provides means to organize and synchronize the dialogue between application processes and manage their data (ISO 8326 and CCITT X.215)	5 Session Layer
4 Transport Layer	Provides the transparent transfer of data between end systems (ISO 8072, 8072/AD1 and CCITT X.214)	4 Transport Layer
3 Network Layer	Provides routing and relay- ing through intermediate systems (ISO 8348, 8348/AD1 AD2, CCITT X.213, ISO 8648, 8880)	3 Network Layer
2 Data Link Layer	Provides the transfer of data between directly connected systems and detects any errors in the transfer (ISO 8886)	2 Data Link Layer
1 Physical Layer	Provides the transparent transmission of bit streams between systems including relaying through different media	1 Physical Layer

Figure 8: OSI Reference Model[11]

[11] RETIX-The Internetworking Company, "ISO and CCITT Data Communication Standards: Principle Standards for End-user Systems", 1986, [n.p.].

The OSI Reference Model sometimes defines more than one standard for each layer. Some of the standards are described below.

ASN.1 (Abstract Syntax Notation One)

ASN.1 is a programming language developed for the OSI Application and Presentation layer protocols. The language defines a standard encoding system for data structures and values (information) associated with those data structures. Abstract Syntax Notation One is defined by the ISO 8824 and 8825 and CCITT X.409. The language acts as a parser (it describes the inflection and syntactical relationships between words) to format incoming and outgoing protocol data units.[12]

MHS X.400 (Message Handling System)

MHS is an electronic mail system which allows the interchange of text, voice, graphics, fax, telex, etc. in a standard format. MHS has been developed for the application and presentation layer protocols of OSI. Services provided by the MHS, defined in CCITT X.400, include an envelope and the message. The transmission and presentation of the message are defined in CCITT recommendations X.409 (Presentation Transfer Syntax and

[12] Ibid.

Notation), X.410 (Reliable Transfer Service RTS), X.411 (Message Transfer Service MTS) and X.420 (Interpersonal Messaging Service IPMS).[13]

Directory Service

The Directory Service is based on the OSI Directory defined jointly by ISO Standard 9594 and CCITT Recommendation X.500. The Directory Service provides a standard data exchange service within the OSI environment. The directory contains entries that represent the objects in the OSI environment. The entries are accessed by name and contain one or more attributes that describe the object.[14]

Information Resource Directory System (IRDS)

A data directory, which means "data describing data", is also known by several other terms, including "data dictionary" and "metadata".[15] A data directory is a utility developed by most database management systems (DBMS) and embedded in the database. The data directory defines and describes the data stored in a database.

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[13] Ibid.

[14] Ibid.

[15] McDonald, J., "Information Resource Directory System (IRDS) and the National Archives of Canada", Paper presented to the Society of American Archivists, St. Louis, Missouri, October 1989.

The Information Resource Directory System (IRDS) standard was originally developed by the American National Standard Institute (ANSI) and subsequently developed as an international standard by the International Standard Organisation (ISO). There are some differences between the ANSI IRDS and ISO IRDS, as the ANSI standard concentrates on the core functions of the IRDS and the ISO standard puts more emphasis on the IRDS framework.[16] The ISO IRDS framework is based on IRDS data architecture which is described below.

A standard IRDS can contain definitions and descriptions of all the information resources of an organisation. This is illustrated by a National Archives of Canada study which investigated the implications of IRDSs on the management of information sources within government institutions and on the management of electronic records in the archives (see Chapter Eight). The study evaluated the existing IRDSs and showed that a data directory can hold information about a file, a document or a single data item.[17]

The IRDS is the equivalent of a "finding aid" or a "file list" in a paper-based system. It is also known as the data dictionary, data catalogue, encyclopedia, system

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[16] Protocols Standards and Communications Inc., "Situation Report on the Information Resource Dictionary Systems (IRDS)", 1989, pp. 14.

[17] Ibid., pp. 3-4.

catalogue or metadata. It contains information about definitions, descriptions and schemas of the user database. This may include the category of the data item, relationships between data items, information about the creation and modification of the data, and the format and whereabouts of the data item in the database.[18]

An IRDS organises data in *levels* and *pairs* which are extensions of the concepts of *data type* and *instances* used in programming languages and DBMSs. The below table shows a *schema* of a database which contains employee *data types* (records) about two employees called Smith and Jones. Data types for each employee are grouped in a *container* which contains *instances* of (information about) the employee.

NAME	DESIGNATION	ADDRESS
SMITH	CLERK	LONDON
JONES	SUPERVISOR	LONDON

Figure 9: A schema of a database

A *data type* is part of a data definition, like that given in a Data Definition Language (DDL) of a DBMS. The

[18] Protocols Standards and Communications Inc., "Situation Report on the Information Resource Dictionary System (IRDS)", pp. 3-4.

term *schema* is also used to refer to a single data definition. An *instance* of a *data type* is a particular value that may be stored in a *container*, such as a record, associated with a defined *data type*. For example, a *schema* may define EMPLOYEE as a *data type*. The *container* associated with the EMPLOYEE TYPE contains *instances* (information) about the EMPLOYEE.[19]

In IRDS architecture, *data type* definitions are stored on one level and the *instances* of their defined types are stored on a lower level. The two levels, containing the type definitions and corresponding instances, form a *level pair*.[20] The IRDS defines four levels and three pairs. These levels and level pairs are summarised immediately below and then defined.

1. Fundamental level ⟶ IRD definition level pair
2. IRD definition level ⟶ IRD level pair
3. IRD level ⟶ Application level pair
4. Application level

Figure 10: IRDS Levels and Pairs

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[19] Ibid., pp. 15-16.

[20] Ibid., pp.16-19.

IRDS Levels

1 **Fundamental Level:** This level is also known as the IRD Definition Schema level. It prescribes the types of objects about which data may be recorded on the IRD level. The definitions of the types of data are stored in the next level.

2 **IRD Definition Level:** The purpose of this level is to store IRD definitions. It may include more than one schema.

3 **IRD Level:** This level contains IRDs. For example, it contains the information that EMPLOYEE is a record type and it identifies which program uses this record type.

4 **Application Level:** This level contains the instances of the data types. It serves the information system users.[21]

Office Document Architecture and Office Document Interchange Format (ODA/ODIF)

ODA/ODIF standards were developed by the ISO (ISO 8613) as a multi-part standard to define an architecture (structure) for compound electronic documents (comprising text, voice, data, tables, graphics, images, etc.) and to prescribe an interchange format of data streams to transmit ODA structured documents. ODA/ODIF standards facilitate

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[21] "Information Resource Dictionary System (IRDS) Framework", Revision 8, November 1989, ISO/IEC SC21/WG3/N1010.

the interchange of electronic documents in a multi-vendor environment by means of data communication or by the physical exchange of storage media.[22]

The ODA defines two types of document structures which provide different but complimentary descriptions. The first is the *logical structure*, which divides the content of the document into hierarchical units called logical objects. These logical objects include chapters, headings, paragraphs, appendices, footnotes and figures which relate to the human comprehensible meanings (semantics) of the content. The second structure is the *layout structure*, which divides the document into hierarchical units called layout objects. Layout objects include pages and columns.[23] ODA logical and layout structures are given in Figures 11 and 12.

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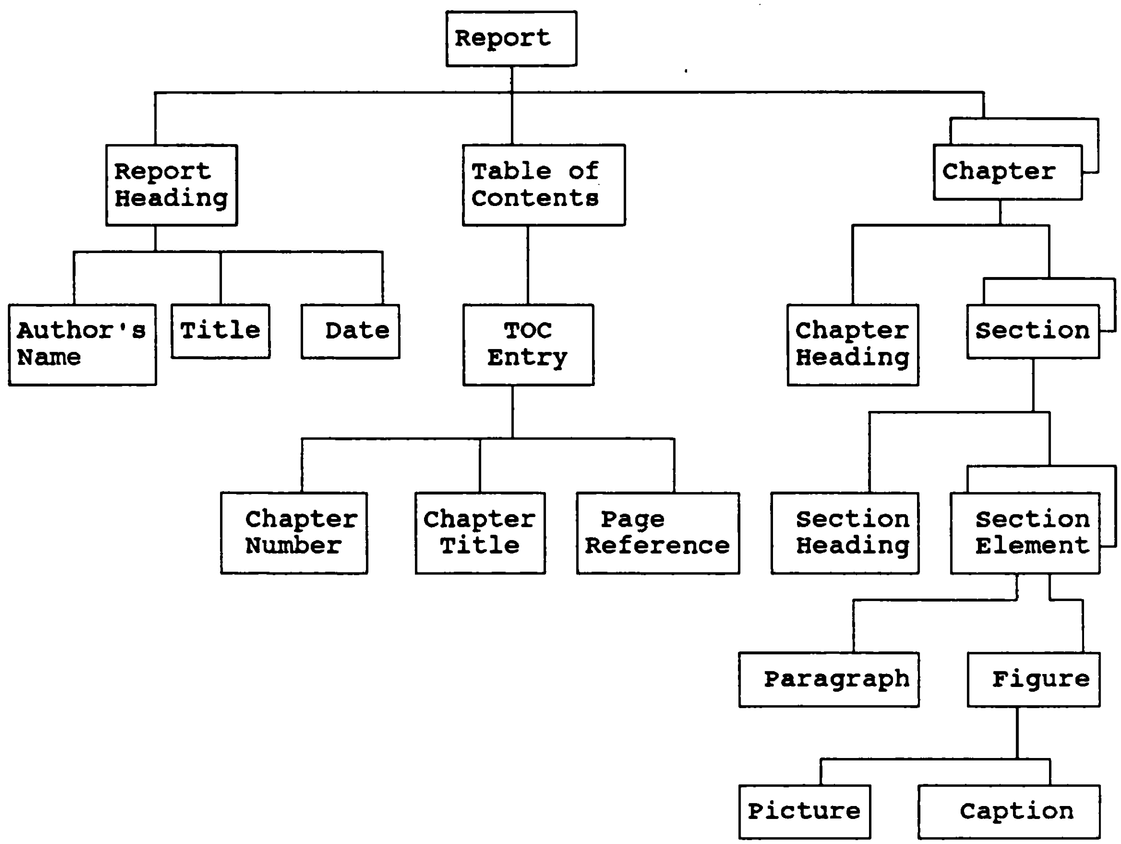
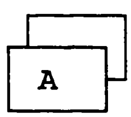
[22] Protocols Standards and Communication Inc., "The Application of ODA/ODIF Standards", 1988, pp. 17-26.

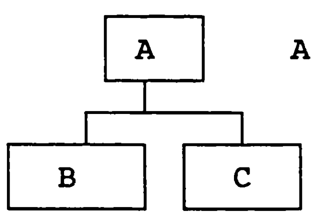
[23] Ibid., p. 20.



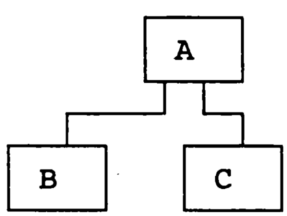
Legend:



One or more occurrences of A; a report may contain one or more chapters.



A consists of B <u>and</u> C; a report heading contains author's name, report title and date.



A consists of B <u>or</u> C; a section element includes either a figure or a paragraph.

Figure 11: ODA Logical Structure

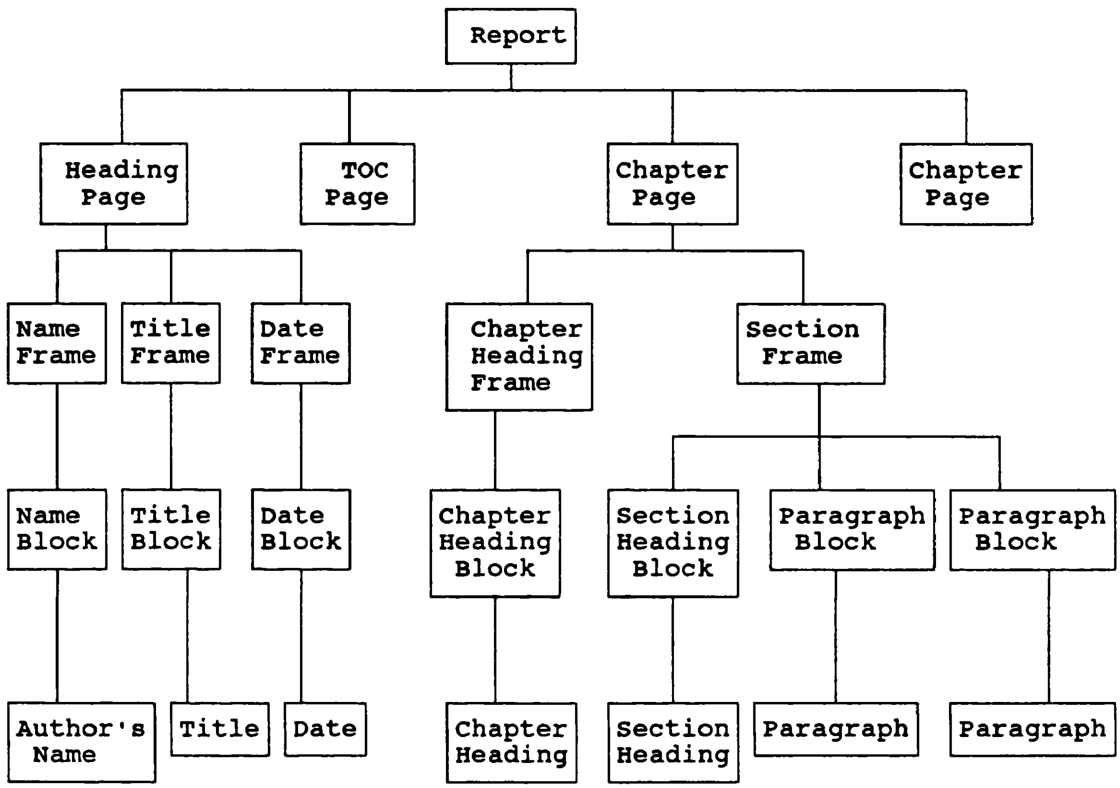


Figure 12: ODA Layout Structure[24]

[24] Ibid., p. 23 and 25.

ODA also provides a profile for each document, giving information about the author, title, subject, size, revision history and security attributes. The document profile also describes the document architecture (formatted, processable or formatted processable). Thus the recipient can easily determine the requirements for imaging and processing the document.[25]

The Office Document Interchange Format (ODIF) component of the ODA/ODIF standard defines the format of the data stream used to transmit ODA structured documents. This data stream consists of a set of data structures, called interchange data units, representing the constituents of the document. These constituents include the document profile, descriptions of logical and layout objects, content portion and presentation descriptions and the content itself.[26]

Although the ODA/ODIF standards provide data interchange in a multi-vendor environment, they do not provide a communication protocol. Since document interchange requires a communication protocol at the Application Level, these standards must be used with a standard communication protocol (e.g. Message Handling Service (MHS) or File Transfer Access and Management

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[25] Ibid., p. 26.

[26] Ibid.

(FTAM)), or any other vendor dependent product.[27]

Each ODA document contains a profile which includes two types of information about the document as a whole. The first type of information (see Figure 13) relates to the storage and management of the document such as the title, subject, author, size, revision history and security attributes.[28]

The second type of information contained in the profile includes specifications of the content architecture such as the specifications of character sets, fonts and styles. These attributes are embedded into the document as processable, formatted or formatted processable (see Figure 14).[29]

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[27] Ibid., p. 32.

[28] Ibid., p. 26.

[29] Ibid.

Document Profile Attributes

Presence of document constituents:

- generic layout structure
- specific layout structure
- generic logical structure
- specific logical structure
- layout styles
- presentation styles
- external document class
- resource document
- resources

Document characteristics:

- document application profile
- document application profile defaults
- document architecture class
- document architecture class defaults
- content architecture class
- interchange format class
- ODA version

Non-basic document characteristics:

- profile character set
- comments character set
- alternative representation character set

Document constituent attributes:

- page dimensions
- medium types
- layout path
- layout texture

- protection
- block alignment
- fill order
- coding attributes
- presentation attributes

Non-basic structural characteristics:

- number of objects per page

Additional document characteristics:

- unit scaling
- font's list

Document management attributes

Document Description:

- title
- subject
- document type
- abstract

Dates and times:

- document date and time
- creation date and time
- local filing date and time
- expiry date and time
- start date and time
- purge date and time
- release date and time
- revision history

Originators:

- organisation
- preparers
- owners
- authors

Other user information:

- copyright information
- copyright dates
- status
- user-specific codes
- distribution list
- additional information

External references:

- references to other documents
- superseded documents

Filing and Retrieval:

- keywords
- document reference
- local file reference

Content attributes:

- document size
- number of pages
- languages

Security attributes:
- authorization
- security classification
- access rights
- encryption indicator
- password

Figure 13: ODA document attributes[30]

[30] Ibid., p. 27.

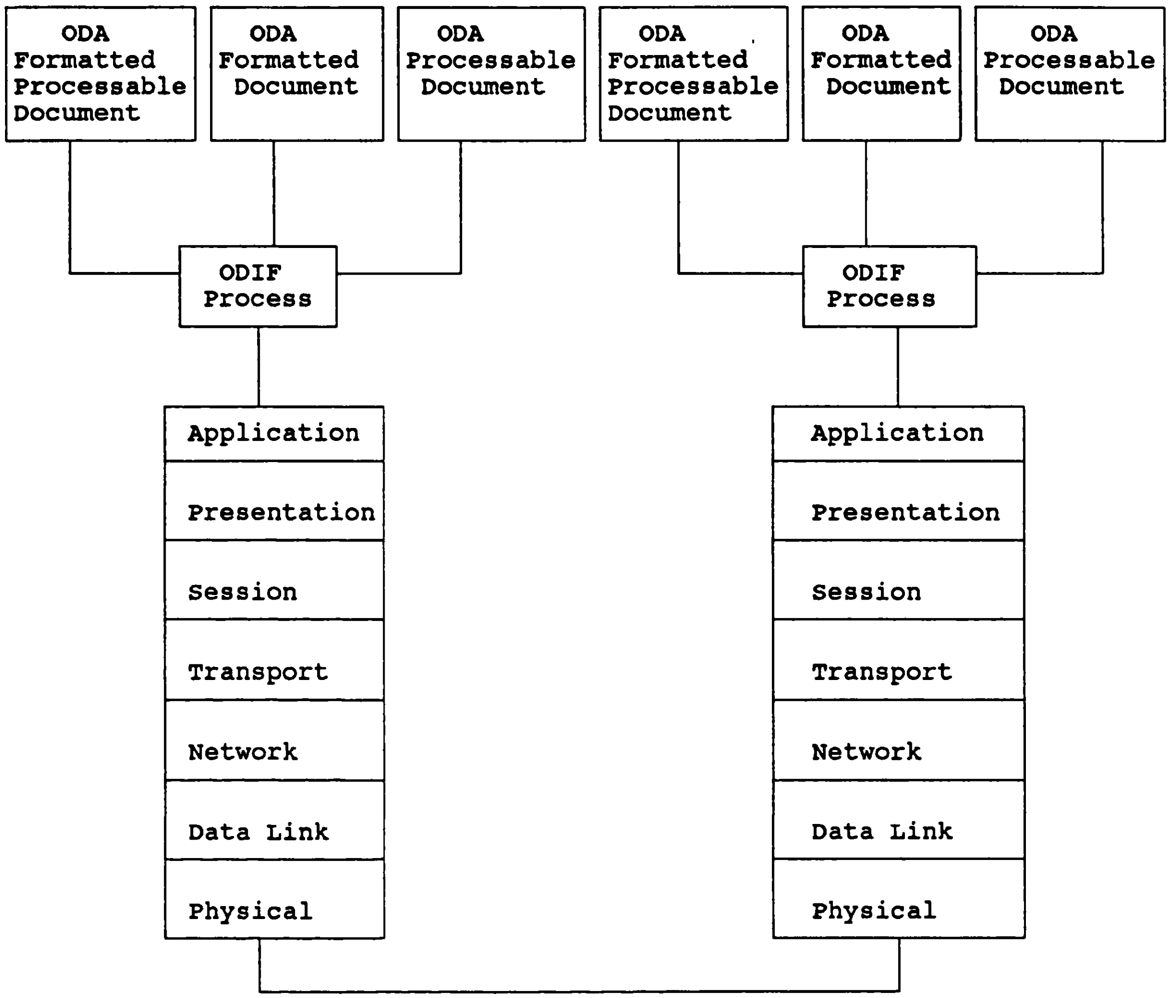

Figure 14: ODA/ODIF and OSI Relationship[31]

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31 Ibid.

File Transfer, Access and Management (FTAM)

FTAM is an international standard developed by the ISO (ISO 8571). It provides facilities that enable remote access to and manipulation of file attributes and file contents. The FTAM specifies a communication protocol at the application layer of the OSI Reference Model using the services provided by the lower layers. The FTAM protocol works independently of the file type. It can manage sequential, indexed, hierarchical, stream and other common file types. Future work on the standard includes an extension to manage relational and network databases. One shortfall of the protocol is that it does not apply to the physical exchange of the media.[32]

Document Transfer, Access and Manipulation (DTAM)

This is a CCITT Recommendation (CCITT Recommendation Series T.400) which deals with the document architecture and interchange protocols. Because the transmission services of DTAM is parallel with ISO 8613 (using Group 4 Facsimile, Teletex or mixed mode terminals), it can facilitate the interchange of ODA/ODIF documents.[33]

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[32] Ibid., p. 8.

[33] Ibid., p. 10.

Computer Graphics Metafile (CGM)

CGM is an ISO standard (ISO 8632) which provides services for the interchange of two dimensional pictures independent of graphics software, graphics devices and graphics systems. CGM itself is not an application, it only provides the facilities to store, retrieve and interchange pictures.[34]

4.4.3 Application Portability Profile (APP)

Application portability refers to the ability to move an application from one computer environment to another with little or no change in the format or integrity of the data. This provides the user with vendor independence, protects investment in application software and improves the interchange of data between incompatible systems.[35]

There have been a few attempts to create a portable environment for computer systems. In the United States, the Institute of Electrical and Electronics Engineers (IEEE) has initiated a project (P.1003) to develop a body of open system architecture standards, known as the Portable Operating System Interface (POSIX). The ISO also started a project to develop a standard user interface for

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[34] Ibid., p. 12.

[35] Protocols Standards and Communications Inc., "Application Portability", 1989, pp. 2-10.

invoking operating system services. The project, called Operating System Command and Response Language (OSCRL) was within ISO TC97/SC21/WG5. Later the project was stopped and the ISO decided to support the work undertaken by the IEEE on POSIX.

In 1987, IBM announced its intention to develop a portable application hardware environment. Systems Applications Architecture (SAA) defines a set of hardware platforms. The application software developed according to SAA specifications would be portable across IBM hardware platforms. Although this would provide a degree of portability, vendor dependency would still be a problem.

The most comprehensive standardisation study on portability has been undertaken by the U.S. National Institute of Standards and Technology (NIST). The NIST project is called Application Portability Profile (APP). It divides the operating environment of an application into six functional components.[36] The figure which follows shows the NIST APP operating environment.

[36] Ibid., p. 13-30.

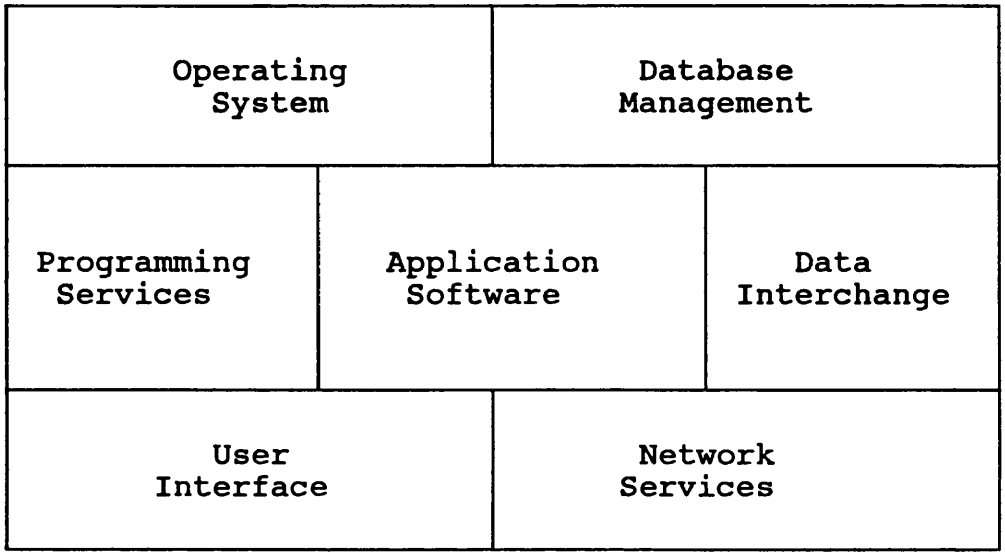

Figure 15: APP Operating Environment

Within this operating environment, the APP provides a number of standards which are independent of the software and hardware technology of any particular system. NIST APP is widely supported by computer manufacturers and software developers in North America, Europe and Japan.[37] The figure that follows shows the NIST APP specifications.

[37] Ibid.

Function	Element
Operating System	POSIX
Data Management	SQL IRDS RDA
Data Interchange	
- Graphics	CGM, GKS
- Product Data	IGES, PDES
- Document Processing	SGML ODA/ODIF
Network Services	
- Data Communication	OSI
- File Management	NFS
User Interface	X Windows
Programming Services	C COBOL Fortran Ada Pascal

Figure 16: APP Specifications

The elements and functions of the APP are described below.

Operating System

The APP specifies the operating system environment as *Portable Operating System Interface (POSIX)*. This standard was developed by the IEEE (Project 1003.1) to define an interface between the operating system and the application software. POSIX is based on the UNIX System V Interface Definition (SVID) developed by the American Telephone and Telegraph Company (AT&T). POSIX can work in any operating system environment, but UNIX systems are preferred. POSIX works as a translator between host and target operating systems.[38]

Database Management

The APP defines three standards for database management. These are the Structured Query Language (SQL), a query language for relational database; the IRDS, standard dictionary for database;[39] and Remote Data Access (RDA), which provides services for accessing remote databases.

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[38] Deitel, H.M., Operating Systems, 1990, p. 13 and 602.

[39] For detailed discussion of IRDS see 4.4.2.

Structured Query Language (SQL) is a high level data manipulation language, originally developed by IBM for database management systems. It became an ISO standard in 1988. It can be used for as a stand-alone query language or it can be embedded in programs written in COBOL and other major languages. SQL defines a set of query commands for relational databases.[40]

Remote Data Access (RDA) is a communication protocol which works at the application layer of the OSI. It defines a general model to access remote data, as well as defining a specific model for the SQL database.

Figure 17 shows a Standard Query Language (SQL) user using the Remote Data Access (RDA) service.[41] The user query is translated into the standard language and the interchange of data is achieved even if the host system uses a different database system. At the same time the RDA service provides communication services between the host system and remote terminal.

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[40] Curtis, G., Business Information systems: Analysis, Design and Practice, 1989, pp. 187-192.

[41] Catley, op. cit., [n.p.].

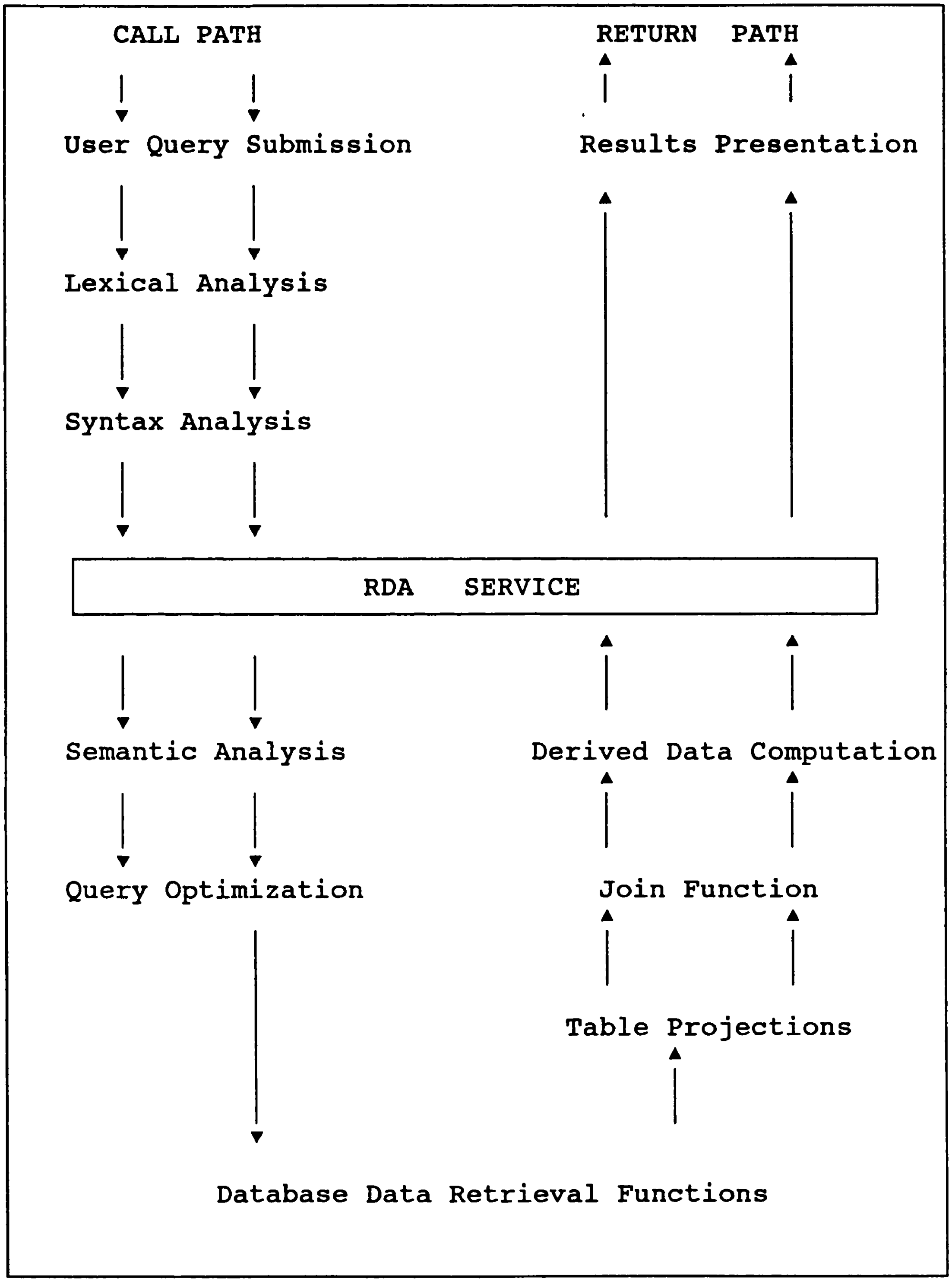

Figure 17: An SQL Query using the RDA Services[42]

[42] Ibid.

Data Interchange

The APP defines two standards for interchanging business graphics These are Computer Graphics Metafile (CGM) and Graphics Kernel System (GKS). For engineering graphics the Initial Graphics Exchange Specification (IGES) is adopted. There are two standards for document processing: Office Document Architecture/Office Document Interchange Format (ODA/ODIF) and Standard Generalized Markup Language (SGML). ODA/ODIF and CGM have been explained above. The following is a brief description of GKS and SGML.

Graphics Kernel System (GKS) was developed by the ISO (ISO 7942). It is a standard application program interface (API) capable of providing common graphics services for a variety of applications. It provides services for storing picture descriptions in a graphics metafile and for displaying the picture on a display device (e.g. VDU). GKS only specifies the language independent nucleus of the interface; in order to support a particular application, the GKS must be embedded in a language dependent layer. This is called language application binding (LAB) which obeys the language conventions of the application.[43]

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[43] Standards, Protocols and Communications Inc., "The Application of ODA/ODIF Standards", p. 12.

Standard Generalized Markup Language (SGML) is a standardized descriptive markup language, developed by the ISO (ISO 8879), which provides services for embedding specially defined markers, called generic identifiers, within a document. These generic identifiers are used to *mark* document elements, such as paragraphs and figures, and to specify the processing procedures to be performed on the marked element. SGML, however, does not specify any document architecture or content architecture and it cannot be used to mark graphics or images incorporated into the text. Therefore, it needs to be used with another standard specifying document architecture, such as ODA/ODIF.[44]

Network Services

APP specifies Open System Interconnection (OSI) and Network File System (NFS) for exchanging data in a network. The OSI provides services for data communication, as has been explained above. NFS specifies services for filing, classifying and retrieving electronic data.

User Interface

Propriety software usually incorporates user interfaces. Therefore, no standards exist for user interfaces. There are two main types of interface:

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[44] Ibid., p. 15.

character string oriented interface (e.g. MS-DOS) and windowing. The latter provides a multi-tasking environment (e.g.UNIX). Windows also provide for the execution of multiple applications simultaneously. For example, a user can edit a document in one window and manipulate a spreadsheet in another, while performing operating system functions in a third. While there are no standards for user interfaces, the APP specifies *X Window* developed by the Massachusetts Institute of Technology (MIT) as the user interface. This is because many vendors support the interface, making it in effect an industry standard. X Window provides a portable windowing environment for the UNIX operating system.[45]

Languages

APP recommends five programming languages as standard; *C, COBOL, FORTRAN, ADA and PASCAL*. Different versions of these languages exist, except C which has an American National Standards Institute (ANSI) standard version.

4.4.4 Data Exchange Standards Outside OSI and APP Environments

Several other standards for data exchange between heterogeneous systems exist outside the OSI and APP

[45] Standards, Protocols and Communications Inc., "Application Portability", pp. 25-26.

environment. These are more concerned with the format of the data being exchanged and do not specify any communication protocol. Examples of such standards include the Machine Readable Catalog for Archival and Manuscript Control (MARC AMC) and the Data Descriptive Format (DDF).

The Machine Readable Catalog for Archival and Manuscript Control (MARC AMC) is an ANSI standard parallel with ISO 2709. The ANSI, in conjunction with the Library of Congress (LC), has developed a number of MARC formats for the exchange of descriptive bibliographic data for libraries and research centres. MARC AMC format was developed as part of the MARC formats. The AMC format consists of several parts. Each part is designated for a particular type of information. All the parts form a bibliographic entry. MARC AMC defines the format of the entry and provides the means for identifying data. These parts are the leader, the directory, the variable control fields and the variable data fields. The format includes 77 variable data fields and up to 12 sub-fields. Each field contains at least one sub-field.[46] Archival use of the MARC AMC format will be evaluated in Chapter Eleven.

Data Descriptive Format (DDF) was developed by the ISO (ISO 8211) to facilitate media and content independent exchange of data between heterogeneous computer systems.

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[46] Sahli, N., MARC for Archives and Manuscripts: the AMC Format, 1985. [n.p.].

This format includes two parts. The first part is called the data descriptive record (DDR) which describes the data contained in the data file. The second part contains the data itself. DDF can be used to interchange data both through a communication protocol and through the physical exchange of the medium. DDF can handle most types of file structures, e.g. sequential, hierarchical, relational and indexed, including network structures.[47]

4.5 SECURITY IN COMPUTER SYSTEMS

4.5.1 Overview

Security issues for computer systems are two-fold. First, there are management issues involving the formulation of policies and preparation of procedures for the use of computer systems. Then there are technical issues involving measures for computer security, such as providing password protection, data encryption and so on. These security issues can be grouped as access control, data encryption and disaster recovery planning. Each requires management and technical support.

[47] Standards, Protocols and Communications Inc., "The Application of ODA/ODIF Standards", p. 9.

4.5.2 Access Control

Access to computer data should be controlled by means of account numbers and/or passwords which allow only authorised users to gain access to the information. Within an organisation different levels of management require access to different information according to their ranks. The password system should allow access to information only to authorised people. However, due to the carelessness of personnel, it is only partially effective. There is a tendency either to select easy-to-remember passwords, which are also easy to guess, or to write them down, which can lead to their ending up in the hands of unauthorised people. This can affect the security of confidential information as well as the integrity of information. Information can be altered either in favour of or against a person. In some cases the whole system is endangered by the introduction of viruses by hackers inside or outside the organisation. All user access accounts should be monitored regularly to minimise the risk of losing valuable information.[48]

4.5.3 Data Encryption

Data encryption techniques involve the storage or transmission of data in a scrambled form which is only intelligible to people with a key to decode it. This is a

[48] Graham, N., The Mind Tool, 1989, pp. 430-434.

very effective way of ensuring that the data cannot be accessed by unauthorised people or intercepted during transmission.[49]

4.5.4 Disaster Recovery Planning

Two important questions to be answered when designing a computer-based information system are: Would the organisation still be able to continue its business effectively if the computer system broke down? How much of the information could be recovered in the case of a disaster, such as a fire or flood?

As mentioned earlier, computer failure can result in great disruption in an organisation's operations.[50] To avoid such problems, the management must make decisions about disaster recovery at the system design stage. The most effective way of minimising the effects of computer failure is to run a duplicate computer centre equipped with identical machines and facilities. This is called a *hot site*.[51] However, this could be very expensive. One alternative is to have a contract with a service bureau whose computer facilities could be used in case of a disaster. Another alternative is to store back-up tapes or

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[49] Ibid.

[50] Aasgaard, op. cit., p. 70.

[51] Stamps, D., "Disaster Recovery: Who's Worried?" Datamation, February 1, 1987, pp. 60-64.

disks in a *cold site*, an off-site computer room with air conditioning, cabling etc. but without computers. In case of an emergency the cold site could be equipped with computers, and back-up copies could be mounted. This will enable the organisation to carry out its operations without major disruption.[52]

4.6 PRESERVATION AND MAINTENANCE OF THE STORAGE MEDIA

Electronic records reside on a fragile media which is easily affected by environmental conditions, magnetic fields and natural deterioration. As mentioned earlier, the majority of electronic records are stored on magnetic media, mainly magnetic tapes. The checklist which follows shows the preservation requirements of the magnetic tapes in active and inactive storage areas.

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[52] Ibid.

Active storage area

1. Fireproof building
2. CO_2 extinguishers
3. No open flames
4. No smoking
5. Dust free conditions
6. No paper chips (keypunch and printers)
7. No food
8. No waxed floors
9. Temp. 70° F ± 5°
10. Humidity 50% ± 5%
11. No Magnetic fields
12. Positive internal air pressure

Storage Cabinets and Racks

1. Shelves adequate in strength
2. Dust free conditions
3. 2" clearance to any electrical fixture
4. Electrically grounded
5. Vertical stacking of tape
6. No magnetic door latches

Tape Containers

1. Cleaned between use
2. Hub supported
3. Dust tight

Inactive storage area

1. Fireproof and protected
2. No fire hazards
3. Dust free conditions
4. Temp. 70° F ± 5°
5. Humidity 50% ± 5%
6. No close magnetic fields
7. Positive internal air pressure

In Transit (short period)

1. Fire resistant packaging
2. Dust protected
3. Careful handling
4. No bumping
5. Temp. 50-90° F ± 10°
6. Humidity 40-60% ± 10%
7. Inspected before and after shipment

Tape Handling

1. No finger contact
2. Lint free gloves
3. Careful handling
4. Clean transports every shift
5. Low wind tension
6. Rewound annually
7. Certified product
8. Receiving inspection

Tape Reels

1. No sharp edges
2. Undistorted flanges and hub
3. Labelled properly[53]

Figure 18: Environmental Conditions and a Handling Checklist for Magnetic Tape.

[53] NARS Handbook of Recommended Environmental Conditions and Handling for Magnetic Tape, Washington D.C., 1972,

Although the life expectancy of a magnetic tape is claimed to be between 12-20 years, it is recommended that tapes should be cleaned every six months and re-copied every year.[54] This is the main reason why records managers and archivists should look for alternative storage media.

By contrast, optical storage media, e.g. a WORM disk, requires minimum maintenance. The technology for manufacturing optical disks (see 4.2.2) prevents any contact with the disk surface where the data is stored and read by laser power. The disk surface is also sealed on both sides with a metal cover. Therefore the WORM disk requires no special environment or storage conditions. As previously mentioned, the life expectancy of an optical disk is likely to be up to 30 years, but the medium has not been on the market long enough to test this.

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[54] Storage, Transportation and Maintenance of Magnetic Tape for Use in Data Processing and Information Storage, British Standards (BS 4783 Part 2), 1988 and National Bureau of Standards, Care and Handling of Computer Magnetic Storage Media, NBS Special Publication 500-101, 1983, pp. 67-70.

CHAPTER FIVE: THE LEGAL AND SOCIAL IMPLICATIONS OF ELECTRONIC RECORDS

5.1 INTRODUCTION

The effects of the computer on business operations have been outlined in Chapter Three. If the computer has such a significant impact on an organisation, it inevitably affects the lives of the people who work for the organisation or use its services. This means that almost everyone who lives in a computerised society will be affected by the computer.

Like any other powerful tool, computers can be used constructively or abused. This is because the computer is used to process an intangible commodity, information, which can be used to invade the private lives of individuals or the confidentiality of a corporation. It is a matter of adjusting the balance between privacy and the freedom of information, both of which are considered to be basic civil liberties. As more and more of society's activities become computerised, an ever-increasing number legal provisions are needed in relation to computer records to protect the people's legal rights.

In dealing with the legal and social aspects of electronic records, the study focuses on the situation in England as an example. However, the situation in other countries, especially those in Europe and North America, is similar. The first part of this chapter explores issues concerning the legal admissibility and authenticity of computer records. Discussions in this section are drawn from an interview held with Mr. G. Ll. Chapman, Deputy Judge Advocate General, and Peter Emmerson as well as from legal and social studies dealing with different aspects of the subject. Questions about liability for computer malfunctions also are raised. The second part of the chapter examines the impact of the computer on social issues and civil liberties.

5.2 LEGAL ASPECTS OF ELECTRONIC RECORDS

5.2.1 Electronic Records As Evidence

As a general principle of evidence, English law insists, wherever possible, that witnesses give evidence in person. However, there is a provision in both civil and criminal cases, whereby a witness can make a statement out of court, if it is in a certain form and signed by the witness. This is known as documentary evidence, and is admissible provided that neither side objects to the evidence. Such evidence is treated as if the witness has given the evidence in person. Recent legislation, such as the Criminal Justice Act of 1988 Section 23, however, is not as strict on these requirements.

Another form of evidence is *hearsay evidence*, which is generally excluded by the law of evidence because it is indirect evidence. For example, in a trial a witness is not permitted to say that "so and so told me he saw this event happened". Documentary evidence about a person, an event or a phenomenon, which does not come from the knowledge of the person giving evidence is considered as hearsay evidence in English law and is not admissible.

Before 1958 in England, computer records were considered documentary evidence. However, because the information held on computers was collected from reports of persons having direct knowledge of the matters involved in the case, computer records became acceptable as admissible evidence under the Civil Evidence Act of 1968.

In 1972, the Criminal Law Revision Committee noted the need for a similar provision in the criminal law of evidence.[1] The Committee's Eleventh Report drew attention to the increasing use of computers by banks, local authorities, business firms, etc. and the difficulties that might be faced in proving certain matters without evidence obtained from a computer.

The Committee's recommendations were not immediately translated into law, as is illustrated by a burglary case

[1] Smith, J.C., "The Admissibility of Statements by Computer" Criminal Law Review, 1981. p. 387.

in 1981 in which the computer evidence submitted by the Bank of England was held to be inadmissible. This case centred on the theft of newly minted bank notes from a bank. Before notes are sent to a bank or building society they are put through a money counter, which sorts out the damaged notes. The money counter is attached to a computer, the function of which is to record the serial numbers of damaged notes.

In the trial the prosecution's evidence included three of the newly minted notes, found on the defendant. The serial numbers of these notes were recorded by the computer as being successfully passed, and they were among the stolen notes. The defence argued that the computer operator could not have had personal knowledge of the serial numbers of the rejected notes and that this knowledge was essential, in order for the evidence of computer printout to be considered documentary evidence. This knowledge was also necessary to determine which serial numbers had passed through the machine successfully.[2] If the Bank of England could have provided the court with a statement indicating that the recording of serial numbers was an organisational activity and that the records produced as a result of this activity were in fact organisational records, the verdict of the court might have been different.

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[2] Ibid., pp. 387-391.

5.2.2 Admissibility of Electronic Records

The Police and Criminal Evidence Act of 1984 made provisions for the admissibility of documentary evidence. Section 68 of the Act deals with documentary evidence in general and stipulates that:

> a statement in a document shall be admissible in any proceedings as evidence of any fact stated therein of which direct oral evidence would be admissible if:
>
> (a) the document is or forms part of a record compiled by a person acting under a duty from information supplied by a person (whether acting under a duty or not) who had, or may reasonably be supposed to have had, personal knowledge of the matters dealt with in that information...

The remainder of Section 68 deals with the qualifications of the person supplying the information. Section 69 of the same Act deals with computer records and states:

> In any proceedings, a statement in a document produced by a computer shall not be admissible as evidence of any fact stated therein unless it is shown:
>
> (a) that there are no reasonable grounds for believing that the statement is inaccurate because of improper use of computer;
>
> (b) that all times the computer was operating properly, or if not, that any respect in which it was not operating

> properly or was out of operation was not such as to affect the production of the document or the accuracy of its contents...

Section 69 indicates that evidence obtained from a computer as printouts is admissible as documentary evidence provided that the computer was working properly. An exception would be if the computer functions as a meter. For example, computerised telephone billing records or computerised cash till receipts are considered as real evidence, not documentary evidence and carry more weight.

Section 69 of the Police and Criminal Evidence Act was modified by the Criminal Justice Act in 1988. Section 24 of the Criminal Justice Act states that documentary evidence is admissible as direct oral evidence.

In England, rulings of judges are another source of the law in addition to acts of Parliament. A past ruling of a judge can be used as a law in a similar case. The Court of Appeal, in the cases of Regina v Minors and Regina v Harper, ruled that:

> The requirements of Section 69 speak for themselves. The only comment we would make is that the failure of a computer or a software program may occasionally result in the total failure to supply the required information or in the supply of unintelligible or obviously wrong information. It will be a comparatively rare case where the computer supplies wrong and intelligible information which pertinently answers the questions posed in the trial. Nevertheless such cases could occur. In the light of these considerations trial judges who are

> called upon to decide whether the foundation requirements of Section 69 have been fulfilled ought perhaps to examine critically a suggestion that any prior malfunction of the computer or software has any relevance to the reliability of the particular computer record tended in evidence.[3]

Thus the legal position now is that electronic records created or received in the conduct of business are admissible as evidence, provided that the computer was working properly at the time a particular record was produced and that a prior malfunction could not have affected the record's production. The value of the evidence submitted will depend on how clearly an organisation can document the operations of its computers.

5.2.3 Authenticity of Records

Section 69 of the Police and Criminal Evidence Act and the ruling of the Court of Appeal in 1989 do not go far enough in making provisions for determining the authenticity of a record. This is left to the cross-examiner.

In fact, the real issue should be how best an organisation can provide information about its record-keeping procedures and practices in order to establish the authenticity of its records. Information systems should be

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[3] Archibold, 10th Cumulative Supplement, vol. 1., 43rd Ed., pp. 273-274.

designed in such a way that after a certain stage the records cannot be changed. Office automation systems, for example, should provide a facility whereby the final version of the record is locked against editing. For databases, this would not be practical, because updating and modifying data are carried out periodically or on a case to case basis as essential functions of the system. The organisation needs to make a decision about the retention of updated data and develop updating and modifying procedures in order to provide an official status for the record.

Systems can also be designed to record users' activities in terms of record creation, manipulation, communication, etc. This will show whether a record has been modified or not. An Information Resource Directory System (IRDS) (see Chapter Four) can provide a useful means of recording users' activities regarding record creation and subsequent changes carried out on a particular record in office automation systems or database management systems.

The accountability of the organisation depends on whether or not it can produce authentic records. Records managers or archivists can play a vital role in developing record-keeping practices whereby the integrity and the authenticity of the record is preserved.

5.2.4 Liability

Liability in relation to computers refers to the legal responsibilities arising from malfunctions of the computer, computer crimes, failure to meet legal requirements of record-keeping and the retention of inaccurate information. These areas should be given serious consideration at the design stage of an information system.

A computer malfunction can cause serious damage to an organisation and in some cases to the people who use the organisation's services. This is especially important in the case of artificial intelligence, expert systems and decision support systems. If, for example, a medical diagnostic system malfunctions, and as a result a doctor prescribes the wrong medicine to a patient, who would be liable? Would it be the doctor, the hospital or the vendor who developed the system? Or, for example, if a decision support system developed for a financial analysis firm malfunctions and the company looses money as result, can the manager be held responsible for the loss?[4] The consequences of computer malfunction cannot be fully foreseen, but an organisation should be aware of the possibility when purchasing computer systems. The purchasing agreement between the organisation and the vendor should be examined carefully.

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[4] Detailed analysis of liability of the computer malfunction is beyond the scope of this study but an extensive coverage of the issue can be found in Jonhson, D.G., Computer Ethics, 1985.

Security against computer crimes is addressed in Section 4.5. It should be noted that the legal framework and social norms in relation to computer crimes are not yet well enough developed to deal with the problem effectively.[5]

Organisations can be held liable for the failure to adequately document their activities. There are legal and financial regulations governing the retention of records for a period after they cease administrative use, and provisions should be made to meet them. In some countries, like the United States and Canada, government organisations cannot destroy records, even if they have no legal or financial value, before the National Archives examines the records for their evidential and informational value. Companies tend to balance the cost of keeping records against the cost of court cases or fines.

Organisations are also responsible for the accuracy of the information they retain. Inaccurate information about individuals or about other organisations may lead to a law suit. This issue is elaborated further in the next section.

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[5] There is a rich literature on the computer crimes some of which also gives examples from court proceedings. See for example, Mandell, S.L., Computers, Data Processing and the Law, 1984.

5.3 PRIVACY

The computer's ability to store and process large amounts of information rapidly provides organisations with new operational possibilities, but it also poses a threat to individuals' privacy. Large organisations and governments have always maintained personal information about their employees and customers. Computers make it possible to process this information quickly and to use it in decision making. Moreover, information can be linked from different databases making it possible to get a complete *data picture* about an individual. The figure which follows shows some of the information collected and maintained about individuals in different organisations.

- Local Authority - School	Police - Local/National - Special Branch	- Driver's Licence - Vehicle Registration
- Post Office - Telephone - Electricity - Gas Company	INDIVIDUAL	- Passport Office - Birth/Death Registration
- Hospital - GP	- Bank /Building Soc. - Credit Card Company - Inland Revenue	- Employment - Social Security

Figure 19: Personal information about an individual by different organisations

The vulnerability of personal data stored in these and many other public and private organisations has led to the enactment of laws to protect the privacy of individuals. The Privacy Acts in the United States and Canada and England's Data Protection Act require organisations to limit the disclosure of personal information to authorised people. These laws also require that organisations maintain accurate and up-to-date information and prohibits them collecting more information than necessary for their operational purposes. Individuals who are the subject of the data have the right to have access to the information and to seek compensation for damage caused by inaccurate information. The organisation holding the data is required to make provisions for the lawful use of the information.[6]

5.4 FREEDOM OF INFORMATION

The United States' Freedom of Information Act of 1974 and the Canadian Access to Information Act of 1983 give the public the right of access to information held by government agencies. The agencies must prepare registers of information which is available to the public. Information classified as secret or confidential and other information related to foreign policy and defence is excluded from the laws.

A similar law was to have been part of the latest Citizen's Charter in England. It was excluded from the

[6] The U.S.A. Privacy Act of 1974, the Privacy Act 1983 of Canada and the Data Protection Act 1984 of England.

Charter on the grounds that a freedom of information act would undermine the accountability of the government.[7]

5.5 TRANSBORDER DATA FLOW

Transborder data flow refers to the movement of technical, economic, scientific and personal data across country boundaries for processing and storage in computer systems.[8] Before the advent of computer and telecommunication technologies, the volume and nature of the data moving across national boundaries were not the same. Traditional carriers of data such as postal, telephone and telex services tended to limit the transfer and dissemination of large amounts of data. Even where large amounts of data were transferred, the manual systems employed to process it were not efficient enough to pose a threat to privacy or to make an impact on the operations of the organisations involved.

Recent developments in computer and telecommunication technology have provided instantaneous access to information for multi-national corporations, international organisations and industries which rely heavily on information processing, such as banking, credit card,

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[7] The Independent 5 July 1991. Three articles appeared on this issue on pages 1, 20 and 21.

[8] Transborder Data Flow: Its Environment and Consequences. In Transborder Data Flow Policies: Papers Presented at the IBI Conference on Transborder Data Flow Policies, Rome 23-27 June 1980, New York: UNIPUB, 1980. pp. 575-680.

insurance, tourism and air transport companies. This enables them to co-ordinate efficiently the functionally diverse and geographically dispersed operations of their large and complex organisations.[9] It results in the continual movement of data across international boundaries.

The use of information in a country other than where it was created poses serious problems of ownership, copyright, privacy and security. However, as yet national and international regulations and policies are inadequate to govern the use of such data. International regulations generally make provisions for co-operation in sharing personal and non-personal information and take into account domestic data protection regulations. Thus personal information transferred beyond the boundaries of a country depends on the existing data protection regulations in that particular country.

Article 12 of the Council of Europe Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data, 28 January 1981, deals with flow of personal information across boundaries and states:

> A Party shall not, for the sole purpose of the protection of privacy, prohibit or subject to special authorisation transborder flows of personal data going to the territory of another Party...

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[9] United Nations Centre on Transnational Corporations, Transnational Corporations and Transborder Data Flows: a Technical Paper, pp. 8-9.

> [unless] its legislation includes specific regulations for certain categories of personal data or of automatic personal data files... except where the regulations of the other Party provide an equivalent protection...

Records managers and archivists should fully understand the implications of transborder data flow issues. They have an obligation to protect people's privacy not only in the country in which they reside but throughout the world.

CHAPTER SIX: CREATION AND IDENTIFICATION OF ELECTRONIC RECORDS

6.1 INTRODUCTION

This chapter evaluates some of the problems facing records managers and identifies the issues that require archivists' attention in the early stages of the information life-cycle.

Records managers need to identify organisational records and ensure their inclusion in the organisation's filing system so that they can shared for carrying out organisational functions. Identification of these records should base on the evidence of organisational activities documented in the records.

In an electronic environment, record creation is an ongoing process because of the ease of creating, manipulating and modifying electronic information. Control of creation is of major concern for records managers in order to ensure that the authenticity of records are preserved.

Archivists also need to be involved with the records at this stage to identify potential archival material and take necessary steps for their transfer to the archives when they are no longer needed by the organisation.

Identifying potentially valuable records at this stage will also assist archivists to make long-term plans for their management in the archives.

6.2 DEFINING RECORDS IN AN ELECTRONIC ENVIRONMENT

Traditionally, a record is defined as recorded information, regardless of the form or medium, which is created, received and maintained by an organisation or individual in the fulfilment of legal obligations or in the course of an organisational activity.[1] The term organisational records refers to records created or received as result of an organisational activity or those which result from an organisational activity. Organisational records reflect the evidence of organisational activities and functions and therefore form part of the corporate memory.

It is not difficult to identify organisational records when they are on paper. However, it is difficult, if not impossible to identify electronic records which reflect organisational activities. First of all, electronic records are not physical entities so the records manager may not know exactly what records are being created in the organisation. He may also have little, if any, control over electronic records. Secondly, the ease of creation, manipulation and dissemination of electronic information

[1] Walne, op. cit., p. 137.

makes it difficult to establish control over record creation. Finally, some electronic records may be meaningless or even unintelligible unless they are considered within the context of the information system and the specific organisational units which created them.

In an office automation system, a record may be modified a number times before, and sometimes after, it is communicated in the course of an organisational activity. This record will not become an organisational record until it is included in the organisation's filing system by the creator, system administrator or the records manager. Unless the record is filed as part of the corporate memory other members of the organisation may not be aware of its existence when they need it. Furthermore, the originality and thus the evidential value of the record may not have been preserved. Organisations need a means of identifying organisational records which document their activities.

In a database system, a record consists of data elements which are combined and processed according to a user's instructions. If such a record is communicated, there may be nothing to indicate how it was created. Moreover, the same data can be processed in a number of different ways to create a number of different records that serve a number of different organisational activities. Therefore, a record created in a database management system can only be defined as an organisational record if there is a means of recording the context of specific organisational activities, the relationship between those activities and the records created and how the data elements have processed.

This discussion illustrates the difficulty of defining organisational records when dealing with electronic data. A definition is needed which is specific enough to show how the information was created, yet is consistent when applied to different types of electronic records as well as different media. A recent study on the management of electronic records, undertaken by an Advisory Committee for the United Nations (ACCIS), addressed this problem. It concluded that organisations should:

> adopt a definition of electronic records built around the concept of a record transaction so that any communicated information in electronic form qualifies as record and is subject to further control. This approach has the advantage of being easy to implement and easy for people in the organisation to understand..."[2]

This definition should assist the creator to determine the organisational records created in an office automation system and take the necessary steps for their preservation. However, the definition short of identifying all types of electronic records, such as those created within a database environment. For example, a user can manipulate a database in a certain way and create a record. This record may be

[2] ACCIS, op. cit., p. 35.

used in making a decision which will result in the creation of other records. However, the record created may not be communicated to anyone and therefore will not be considered as an organisational record.

One common characteristic of all records is that they are created as result of an organisational activity but only some provide evidence of the activity. Therefore, records can be defined as carriers of recorded information that documents organisational activity and should be retained as part of the corporate memory to maintain organisational accountability and fulfil the legal obligations of the organisation.

6.3 CREATION OF ELECTRONIC RECORDS

6.3.1 Background

Electronic records are created for the same reason as conventional records. They are the result of transactions made in conducting the day-to-day business of an organisation. These can include a letter transmitted through electronic mail facilities, a word-processed report in electronic form, a database set up to analyze surveys, census results or personnel information. However, electronic records are created, stored and disseminated in a different way from conventional records. Record-keeping practices for the management of electronic records should take these differences into account.

The sections that follow examine practical and policy issues related to the management of electronic records. These issues should be considered at the creation stage of electronic records or even prior to creation.

6.3.2 Control of Creation

In an electronic environment it is very easy to alter information. This is one of the main advantages of the computer. However, there must be a point at which the authenticity of the records should be preserved. This raises the questions of when, for example, a word-processed letter actually becomes an organisational record and what happens to the previous versions of the document. An office automation system should be designed in such a way that when a record is created in the course of an organisational activity the editing function of the system should lock. This means that no changes should be made to a document after an organisational activity has been recorded since the document becomes a record of that activity. In turn, this activity will result in the creation of other records whose integrity should also be preserved by the system. This will ensure the legal validity of the records.

It is obvious that an organisation cannot keep every working version of a document. There are two possible solutions here. First, all the drafts may be kept until they are reviewed and a decision is made concerning their retention. This will ensure the preservation of the decision-making process that led to the creation of the record, but it will be time consuming and expensive to implement. Second, only the latest version may be kept until finalised and ultimately only the final copy preserved.

In a database management system (DBMS), it is difficult to control the creation of records. DBMS is used here to cover geographic information systems, financial analysis programs, spreadsheets and hypertext, all of which have common data definition and manipulation characteristics. In such systems, a user can construct a document by combining different fields (the smallest unit of information in the database). The document then can be communicated to another person or computer, thereby recording an organisational activity.

However, the creation of such a document only involves creating a "view of a database" by arranging the data fields in the database in a certain format. This can be achieved with or without entering or changing data in the database. These views of the database provide evidence of organisational activities which should be preserved if the document is to have evidential value.

It is also significant that database systems are updated regularly. This means that the information in the system stays "active" all the time and that updated information is lost if measures are not taken to preserve it. Issues related to the retention of such information will be evaluated in Chapter Seven.

Electronic records therefore must be managed within the context of overall information system within which they are created. Records managers and archivists must shift their focus from the records themselves to the records system which controls the creation of the records. The ACCIS study examines this issue as:

> In paper-record systems, records managers identify records at the level of files because files are usually equivalent to the record system. The exceptions - when paper files are not complete record systems - are useful to illustrate the point that actually records managers and archivists have in the past also taken the records system as their focus. For instance, in records systems consisting of two files, one of which (a finding aid) serves as an index to the other, the two files together are a record system, and records managers have recognised this in their appraisal determinations by retaining one of these files only when the other has been retained...[3]

It is vitally important that records managers and archivists apply the skills gained in documenting records

[3] Ibid., p. 36.

within the record system to the management of electronic records. The Information Resource Dictionary System (IRDS)[4] can be used to control electronic record creation and to preserve the functions of the system which determines the creation and manipulation of records within the system.

6.5.3 Electronic Filing Systems

Paper-based filing systems are designed to reflect the administrative structure of the organisation. Generally, the prefixes or the primary numbers in filing codes correspond to divisions within the organisation. These codes are followed by subject classification numbers. Each file is also given a name reflecting the subject matter of the file.

In computer-based systems, file names and the filing codes are limited by the operating system. Operating systems limit the number of characters used in file names. Within the DOS (Disk Operating System) environment, for example, only eight alphanumeric characters can be used for the file name and three characters for the file name extension. In comparison to manual systems, this is a very limited means of recording the contextual information about a particular file.

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[4] For a full discussion of IRDS see section 4.4.2.

Computer-based systems do allow the user to create sub-directories in the system, which makes it possible to form a tree (hierarchy) of the organisation, showing the relationship between the divisions. This alleviates some of the deficiencies of the filing facilities of the operating system, but it does not provide the information supplied by a manual filing system.

Yet, ideally filing systems for electronic records should go beyond the information provided by manual systems. They should enable users to have automated access to non-electronic records. Otherwise, the organisation will have to have two separate filing systems, one for paper records and one for electronic records. This will prevent integrated access to the organisation's information resources and lead to duplication of information on different media. Unfortunately, the operating system's filing facilities cannot manage a single filing system effectively.

Most office automation systems provide facilities for filing electronic documents created within a particular software environment. An evaluation of these systems would be beyond the objectives of this study. However, it should be noted that most off-the-shelf office automation systems leave the responsibility for filing and for setting retention periods to the user or the creator of the document. Very few systems have facilities for assigning responsibility to a system administrator who can control the filing and retention of information within the system. This means that the user has to learn the organisation's filing system and be aware of the importance of the corporate use of the information. Usually this does not happen. Users tend to take filing short cuts and do not file documents for corporate use unless required to do so. Moreover, users rarely receive guidance on the informational value of the document and the need to set retention periods accordingly. As mentioned earlier, they tend to set the retention period in line with their own perspective of what is needed. The issues related to retention are discussed in Chapter Seven.

The best way to file electronic records effectively, and at the same time to provide for automated access to non-electronic records, is to develop the filing system as a separate application and build it into the system. In such a system, whenever a user creates or receives a document electronically, be it a word processed report, a business graphic or a electronic mail message, it is filed within the filing system. The system will provide facilities for entering descriptive data about records and descriptions of non-electronic documents can be included. An IRDS system can provide the solution to an organisation's record-keeping, filing and retrieval problems.[5]

[5] See Section 4.4.2.

An alternative to a standard IRDS is a custom designed filing system catering for all the parties who use the system. This is a more time consuming and expensive option but the benefits justify the cost and effort. The National Archives of Canada, in its policy to promote the corporate management of government information holdings, supports this view. In recent years, it has mounted two important projects in this area. The first, which is called FOREMOST (FOrmal REcords Management and Office Systems Technology), was set up to list the functional requirements of office automation applications.[6]

These lists provided the basis for the second project, which was to develop a prototype software based on the FOREMOST application. This project was named as IMOSA (Information Management and Office Systems Assessment). The software was designed by a private company and the National Archives of Canada tested it. The software creates a "profile" for each document to be filed, giving details of document name, version number, subject, author, where the document is filed, file number, security classification, cross references and so on. The same data is used for electronic and non-electronic documents.[7]

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[6] National Archives of Canada, "FOREMOST (Formal Records Management and Office Systems Technology): Functional Requirements Definition", draft version, Ottawa, 1989.

[7] National Archives of Canada, "IMOSA Project", unpublished paper, Ottawa, 1990.

Like most off-the-shelf office automation systems, IMOSA requires the user to do the filing. The advantages of such a system in terms of filing and retaining electronic records are debatable. It can be useful for the records manager in identifying record creators and records with continuing value. However, it also requires continuous user training for the accurate description of records in the organisation's records system.[8]

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[8] U.S. General Services Administration, Electronic Record-keeping, 1989, p. 6.

CHAPTER SEVEN: THE APPRAISAL AND RETENTION OF ELECTRONIC RECORDS

7.1 APPRAISAL

7.1.1 Overview

Records managers and archivists appraise records in order to achieve cost-effective management of their holdings. The records manager identifies the information needs of the organisation, retains information needed to meet those needs and discards useless information to enable efficient use of space and resources. The archivist identifies the records which are historically valuable for future use.

To a large extent appraisal is subjective. Criteria and guidelines for selection must ultimately be applied at the discretion of the appraiser. An organisation selects and retains records according to its legal, financial and operational record-keeping requirements. However, the selection of records for long term preservation in an archives is shaped by the culture of the society in which the records are created.

7.1.2 Appraisal Practice in England and Its Application to Electronic Records

In England, the archival profession was influenced greatly by Sir Hilary Jenkinson's philosophy of archival practice. Jenkinson noted that until the mid-nineteenth century, administrators took retention decisions on the grounds of what was useful for operational purposes.[1] He compared past and present practices of selecting records and asserted:

> ...In a word we can criticize the past only if it failed to keep up to its own standard of values. But in the case of the present what is standard? what is the criterion of Destruction? There is the difficulty, and there the starting point of criticism. The person or body in our times who is entrusted with the task of destruction has to exercise choice not on the grounds of what is for practical purposes of Administration but what is worth preserving in the interests of History: and it is rare, as we have said, not to find him or them attacked sooner or later either for the choice itself or for the manner in which it has been carried out.[2]

It is interesting to note that Jenkinson referred to appraisal as destruction, and the archivist or the person who does the selection as the *Destroyer*. The appraiser looks for reasons either to destroy or to keep the record. The difference between the two approaches may or may not be significant, but the important point is to achieve a

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[1] Jenkinson, H., A Manual of Archive Administration, 1966, pp. 139-147.

[2] Ibid., p. 140.

balance between the value of the records and the quantity of records to be kept. Destroying records often worries historians who want to keep as much as possible.

The more important point that Jenkinson made concerns the criteria of selection. He claimed that archivists have been concerned traditionally with the records' informational value rather than their administrative use because they were concerned with records which had already ceased to be used administratively.

As regards the timing of the appraisal of modern records, where it should take place and who was responsible, Jenkinson suggested:

> ...in the case of Archives now compiling and those to be compiled in the future, we have at least a place where destruction may be possible; and in the action of the Administration, the actual body who produces the Archives, upon its own documents *before they reach the Archive stage* we may have the solution for our difficulties. It will be seen that we propose to follow to some extent what is the normal practice of the present day in relying upon the Administrator himself to deal with the growing bulk of his own collections. The difference in our point of view is that we wish to increase his activities and to eliminate from them any motive based on the alleged historical requirements of the future. At the same time we wish to ensure that the future (whose exact needs we do not know) shall be provided at least with as representative a body of unimpeachable Archives as the past has left to us.[3]

[3] Ibid., pp. 150-151.

Jenkinson's appraisal philosophy suggests that the selection of records should take place within the originating agency and that the criteria for selection should be based on the operational value of the records. At the same time a record of the agency's history should be preserved.

Jenkinson did not address the question of how to balance the administrator's need to get rid of what is no longer needed for the operations of his organisation and the importance of keeping what may be of use to future researchers. Does the administrator have the knowledge and foresight to make decisions about the fate of his records? More importantly, is it practical to expect him to have the time to do so? And what is the role of the archivist? What can he contribute to the management of records within the originating agency apart from the custody of inactive records and the provision of basic reference services to the public?

Appraisal practice in Britain and elsewhere underwent significant development as result of the recommendations of a committee set up in 1954 to evaluate records management and archival practices. The committee was chaired by Sir James Grigg, and its report is known as the Grigg Report.[4] In Britain, the Public Records Act was passed soon after

[4] Grigg Report, 1954.

the publication of the report.[5] The Act suggests that appraisal should be carried out in two stages and this in fact became the practice. The creating agency reviews the records on the grounds of what is useful to the organisation at present and in the near future when records cease be of administrative use, which is five years after creation. At this stage some records are discarded and the remaining records are transferred to a records centre. When the records are 25 years old, the archivists reviews them for their evidential and informational value and makes a decision regarding their ultimate disposition.[6]

The Public Record Office (PRO) appoints inspecting officers whose primary role is to evaluate the agency's records and make provisions for the records to be transferred to the PRO. However, the inspecting officers also advise departments on the management of semi-current records and other records management issues.

Section 3 of the Public Records Act of 1958 requires every government department to appoint a Departmental Record Officer (DRO) to be responsible for the care of all public records. Such responsibility should start from the time the records are created or received in the department and end when they are destroyed or transferred to the PRO or a place of deposit outside the PRO for permanent

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[5] Cook, M., Archives Administration, 1986, p. 63.

[6] The Grigg Report, 1954.

preservation.

Although the Grigg Report and the Public Records Act made provisions for appraising all public records, regardless of their physical form or medium, no one realised how soon medium would become an important issue. Therefore, no specific guidelines were drawn up for electronic records regarding the timing of appraisal and by whom it should be carried out. The PRO started to address electronic records issues in the early 1970s and prepared broad guidelines for the appraisal of such records. These guidelines were limited to categories of records with long term value. The PRO policy on the selection of electronic records is similar to the two stage process suggested in the Grigg Report for traditional records. Its priority has been to survey and identify records with potentially long-term value.[7]

This approach to the selection of electronic records creates serious problems. As mentioned earlier, it is vital that the archivist should identify potentially valuable electronic records at the point of creation. Electronic records will not wait unattended in dormant storage like paper records, and computer system personnel will want to make use of the media carrying unwanted data.

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[7] Cox, N., "Computer-readable Records from a Government Archivist's Point of View: Surveying and Appraising". Proceedings of a Seminar at the University of Liverpool, 26 September 1986, 1987, pp. 5-21.

He cannot sit back and wait for electronic records to be handed over to him. They must be managed due to the instability of the medium on which they reside and the risk of losing documentation which is essential for retrieving electronic records in the future. Moreover, data exchange requirements must be observed. Otherwise information which might be of use to future researchers is likely to be lost.

Data processing managers usually make provisions for backup copies of data for safety purposes, such as a power failure, system crash or fire. These backup copies should be stored off-site. This provides the archivist with an opportunity to help the administrator. By taking these records into custody at an early stage, he can provide safe storage facilities and at the same time identify potentially valuable records and make provisions for the future.

However, the archivist needs to bear in mind the legal and financial implications of this practice. In most countries, records are not open for public inspection before they are 25 to 30 years old. This means that the archives has to maintain these records for some considerable time even before they are open to the public. The cost of maintaining the ever growing number of electronic records will be a burden on the archives and is an important factor when making a decision about the ultimate disposal of the records.

7.1.3 North American Appraisal Practices

North American archival practices have been influenced to a large extent by the views of the American archivist T.R. Schellenberg. His influence on North American archival practice is stronger than Jenkinson's on English archival practice. The philosophies of the two archivists differed but were complimentary rather than contradictory. Schellenberg, unlike Jenkinson, defines appraisal as "selection for preservation" and put more emphasis on the evidential and informational rather than on the administrative value of records.[8] Concerning the "primary" and "secondary" values of records, he asserts:

> The values that inhere in modern public records are of two kinds: primary values for the originating agency itself and secondary values for other agencies and private users. Public records are created to accomplish the purposes for which an agency has been created-administrative, fiscal, legal, and operating. These uses are of course of first importance. But public records are preserved in an archival institution because they have values that will exist long after they cease to be of current use, and because their values will be for others than the current users..[9]

Schellenberg formulated his ideas on appraisal mainly in relation to non-electronic records. For electronic records, he suggested:

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[8] Schellenberg, T.R., "The appraisal of modern public records", in A Modern Archives Reader: Basic Readings on Archival Theory and Practice, 1984, pp. 57-70.

[9] Ibid., p. 58.

> The term "form" as applied to the records rather than to the information contained in them relates to the physical condition of the public records. Physical condition is important, for if records are to be preserved in an archival institution, they should be in a form that will enable other than those who created them to use them without difficulty and without resort to expensive mechanical or electronic equipment. Chemistry notebooks, for example, are not likely to be intelligible to others than the chemists who recorded the records of their experiments in them; while punchcard, and tape recordings are commonly unsuitable without resort to expensive equipment.[10]

Electronic records continued to be considered non-archival in the United States until the late 1970s. In 1978, Charles Dollar prepared guidelines for the appraisal of electronic records.[11]

In Canada, in 1981, the Public Archives of Canada issued guidelines for appraising electronic records. In 1983, a RAMP Study by Harold Naugler addressed the issues involved in appraising electronic records.[12] Naugler's study is based on work carried out by Dollar and by the Public Archives of Canada. He also included some examples of European experiences. Dollar's and Naugler's guidelines are widely accepted by the archival community. These guidelines will be elaborated in Section 7.3.

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[10] Ibid., pp. 65-66.

[11] Dollar, C.M., "Appraising Machine-readable Records", American Archivist, 41 (October 1978), pp. 423-430.

[12] Naugler, H., The Archival Appraisal of Machine-readable Records: a RAMP Study with Guidelines, 1984.

7.2 THE CHARACTERISTICS OF APPRAISAL PRACTICE

7.2.1 General Considerations in the Appraisal Process

Over the years, records managers and archivists have developed programmes for systematically inventorying, scheduling, appraising and disposing of non-electronic records. They have found it harder to develop the same kind of management programmes for electronic records. This is largely due to the fact that they are not involved in system design, have no physical or intellectual custody of the records, usually do not have close contact with computer systems personnel and, probably most importantly, do not understand computer-based systems. Often computer systems personnel are not interested in records managers' and archivists' concerns regarding the management of electronic records.

Electronic records appraisal programmes require a different approach from those employed for non-electronic records. Traditionally, records managers and archivists based their records management programmes on the physical form of records and the life-cycle concept. Preserving the information meant preserving the media because of the permanent relationship between the information and its medium. With electronic records, the physical form is irrelevant. There is no permanent relationship between the media and the information. The information can be copied onto a different medium or erased completely without leaving any evidence. Unlike conventional records, the carrier can be re-used. These factors require a new approach from records managers and archivists when dealing with electronic records. They need to change their concept of a "record" from being a physical entity to being a "data element", free from any physical form.

The application of the life-cycle concept to the management of electronic records has been discussed in Chapter Two. It would be useful to return to this discussion in the context of the appraisal of electronic records. Traditionally, the archivist does not become involved in the appraisal of records during the early stages of the life-cycle. The appraisal of records normally takes place after the records cease to be in administrative use. Record disposal schedules can be applied at an early stage to discard useless information and to preserve valuable records. However, it is not always possible to determine the value of records at the early stages and the records will require a further examination by the records manager and the archivist to determine their ultimate disposition.

Electronic records need to be identified and scheduled when they are created. This means that the records manager and the archivist need to be involved at the time of creation of the record, or even earlier if possible. This poses a serious problem, especially for the archivist. The records manager's involvement can be achieved through organisational policies setting out responsibilities for all parties involved in the organisation's record-keeping activities. However, it is not easy for national archives to have a say in the records management programme of government departments which are outside their jurisdiction.

There is a need to re-consider records management and archival practices not only in terms of electronic records but of all records. Records management programmes have to be related to technological developments which change the way in which information should be handled.

7.2.2 Cost-Benefit Analysis in Relation to Electronic Information

A cost-effective records management programme is dependent upon the disposition of records at the earliest possible moment after they cease to be of use. Disposal schedules are used to discard unnecessary information thus helping to ensure that useful information is more accessible and better managed.

Records managers and archivists have developed a number of approaches to cost-benefit analysis when examining paper-based records systems. In addition to their concern with disposal, they try to achieve savings in terms of storage. They must evaluate the benefits of centralised vs decentralised on-site storage, the microfilming of frequently used records and the establishment of record centres for low cost off-site storage of records. None of these approaches are meaningful in relation to electronic records.

For example, one 2400 foot reel of magnetic tape recorded at 6250 bpi can store 125 feet of textual records. This means that space is no longer an issue affecting retention decisions. The density of storage media is increasing, enabling more information to be stored on less disk space, and indeed the capital cost of storage media is decreasing steadily. It is also important to note that the medium can be re-used instantly so that no recycling process is necessary. Yet, despite all these factors, the cost of preserving electronic information is increasing and will continue to do so.

Cost-benefit analysis as applied to electronic records should be based on the cost of preserving and providing access to archival copies.[13] This includes the hardware and software costs, the costs of collecting data, processing costs and the costs of personnel to carry out each operation. It should also be borne in mind that once

[13] Archival copy refers to a back-up copy the data file to be stored outside the premises where the computer system is installed.

an archival copy of a given data file is produced, it cannot remain unattended for long in the storage area. It needs to be rewound and recopied regularly in order to avoid deterioration of the medium. Finally, the migration of data to newer media in order to keep up with technology is essential but very costly.

All these considerations should be taken into account when retention decisions are made. As a result, records managers and archivists need to re-consider their retention policies and practices. As the cost of preserving electronic records is a continuing burden to the institution, it is not viable to retaining them permanently. The Advisory Committee for the Co-ordination of Information Systems (ACCIS) emphasises this issue in its report to the United Nations and goes on to question the permanent retention of paper records.

> Records managers and archivists have fallen into the bad habit with paper-based systems of either scheduling records for destruction after a fixed number of years or assigning them the status of "permanent". These permanent records are transferred to archives, where they presumably are intended to remain "permanently". It should be obvious that no matter how little it costs to keep a record for a year, if one intends to keep them permanently (i.e. for an infinite period of time), one is committing oneself for an infinite expenditure. Since no qualifiable benefits can justify an infinite expenditure, the concept of permanent retention must give way in face of risk management analysis. It is especially important to dispense with the concept of permanent retention when we are dealing with electronic records because the cost of keeping electronic records in electronic formats are quite substantial and subject to variables that make it

impossible to predict, within even an order of magnitude, what costs will be more than a decade from now.[14]

7.2.3 Scheduling Electronic Records

As mentioned earlier, in paper-based systems, records managers and archivists have developed schedules for the timely disposition of record series. Record schedules are prepared according to the financial and legal regulations and administrative requirements of the creating agencies. This enables the records manager to implement cost-effective retention of valuable information, while making sure nothing is kept longer than necessary.

Retention schedules are especially useful for identifying records with short term value and those with finite value such as personnel files. Anything in between is usually evaluated by the archivist in terms of its potential archival value. When records cease to have administrative value, but still require review at a later date, they are usually transferred to a low cost storage area. Being relatively stable physically, they can wait until reviewed for their ultimate disposal.

In an electronic environment, however, records managers need to focus on scheduling and retaining information rather than on the medium, because there is no

[14] ACCIS, op. cit., p. 44.

permanent relationship between the medium and the content. Active storage (on-line storage) of electronic records is very expensive. When records are no longer required by the organisation, they have to be taken out of the system and stored off-line (usually on magnetic media). Disposal schedules should be built into the system design to determine the retention period of information both on-line and off-line. It is also very important to schedule the information system documentation and audit trails (metadata) of the system at the same time, since they provide information about the system requirements, creation, use and content of records and their relationships to other records.

In paper-based systems, scheduling should take place at the time of creation or during the active stage of the records. This enables the records manager or the archivist to eliminate records which have no value to the organisation and to plan the destruction of others after a limited period of time.

As electronic records contain a considerable amount of personal information, the scheduling process should take into account laws governing the retention of and access to personal information, such as privacy laws, data protection regulations and so on. To facilitate access to records containing personal information, the records manager or the archivist should either set the closure period far enough ahead, so that the person involved will not be affected, or remove personal identifiers, so that the records can be opened to public inspection. If the first option is chosen, then the value of the record should justify the cost of retaining that particular document which may have to be retained for a long period without being open to the public. If the second option is taken, the effect of taking out the personal identifiers on the value of the record should be weighed carefully as should the cost of this operation. This issue is elaborated further in section 7.3.2.

7.3 APPRAISING ELECTRONIC RECORDS

7.3.1 Overview

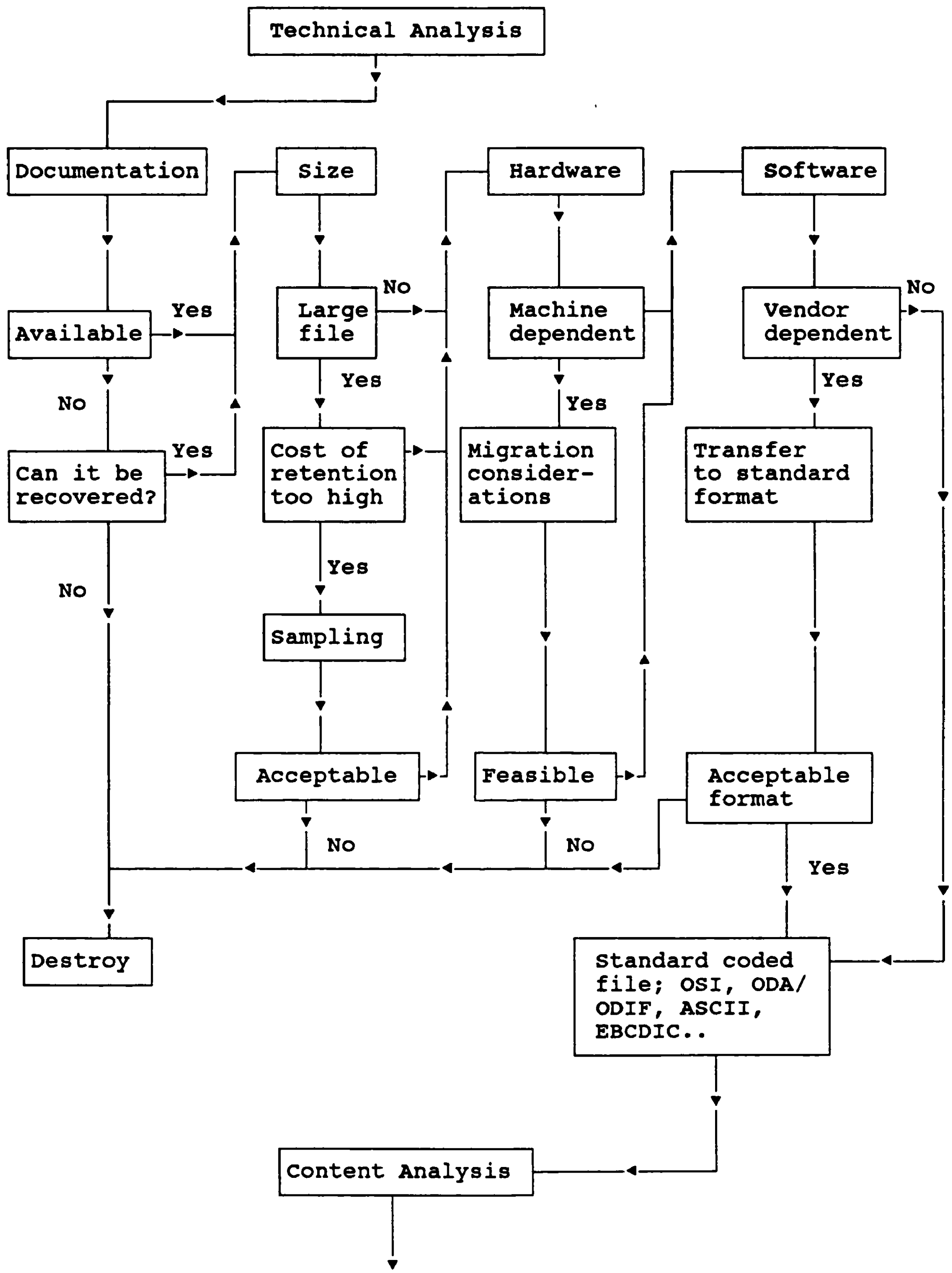
As mentioned in Section 7.1, guidelines for appraising electronic records were drawn up in the late 1970s. The first attempt to establish guidelines was made by Charles Dollar. Dollar evaluated electronic records in two stages. In the first stage, he analyzed the technical aspects of the record. If a particular record satisfied the technical requirements for preservation, then a content analysis was carried out in order to determine its evidential and informational value. Dollar's ideas formed the nucleus of the 1984 UNESCO RAMP study, carried out by Harold Naugler on the appraisal of electronic records. Dollar's study is now in practice at the National Archives and Records

Administration (NARA) of the United States and Naugler's is in practice at the National Archives Canada. In the United Kingdom, the Public Record Office has also issued broad guidelines for the appraisal of electronic records. However, the PRO guidelines tend to focus on types of records, rather than the elements of a technical and content analysis. These studies and their application to the appraisal of electronic records are evaluated in the sections which follow.

7.3.2 Technical Analysis

The appraisal of electronic records should start by identifying the technical characteristics of a particular record before evaluating its content. If a record cannot be technically retrieved, there is no point in making a detailed content analysis.

Figure 20 provides a step by step pathway for a technical and content analysis of the appraisal process. There are three major questions to be answered when analyzing the technical aspects of a record. These are: Is the file adequately documented? How large is the file? What are the hardware requirements and what are the software requirements? The figure illustrates the processes involved and information required to carry out these processes. These processes are discussed in greater detail below.


Technical Analysis
Documentation
Size
Hardware
Software
Available
Yes
No
Can it be recovered?
Yes
No
Large file
No
Yes
Cost of retention too high
Yes
Sampling
Acceptable
No
Machine dependent
Yes
Migration consider-ations
Feasible
No
Vendor dependent
No
Yes
Transfer to standard format
Acceptable format
Yes
Destroy
Standard coded file; OSI, ODA/ ODIF, ASCII, EBCDIC..
Content Analysis

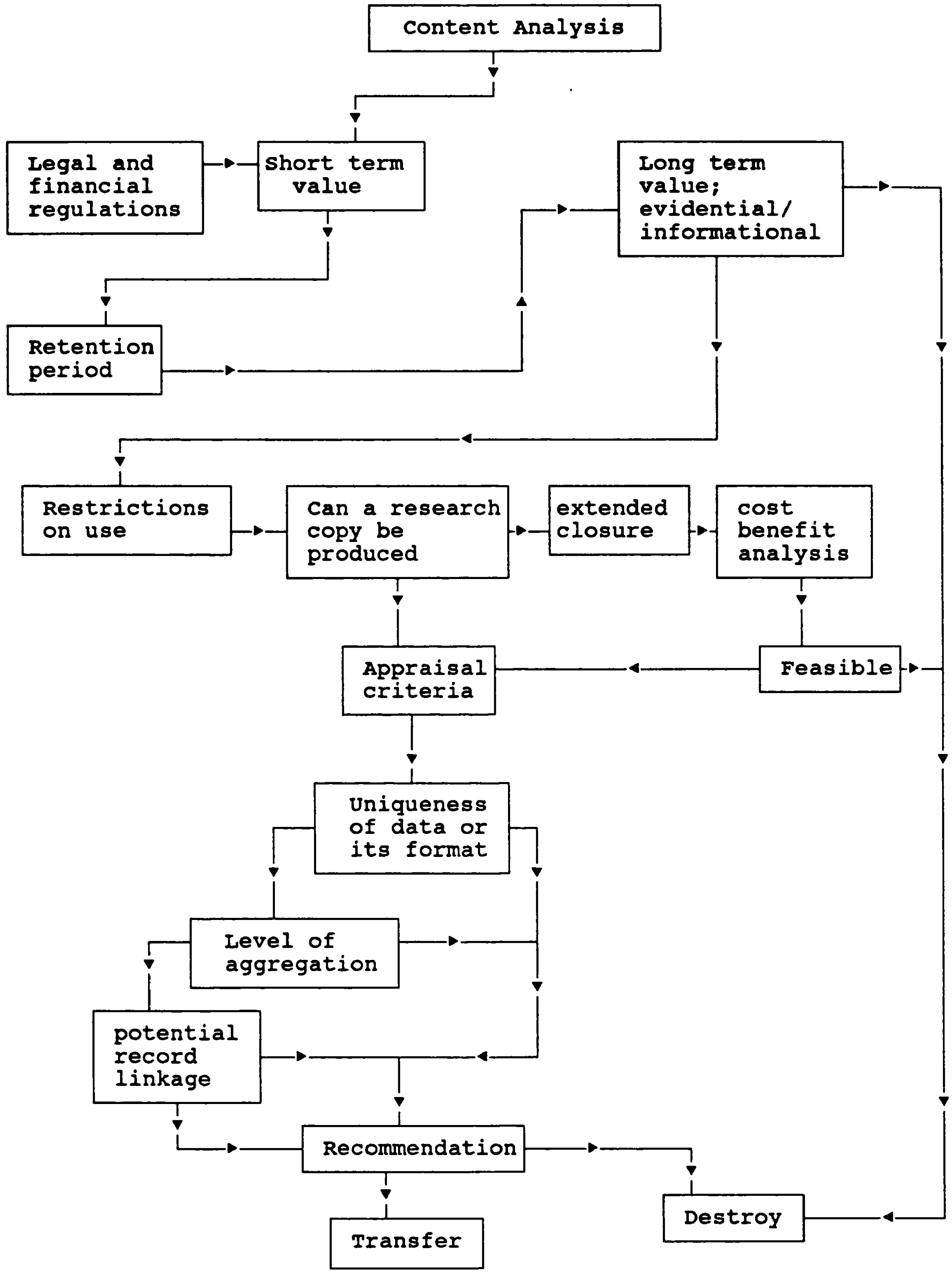


Figure 20: Appraisal of electronic records

Documentation

The importance of documentation cannot be over emphasised. Without proper documentation a file is virtually useless. For textual files, the file itself should provide information about its contents and provenance. This is not the case for statistical, survey or geographical data and databases. Here an understanding of the relationships between data items is essential if the records are to be intelligible. Basic documentation must be preserved with the records.

As yet, there is no standard for providing documentation on electronic records. In practice, when archivists acquire a particular set of data they try to assemble as much information as possible and then evaluate it to decide whether or not it is adequate. This information should be assembled when the record is created or, if this is not possible, during its active life. It is very difficult to recover this information after time has elapsed. Records without documentation can be destroyed without further examination, as they are of no use to anyone.

The Data Archive at Essex University (ESRC), in the U.K. has had 25 years of experience in running a data archive; its basic documentation requirements provide an example of the information which should accompany the records. The Data Archive requires:

- a codebook, indicating what is where on the data file,
- technical specifications, indicating how the file was written, on what equipment, etc.,
- a questionnaire, if data are survey based,
- coding schemes employed, e.g., open ended questions, in surveys, the codes attached to the geographical areas and so on,
- listings of sources, definitions, data collection procedures, etc., for statistical files,
- names of persons responsible for data collection and file creation,
- references to related files or publications based on the data.[15]

Size of the File

The size of a data file is another important consideration in determining the ultimate disposition of electronic records. Large data files do not occupy much shelf space, but the cost of processing and preserving them is high. Retrieval of data items may also prove difficult.

A cost-benefit analysis should be carried out to determine the value of the data in the file and the cost of

[15] Taylor, M.F., "Locating, Appraising and Acquiring Computer Records; a View From Experience". Proceedings of Seminar at the University of Liverpool, 26 September 1986, 1987, pp. 26-27.

processing and preserving it. If the cost is unjustifiably high, sampling should be considered. The sampling method employed will depend on the characteristics of the data in question. It can be "random", "systematic", "purposive" or "judgemental". Whichever method is employed, the sample data should represent the whole. It is important to consider how the sample data can be linked together and used as a unit in the future. This will involve the archivist's assessment of the data and its likely research use in the future.[16] For example, depending on the nature of the data in the file, the archivist may decide to sample data fields and preserve a condensed version of the file, take a sample of the file in a limited time period or preserve data covering a particular geographic area.

However, it should be noted that sampling will reduce the research value of records. Therefore, the cost of preserving the sampled version of the data file should be re-analyzed in relation to the research value of the data.

Over the years a number of sampling techniques have been developed. An evaluation of these techniques is beyond the objectives of this study, but there is a detailed examination of sampling techniques in a relevant UNESCO publication.[17] Although this publication is

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[16] Ibid., p. 27.

[17] Hull, F., The Use of Sampling Techniques in the Retention of Records: A RAMP Study with Guidelines, 1981.

specific to paper records, its principles can be applied to electronic records. Whichever sampling technique is chosen, there are a number of considerations to be taken into account. These, as stated by Naugler, are:

- A sampling scheme for case files should be equally applicable to the paper, microfilm, machine-readable, and other storage media components and be appropriate to the various technologies utilized,

- A sampling scheme should be cost-effective, easy and simple to implement, and administratively workable given the limited human and financial resources available,

- A chosen sampling scheme should be simple and, if at all possible, uniform across all government agencies,

- A sampling scheme should be consistent over a long period of time, maximizing the probabilities of creating longitudinal records and research possibilities,

- A sampling scheme should maximize record linkage possibilities,

- A sampling scheme for case files should minimize overall bias on a total or government-wide basis and, where bias is unavoidable for a particular sector, the degree of possible bias should be known,

- A sampling scheme should readily lend itself to supplemental targeted sampling where deemed appropriate and necessary by the archivist.[18]

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[18] Naugler, op. cit., p. 92.

Hardware and Software Dependency

Although hundreds of different configurations of computer systems exist, hardware dependency of data is not a serious problem for archivists. Usually the data can be interchanged between incompatible systems if the resources are available for processing. The processing cost of migrating data should be the main consideration in deciding on the disposition of the data, especially as the archives may have to have this done externally.

The media on which the data resides is also varied and is another factor to be considered. Transferring data to a standard media is costly and should be given some thought. Software compatibility should be taken into consideration at the stage of system design. Special attention should be paid to the way in which the program is coded. If the program is written according to data exchange standards, the transfer process will not be complicated. However, data exchange standards are not applied at present. Therefore the interchange of data between different systems remain to be problem for records managers and archivists. A more detailed analysis of hardware and software considerations for managing electronic records is given in Chapter Four.

7.3.3 Content Analysis

If the technical analysis satisfies the appraisal criteria set by the archives, the next step in appraising electronic records is to evaluate their content. The content analysis is similar to that applied to conventional records. The main criterion for selection is the potential future use of the record, which is determined by its evidential and informational values.

As with the technical analysis, the content analysis of electronic records should be carried out at the time of the creation of the record. The records manager, with the help of the users, can evaluate the records in the light of organisational needs. Then the archivist should be able to decide whether the record in question has long term value. However, the archivist's evaluation of the record at this stage may not reflect its value in the future, as he has no way of knowing how important the subject will become in the future. It is also possible that the information contained in some of the records could be found in a different format in the future, or it may be published. Therefore, the archivist may have to keep a higher percentage of the information than with paper records, which can be re-evaluated with time.

Short Term Value of Records

In the short term, the value of records is determined by their use within the creating agency. Organisations create information for operational purposes. When the operation is completed, the record is rarely consulted. In principal, the decision concerning the operational value of the record can be taken by the users. However, government institutions are accountable for their actions. This means that they have to keep their records for a certain period of time after the records cease operational use. This period is set by regulations governing public records, such as a national archives act and various legal and financial regulations.

The physical custody of the records with short term value should remain with the information technology unit until they are destroyed. The time between the end of their active life and the required retention period is crucial, because it is during this period that records usually get lost or destroyed. The management of electronic records in this period is usually neglected and the information technology manager regularly wipes out information considered to be useless in order to re-use the media.

The records manager should ensure the effective use of schedules by all personnel, but especially by the information technology manager, so that nothing with continuing value gets destroyed.

Long Term Value of Records

The long term value of records refers to their potential use by people other than those who create them. The archivist evaluates the records to determine their evidential and informational value. Evidential value refers to information about the existence, functions and activities of the organisation, as well as evidence of transactions made in the course of organisational activities. Schellenberg explains evidential value as follows:

> At the outset it is important to emphasize that appraisals of evidential values should be made on the basis of a knowledge of the entire documentation of an agency; they should not be made on piecemeal basis. The archivist must know the significance of particular groups of records produced at the various levels of organisation in relation to the major programmes or functions.[19]

The informational value of records is determined by the information they contain about persons, places, events, phenomena, etc. Computers have made it possible to carry out research involving large amounts of data in such fields as science, technology, administration, sociology, economics, politics, natural resources, geography, national

[19] Schellenberg, The Appraisal of Modern Records, p. 11.

security and the military. The archivist cannot possibly be familiar with all these subject areas and he needs to make contact with researchers to help him determine the informational value of the records.

Restrictions on Use

Access restrictions are common in every country. They are usually imposed in order to protect the privacy of individuals, but there are other reasons for restricting access to records, for instance national security. The appraisal decision should take account of all relevant legal or security regulations. For example, if a file has to be closed to the public for a long period and if the cost of maintaining it during this period is not justifiable, it may be decided to destroy the file. With electronic records, sensitive or personal information can be taken out and an anonymised version of the file can be produced for research purposes. In this way, the file can be open to the public immediately. However, as noted earlier, the anonymisation process may also affect the evidential value of the record. Moreover, the cost of the process should be taken into account.

Appraisal Criteria

The retention of information in an archives is not justified unless there is evidence of how the information was used, by whom and for what purposes. The evidential value of the information can best be captured by system audits, transaction logs and metadata. These issues should be kept in mind when retention decisions are made.

The criteria for the selection of conventional records can be applied to electronic records as well. Because of the nature of electronic records, other criteria also should be applied to ensure that the preservation cost is justifiable. These include the uniqueness of data or its format, the level of aggregation and the potential of record linkage, which are discussed below.

Uniqueness of Data or Its Format

The most important factor in determining the disposition of electronic records is whether they can be found on another media. People tend to print out the final versions of documents especially those created within an office automation system. Legal requirements tend to promote this tendency.[20]

It may appear to be more advantageous to preserve the electronic version of the record in terms of the compactness of the media and the possible wider dissemination of information. However, there are many disadvantages to keeping records in their electronic

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[20] See Chapter Five.

version, notably machine dependency, the migration requirements of data and the instability of the media. It is generally advisable to preserve the paper version where possible, particularly as the data in electronic records created within office automation systems is not often manipulated.

Information contained in other types of electronic records, such as those created within a database management system, is not likely to be printed out in full, although some of it will be available in paper form as micro-level printouts or management reports. The computer system also will create input files, transaction files, master files etc., which will duplicate some of the information contained in the user file. However, a complete set of manipulatable data is unlikely to be found anywhere else. The archivist needs, as far as possible, to check all sources to ensure that nothing which is duplicated elsewhere is selected for preservation.

Level of Aggregation

The level of aggregation refers to whether a data file has been summarised or not. This is an important factor in making an appraisal decision. If a data file is aggregated, it is less likely to have high research value as the information will already have been manipulated and some form of summary will have been created. If the information exists only in an aggregated form then the long-term research value of the record will be limited. Dollar explains this principle as follows:

> Generally, the informational value of computer readable records is proportional to their level aggregation. For example, a summary of census data at the enumeration district level is far more valuable to researchers than a summary of county level census data. Similarly, census information at the household level is more valuable than a summary at the enumeration district level. The rule is that while you can never disaggregate summarised data (down from group data to individual data), you can always aggregate micro-level data to the desired summary level. Thus, unaggregated micro-level data has the greatest potential for further computer processing.[21]

Potential Record Linkage

Another important consideration in appraising electronic records is the potential linkage of a set of data with other data sources. Archivists and records managers describe the connections between conventional records by the means of finding aids or indexes. However, this effort is labour intensive for the results it yields. Record linkage can be achieved with electronic records (other than textual records) more successfully and more easily, as Naugler puts it:

> A further significant factor in the appraisal of machine-readable records is the potential for record linkage. This is when common identifiers

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[21] Dollar, C., Appraising Machine-readable Records, p. 73.

such as name, address, social insurance or security number, and date of birth or common attributes such as sex, race and age, are combined from two or more sources. Although, record linkage is possible with textual records, it is a very time consuming process. However, with machine-readable records the computer can be programmed to match cases which share common identifiers or attributes and, as a result, the linkage of thousands and even millions of cases becomes possible.[22]

Recommendation of the Archivist

A further step in deciding on the disposition of electronic records is the archivist's recommendation based on a technical and content analysis. The recommendation should take into account the subject matter, source and reliability of the data and the cost of preserving the file.

7.4 THE RE-APPRAISAL OF ELECTRONIC RECORDS

It is so costly to maintain electronic records that they should be re-appraised regularly to determine their continuing value after they are transferred to the archives.

Archivists do sometimes re-appraise conventional records after they have been accessioned but this is rare. When they appraise records, they try to foresee the needs of researchers thirty or more years hence. It is likely

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[22] Naugler, op. cit., p. 41.

that this decision may be reconsidered in the future. In any case, re-appraisal is a debatable issue. Some argue that it is unethical to destroy archives since the accessioning process is a promise to the creators that the records will be permanently preserved. Moreover, the records may already have been consulted and quoted by researchers. However, if the records are not re-appraised, the archives may have to maintain records which are never consulted.

Rapport's 1981 paper on re-appraisal policy gives a brief history of the debate on the issue.[23] In his paper, he formulates a re-appraisal policy based on reviews of records at regular intervals and suggests that records which fail to satisfy the criterion of continuing value should be destroyed.[24]

It is essential to re-appraise electronic records to determine their continuing value because of the cost of maintaining them for permanent preservation is so high. Thus, a re-appraisal policy should be formulated to determine their continuing value.

Naugler's study on appraising machine-readable records deals with the re-appraisal issue. He suggests that upon

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[23] Rapport, L., "No Grandfather Clause: Reappraising Accessioned Records", A Modern Archives Reader, 1984, pp. 80-90.

[24] Ibid.

acquisition records should be assigned a review date based on either the length of time that the record will be likely to have research value or the preservation requirements of the record, such as copying, rewinding and cleaning the tapes or migrating the data to new media or systems. He also suggests that the next review date should be within five to ten years for most records and no more than thirty years for any record. Any record which fails to meet the criterion of having continuing value should be assigned a probation period. After this time a final decision should be taken on its fate.[25]

The United Nations Advisory Committee's report also suggests re-evaluation reviews dictated by the migration requirements of electronic records. It asserts that:

> Technological change forces the regular move of electronic information from one medium and format to another, and to the implementation of new software facilities. In the past twenty five years, major changes have taken place more than once a decade, and most data processing organizations face fairly substantial operating system changes or upgrades every several years. Experience shows that substantial costs are involved in the migration of data to new media and new software environments. These costs can easily exceed the costs of storage during periods between migrations. The time at which migration requirements become known also marks a time that good cost estimates for change and reasonable estimates of the length of the next period of stability can be made. Therefore, policies linking the re-assessment of archival value to the timing of data migration, will result in the most realistic cost/benefit analysis of the "continuing value" of records for an

[25] Naugler, op. cit., pp. 93-95.

organization.[26]

As can be seen from the views quoted above, re-appraisal is more acceptable for electronic records than for paper records. Although the approach as to how to re-appraise records varies, the necessity to do so is well understood.

7.5 THE IMPLEMENTATION OF APPRAISAL DECISIONS

Appraising electronic records is not as straightforward as it might appear from the previous discussion. It can be very difficult and time consuming to identify and obtain the information essential to evaluate a particular set of data. These difficulties result mainly from the lack of policies and strategies for dealing with electronic records. Records managers do not have physical custody of electronic records and they are not always involved in controlling them intellectually. Their knowledge of computer operations is often limited and they tend to be ill-informed about electronic records. The retention of these records tends to be left to users and computer personnel, who are mainly interested in current information. Archivists have similar problems in managing electronic records.

[26] ACCIS, op. cit., p. 44.

Early intervention by records managers and archivists is a crucial aspect in the appraisal of electronic records. For the records manager, knowledge of what is created in the organisation in electronic form enables him to prepare schedules for the timely disposition of records. The records manager's initial evaluation of the records is a very important factor for the archivist when appraising them.

The information necessary to evaluate electronic records should be collected during the system design stage or when the records are created. This information can be stored in electronic or paper form. An Information Resource Dictionary System (IRDS) is a useful tool for controlling data about the information system as well as about the information itself.[27] A sample appraisal form is provided in Figure 21. The records manager should collect this information in consultation with users and computer personnel. Computer personnel can help answer questions about the technical aspects of electronic records and the computer system.

The necessity for co-operation and improved communication between records managers and archivists, as discussed in Chapter Two, is readily apparent in the appraisal process. When the archivist is aware of what records the organisation creates, he can prepare an

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[27] See Section 4.4.2.

appraisal programme for electronic records and identify valuable records during the early stages of their life-cycle.

APPRAISAL FORM

1. Control No:	2. Date:
3. Creating Agency:	4. Contact Person:
5. Telephone No:	
6. System Information:	
7. File Title and Dates:	
8. Series Title (if any):	
9. Description:	
10. Type of Data:	11. Size of File:
12. Hardware:	
13. Operating System:	14. Software:
15. Updates:	
16. Updated Data:	

17. Documentation:	Yes	No	N/A
Codebook:	☐	☐	☐
Input Sources:	☐	☐	☐
Outputs:	☐	☐	☐

18. Agency Retention Period:	
19. Restrictions:	20. Date:

21. Value of Data:	Yes	No	N/A
Informational:	☐	☐	☐
Evidential:	☐	☐	☐
Legal & Financial:	☐	☐	☐
Uniqueness of Data:	☐	☐	☐
Is Data Aggregated:	☐	☐	☐
Potential Record Linkage:	☐	☐	☐

22. Comments:
23. Recommendation:
24. Next Review Date:

Figure 21: Appraisal Form

The data required to complete this form is described below.

1 **Control Number:** A unique number given to each file for management control purposes. The records manager can develop a systematic numbering system or give a consecutive number to each file. Another possibility is the use of file classification numbers. The control number can also be used by the archives for the same purpose.

2 **Date:** The date of completion of the form for management purposes.

3 **Creating Agency:** The agency that creates the information. This is mainly for the use of the archives.

4-5 **Name of the Contact Person and Telephone Number:** The person who is responsible for the collection of the information, usually the records manager. This person provides a link between the archivist and the records to be transferred to the archives.

6 **System Information:** The name, purpose and function of the system. This will help to put the files created by the system in context.

7 **File Title and Dates:** File title and inclusive dates.

8 **Series Title:** If the file is part of a series, the series title should be indicated.

9 **Description:** A brief description of the data contained in the file.

10 **Type of Data:** This refers to whether or not it is a database file, a word processed document, survey data, etc. The type of data contained in the file may not be easy to identify. For example, a document may contain text, graphics, images, voice, parts of a database, etc. The main data types can be classified as:

<u>Digital documents:</u> These are the electronic records that most closely correspond to their paper counterparts, such as word processed documents, electronic mail messages, scanned images, computer-aided designs, etc.

<u>Databases:</u> These are collections of logical records forming a database file. They can also be defined as the collection of files with pre-determined relations. A database file, for example, can include a master file (consisting of logical records), an index file or files, catalogue, report, format and view files. Examples of databases include any set of data managed by a database management system (DBMS), spreadsheets, project planning and forecasting systems and so on. A database management system usually has a resource directory (also known as an information resource directory system or IRDS) built into the system which provides details of record layout, relationships between records, file and record hierarchy and user accounts.[28]

[28] See Section 4.4.2.

Statistical Data: Any set of data such as census and survey data collected for statistical purposes and managed by statistical analysis software.

Artificial Intelligence (AI): These systems are designed to solve complex problems that require reasoning. Natural language processing, robotics and expert systems are the most common applications of artificial intelligence systems.

Hypermedia and Hypertext: Hypermedia refers to documents consisting of text, data, images, graphics and sound which are used in a hypertext environment. A hypertext system can link data in different formats with the aid of keywords, phrases, concepts, etc. which activate the system.

Remote-Sensing Systems: These are systems which receive input via remote sensors. The computer receives and stores the data, for example, about the environment, crop growth, the atmosphere and so on. The data is not aggregated and therefore is likely to have a high research value.

Geomatic Information Systems: Geomatics is the scientific and technical domain concerned with geographical data. Geomatic information systems include, among others, land and geographic information systems, automated mapping systems and digital image processing systems.

11 **Size of the File:** The size of the file can be given in bytes or number of tapes etc.

12 **Hardware:** The make and model of the machine.

13 **Operating System:** The operating system under which the system runs, e.g. DOS, UNIX, OS/2, etc.

14 **Software:** The name and version number of the software under which the data is processed.

15 **Updates:** If the data is updated, the interval of the process should be indicated i.e. daily, weekly, monthly, irregularly, etc.

16 **Updated Data:** This concerns what happens to updated information. It might be copied on to an external storage medium or it might be overwritten.

17 **Documentation:** Documentation is the general term covering all the information necessary to evaluate a data file. It also refers to the information without which the data set would be unintelligible. The existence of such documentation should be indicated and the documentation should be retained with the data file.

18 **Agency Retention Period:** This is the period during which the data is required for the agency's operations. Legal and financial regulations which govern the retention of records should be taken into account.

19 **Restrictions:** Restrictions on the use of the records should be given and the relevant legislation indicated, for instance, the Privacy Act, Data Protection Act and so on.

20 **Date:** The date until which the record is closed to

public inspection.

21 **Value of data:** The informational and evidential potential of the data, its uniqueness, level of aggregation and potential record linkage should be evaluated.

22 **Comments:** Any comments which would be helpful in the appraisal decision process should be indicated.

23 **Recommendation:** A judgement should be made about the ultimate disposition of the data based on an evaluation of the information available about it. The recommendation could be a limited retention period, immediate destruction after the data ceases to be in operational use or another review after a period of time.

25 **Next Review Date:** If the data has continuing value, the date when it should next be appraised should be indicated. Regular reviews of electronic records will ensure the most cost-effective retention.

7.6 RETENTION OF ELECTRONIC RECORDS

7.6.1 Overview

It is important that management establishes a policy for preserving information with continuing value and that the retention format should also be preserved. This policy should ensure that no record is destroyed accidentally, that the authenticity of the record is maintained and that the evidential value of the record is preserved.

7.6.2 Setting Parameters for the Retention of Electronic Records

Records managers are responsible for developing the organisation's policy for the retention of electronic records. Retention policies can only be applied if the users of the system understand their importance in the management of the corporate memory. In most electronic office systems it is the users who classify the records and determine their retention periods. The major problem with these systems is that the user often determines the retention period according to his own requirements. He tends to disregard the organisation-wide use of the records and their informational value or the potential future use of the records. Therefore, the information management policy should clearly indicate what constitutes a "record", giving clear-cut guidelines on how to determine the legal, informational, financial and operational value. This should enable the organisation to capture only the necessary information in the first place.

In the absence of a clear definition of what is a record, an organisation may opt to capture all information that it creates or receives and then to apply retention schedules. This approach is the approach which the United States National Archives and Records Administration takes in relation to records created by federal agencies. Many United Nations organisations have also adopted this policy. The disadvantage is that the records manager or the archivist has to review every new category of records created before a decision can be made about disposition.[29]

The National Archives of Canada adopts a different approach, which allows the creators to decide on the retention of the records they create. The weakness of this option is that it lays too much emphasis on the personal perspectives of the creator.[30] As mentioned earlier, users often do not consider the potential future use or corporate use of the records.

The policy should adopt a definition of electronic records which encompass the corporate use of records and the organisation's legal obligation to preserve records for reasons of accountability. Most national archives acts make provisions for the preservation of public records, regardless of the physical form or medium. Such provisions should also be incorporated into each organisation's record-keeping policy.

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[29] ACCIS, op. cit., p. 35.

[30] Ibid., p. 36

7.6.3 Identifying Electronic Records' Types

Identification is used here to mean the process of determining the value of records by their form or diplomatics. Diplomatics is the science dealing with types and elements of documents.[31] Over the years, archivists and records managers have developed different criteria for identifying paper records which enable them to determine the value of records.

The main difficulty in identifying electronic record types by the same methods used for paper records is that the contextual information which helps to determine types of documents is not found in electronic records or is very limited. The ACCIS study addresses the issue as:

> An equally serious challenge to traditional tactics of records management is the cultural fluidity of electronic document types. Document type, or form-of-material, is a name given to the cultural shape (as opposed to the physical format) of particular types of documents whether these are composed of text, sound and/or image. Forms-of-material are recognisable from their structure without having to rely upon their content, and as consequence, the 'medium', or form, is the message. Thus, we immediately know what kind of information will be contained on a page of a double entry bookkeeping journal, a curriculum vitae, or certificate of commendation, without having to 'read' them. This has enabled records managers and archivists to use the form-of-material as a shorthand for content indexing and for other management decisions, such as retention schedules.[32]

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[31] Walne, op. cit., p. 60.

[32] ACCIS, op. cit., p. 103.

7.6.4 The Evidential Value of Records and Metadata Systems

Computer-based information systems allow the user to modify and erase information quickly and easily. This has great benefits for the user but serious implications for the security and authenticity of the records. This issue should be addressed at the system design stage so that the necessary precautions can be taken to maintain the security and integrity of records. For office automation systems, the computer system should be designed to protect records from being erased or modified when they become organisational records (see Chapter Six). This will ensure that no organisational record can be erased accidentally and that the authenticity of the records is maintained.

System audits, or metadata, will show the usage of the records by a particular user. This is particularly important in determining how the information was used and for what purposes. Especially with database management systems, the way the user views and uses a particular database is the only evidence of how the database was used to perform organisational activities. The system audits and metadata, which provide information about use of the system and records, should be preserved if the evidential value of the record is to survive.

7.6.5 Strategies for Retaining Electronic Information

A decision must be taken about whether the information is to be retained in electronic form, computer output microfilm or another format, such as a print-out. The advantages and disadvantages of each should be investigated before a decision can be made. If the information is to be retained in electronic form, a choice has to be made about the form of retention, which may be a sample of the data, snapshots, backups, etc, depending on the nature of the data. These options are discussed below.

Sampling: As mentioned in Section 7.3.2, sampling is one the most effective ways of retaining information from large files. It is most useful where it is not feasible for the archives to retain a whole data file. This technique has the advantage of making it possible to retain large amounts of information. However, to a great extent the value of the data is lost and if the sampling technique is not properly designed, the sampled version of the data file may be biased.[33]

Snapshots: This technique is especially useful when electronic information is constantly updated, whether

[33] An account of the use of sampling in appraisal was given in section 5.3. See also Naugler's Archival Appraisal of Machine-readable Records: a RAMP Study with Guidelines, op. cit., pp. 90-93 and Hull's The Use of Sampling techniques in the Retention of Records: a RAMP Study with Guidelines, op. cit.

regularly or on a case by case basis. It involves taking a copy of the data file periodically. Although this ensures the retention of the information, the archival value of the information is debatable. The evidential value of the record, which is found in the metadata (how the information was used), will not be continuous and it will be very difficult to capture the metadata by taking snapshots of the file.

Backups: Most computer systems have a facility for making a backup copy of the data whenever it is modified. Information technology managers also make backup copies of data for safety purposes. The retention of these backup copies will ensure that the data can be re-constructed in the event of a disaster or system malfunction. When making backup copies, it is important to include metadata so that organisational activities can also be re-constructed.

CHAPTER EIGHT: CONTROL AND USE OF ELECTRONIC RECORDS

8.1 INTRODUCTION

This chapter covers issues relating to the control and use of electronic records within the creating agency and the archives. It evaluates issues related to documenting and describing electronic records, storage media, access to the records and the responsibilities of different parties with a stake in the management process of electronic records. Archival control and the public use of electronic records will be dealt with in detail in Chapter Ten, but some of these issues are discussed here as they require the attention of the archivist at the early stages of the records' life-cycle.

Comparisons will be made to paper-based systems in order to reach a better understanding of computer systems. Computer records differ from paper records in terms of usage. Although they are created and maintained for the same reason, to carry out the day-to-day business of the organisation, their management requires a different approach, which is mainly dictated by the technology upon which electronic records are dependent. Technological and legal problems associated with the control and use of electronic records will also be discussed briefly in this chapter.

8.2 DOCUMENTATION AND DESCRIPTION OF ELECTRONIC RECORDS

8.2.1 Documenting Electronic Records

Intellectual control over electronic records and access to them is achieved through documentation and description. These processes should be standardised to ensure that the records will be accessible in the future and that data exchange between different computer systems will be possible. It should not be necessary to re-describe records in the archives or, at most, this should involve minimal modification, if the records are documented and described properly at the early stages of their life-cycle.

To document records is to describe them within the system in which they were originally created. Documentation provides information about data and its relationships to other information sources. Proper documentation will dramatically reduce the time and effort the archivist spends in appraising and processing records.

Records managers and archivists regularly document paper and other non-electronic records. They collect information about the creators of the records, how the records are created and accessed, how they are used and how the records serve to execute the specific functions of the organisation. This information is collected in order to assist the user in understanding the records in the context of the record-keeping system. Without this contextual information, the records would still be intelligible although not as valuable.

With electronic records, however, documentation or information about the data is more than a means of assisting users, it is an absolute necessity. Moreover, it is not something which can be done at a later stage. Records managers and archivists must describe electronic records at the information system level in order to be able to show the relationships between data items, their creation and use. By documenting records according to descriptive standards, they will ensure the preservation of the evidential value of records.[1]

The importance of documentation as the means of accessing records was discussed in Section 7.3.2. The archivist should acquire documentation with the records. If the necessary precautions have not been taken by the records manager, archivist and computer personnel, it is often impossible to trace the documentation. Even when documentation is available, it often proves to be inadequate.

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[1] For a discussion of the minimum documentation requirements of electronic records see Section 7.3. Information Resource Directory Systems (IRDS) as discussed in Chapter 4.

8.2.2 Describing Electronic Records

Traditionally, filing and classifying records at the active stage and describing records in the archives are performed as separate functions of records management and archival administration at different stages of the record life-cycle. Both functions have the objective of making possible the retrieval of information and both consist of information about records and the record system. Integration of the two functions would save time and energy, but is not usually achieved.

With paper-based systems, archivists describe records after they are transferred to the archives. The records are described in detail at the file series level and listed at the data item (file) level. The finding aids provide information about the creators of the records and the records themselves. Because the records can be read without machines, the contextual information is established and maintained separately, and the records would be intelligible. To some extent, the functions of the archives, such as appraisal, acquisition and reference services, can be carried out without it.

The description of data in electronic form is a far more crucial process. The archivist must be familiar with the technical aspects of the computer system on which the records were created and managed as well as the information contained in the records in order to describe them adequately. Descriptions of the records must be maintained throughout the life-cycle and are essential to the archivist when he makes a decision on the ultimate disposition of the records. This requires a shift by the archivist in emphasis of description from the data item level to the information systems level, and the description function needs to be built into the system design stage.

Every computer-based system includes some form of embedded data catalogue or directory. This manages the creation and use of the data under the control of the system. However, as these directory systems are usually produced as part of the application software, they are vendor dependent and their compatibility with other systems will be limited.

A standard Information Resource Directory System (IRDS) can hold all the definitions and descriptions of an organisation's information resources.[2] A study undertaken on behalf of the National Archives of Canada underlines the implications of IRDSs on the management of information sources within government institutions and for the archives. The study evaluates the existing IRDSs and shows that a data dictionary might hold information about a

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[2] See Section 4.4.2.

document, a file or a single data value.[3] This information includes:

- the category of the data item,
- relationships to other data items,
- when and by whom it was created,
- when and by whom it was modified,
- the total number of modifications since it was created,
- a description of the data item, such as its formats and, possibly, a range of valid values,
- databases or files in which the item appears and,
- the location of the item in these databases or files.[4]

As a general data management tool, a data dictionary can hold all of the information related to the management and disposition of records, whether machine-readable or not. The following are some of the management functions identified by the Canadian Study that could be managed by the data dictionary:[5]

- details of the file classification system,
- characteristics of automated systems and applications used to create and

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[3] Protocols Standards and Communications Inc., "Situation Report on the Information Resource Dictionary Systems (IRDS)", pp. 3-4.

[4] Ibid.

[5] Ibid.

manage the records,

- information which helps to describe the source (provenance) and the original order and context (respect des fonds) of the records,

- retention schedules, specifying retention periods and the state of the records during each period,

- disposal schedules, specifying disposition upon expiry of each retention period, including the physical destruction or transfer to the National Archives as archival material,

- data management controls indicating the security classification and political sensitivity of the records and allocating modifications and retrieval rights to specific management levels, organisations or other identifiable groups and individuals.[6]

Theoretically, a data directory serves as a useful tool for documenting and describing electronic records in the creating agency. When a particular data file is transferred to the archives, the data directory will ease the archivist's job to a great extent. Of course, the archival description of electronic records would require some changes in the original description, but these changes would be minor and would not require an extensive study of the data file. The archival description of electronic records is discussed in greater detail in Chapter 10.

An example of data which could be described in a data directory follows. It should be kept in mind that this is

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[6] Ibid.

a description of a data file, not a data item. Obviously the description of a data item would be more detailed, giving references to the files where a particular data item appears.

Description of a data file:

1 **Creator:** the person(s), organisation, or organisational unit(s) responsible for creating the record.

2 **Title:** the title and sub-title of the data file.

3 **Dates:** the date of creation and subsequent modifications.

4 **Classification number:** the unique identification (and classification) number given to the file.

5 **Series information:** description of the series, if the file is part of one, e.g. series title, series number.

6 **Addressee:** to whom the file is communicated, if it is, internally or externally.

7 **Data collection:** information about how the data was collected, methods of data collection, geographical coverage (if applicable), time span, etc.

8 **Content:** a brief summary of the information contained in the file.

9 **Related sources:** references to related documents.

10 **Accompanying material:** references to any material accompanying the file, such as input forms,

questionnaires, codebook or any other relevant documentation.

11 **Restrictions on use:** any statutory or regulatory restrictions on the use of the record by different levels of management and by the public.

12 **Type of data:** whether the file contains textual, numeric, survey data, machine instructions, etc.

13 **Size:** the size of the file.

14 **Technical requirements:**

<u>storage medium:</u> e.g. magnetic tape, recording density e.g. 1600 bpi, 6250 bpi, physical arrangements of records, such as blocked, coded, hierarchical, etc.,

<u>hardware requirements:</u> the make and model of the computer.

<u>software environment:</u> the release name and version number of the software.

<u>operating system:</u> the operating system and version number that controls the computer system.

15 **Retention period of the record:** the date until which the file is required by the creating agency.

16 **Information on disposition of the file:** e.g.:

- destroy after specified period,
- transfer to the archives on the expiry of retention period, or
- review retention period after a specified time.

8.3 PROVIDING ACCESS TO ELECTRONIC RECORDS

8.3.1 Overview

There is no point in retaining records unless they can be accessed in the future. The retention format of electronic records can be a barrier to the user and they should be retained in a format which will maximise access. When access is provided, consideration should be given to issues related to privacy and security. Access to records should be controlled to ensure the authenticity of records.

8.3.2 Maintaining Security

The ease with which electronic records can be accessed, manipulated and communicated raises questions about their security, authenticity, privacy and confidentiality. The legal issues involved should be a major conçern for top management. Access to electronic records within the framework of rules and regulations governing their creation, use, retention and disposition must be addressed as policy issues at and during the system design stage.

The security of electronic records involves both technical issues, such as protection against fraud, embezzlement, sabotage and unauthorised access, and legal issues, such as freedom of information, privacy of individuals, confidentiality, data protection regulations and so on. For a detailed discussion of these issues see Chapter Five. The Security problems involved in managing electronic records can be overcome by formulating and implementing clear-cut policies and technical precautions.

8.3.3 The Authenticity of Records

The authenticity of records determines the accountability of the organisation. As organisations increasingly maintain their policy records, case files, etc on computer-based systems, their accountability is reliant upon well managed electronic records. The ease with which information in electronic form can be modified without leaving any trace is a threat to the authenticity of records. In the event of a dispute concerning the creating agency and its records, the authenticity of records has to be proved by showing how the records are managed. Policies must be formulated to ensure the authenticity of records and thereby to maintain organisational accountability.[7]

8.3.4 Technical Aspects of Providing Access

As electronic records are dependent upon the hardware and software environments in which they are created, access will only be possible within the system environment, unless

[7] For a legal and technical analysis of the issues involved in maintaining authenticity of records see Sections 5.2.3 and 4.5.2 respectively.

the data is transferred to a format and standard system environment from which it can be accessed. The retention format of electronic records and the medium on which they reside may make it difficult to access them.

Preserving records in the hardware and software environment in which they were originally created will only ensure access for a short period. Technological developments dictate a change in hardware and, especially, in software every two to five years. If the timely migration of information to newer systems is not carried out, valuable information may be lost because of technological obsolescence.

Policy decisions should be taken to address the issue of technological dependency and to ensure the migration of data to newer systems. Migration considerations will also have an effect on retention decisions. The cost of transferring information to a new format and medium should be justified by the value of the information.[8]

8.4 STORAGE OF ELECTRONIC RECORDS

Records managers and archivists are concerned with storing records in the most cost-effective way. Electronic records reside on a variety of fragile media, which are

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[8] For a cost benefit analysis of retaining electronic information and re-evaluating records see sections 5.2.1 and 5.4.

subject to rapid deterioration and technological obsolescence. Timely migration to newer media and systems, according to technological developments, is essential.

Storage media are produced in a highly competitive market place where different media are introduced on a daily basis. There is now a variety of storage technologies available, including optical, magnetic, crystal-clear and digital audio-technology. There are also hybrid technologies such as magneto-optical and storage techniques such as data compression and holographic data storage. These are examined in Chapter Four. The decision as how to store data in the most cost-effective way should be based on an evaluation of these technologies and products.

Records managers and archivists are less concerned with how the records are stored or on what media than with the cost of retaining records and how their use in the future can be assured through technological migration to a format and medium which can be accessed. Traditionally, records managers have physical custody of semi-current records, as the medium and the information are inseparable. However, electronic records can be transferred to different carriers at the touch of a button and are technologically dependent. Conventional records can be stored in low cost record centres but electronic records cannot be left in dormant storage areas unattended. Their maintenance can be achieved best by the information technology unit of the organisation. Therefore, they should be retained and maintained (and transferred to new technologies when necessary) in information technology units. The records manager and the archivist should be in charge of the intellectual control of the records until they are transferred to the archives.

8.5 RESPONSIBILITIES IN MANAGING ELECTRONIC RECORDS

It is important to assign clear-cut responsibilities for all aspects of the management of electronic records. This includes defining the role of the people involved, from top management down to computer operators. The responsibilities of the top management start with the recognition of the requirements of the records management unit as a basis for formulating policies needed to deal with the challenges posed by electronic records.

Assigning responsibilities will involve careful planning to identify the tasks to be carried out and by whom. Life-cycle management[9] of information systems should be employed to cover all aspects of managing records, from system design to the final disposition of the records created by that system. All the tasks that need to be

[9] The distinction should be made between the life cycle of information system development and life cycle management of the information system. The life cycle concept has a different meaning in software engineering terminology, which primarily deals with information systems design and implementation.

undertaken should be identified and the responsibilities of people or organisational units should be assigned, so that no records are lost due to negligence.

One of the most effective ways to manage information is to group all the units involved in an organisation's information handling activities, such as those responsible for records management, external information sources and library services and information technology units, together. This will enable the organisation to use its information resources efficiently and in the most cost-effective way. It will also allow maximum co-ordination and co-operation between information specialists. This may require the reorganisation of some units and the re-definition of the roles and responsibilities of the units involved. A typical information management unit could have the following structure:

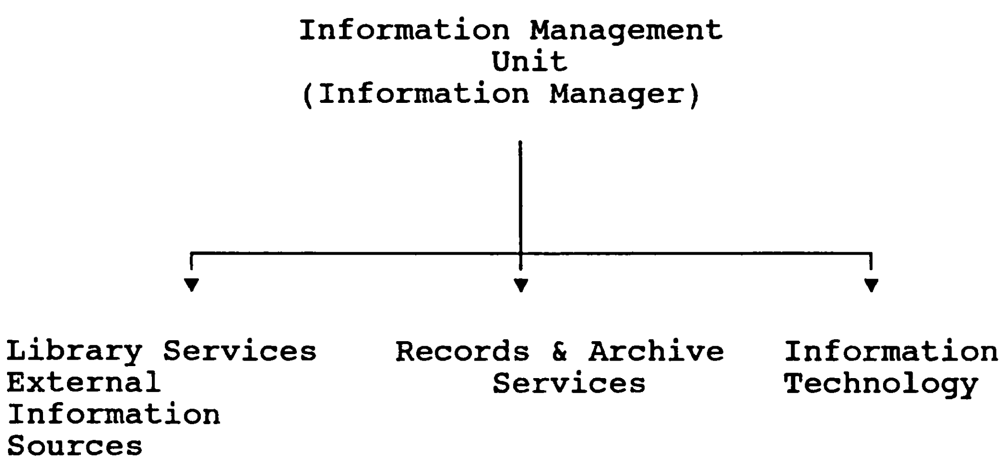

Figure 22: Information Management Unit

The information manager should take a collective approach to information sources, treating all information as a resource, regardless of its source or medium. He should:

1 co-ordinate and be aware of the activities of the research and development unit in the investigation and determination of the information needs of the organisation,

2 maintain and co-ordinate the activities of all the units in the development and implementation of information systems, automated or manual, to meet these needs,

3 maintain and keep an up-to-date inventory of all the information sources of the organisation in order to avoid unnecessary duplication of information. This inventory should include a description of each system by which the information is created and its functions,

4 co-ordinate the development of retention and disposal schedules for the cost-effective management of information sources,

5 monitor and approve the timely execution of disposal schedules through destruction, transfer to the records centre/archives or presentation to other interested institutions, such as academic institutions or tape libraries (see Chapter 7),

6 monitor the use of information in compliance with

the laws and regulations governing access to information containing personal information, dealing with confidential matters and so on,

7 monitor information systems regularly to determine their ability to meet organisational needs,

8 liaise with the units responsible for information systems and the users of these systems to develop policies, criteria, procedures and guidelines for the life-cycle management of information,

9 co-ordinate training and information management awareness programmes for users.

The responsibilities of each sub-unit within the information unit also should be clearly defined. This will ensure that the organisation's information requirements are met and avoid the duplication of information by different sub-units.

The Library Services and External Information Sources Unit[10] should be primarily engaged with the exploitation, acquisition or collection and organisation of external sources such as books, journals, press cuttings, external databases and so on, which are relevant to the business of the organisation. It should also deal with user enquiries and provide reference services.

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[10] An extensive analysis of these services is beyond the scope of this study.

The Records and Archive Services Unit should have a range of responsibilities which include:

1. preparing a records management programme which is in line with the information management policies and activities of the organisation,
2. identifying organisational activities, information creators and their information needs, and preparing plans to satisfy these needs,
3. creating an awareness of records management procedures among users,
4. preparing an effective file classification and indexing system,
5. controlling file creation, maintenance and movement,
6. coordinating the activities of registry(ies) or record-keeping units,
7. preparing and maintaining retention and disposal schedules for all information systems of the organisation at the stage of the system design,
8. identifying vital records and preparing a vital records programme,
9. making sure that all necessary precautions are taken to prevent unauthorised access to the records and to maintain the legal status of the records and organisational accountability.

Ideally, the Information Technology Unit should be placed under Information Management, although there might be socio-political implications which would prevent this. Computer specialists usually have higher grades and positions than records managers and archivists, whose contribution is yet to be recognised. If the Information Technology Unit is under a different division, then every effort should be made to maintain the maximum possible co-ordination and co-operation with the information management programme. The responsibilities of this unit should include:

1 managing the organisation's computer and telecommunication resources,
2 maintaining the organisation's computer records throughout their life-cycle,
3 investigating which of the organisation's administrative functions can be computerised,
4 taking the necessary steps for the retention and disposition of records, according to agency retention and disposal policies,
5 improving computer literacy among users and helping them in the transition to an automated office environment.

A research and development unit or committee should be formed on an ad-hoc basis comprising information technology specialists, records managers and archivists. The main duty of this unit would be to carry out research to improve the organisation's record-keeping activities. The unit or committee should address:

1. the application of data exchange and information technology standards,
2. possible technological improvements,
3. the migration of the organisation's information systems to newer systems,
4. the legal aspects of records keeping,
5. the efficient and cost-effective use, retention and disposition of information.

CHAPTER NINE: THE DISPOSITION OF ELECTRONIC RECORDS

9.1 INTRODUCTION

This chapter examines issues relating to the disposition of electronic records and the implications for the archives and the creating agency. This is the final process in the management of electronic records within the creating agency. It involves the disposition of records no longer necessary for operational purposes by means of destruction or transfer to an archive or other interested body, such as a data library.

9.2 THE DESTRUCTION OF ELECTRONIC RECORDS

The manner of destruction of electronic records depends on the storage medium. Electronic records reside on a variety of magnetic or optical media (or the combination of the two), using digital or analog recording technologies.

There are two ways of destroying electronic information. The information can be erased, provided it is stored on an erasable media. However, in some cases the storage media must be destroyed in order to destroy the information. Unerasable optical disks and WORM (Write Once

Read Many) devices are examples of this category of media.[1]

There are two approaches to destroying electronic information. A person or a unit within the organisation can be nominated to carry out the process, or the data can be automatically destroyed.

The first choice involves the application of retention schedules by the records manager with the assistance of the information technology manager. Such an arrangement will ensure that nothing is destroyed by mistake and give the records manager an opportunity to monitor what is being destroyed.

The second choice involves building a destruction mechanism into the software application. This requires scheduling all the records in the system at the system design stage and assigning them retention periods. When the retention period has expired, the records earmarked for destruction can be automatically erased by the system or transferred to the archives. Records that need to be reviewed before their ultimate disposition can be assigned a review date; when the time comes for review a decision can be made on their disposition.

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[1] A full comparative discussion of storage media can be found in the Chapter Four.

In most countries the public records act requires creating agencies to obtain approval from the national archives before destroying records. Although these acts may not explicitly address electronic records, they usually refer to "regardless of form or medium", and this phrase can be interpreted to cover electronic records. This means that the records manager has to compile a list of records to be destroyed and obtain authorization before hand. Retention schedules, which are prepared at the system design stage and at the stage of creation of the record, can be used to facilitate the automatic disposition of records.

9.3 TRANSFER OF ELECTRONIC RECORDS TO THE ARCHIVES

Records identified as having a continuing value should be transferred to the archives soon after they cease to be needed for operational purposes. Normally, the archives does not take custody of paper records until near the time that they can be opened to public inspection. Records centres, or other low cost storage areas, are often used to store semi-active records.

Electronic records cannot be subjected to the same procedures. As noted in Chapter Two electronic records can have active and semi-active copies at the same time and the only distinction between the two is determined by where they are stored.[2] They reside on a fragile and technology dependent medium which is subject to rapid deterioration and technological obsolescence. The storage of electronic records at the active and semi-active stage would be costly for the creating agency. To be able to preserve these records, the agency needs to maintain storage facilities for the back-up copies of its current records and semi-current records and to meet the environmental and technological requirements of the records.

In order to reduce the cost of retaining electronic records at the semi-active stage, the archives and the creating agency can make arrangements for preserving these records. If an archives has facilities for managing non-current electronic records, it will be able to provide facilities for semi-current records and back-up copies of records. This means that the creating agency does not have to maintain off-site storage facilities for back-up copies of its electronic records. Instead, it can make financial contributions towards the cost of maintaining these records in the archives, until they can be opened to public. This will ensure the preservation of electronic records for future use and the transfer of the records to archival custody at an early stage. It can also finance better preservation conditions in the archives.

[2] For a discussion of the life cycle concept as applied to electronic and paper records see Chapter Two.

The archives will inevitably acquire records created in a number of different and incompatible hardware and software environments. Since it cannot acquire all of these computer systems and software packages, the records need to be transferred to a standard format, according to standards which have been adopted nationally and internationally. This means that when electronic records are transferred to the archives they need to be copied onto a standard medium and then transferred into a hardware and software independent environment.[3] This can be carried out by the archives, or by a computer service bureau under the supervision of the archives, according to the hardware and software standards adopted by the archives.

When processing electronic records in this manner the archivist needs to preserve the format in which they were originally created. Otherwise evidential value of the records will be lost.

The archivist also needs to establish transfer procedures for electronic records. After a record is appraised as having archival value, the archives should approach the organisation to obtain the release of the record. A transfer agreement should be signed with the creating agency, making the archives the official custodian of the record. This should include the name and address of

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[3] For a discussion of hardware and software standards see Chapter Four, and for a detailed account of archival processing of electronic records see Chapter Ten.

the transferring body, the place to which the records are to be transferred, the file title and description, restrictions on use, reason for transfer, archives control number, conditions of the transfer (timing, transfer medium e.g. tapes and disks, etc.) and the authorised signatures of the archivist and the donor.[4]

9.4 THE PRESENTATION OF RECORDS TO OTHER AGENCIES

In some circumstances electronic records may be transferred to institutions other than national archives, for instance, university libraries, research centres, data archives, tape libraries and so on. For clarity purposes, the term "data archive" will be used to refer to these kind of institutions. Usually data archives form their collections through commercial and private acquisition. However, as in the case of the Economic and Social Research Council (ESRC) Data Archive in the U.K., an increasing number of electronic records are also acquired from government institutions. Data archives typically hold databases, statistical and survey data which have high research value but little or no evidential value.

Donors often tend to choose to deposit their data collections in data archives because of the services they provide to donors and users. The holdings generally are

[4] This is the procedure followed by the National Archives of Canada.

more easily and widely accessible via telecommunication networks to the research community and public than they would be in a national archives. Moreover, data archives tend to have a more aggressive acquisition policy than national archives as they are eager to enrich their collections.

There are a growing number of data archives throughout the world. For example, in the U.K., the Economic and Social Research Council (ESRC) Data Archive was established to collect computer readable information about British society. Most of the archive's holdings come from the commercial sector or from academic researchers. The archive has made agreements with some government departments, including the Department of Employment, the Office of Population Censuses and Survey and the Central Statistical Office to transfer data which relates mainly to censuses and surveys. The archive holds data on computer tapes in a standard format. A user can request data by mail in a specific format according to his requirements and the archive will process the data accordingly. The archive also provides facilities for direct access via the inter-university network (JANET) and the British Telecom Packet Switching System.[5]

[5] Tanenbaum, E., "The Economic and Social Research Council (ESRC) Archive: A Practice of Data Ecology", Statistical News, November 1986, No. 75.

Data archives are an alternative to national archives as suitable repositories for some types of electronic records. Electronic records which do not include sensitive or personal information can be presented to these institutions for the benefit of researchers, although this practice may have implications for the definition of public records and the responsibilities of the national archives.

CHAPTER TEN: ARCHIVAL MANAGEMENT OF ELECTRONIC RECORDS

10.1 INTRODUCTION

Once electronic records become archives they are managed according to the same fundamental principles as are conventional records, but the time scale and attention to detail must be much more precise. Conventional records, provided that environmental conditions are favourable, can last for years with little or no deterioration. In an automated environment, it is necessary to consider the information system as a whole, and the timing of the evaluation of the records created within the system is crucial. The rapid changes in the technology used, the vulnerability of the media and the difficulties involved in documenting the system at later stages necessitate the archivist's involvement at the earliest possible date.[1]

The archival management of electronic records refers to the activities that are or should be undertaken by the archives while the records are in their active and semi-active stages, as well as to the processes performed after the records are transferred to the archives. Over the last twenty five years or so, a number of archives around the world, notably those in Canada, Sweden and the United States, have been acquiring and preserving electronic

[1] Bell, L., "The Archival Implications of Machine-Readable Records", Washington, D.C. VIII International Congress on Archives, 1976.

records. Although archivists in many other countries have expressed concern about the need for the archival management of electronic records, they have faced obstacles. The main obstacles are inadequate legal jurisdiction, lack of resources and poor relationships with computer specialists.

Inadequate Legal Jurisdiction

National archives are responsible for the national heritage of their respective countries through the acquisition and safe-keeping of records. They must provide reference services to the government, researchers and the general public, all of which they serve. This applies to electronic records as well as conventional records. The Public Records Act of 1958 in the U.K., the Federal Records Act of 1976 in the United States and National Archives Act of 1987 in Canada give the archives power to deal with electronic records through the use of the common phrase "regardless of medium, form or characteristics". The archives thus have a mandate to concentrate on the information contained in the records, rather than on the medium on which information is recorded. The limitation of these laws is that records are not opened to the public for thirty years.[2] Therefore they are not usually accessioned until a few years before this time. This practice works against the early accessioning of electronic records.

[2] This may vary from one country to another.

Martin Fishbein proposes three options to solve this problem:

- the establishment of departmental tape libraries for the preservation of significant information in machine-readable form;
- the establishment of a central organisation for such preservation; or
- a change in the enabling authority to permit the archives to accept a record copy of any machine-readable file that is appraised as having permanent value.[3]

If none of these options are feasible, the archivist should get round the obstacle by informal arrangements. It is no use hiding behind red tape.

Lack of Adequate Resources

Managing electronic records is a time and money intensive commitment and it has to be a continuous process. Once records with continuing value are identified, the archivist needs to take them into custody or to make arrangements with agencies for their care until the archives can acquire them. This requires continuous liaison with creating agencies. The need for constant follow-up is illustrated by the experience of the National Archives and Records Administration (NARA) in the United

[3] Fishbein, M.H., Guidelines for Administering Machine-Readable Archives, 1980, p. 9.

States. It was found that the records of the Federal Government which were scheduled for transfer to the archives were not coming in on time. NARA could not cope with the workload, due to inadequate staffing, nor could it manage the necessary follow-up visits to departments. It then started a project called GAPS[4], which aims to control the transfer of historically valuable electronic records. With this project, NARA aims to clear the backlog and gain control over the acquisition of electronic records.

Poor Relationships Between Information Technology Managers and Archivists

Records managers and archivists often do not know what records are being created in electronic form within an organisation. Information technology managers tend to manage the electronic records, and in some cases an outside agency is responsible for the job. Relationships between the records manager and/or the archivist and the information technology manager are often poor. The poor communication between the information technology manager and the records manager/ archivist is to a large extent due to the social, psychological and political barriers between them and to their different uses of terminology.[5]

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[4] This term is not an acronym. It refers to the gap between the National Archives and electronic records.

[5] See Chapter Two.

10.2 THE CHANGING NATURE OF ELECTRONIC RECORDS

Archival programmes have been developed for appraising, scheduling, processing and preserving computer records which date back to the 1960s. However, the nature of electronic records has changed dramatically. Electronic records created in the early days of computerisation consisted of mainly statistical data and survey and census results or they were generated by special programs designed to solve specific problems at centralised computer centres, mainly on mainframe computers. As a result, large quantities of scientific, economic, demographic and operational data were created in electronic form and preserved on magnetic tapes and punch cards. Developments in micro-computer technology and in software have led to the decentralisation of data processing activities and to more computerisation. The introduction of office automation systems was a major breakthrough in office work. Electronic records are no longer simply numerical data with simple layouts, but complex structured compound documents, often consisting of text, data, graphics, images and voice.

If archival programmes are to be effective, they need to be evaluated regularly in relation to technological developments. The archival management of electronic records should take into account computer records created in the early days of computerisation, computer records today and those of the future. Thus, the archival management of electronic records should be geared towards:

- dealing with the situation as it is now, which includes managing relatively old computer records as well as current computer records,
- facilitating record management programmes to avoid further mismanagement of electronic records,
- re-defining the role of archival institutions in managing records, regardless of the medium on which they are held.

10.3 MANAGING ELECTRONIC RECORDS IN THE ARCHIVES

10.3.1 Overview

The archival management of computer records involves identification, appraisal and scheduling, acquisition, transferring data to a standard format, description, preservation and the provision of reference services. Some of these functions require the early intervention of the archives and have already been dealt with in previous chapters.

10.3.2 Identification of Records

The role of the archives in identifying potentially valuable records at the system design or creation stage has been discussed in Chapter Six. However, the use of computers in the office started long before there were archival programmes for managing electronic records. Therefore, there are many computer records which still need to be identified and evaluated for their continuing value. These are usually stored on magnetic tapes which have received little or no attention.

Archival programmes should make a distinction between the older and current computer records and those which will be created in the future. This will enable archivists to design archival programmes to manage computer records which will be created in the future in a well organised manner and at the same time to gain control of those which already exist. For the older records, they should start with a survey or inventory in order to obtain a realistic idea of what information is available in electronic form.[6] Such surveys may have several objectives. Some of them are:

- to prepare long term programmes for the management of electronic records,

[6] Hedstorm, op. cit., p. 35.

- to establish a relationship between the creators of electronic records and the archivist,

- to identify records with continuing value.

In an electronic environment, a survey is most useful if it gathers descriptive information about all the records associated with the record-keeping system, regardless of their form or characteristics. In such a survey, information is collected about all of the input documents, such as data entry forms, about electronic records themselves and about the output from the system. This will enable the archivist to assemble information about the entire record-keeping system and to understand and determine the relationships between the components of the system.[7]

The archivist also needs to consider the following points as regards the resources available to him.

- The difficulties of preserving old data files, in terms of processing and documenting them,

- The inclusion or exclusion of all record formats and storage media. For instance the programme might include statistical data but exclude word processing data, or include the data on magnetic

[7] Ibid.

tapes but exclude punchcards,

- The coverage of the types of data, such as data generated databases, office support systems and so on.[8]

The archivist can use a standard form to gather the necessary information about each data file or data set. The content of this form may vary according to the scope and the purpose of the survey. The following survey form was used in the Wisconsin Survey of Machine-Readable Public Records.

The information collected about electronic records and the computer system can also be used in appraising and documenting electronic records.

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[8] Ibid.

MACHINE-READABLE RECORDS SURVEY FORM

Part 1. File Identification

1. Custodian

2. Contact Person:
   Building:
   Phone:

3. System Title:
4. File Title:
5. Inclusive Dates:
6. Additional Contact Person: Address Phone

Part 2. File Description

7. Purpose and Use:

8. Contents:

9. Arrangement/Sort Sequence:
10. Input:

11. Output:

12. Is the File Updated? _____ No _____ Yes (If Yes, Describe):

    Update Cycle: _______ Daily _______ Weekly
    _______ Monthly _______ Other

13. Describe Any Restrictions on Access to the File:

14. Describe Documentation:

Part 3. Technical Information

15. Hardware Used:
16. Software Requirements:

17. File Structure:
18. Logical Record Length:
19. Number of Logical Records:
20. Storage Medium:
21. Physical Volume:

22. Additional Comments:

    Completed by: Date:

Attach Source Document(s), Record Layout(s), Relevant Flowchart(s)

Figure 23: Wisconsin Machine-Readable Records Survey Form

The fields of the survey form are defined as follows:

1 **Custodian (author, creator):** Legal custodian of a data file. This can be a government unit, an individual, a corporate body or the ownership can be shared.

2 **Contact Person:** The name, address and phone number of the person who provided the information about the identity and contents of the data file.

3 **System Title:** The name of the automated system or a database. This is especially useful if the organisation has more than one automated system. The title will help to keep track of related data files.

4 **File Title:** The name of the data file which distinguishes the file from other files within the system. In most cases, however, the file title is not meaningful to anybody except the person who assigned it, or it does not reflect the contents of the file. In these cases the archivist needs to assign a comprehensible name to the file and to make cross references between the actual file title and the newly assigned file title.

5 **Inclusive Dates:** When providing the inclusive dates of a file, the archivist can choose from the following:

a dates covered by the information in the data file,

b dates of the actual creation and closure of the data file,

c if the file is constantly updated, the starting date only.

6 **Additional Contact Person:** The name, address and phone number of an additional contact person.

7 **Purpose and Use:** The reason or reasons why the file was created and how it was used.

8 **Contents:** A list or summary of the data elements in the file. According to the nature of the file, the archivist may wish to include additional information.

9 **Arrangement/Sort Sequence:** Indicate whether the records are stored at random or in a sequence. Sometimes there might be more than one sort sequence.

10 **Input:** Describe the data collection methods and data entry procedures. If there is data input form, it should be attached.

11 **Output:** Include any printouts or reports (including published reports) which are produced from the file.

12 **Updates:** The archivist should indicate:

- a update procedures,
- b frequency of updates,
- c data elements which are subject to updating,
- d practices concerning whether the updated information is stored off-line or deleted.

13 **Restrictions:** If there are restrictions, the archivist should indicate:

- a restriction on access and use,
- b the source of authority,
- c the date of termination,
- d special conditions under which access is granted

or denied.

14 **Documentation:** Information about the data elements, file structure, record layout and the relations to other data files should be supplied with the data file.

15 **Hardware:** The make and model of the computer.

16 **Software Requirements:** The name and version of the computer program.

17 **File Structure:** The record type (rectangular, hierarchical, undefined, etc.) and the type of access (sequential, direct, DBMS, etc.).

18 **Logical Record Length:** The file may contain:

a a variable record length; in this case the longest record length should be given,

b a fixed record length.

19 **Number of Logical Records:** The logical records contained in the data file should be counted.

20 **Storage Medium:** The medium on which the data is stored, such as floppy disks, magnetic tape or punched cards.

21 **Physical Volume:** The number of reels, disks etc.

22 **Additional Comments:** Additional information, such as any major changes in the system or in the file, any related files, retention practices, technical errors, etc.[9]

[9] Ibid., pp. 36-41.

Identifying electronic records through surveys of this kind can help to identify what has been created in the organisation, but it cannot help to recover lost data. If the survey is carried out long after the data has been created it is unlikely to recover the documentation, without which the data file is virtually useless.

Where there is a wide range of computer records created under the control of different types of software which are vendor dependent, the archives may not be able acquire the data files, due to system dependency. The application of data exchange standards can be a great help in identifying potentially valuable records. The Information Resource Directory System (IRDS)[10], for example, provides a long-term technology independent solution to the identification of records. If an organisation maintains a standard IRDS to control descriptions of its holdings, electronic or otherwise, then the archives can gain access to these descriptions through an IRDS service interface.[11]

10.3.3 Appraisal and Scheduling

The archivist cannot wait to appraise computer records until they cease to be active. The records will not

[10] See Chapter Four for details.

[11] McDonald, J., "The Information Resource Directory System (IRDS) and the National Archives of Canada", p.5.

survive, due to the unstable technological environments in which they reside. Moreover, they may never be retired if they are updated regularly and are kept in current use all the time. The archivist needs to appraise them at early stages of their life-cycle and schedule them for transfer to the archives. Appraisal and scheduling of electronic records are discussed in detail in Chapter Seven.

Record schedules can be built into the system to facilitate the timely disposition of the records. In the case of electronic records, the automatic destruction of records with a short-term value can be achieved by using an IRDS. It can also facilitate the timely transfer of records according to the records schedules.

10.3.4 Acquisition

Acquisition involves the physical transfer of electronic records to the archives. When transferring the records it is crucial that related documentation is also transferred. Again, an IRDS can be very useful in transferring the documentation. The creating agency can maintain the documentation in a standard directory system and transfer it at the same time.

When transferring records, the archives and the creating agency sign a transfer form declaring that the archives has legal custody of the records. The National

Archives of Canada (NAC) uses a standard transfer form which sets out the details of the file and conditions attached to the transfer. The conditions of transfer vary, according to the nature of the file. For example, if the file is updated regularly, the transfer agreement may include the transfer of an annual copy of the file as a condition, enabling the archives to obtain a complete set. The archives and the creating agency keep a copy of the agreement as a legal record. The following transfer form is used by the National Archives of Canada. The conditions set out in the transfer form are specific to database systems and may vary for different types of electronic records.

AGREEMENT TO TRANSFER DATA TO THE NATIONAL ARCHIVES

TO: National Archives of Canada

FROM: Creating Agency

FILE TITLE:

DESCRIPTION:

REASON FOR TRANSFER: Historical

ACCESS RESTRICTIONS:

GOVERNMENT ARCHIVES CONTROL NUMBER:

CONDITIONS OF TRANSFER:

1. The donor agrees to maintain a copy of the data and supporting documentation until such time Government Archives Division acknowledges receipt.

2. The Government Archives Division agrees to forward an archival quality tape to the donor for the purpose of copying the data.

3. A copy of the data will be henceforth transferred by the donor to the Government Archives Division on an annual basis either at calendar year end (31 December) or at fiscal year end (31 March), whichever is operationally convenient to the donor.

4. The Government Archives Division will not be responsible for departmental reference work on the data operationally within five years.

AUTHORIZED SIGNATURES

NATIONAL ARCHIVES		DONOR	
NAME:	____________________	**NAME:**	______________
POSITION:	____________________	**POSITION:**	______________
DATE:	____________________	**DATE:**	______________

DISTRIBUTION: This copy to be retained by the donor / sent to the Government Archives Division.

10.3.5 Processing

Where data exchange standards are not employed, the archivist needs either to acquire the software and hardware used to create the information or to transfer the data to a software and hardware independent environment. The implications of acquiring data files from a range of incompatible computer systems are discussed in Chapter Four.

Unfortunately, many of the data files created within the last 25 to 30 years are likely to be software and hardware dependent, because standardisation activities have not yet produced tangible results. Since the archives cannot preserve records in a technology dependent environment, electronic records need to be processed. Processing will ensure the future use of records in a technology independent environment.

The archives should develop procedures for processing data files. The first decision that needs to be taken concerns the medium onto which the records will be transferred. Records usually come from the creating agencies on a variety of storage media, in different densities, with different labelling and so on. Despite developments in optical storage devices, magnetic tape continues to be the prime archival storage medium.

The procedures for processing electronic records will vary according to the type of data being processed and the storage medium onto which the data is being copied. Processing data files involves verifying the data against the record layout; checking errors, inconsistencies and undefined codes; and making a partial printout of the data file. The preparation of a codebook and other documentation is also a part of the processing activity. A technical analysis of optical disks and magnetic tape is provided in Chapter Four. Processing procedures for magnetic tape and optical disks are examined below.

An archives which maintains its electronic records on magnetic tape must choose a standard magnetic tape specification. The alternative specifications are:

	Magnetic tape:
Density:	556, 800, 1600, 6250 bpi
Track:	7 or 9
Parity:	Even or Odd
Internal label:	None, IBM, ANSI, Other

Figure 24: Magnetic tape specifications

It is also important to develop procedures for indicating file structures, file blocks and block sizes. The file structure shows the access method and record length. Access method indicates how the data can be accessed. This can be sequential, at random or by use of a database management system. Record length is the amount of storage space allocated for each logical record, which can be either fixed (each type of logical record is allocated an exact amount of space) or variable. File blocks show how the files are blocked, such as fixed-length blocks or variable-length records. This is especially important when processing large size files. Block size is the maximum number of characters included in a file block, i.e 20,000 or 30,000 characters.

In the case of statistical data or simple databases, the data file is transferred to the ASCII (American Standard Code for Information Interchange) or the EBCDIC (Extended Binary Coded Decimal Interchange Code) coding system. However, in the case of textual data, complex databases or graphical data, neither ASCII nor EBCDIC is sufficient to transfer the physical and logical attributes of the data. When processing this kind of data, it is likely that contextual information will be lost, unless the software used to create the data conforms to other data exchange standards such as Office Document Architecture/ Office Document Interchange Format (ODA/ODIF) or Standard Generalised Markup Language (SGML), which are capable of transferring data structure and layout (see Chapter Four).

The archives may also choose to preserve its electronic records on optical WORM disks. WORM disks are likely to be a standard storage medium in the future. There has been a number of projects to test the suitability of WORM disks for the archival preservation of electronic records and they have proved satisfactory.[12] Electronic data transferred to WORM disks in the archives need to be converted into a standard coding system, just as when records are copied onto a magnetic tape.

10.3.6 Description

Archival description of electronic records differs from the description of records in their active life, as the use and users of records are different. However the information contained in the IRDS can form the basis of archival description. The need to describe electronic records within the creating agency and the use of IRDS in describing and documenting computer records are covered in Chapter Six.

Standardised archival description has been an objective in North America and Europe, especially in the last ten years. A number of standardisation activities have been undertaken at national and international levels and the results are promising However, there is still more

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[12] Public Record Office, "Optical Disk Project Final Report", 1989.

work to be done before reaching an internationally accepted standard of describing archives.

Librarians took the first initiative in this area. The increasing amount of electronic material in libraries has resulted in the development of cataloguing rules for Machine-Readable Data Files (MRDF) as part of the second edition of the Anglo-American Cataloguing Rules (AACR2).[13] The attempts to standardise archival description have led to the development of the Machine-Readable Cataloguing Archives and Manuscripts Control (MARC AMC) format.[14] The MARC AMC Format was designed for describing paper records in electronic form.

The Bureau of Canadian Archivists (BCA) appointed a working group to investigate archival description issues.[15] The working group made a number of recommendations regarding the development of standards for archival description. With regard to electronic records, it recommended that a committee be appointed to develop standards for machine-readable archives drawing on the AACR2, Chapter Nine and Cataloguing Machine-Readable Data

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[13] Anglo-American Cataloguing Rules, 2nd Ed., 1988 Revision.

[14] Evans, M.J. and Weber, L.B., MARC for Archives and Manuscripts: a Compendium Practice, 1985.

[15] Bureau of Canadian Archivists, Towards Descriptive Standards, Report and Recommendations of the Canadian Working Group on Archival Descriptive Standards, 1985.

Files by Sue Dodd.[16] The committee also recommended participation in the activities of the International Federation of Library Associations (IFLA) in developing an International Standard for Bibliographic Description (ISBD)[17] for machine-readable files.[18] As a result of these recommendations, the BCA adopted the AACR2 and produced the Rules of Archival Description (RAD).[19] In the United States, Steven Hensen developed a standard for describing archival materials called Archives, Private Papers and Manuscripts (APPM).[20] In the U.K., the Archival Description Project led to the production of the Manual of Archival Description (MAD).[21]

In North America, standardisation activities have tended to be directed towards developing a form of description which could be included in bibliographic databases. In contrast, the aim of the work in the U.K. has been to assist archivists in developing finding aids

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[16] Dodd, S., Cataloguing Machine-Readable Data Files: an Interpretive Manual, 1982.

[17] ISBD (CF): International Standard for Bibliographic Desription: Computer Files, London: IFLA UBCIM Programme,1989.

[18] The Bureau of Canadian Archivists, op. cit., p. 69.

[19] The Bureau of Canadian Archivists, Rules for Archival Description, 1990.

[20] Hensen, S.L., Archives, Private Papers and Manuscripts: a Cataloguing Manual for Archival Repositories, Historical Societies and Manuscript Libraries, 1990.

[21] Cook, M. and Procter, M., Manual of Archival Description, 1990.

inside the repository.[22]

The International Council on Archives (ICA) has formed a commission to investigate archival description standards. The Commission has agreed to identify data elements of archival description based on the APPM, MAD2 and RAD and has developed a model showing the archival arrangement of *fonds*.[23] AACR2, MARC AMC and MAD2 are described below.

AACR2

AACR2 describes the data elements that need to be included in the bibliographic citation of a computer file and provides a standard format for arranging these elements.[24] The AACR2 rules for cataloguing computer files were interpreted in a comprehensive manual prepared by Sue Dodd.[25] She organised the descriptive data elements of computer files into six groups, according to their use in different finding aids or in management control tools. These groups are:

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[22] Cook, M., "Towards International Archival Data Exchange: Description Standards", Archivi & Computer, 1991(1), pp. 18-25.

[23] International Council on Archives, "Statement of Principles Regarding Archival Description", Report of the ICA Ad Hoc Commission on Descriptive Standards, January 1991.

[24] Anglo-American Cataloguing Rules, pp. 220-241.

[25] Dodd, op. cit.

1 identification for bibliographic control,

2 description,

3 classification by subject,

4 technical information,

5 information related to analysis and use,

6 arrangements for preservation and maintenance.[26]

Figure 25 below indicates the data elements which should be included in a bibliographic citation of computer files in AACR2 and Figure 26 shows Dodd's analysis of descriptive data elements of computer files.

[26] Ibid., p. 157.

1 Title and Statement of Responsibility Area
- parallel titles
- other title information
- statement of responsibility

2 Edition Area
- edition statement
- statement of responsibility relating to the edition
- statement relating to named revision of an edition
- statement of responsibility relating to a named revision of an edition

3 File Characteristics Area
- file characteristics

4 Publication, Distribution, etc., Area
- place of publication, distribution, etc.
- name of publisher, distributor, etc.
- statement of function of publisher, distributor, etc.
- date of publication, distribution, etc.
- place of manufacture, name of manufacturer, date of manufacture

5 Physical Description Area
- extent of item (including specific material designation)
- other physical details
- dimensions
- accompanying material

6 Series Area
- series statement

7 Note Area
- Notes

8 Standard Number and Terms of Availability Area
- standard number
- key-title
- terms of availability
- qualification

9 Supplementary Items

10 Items Made up of Several Types of Material

Figure 25: AACR2 MRDF description data elements

1. Identification

Corporate or personal author
Title, subtitle and title information
General material designation
Edition and statement of responsibility relating to edition
Production statement including place, organisation and date of production
Distribution statement including place, organisation and date of distribution
Size of file
Series statement (title and numbering)
Notes

2. Description

Unique identification number
Type of file (numeric, text, computer program, etc.)
Bibliographic citation of MRDF
Methodology (universe sampling, unit of analysis, etc.)
Geographic coverage
Time period
Dates of data collection
Summary (description of subject)
Source of data
Size of file
Documentation reference
Related publications
Restrictions
Contact Person

3. Classification

Subject classification
Index terms, descriptors or key words
Geographic headings
LC Classification Number
DDC Code
LC Geographic Classification

4. Technical Information

Mode of access
Storage medium
Memory and storage requirements
Recording density, blocking factors, etc.
Computer compatibility
Software compatibility
Peripheral requirements
Special formats or system files

5. Analysis and Use

File structure/sort sequence
Condition of data
Restrictions on use
Intended audience or level of expertise
Linkage with other files or programs
Unit of analysis
Sampling procedures
Citation and location of documentation

6. Preservation & Maintenance

Archival study number
Donor
Acquisition date
Processing date
Retention status
Restrictions
Cost for file duplication/ dissemination
Frequency of updates/additions
Holdings notes for serials or like MRDF
Processing history; changes, revisions, modifications, etc.
Documentation number or shelf location

Figure 26: Sue Dodd's analysis of AACR2 descriptive data elements of computer records.[27]

[27] Dodd, op. cit., pp. 158-159.

MARC AMC

This is one of the MARC formats developed by the Library of Congress. The first format for archives and manuscripts was developed in 1973, but it was not widely accepted by the archival community due to its limitations. The National Information Systems Task Force (NISTF) studied it and went on to develop the second MARC AMC format between 1977 and 1985. The AMC format defines the descriptive data elements of records for the exchange of bibliographic data in network systems.[28] Many university libraries and research centres in the U.S.A. use this format. For example, it is used in the network services provided by the On-line Computer Library Centre (OCLC) hosted by Ohio University as well as that used by the Research Libraries Information Network (RLIN). The RLIN was developed by the Research Libraries Group (RLG).[29] The RLIN AMC format is a combination of Hensen's APPM and MARC AMC standards.[30] Figure 27 shows the MARC AMC format descriptive data elements.

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[28] Sahli, op. cit., [n.p.].

[29] "RLIN Developments in Archive and Manuscript Records", <u>Outlook on Research Libraries</u>, 1984(6), pp. 14-15.

[30] Reed, D., "The RLIN AMC Format: an Experiment in Library Compatible Archival Data Automation", <u>Journal of the Society of Archivists</u>, 1985(7), pp. 450-455.

MARC AMC DATA FORM

(035) LOCAL CONTROL # ƀ ƀ ($a) ____________

(099) STORAGE LOCATION ƀ ƀ ($a) ____________

(100/110) MAIN ENTRY (CREATOR) ___ ƀ ($a) ____________

DATES ($d) ____________

(245) TITLE __ __ ($a) ____________

DATES ($f) ____________

(300) EXTENT ƀ ƀ ($a) ____________ ($a) ____________

(340) MEDIUM ƀ ƀ ($a) ____________

(351) ARRANGEMENT ƀ ƀ ($a) ____________

(506) RESTRICTIONS ƀ ƀ ($a) ____________

(510) REFERENCES ___ ƀ ($a) ____________

($c) ____________

(520) SUMMARY AND SCOPE NOTE ___ ƀ ($a) ____________

(524) PREFERRED CITATION ___ ƀ ($a) ____________

(540) USE/REPRODUCTION TERMS ƀ ƀ ($a) ____________

(541) ACQUISITION SOURCE ƀ ƀ

RECEIVED FROM ($a) ____________

ADDRESS ($b) ____________

STATUS ($c) ____________

DATE RECEIVED ($d) ____________

(544) ASSOCIATED MATERIALS ƀ ƀ ($d) ____________

($a) ____________

(545) BIBLIOGRAPHICAL/HISTORICAL NOTE b b ($a) ______

____

____

____

(555) FINDING AIDS NOTE ___ b ($a) ________________

____

(561) PROVENANCE b b ($3) ______________________

($b) ________________ ($a) ________________

(583) ACTIONS b b ($) ____________ ($) __________

($) ______________________ ($) __________

(584) FREQUENCY OF USE b b ($3) __________ ($b) ____

(600) SUBJECT ADDED ENTRY - PERSONAL NAME ___ 0

($a) ________________ ($a) ________________

(610) SUBJECT ADDED ENTRY - CORPORATE NAME ____ ___

($a) ________________ ($a) ________________

(650) SUBJECT ADDED ENTRY - TOPICAL ___ ___

($a) ________________ ($a) ________________

(655) FORM/GENRE b 7 ($a) ____________ ($a) ________

(700) ADDED ENTRY - PERSONAL NAME ___ ___

($a) ________________ ($a) ________________

(710) ADDED ENTRY - CORPORATE NAME ___ ___

($a) ________________ ($a) ________________

(851) LOCATION b b ($a)______________________

($b) ________________ ($c) ________________

Figure 27: MARC AMC Format[31]

[31] N. Sahli, MARC for Archives and Manuscripts, [n.p.].

MAD2

MAD2 standards for describing archival materials differ from the standards mentioned above in that they are expressed in concepts familiar to the archival community.[32] The descriptive data elements are arranged as hierarchical organisational units. Each organisational unit is represented by a level that contains management and collection information.[33] MAD2 descriptive data elements and description levels are set out in Figures 28 and 29.

[32] Cook. M., "Towards International Archival Data Exchange: Description Standards", op. cit., p. 19.

[33] Cook, M. and Procter, M., MAD User Guide: How to Set About Listing Archives. A Short Explanatory Guide to the Rules and Recommendations of the Manual of Archival Description, 1989.

ARCHIVAL DESCRIPTION SECTOR
Identity statement area*
    Reference code*
    Title*
        Term for form, type or genre
        Name element
        Simple span or bulk dates

Level number

Administrative and custodial history area
    Administrative history
    Custodial history
Content and character area
    Abstract: summarises content of the archive
    Diplomatic description: data on script, language, etc.
    Physical description: size, bulk, etc.
Access, publication and reference area
    Access, copying, copyright, use in publication, related materials, exhibition or loan.

MANAGEMENT INFORMATION SECTOR (not open to public)
Administrative control information
    Acquisition or accession data
    Location
Process control area
    Processing stages, production of reference, appraisal
    Conservation area: repair, etc.

* At least one of the elements of the identity statement must be present in any description. Otherwise all areas, sub-areas and data elements are optional

Figure 28: MAD2 data elements[34]

[34] Cook, M., "Towards International Archival Data Exchange: Description Standards", op. cit., p. 22.

0. Repository Level 1. Archive Group	Management Levels
2. Group/Collection 3. Sub-Groups 4. Possible Sub-Groups	Macro Description Levels
5. Class 6. Possible Sub-Classes	Main Control Levels
7. Item 8. Piece	Micro Description Levels

Figure 29: MAD2 Description Levels[35]

[35] Cook, M. and Procter, M., MAD User Guide, op. cit., pp. 5-16.

10.3.7 Reference Services

One of the main functions of an archives is to provide reference services to the creators of records and to the public. This is done in a number of ways. For non-electronic records, such as paper, audio-visual or microfilm/microfiche records, photographs and maps, an archives provides search room facilities where researchers can order and examine records. A basic characteristic of this service is that the archives also maintains the necessary equipment, such as microfilm readers or sound facilities to enable the user to have access to the information he requires.

Archivists perceive reference services for electronic records in different ways. There is no fully operational national archives for electronic records.

The National Archives of Canada (NAC) offers reference services by providing a copy of the data file on magnetic tape for a fee and the user must find facilities elsewhere to access the data. The machine-readable holdings of the NAC are listed in the Canadian Union List of Machine-Readable Data Files (CULDAT).[36] Upon user request, a

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[36] "A Union List of Canadian Machine Readable Data Files: Past, Present and Future", Machine Readable Archives Bulletin, Summer 1984, 2(2), pp. 1-2.

"CULDAT", Machine Readable Archives Bulletin, Spring 1986, 4(1), pp. 1-2.

magnetic tape copy of the data file is prepared, according to the user's specifications, by a service bureau. The service is provided at the user's expense, according to a set formula (see Figure 30).[37]

In the United States, the Centre for Electronic Records at the National Archives and Records Adminstration (NARA) describes its holdings in a list titled, A Partial and Preliminary List of Data-sets in the Custody of the National Archives. Again, users request a data set, provide the specifications of the magnetic tape, i.e recording density, block size, etc and pay the cost of copying (see Figure 30).[38]

In the U.K., the Public Record Office (PRO) plans to open a Computer Readable Data Archive (CRDA) to hold electronic records dating from the 1970s. However, due to limited resources and lack of skilled manpower, it has not been able to acquire many electronic records. It currently concentrates on identifying and appraising electronic records rather than on acquiring them.[39] By contrast, the

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"CULDAT Record Format", Machine Readable Archives Bulletin, Fall 1987, 5(3), pp. 1-2.

[37] Machine Readable Archives Bulletin, Winter 1984, 1(4), p. 2.

[38] Centre for Electronic Records, Reference Services, Standard letter and information sent to the users.

[39] Cox, op. cit., p.12.

Economic and Social Research Council (ESRC) Data Archive[40] has provided reference services for electronic records for twenty five years. The Data Archive maintains a magnetic tape library where data sets on a variety of subjects are preserved. Some of its holdings come from government sources. The Archive provides reference services in many ways. Users can apply to get copies of data sets and use them at their convenience, or they can access the holdings via the Joint Academic Network (JANET). Alternatively, they can request that data sets be down-loaded onto their own computers, using the Network File Transfer (NFT) services of JANET. A number of the Data Archive's large data sets are also available from the University of London Computer Centre (ULCC). The Archive has a scale of charges for its services (see Figure 30).[41]

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[40] See also 7.3.2 for details of other activities of the ESRC Data Archive.

[41] ESRC Data Archive, Notes and Forms for Enquirers and Users, [n.d.], [n.p].

	On-line	NFT	Magnetic Tape (a)
NAC	N/A	N/A	CND$ 40
NARA	N/A	N/A	US$ 90
ESRC Data Archive	Nil £20 £40 £100	Nil £20 £40 £200	Nil (b) £100 (c) £200 (d) £1000 (e)

(a) Price of one data set copied onto one magnetic tape. Documentation and postage are not included in the price
(b) Academic users and donors
(c) Charitable non-profit making organisations
(d) Non-charitable non-profit making organisations
(e) Commercial organisations

Figure 30: The cost of access to electronic records.

An archival service which is setting up a public reference programme to provide access to electronic records should consider the following points:

1 Using computer systems requires a considerable amount of knowledge and skill. Therefore, the system's user interface, whereby the researcher searches and uses electronic records, should be as simple as possible.

2 The archives should provide an in-house facility for using computer records. Often it is assumed that everybody has, or should have, access to a

computer or computer centre. It is true that the academic or commercial users do normally have access to computers. However, this is not true for everyone who wishes or needs to use computer records. Some members of the public or users coming from overseas for a short period may not have access to computers.

3 The archivist should consider the legal implications of providing access to records, particularly with regard to privacy and copyright (see Chapter Five).

CHAPTER ELEVEN: CONCLUSION

This study has examined a range of issues relating to the management of electronic records. It has considered how archival and records management programmes address these issues at present and how such programmes can continue to be improved. Organisation theory, legal and social issues and technical considerations have been investigated as a background to understanding the complex nature of electronic records and their management.

The principle conclusion supported by this is that the difficulties inherent in managing electronic records are management related rather than technology related. Records managers and archivists will be able to meet the challenges posed by electronic records only if they can learn to communicate better and be more flexible. Their roles and responsibilities and those of information technology managers and their relationships with each other need to be re-defined. They must become involved in each others' disciplines if they are to achieve effective management, not only of electronic records but of all recorded information, regardless of form or medium.

Computer-based information systems are revolutionizing the way information is created, processed, used and kept. Electronic records should be managed according to the same principles as paper records, yet they require different management techniques due to their dependency on technology and the fragile nature of the media on which they reside.

Over the last thirty years, electronic records have become more complex and compound. Sophistication in computer, telecommunications and software technology will continue to develop. Relational database systems, geographic information systems, computer assisted design and manufacturing systems, and the like are examples of the changing nature of electronic records. These systems are being used in an ever-advancing personal computing, telecommunications and networking environment. Management of these records is far more complicated than the management of those created in the 70s and 80s. A major challenge to records managers and archivists is how to cope with the ever-changing technology and to develop methods of managing electronic records in the 90s and beyond.

Many of the technical problems associated with electronic records, such as system dependency and the need to exchange data between heterogeneous systems, can be overcome by introducing data exchange standards. The Open System Interconnection (OSI) Reference Model and the Application Portability Profile (APP) provide long-term technology independent solutions to technological obsolescence. However, at present, these standards are rarely used, nor are records managers and archivists well informed about them. Thus, their benefits remain largely theoretical.

The media upon which electronic records are recorded is of great importance. The media should be suitable for archival preservation. At present, magnetic tape is preferred as the primary storage medium for long-term preservation. However, the preservation of magnetic media requires controlled environmental conditions and regular cleaning and rewinding. Optical disk systems offer secure long-term storage for electronic data. Their preservation and maintenance are easier and cheaper compared to the magnetic storage media. They also offer more stable storage conditions for electronic data. The storage capacity of optical discs is considerably higher than that of magnetic media and access time is quicker.

In the light of new technologies, which are being introduced at an ever-increasing rate, the life cycle concept must be re-evaluated. Most decisions concerning the management of electronic records should ideally be taken at the system design stage. Therefore, records managers and archivists should become involved in the design process in order to ensure the proper management of records of the future. The information technology manager has a role to play in all stages of the life cycle process, but these are yet to be defined. At the moment there are divisions between the stages from creation to disposition; these must be eradicated in relation to electronic records.

Here is yet another reason why the distinct roles assigned to records managers and archivists also should be reconsidered; electronic records require an integrated and multi-disciplinary approach.

The principle of provenance is of major significance to the arrangement and description of electronic and non-electronic records and its application should be explored in depth. When properly applied the principle of provenance will facilitate the retrieval of records and the recording of changes in the administrative histories of organisations, changes in the relationships between organisational units and inter-organisational relationships.

Records managers and archivists have tended to overlook the theory of organisation as it has developed over the last hundred years, despite the fact that their work is directly related to the structure and activities of administration. In order to be able to record and preserve the documentation generated as a result of the activities of large complex organisations, these professions must make a thorough study of the nature of modern organisations. They then can design their records management and archival programmes accordingly. The impact of information technology on the structure, business strategy and management of organisations is of major significance and must be taken into account by records managers and archivists.

The difficulties inherent in capturing information about the provenance of electronic records can be overcome by introducing relation systems - that is, "data about data". A standard Information Resource Directory System (IRDS) can be used to capture relation and evidence about the creation and use of electronic records. In addition, all of an organisation's information sources can be described and documented by an IRDS. The information held in this system can be transferred to the archives along with the records. The IRDS will provide the archivist with a complete picture of an organisation's records and its activities. This is the information needed to prepare finding aids which accurately describe organisational activities. However, the IRDS currently is not used in documenting electronic records therefore their full benefits to records management and archival profession cannot be determined. Records managers and archivists should promote the use of standard directory systems.

Since information in electronic form can always be re-configured, the concept of original record as traditionally understood is meaningless. Thus, this idea needs to be re-considered in relation to electronic records. Nevertheless, the concept can be used to establish accurate documentation of organisational activities. The relationships between electronic records and specific organisational activities can also be established by recording audit trails and user transactions in the creation and use of records.

The original order of records means the physical arrangement of records. In an electronic environment records are stored in the computer's memory at random. Although the data is recorded at random, the computer keeps track of logical relationships between records. Therefore, the concept of original order can be interpreted as the "logical order" of records or the logical relationships between records.

Computer-based information systems provide users with the means to manipulate, update and change data easily. However, these advantages also cause problems when trying to maintain authentic records upon which the organisation's accountability depends. Authenticity of records can be maintained if only a number of technical precautions are taken and are supported by a clearly defined retention policy.

The legal admissibility of electronic records varies from one country to another. Even where such records are admissible, the law tends to be concerned with the proper functioning of the computer, rather than with the computer processes that control the creation and use of electronic records. The legal framework is not yet adequate to deal with electronic records.

Another important issue in relation to computer records arises from the ease with which personal information can be created and disseminated in electronic form. Data Protection/Privacy Acts and Freedom of Information/Access to Information regulations require records managers and archivists to take precautions to protect this information by providing access (data) registers of personal and sensitive information.

The intellectual control of electronic records, as well as the control of other information resources of the organisation, can be achieved through an integrated filing system that reflects the activities of the organisation and the relationships between units within the organisation.

Electronic records need to be appraised on technical grounds. Their evidential and informational value, including financial, legal and administrative value, need to be determined through a content analysis. Appraisal criteria developed for determining the informational value of paper records can be used for electronic records. However, records managers and archivists must develop special techniques for preserving the evidential value of electronic records, as this is usually determined by the way the information is processed and by the contextual information of the record. The technical analysis of electronic records involves determining their hardware and software dependency. The records should also be re-appraised periodically as an essential part of records management and archival administration to determine their continuing value.

The importance of providing full documentation for electronic records cannot be over emphasised. System documentation, file classification and the archival description of records can be accomplished as an integrated records management/archival function. This is essential if access to the records is to be preserved. As yet there are no standards on what documentation should accompany electronic records. This is an area where further study is needed, professional bodies would be best suited to carry it out. In addition to ensuring intellectual control over information resources, records and information technology managers need to ensure the security and integrity of records. Technical and managerial precautions must be taken to monitor access to the records and to ensure their authenticity.

The archival management of electronic records requires major changes in traditional archival methods. The "thirty year rule" cannot be applied to electronic records, as they cannot survive that long unattended. Archivists should prepare long-term plans for dealing with records and re-evaluate their plans periodically in order to keep abreast of technological changes. Archival requirements must be taken into account when the computer system is designed. Due to the fact that technology changes from day to day archivists must also follow developments in data exchange standards, electronic data storage technology and relation systems and promote their implementation. They should identify potential archival records at early stages of the life cycle and follow them through until they are transferred to the archives. Records in current use need to be monitored by maintaining an inventory of potential archival material. This will enable archivists to plan for the management of these records in the future.

Archival description must be standardised to enable the bibliographic exchange of data. In order to achieve the widest possible dissemination of information archivists must follow developments in this area and adopt international standards where possible. An in-house system for disseminating information, including network file transfer, on-line services and copying facilities in the archives would help towards achieving this aim.

A well-defined approach to managing electronic records based on these lines is essential to prevent the loss of valuable information. Such information forms the basis of a nation's history. The protection of human rights is dependent on the correct management of information. What is needed is an approach which takes account of the complexities of today's technology and organisational needs. Only in this way will information created today and in the future will survive.

SELECTED BIBLIOGRAPHY

AASGAARD, D.O. [et al]. An Evaluation of Data Processing "Machine Room" Loss and Selected Recovery Strategies. University of Minnesota, Management Information Research Centre WP-79-04.

ADVISORY COMMITTEE FOR THE CO-ORDINATION OF INFORMATION SYSTEMS (ACCIS). Management of Electronic Records: Issues and Guidelines. New York: United Nations, 1990.

Anglo-American Cataloguing Rules. 2nd ed. 1988 Revision. Chicago: CLA, ALA, LA, 1988.

Archival Administration in the Electronic Information Age: A Report on Phase One of Archival Administration in the Electronic Information Age: An Advanced Institute for Government Archivists. June 4-16, 1989. Pittsburgh: University of Pittsburgh, School of Library and Information Science, 1989.

ARTLIP, Paul M. "Different Optical Disk Formats Co-exist to Provide End-user Applications Flexibility". IMC Journal, March/April 1988, pp. 13-15.

ATHERTON, Jay. "From Life Cycle to Continuum: Some Thoughts on the Records Management-Archives Relationship". Archivaria, 21 (Winter 1985-86), pp. 43-51.

BAILEY, Catherine A. "Archival Theory and Machine Readable Records: Some Problems and Issues". Unpublished master's thesis, University of British Columbia, 1988.

BEARDSHOW, John and PALFREMAN, David. The Organisation and Its Environment. Plymouth: Macdonald and Evans Ltd., 1979.

BEARMAN, David A. and LYTLE, Richard H. "The Power of the Principle of Provenance". Archivaria, 21 (Winter 1985-86), pp. 14-27.

BELL, Lionel. "The Archival Implications of Machine-Readable Records". Washington, D.C.: VIII International Conference on Archives, 1976.

BELL, Lionel and ROPER,Michael, ed. "Proceedings of an International Seminar on Automatic data Processing in Archives". London: HMSO, 1975.

BENDER, David R. "Transborder Data Flow: An Historical Review and Considerations for the Future", Special Libraries, Summer 1988, 79(3), pp. 230-235.

BEVINS, Anthony. "Major Says No to Freedom of Information". The Independent, July 5, 1991. p.1.

BRABB, G.J. Business Data Processing. Boston: Houghton Mifflin Co., 1982.

BRAIZER, Jan. "The Archivist: Scholar or Administrator". Archives and Manuscripts, May 1988, 16(1), pp. 9-14.

BRICHFORD, M.J. Archives and Manuscripts: Appraisal and Accessioning. Chicago: Society of American Archivists, 1977.

BROOKS, P.C. "Current Aspects of Records Administration: the Archivist's Concern in Records Administration". American Archivists, July 1943, 6, pp. 158-164

BROWN, David and GAVREL, Katharina. "The Appraisal of Government EDP Records". Machine Readable Archives Bulletin, Winter 1987, 4(4), pp. 1-2.

BROWN, G. "The Archivist and the Records Manager: A Record Manager's Viewpoint". Records Management Quarterly, January 1971, 5, pp. 21+

BROWN, Thomas E. "The SAA Confronts the Computer". The American Archivist, Fall 1984, 47(4), pp. 366-382.

BURCHETT, R. "Data Analysis and the LBMS Structured Development Methodology". Information Technology Training, 3, 2 May 1985.

BUREAU OF CANADIAN ARCHIVISTS. Rules for Archival Description. Ottawa, 1990.

________. Toward Descriptive Standards: Report and Recommendations of the Canadian Working Group on Archival Descriptive Standards. Ottawa, 1985.

CANADIAN STANDARDS ASSOCIATION. "Information Processing Systems - Open System Interconnection - Basic Reference Model. CAN3-Z243.100-86". Toronto, 1986.

CANNING, Bonnie. "Automated Document Management: Assessing the Need". IMC Journal, Second Quarter 1985, pp. 9-10.

________. "Optical Disk Systems: New Hub for Integrated Office Automation". IMC Journal, July/August 1988, pp. 14-15.

CATLEY, Bruce. "Data Management Standards in the Formulation of Technology Strategy". Paper presented to the Information Resource Management Association of Canada, Toronto, February 15, 1989.

________. "Information Technology Standards Relating to Office Systems". Paper presented to the Society of Canadian Office Automation Professionals, Ottawa, October 18, 1989.

CENTRAL COMPUTING AND TELECOMMUNICATION AGENCY (CCTA). Guidelines for Directing Information Systems Strategy. London: [n.d.].

________. Managing Information as a Resource. London: 1990.

________. Multi-User Office System Records Management. London: [n.d.]

________. Records Management: A Software Profile. London: 1988.

CHANDOR, Anthony A Dictionary of Computers. By A. Chandor with John Graham and Robin Williamson. Harmondsworth: Penguin Books Ltd., 1977.

"Charters That Fail Citizens". The Independent, July 5, 1991. p.20.

CHASSE, Kenneth L. "A Reply to A.F. Sheppard's Commentary on the Admissibility in Court of Computer Printouts". Archivaria, 20 (Summer 1985), pp. 158-161.

________. "The Legal Issues Concerning the Admissibility in Court of Computer Printouts and Microfilm". Archivaria, 18 (Summer 1984), pp. 166-201.

CINNAMON, Barry. "Optical Disk Applications". IMC Journal, July/August 1988, pp. 19-22.

COMMITTEE ON THE RECORDS OF GOVERNMENT. Report. Washington, D.C., 1985.

COOK, Michael. Archives Administration: A Manual for Intermediate and Smaller Organisations and Local Governments. London: Dawson, 1986.

________. Archives and the Computer. 2nd ed. London: Butterworths, 1986.

________. The Management of Information from Archives. Aldershot: Gower, 1986.

________. "Towards International Archival Data Exchange: Description Standards". Archivi & Computer, 1991(1), pp. 18-25.

COOK, Michael and PROCTER, Margaret. MAD User Guide: How to Set About Listing Archives. A Short Explanatory Guide to the Rules and Recommendations of the Manual of Archival Description. Aldershot: Gower, 1989.

________. Manual of Archival Description. 2nd Ed. Aldershot: Gower, 1990.

COOK, Terry. "From Information to Knowledge: An Intellectual Paradigm for Archives". Archivaria, 19 (Winter 1984-85), pp. 28-49.

Copyright and Designs Law: Report of the Committee to Consider the Law on Copyright and Designs. Chaired by the Honourable Mr Justice Whitford. Presented to the Parliment by the Secretary of State for Trade by Command of Her Majesty (Cmnd 6732). London: HMSO, 1980.

COX, Nicholas. "Computer-Readable Records from a Government Archivist's Point of View." In Approaches to Problems in Records Management: Computer-Generated Records. Proceedings of Seminar at University of Liverpool, Liverpool 26th September 1986. Winchester: Society of Archivists, 1987. pp. 5-22.

"Critical Comparison of Z39.50: Information Retrieval Service Definition and Protocol Specifications for Library Applications and Open System Interconnection Application Layer Standards". ISO, Preliminary Draft Copy. [n.d.].

CURTIS, Graham. Business Information Systems: Analysis, Design and Practice. Wokingham: Addison-Wesley, 1989.

DALE, Ernest. Management: Theory and Practice. 2nd ed. New York: McGraw-Hill, 1969.

DAUM, Patricia B. "Records Management and Human Nature". Records Management Quarterly, October 1988, 22(4), pp. 29-37, 49.

DAVIS, Gordon B. and OLSON, Margrethe H. Management Information Systems: Conceptual Foundations, Structure and Development. 2nd ed. New York: McGraw-Hill, 1985.

DEITEL, Harvey M. An Introduction to Operating Systems. 2nd ed. Reading, Mass.: Addison-Wesley, 1990.

Dictionary of Computing. 3rd ed. Oxford: Oxford University Press, 1990.

DODD, Sue. A. Cataloguing Machine-Readable Data Files: An Interpretive Manual. Chicago: American Library Assocation, 1982.

DOLLAR, Charles M. "Appraising Machine-Readable Records." In A Modern Archives Reader: Basic Readings on Archival Theory and Practice. Edited by Maygene F. Daniels and Timothy Walch. Washington, D.C.: National Archives and Records Service, 1984. pp. 71-79.

________. Electronic-records Management and Archives in International Organisations: A RAMP Study With Guidelines. RAMP Report (PGI-86/WS/12). Paris: Unesco, 1986.

________. "The Impact of Information Technologies on Archival Principles and Practices: Some Considerations". Draft version 12.0. Washington, D.C.: September 27, 1990.

DOLLAR, Charles M. and WEIR, Jr., Thomas E. "Archives Administration, Records Management and Computer Data Exchange Standards: An Intersection of Practice". Unpublished Report. Washington, D.C.: National Archives and Records Administration, 1988.

DUCES, Brigitte. Information Activities of the World Bank. Paper presented at the Annual Meeting of the International Federation of Library Associations and Institutions, Paris, August 24, 1989.

DUCHEIN, Michel. "The Principle of Provenance in Archives Administration." In Modern Archives Administration and Records Management: A RAMP Reader. Compiled by Peter Walne with the assistance of a working group of International Council on Archives. Paris: UNESCO, 1985. pp. 85-110.

Electronic Records Issues: A Report to the Commission. Commission Reports and Papers No.4. Washington, D.C.: National Historical Publications and Records Commission, 1990.

EMMERSON, Peter. "Computer-Generated Records: Some Legal Aspects." In Approaches to Problems in Records Management: Computer-Generated Records. Proceedings of Seminar at University of Liverpool, Liverpool 26th September 1986. Winchester: Society of Archivists, 1987. pp. 32-40.

________. "The Baby and the Bath Water: Managing Records and Information in the Light of Electronic Systems Development". International Records Management Journal, First Quarter 1990, 6(1), pp. 5-12.

ERMANN, David M., Williams, Mary B. and Gutierrez, Claudio, eds. Computers, Ethics, and Society. New York: Oxford University Press, 1990.

EVANS, Frank B. "Archivists and Records Managers: Variations on a Theme." In A Modern Archives Reader: Basic Readings on Archival Theory and Practice. Edited by Maygene F. Daniels and Timothy Walch. Washington, D.C.: National Archives and Records Service, 1984. pp. 25-37.

EVANS, Max J. and WEBER, Lisa B. MARC for Archives and Manuscripts: A Compendium of Practice. Madison: The Historical Society of Wisconsin, 1985.

FARHOOMAND, A.F. and MURFY, M. "Managing Computer Security". Datamation, January 1, 1989, pp. 67-68.

FINNEGAN, Ruth, SALAMAN, Graeme and THOMPSON, Kenneth, eds. Information Technology: Social Issues, A Reader. Sevenoaks, Kent: Hodder and Stoughton in assocation with the Open University, 1990.

FISHBEIN, Meyer H. Guidelines for Administering Machine-Readable Archives. Washington, D.C.: Committee on Automation, International Council on Archives, November 1980.

FRANK, John W. "Micrographics and Optical Disk: Friends or Foes?" IMC Journal, July/August 1988, pp. 7-9.

GANGON-ARGUIN, Louise. An Introduction to Authority Control for Archives. Ottawa: Bureau of Canadian Archivists, Planning Committee on Descriptive Standards, 1989.

GAVREL, Katharine. Conceptual Problems Posed by Electronic Records: A RAMP Study. Paris: Unesco, 1990.

GAVREL, Sue. "CULDAT: Canadian Union List of Machine-Readable Data Files". Machine Readable Archives Bulletin, Winter 1985, 2(4), pp. 1-2.

________. "EDP Records Scheduling Program". Machine Readable Archives Bulletin, Summer 1985, 3(2), pp. 1-2.

GEDA, Carolyn L. [et. al], eds. Archivists and Machine-Readable Records. Chicago: Society of American Archivists, 1980.

GILLIE, Oliver. "The Cloak of Secrecy That Restricts Freedom". The Independent, July 5, 1991. p.21.

GRACY, David B. Archives and Manuscripts: Arrangement and Description. Basic Manual Series. Chicago: Society of American Archivists, 1977.

GRAHAM, John. The Penguin Dictionary of Telecommunications. Harmondsworth: Penguin Books Ltd., 1983.

GRAHAM, N. The Mind Tool. St. Pauls, Minnesota: West Publishing Company, 1989.

GREEN, Adam. The Development of Policies and Plans in Archival Automation: A RAMP Study with Guidelines. Paris: Unesco, 1991.

GRIGSBY, Mason. "The Integration and Use of Write-Once Optical Information Systems". IMC Journal, July/August 1987, pp. 9-13.

GRIMM, Vanessa J. "President's Electronic Records Should Be 'Official' Groups Say". Government Computer News, August 21, 1989.

HAAS, Joan K., SAMUELS, Helen W. and SIMMONS, Barbara T. Appraising the Records of Modern Science and Technology: A Guide. [Cambridge, Mass.]: Massachusetts Institute of Technology, 1985.

HAMILTON, Peter. Computer Security. London: Associated Business Programmnes Ltd., 1972.

HAMMITT, J.J. "Government Archives and Records Management". American Archivist, April 1965, 28(2), pp. 219-222.

HANDY, Charles B. Understanding Organisations. Middlesex: Penguin Books Ltd., 1987.

HAWORTH, Kent M. "Standardizing Archival Description in Canada". Archivi & Computer, 1991(1), pp. 13-17.

HEDSTORM, Margaret L. Archives and Manuscripts: Machine-Readable Records. S.A.A Basic Manual Series. Chicago: Society of American Archivists, 1984.

HENSEN, Steven L. Archives, Private Papers and Manuscripts: a Cataloguing Manual for Archival Repositories, Historical Societies and Manuscript Libraries. 2nd ed. Chicago: Society of American Archivists, 1990.

HICKERSON, H. Thomas. Archives and Manuscripts: An Introduction to Automated Access. Chicago: Society of American Archivists, 1981.

HOLLINGDALE, S.H. and TOOTHIL, G.C. Electronic Computers. Harmondsworth: Penguin Books Ltd., 1965.

HOPKINS, Mark. "Admissibility: A Review and Update". Archivaria, 20 (Summer 1985), pp. 162-165.

HOSKINS, Tony. The Electronic Office. London: Pitman Publishing, 1986.

"How Computers Remake the Manager's Job". Business Week, April 25, 1983. pp. 68-70.

HOWE, Lindsay. "The Use of Optical Disc for Archival Image Storage". Archives and Manuscripts, May 1990, 18(1), pp. 89-118.

HULL, Felix. The Use of Sampling Techniques in the Retention of Records: RAMP Study with Guidelines. Paris: Unesco, 1981.

"Information Resource Dictionary System (IRDS) Framework". Revision 8. ISO/IEC SC21/WG3/N1010: November 14, 1989.

INTERNATIONAL COUNCIL ON ARCHIVES. "Statement of Principles Regarding Archival Description". Archivi & Computer, 1991(1), pp. 8-12.

JENKINSON, Sir Hilary A Manual of Archive Administration. London: Percy Lund, Humphries and Co. Ltd., 1966.

JIMERSON, Randall C. "Redifining Archival Identity: Meeting User Needs in the Information Society". American Archivist, Summer 1989, 52(3), pp. 332-340.

JONES, Bernard. "Data Storage on Optical Disks: A CCTA Experience." In Approaches to Problems in Records Management: Computer-Generated Records. Proceedings of Seminar at University of Liverpool, Liverpool 26th September 1986. Winchester: Society of Archivists, 1987. pp. 40-47.

KESNER, Richard M. Automation for Archivists and Records Managers: Planning and Implementation Strategies. Chicago: American Library Association, 1984.

________. Information Management, Machine Readable Records and Administration: An Annotated Bibliography. Chicago: Society of American Archivists, 1983.

________. Information Systems: A Strategic Approach to Planning and Implementation. Chicago: American Library Association, 1988.

KIS, Halyna V. "Three Year Plan for the Management of Machine-Readable Data in Manuscripts Division: [A Report prepared for the National Archives of Canada]". February 1989.

KNOPPERS, Jake V.Th. "From Records Management to Information Management in the Light of New Technologies". Paper presented as the keynote address at the Second Annual Government Seminar, June 8, 1988. London: 1988.

KOONTZ, Harold, O'DONNELL, Cyril and WEIHRICH, Heinz. Essentials of Management. 3rd ed. New York: McGraw-Hill, 1982.

LANGEMO, Mark. "An Introduction to Information Resource Management". Records Management Quarterly, October 1988, 22(4), pp. 20-28, 41.

LUCEY, T. Management Information Systems. Eastleigh: DP Publications Ltd., 1987.

LUTZKER, Michael A. "Max Weber and the Analysis of Bureaucratic Organisation: Notes Toward a Theory of Appraisal". American Archivist, Spring 1982, 45, pp. 119-130.

LYNCH, Clifford A. "Optical Storage Media, Standards and Technology Life-Cycle Management". Records Management Quarterly, January 1986, 20(1), pp. 44-52.

LYTLE, Richard H. "Intellectual Access to Archives: I. Provenance and Content Indexing Methods of Subject Retrieval". American Archivist, 43 (Winter 1980), pp. 64-75.

________. "Intellectual Access to Archives: II. Report of an Experiment Comparing Provenance and Content Indexing Methods of Subject Retrieval". American Archivist, 43 (Spring 1980), pp. 191-207.

MANDELL, S.L. Computers, Data Processing and the Law. St. Pauls, Minnesota: West Publishing Co., 1984.

MARKOFF, John. "Computers Challenge Freedom of Information Act". The New York Times, June 18, 1989.

McDONALD, John. "An Approach to the Identification and Scheduling of EDP Data". ADPA, 1985, 5(1), pp. 51-67.

________. "Building the "Front End" to a Machine Readable Archives Programme: the Experience of the National Archives of Canada". Draft paper. November 1989.

________. "Data and Document Interchange Standards: A View from the National Archives of Canada". Paper Presented to the Society of American Archivists, New York, N.Y., October 1987.

________. "Records Management and Data Management: Closing the Gap". Records Management Journal, Spring 1989, 1(1), pp. 4-11.

________. "The Information Resource Directory System (IRDS) and the National Archives of Canada". Paper Presented to the Society of American Archivists, St. Louis, Missuri, October 1989.

________. "The National Archives of Canada and Office Systems: A Status Report". November 1989.

McGREGOR, D. The Human Side of Enterprise. New York: McGraw-Hill, 1960.

MEADOWS, A.J. [et al]. Dictionary of Computing and Information Technology. 3rd ed. London: Kogan Page Ltd., 1987.

MINKLER, Whitney S. "An Objective Overview of Digital Imaging (Optical Disk) Systems Procurements". Records Management Quarterly, October 1988, 22(4), pp. 3-7.

MORDDEL, Anne. Justifying the Automation of Records Management. London: Information Made Easy, 1988.

MYERS, K.N. "Avoiding a Crisis". Datamation, February 1, 1986, pp. 81-82+.

NATIONAL ACADEMY OF PUBLIC ADMINISTRATION. "The Effects of Electronic Recordkeeping on the Historical Record of the U.S. Government: A Report for the National Archives and Records Administration". January 1989.

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA). "A Federal Records Management Glossary". Unpublished. Washington, D.C., 1989.

________. "Electronic Records Management". Draft Final Rule [n.d.]

________. Managing Electronic Records. Washington, D.C., 1990.

NATIONAL ARCHIVES OF CANADA, GOVERNMENT RECORDS BRANCH. "FOREMOST: Formal Records Management for Office Systems Technology: Draft Functional Requirements Definition". Ottawa: 1989.

NATIONAL ASSOCIATION OF GOVERNMENT ARCHIVES AND RECORDS ADMINISTRATORS. "A New Age: Electronic Information Systems, State Governments and the Preservation of the Archival Record". Draft version. December 1990.

NATIONAL HISTORICAL PUBLICATIONS AND RECORDS COMMISSION. Electronic Records Issues: A Report to the Commission. Commission Reports and Papers No.4. March 1990.

NAUGLER, Harold. The Appraisal of Machine-Readable Records: A RAMP Study with Guidelines. RAMP Report (PGI-84/WS/27). Paris: Unesco, 1984.

NEW YORK STATE FORUM FOR INFORMATION RESOURCE MANAGEMENT. "Information Policy Briefing Paper". [n.d.]

NEWTON, Carl. "Records Management: A Strategic Approach to Information Systems". International Records Management Journal, April 1988, 4(2), pp. 7-15.

________. "Strategic Information Management". Records

Management Journal, Winter 1989, 1(4), pp. 155-161.

ORILIA, Lawrence S. Introduction to Business Data Processing. 2nd ed. New York: McGraw-Hill, 1982.

PARKIN, Andrew. System Analysis. 2nd ed. London: Edward Arnold, 1991.

PEDERSON, Ann, Editor-in-Chief Keeping Archives. Sydney: Australian Society of Archives Incorporated, 1987.

PETERS, Thomas J. and WATERMAN, Jr., Robert H. In Search of Execellence: Lessons from America's Best-Run Companies. New York: Harper & Row, 1980.

PETERSON, Trudy H. "Archival Principles and Records of New Technology". The American Archivist, Fall 1984, 47(4), pp. 383-393.

PRESSMAN, Roger S. Software Engineering: A Practitioner's Approach. New York: McGraw-Hill, 1982.

PRITCHARD, John A.T. "Document Image Processing Systems: Where They Are and Where They Are Going". Records Management Journal, Autumn 1990, 2(3), pp. 81-86.

________. Introducing Electronic Archiving. Manchester: National Computing Centre Ltd., 1985.

"Proceedings of a Conference on the Management of Governmemt Information Holdings (MGIH)". [Ottawa], December 11, 1989.

PROTOCOLS STANDARDS AND COMMUNICATION INC. "The Application of ODA/ODIF Standards". Prepared for the National Archives of Canada. Unpublished. Ottawa: 1988.

________. "Application Portability". Prepared for the National Archives of Canada. Unpublished. Ottawa: 1989.

________. "Situation Report on the Information Resource Dictionary System (IRDS)". Prepared for the National Archives of Canada. Unpublished. Ottawa: 1989.

PUBLIC ARCHIVES OF CANADA. "Second Interim Report of the PAC/DOC Information Management Working Group". Prepared by John McDonald with the assistence of the PAC/DOC Information Management Working Group. Draft copy. Ottowa: 1985.

PUBLIC RECORD OFFICE. "Public Record Office Optical Disk Project". Final Report. January 1989.

PUGH, D.S. [et al]. "A Conceptual Scheme for Organisational Analysis". Administrative Science Quarterly 1963, 8, pp. 299-315.

RAPPORT, Leonard. "No Grandfather Clause: Re-appraising Accessioned Records". In A Modern Archives Reader: Basic Readings on Archival Theory and Practice. Edited by Maygene F. Daniels and Timothy Walch. Washington, D.C.: National Archives and Records Service, 1984. pp. 80-90.

REED, D. "The RLIN AMC Format: an Experiment in Library Compatible Archival Data Automation". Journal of the Society of Archivists, 1985(7), pp. 450-455.

"Reference Model for Data Management". Draft paper. ISO-IEC/JTC1/SC21/WG3/N1007. November 1989.

RICKS, Betty R. and GOW, Kay F. Information Resource Management: A Record System Approach. Cincinnati, Ohio: South-Western Publishing Co., 1988.

ROBERTS, David. "The Disposal and Appraisal of Machine-Readable Records: From the Literature". Archives and Manuscripts, May 1985, 13(1), pp. 30-38.

ROBERTS, David. "The Disposal of Electronic Records in Electronic Office Automation Systems of the Australian Public Service". Archives and Manuscripts, November 1989, 17(2), pp. 219-231.

ROBERTS, John W. "Archival Theory: Much Ado About Shelving". American Archivist, Winter 1987, 50(1), pp. 66-74.

SAFFADY, William. Optical Disks vs. Micrographics: as Document Storage and Retrieval Technologies. London: Meckler, 1988.

________.Optical Disks vs. Magnetic Storage. London: Meckler, 1990.

SAHLI, Nancy. MARC for Archives and Manuscripts: The AMC Format. Chicago: The Society of American Archivists, 1985.

SAUNDERS, Wendy. "Information Holdings - the Environment Canada Approach". Paper presented to the Treasury Board Office Systems Standards Working Group, Ottawa, February 20, 1990.

SCHELLENBERG, Theodore R. "The Appraisal of Modern Public Records." In A Modern Archives Reader: Basic Readings on Archival Theory and Practice. Edited by Maygene F. Daniels and Timothy Walch. Washington, D.C.: National Archives and Records Service, 1984. pp. 57-70.

________. The Management of Archives. Foreword by Jane F. Smith. Reprint. Orginally Published New York: Columbia University Press, 1965.

SCHILLER, I.P. "The Archival Profession in Eclipse". The American Archivist, July 1948, 11, pp. 227-233

SHEPPARD, A.F. "Records and Archives in Court". Archivaria, 19 (Winter 1984-85), pp. 196-203.

SHIFF, R.A. "The Archivist's Role in Records Management". The American Archivist, April 1956, 19, pp. 111-120.

"Shrinking of Middle Management". Business Week, April 25, 1983. pp. 54-56+.

SMITH, J.C. "The Admissibility of Statements by Computer". Criminal Law Review, 1981, pp. 387-391.

STAMPS, D. "Disaster Recovery Planning: Who's Worried?" Datamation, February 1, 1987, pp. 60-64.

STATE ARCHIVES AND RECORDS ADMINISTRATION. Establishing an Agency Records Management Program. New York, 1990.

________. Introduction to Optical Disk. New York, 1990.

________. Managing Records in Automated Office Systems. New York, 1990.

TANENBAUM, Eric. "The Economic and Social Research Council (ESRC) Archive: A Practice of Data Ecology". Statistical News, November 1986, No.75.

TAPPER, G.D. "Optical Disks: Standards". IMC Journal, July/August 1988, pp. 41-42.

TAYLOR, Hugh. "Information Ecology and the Archives of the 1980s". Archivaria, 18 (Summer 1984), pp. 25-37.

TAYLOR, Marcia F. "Locating, Appraising and acquiring Computer Records: A View from Experience." In Approaches to Problems in Records Management: Computer-Generated Records. Proceedings of Seminar at University of Liverpool, Liverpool 26th September 1986 Winchester: Society of Archivists, 1987. pp. 22-32.

TRAVIS, Irene L. Document Management Technology Arthitecture. ITF Staff Paper No.3. Washington, D.C.: World Bank, Information, Technology and Facilities Department, 1989.

TREASURY BOARD OF CANADA. ADMINSTRATIVE POLICY BRANCH. "Canadian Open Systems Application Criteria (COSAC): Overview". Draft version release 1.2. Ottawa: June 1989.

________. "Database Language SQL". TBITS-2. Unpublished. Ottawa, February 1989.

________. "Open System Interconnection - Basic Reference Model". TBITS-1. Unpublished. Ottawa, June 1988.

________. "Management of Government Information Holdings". Unpublished. October 1989.

TREASURY BOARD OF CANADA. INFORMANTION MANAGEMENT DIVISION. "Information Management Policy Overview: Strategic Direction in Information Technology Management in the Government of Canada". Unpublished. Ottawa: 1987.

UNITED NATIONS CENTRE FOR TRANSNATIONAL CORPORATIONS. Transnational Corporations and Transborder Data Flows: a Technical Paper. New York: 1982.

U.S. DEPARTMENT OF COMMERCE. NATIONAL BUREAU OF STANDARDS. Guidance on Requirements Analysis for Office Automation Systems. NBS Special publication 500-147. Prepared by Lynne S. Rosenthal [et al]. Gaithersburg, MD, 1987.

U.S. GENERAL SERVICES ADMINISTRATION. Electronic Recordkeeping. Washington, D.C.: 1989.

WALNE, Peter, ed. Dictionary of Archival Terminology. ICA Handbooks Series Volume 3. München: K.G. Saur, 1984.

WALTER, Gerry. "An Overview: Technology and Application Status of Optical Disk Systems". IMC Journal, July/ August 1988, pp. 10-13.

WEBER, Max. "Essentials of Bureaucratic Organisation: An Ideal Type Construction". In Reader in Bureaucracy. Edited by R.K. Merton. Glencoe, Illinois: The Free Press, 1952.

WILLIAMS, Bernard. "Optical Disks at the Public Record Office". Information Media & Technology, 20(5), pp. 204-205.

WOOD-HARPER, A.T., ANTILL, Lyn and AVISON, D.E. Information Systems Definition: the Multiview Approach. Oxford: Blackwell Scientific Publications, 1985.

WORLD BANK. INFORMATION SERVICES DIVISION. "Integrated Records and Archives Management System: System Requirements". November 1989.

_______. "Records Appraisal Standards Project: Guidelines for Appraising World Bank Group Records". A report of a special project undertaken in the World Bank, Information Technology and Facilities Department, Information Services Division, September 1989.

YEN, David (Chi Chung) and TANG, Hung-Lian. "Future Trends of Computer-Based Information Systems". Records Management Quarterly, October 1988, 22(4), pp. 12-18, 41.

<u>**LIST OF INTERVIEWS**</u>

8.3.1989	WISHART, L. (Chief Librarian, Information and Library Services, Home Office, London). <u>Records management programme at Home Office</u>.
16.3.1989	HEYHOE, R. (Head of O&M and Forms, Department of Trade and Industry (DTI), London). <u>Records management programme at DTI</u>. <u>Electronic records at DTI and their management</u>.
4.10.1989	EMMERSON, P. (Chief Archivist, Barclays Bank Plc., London). <u>Overview of electronic records programme at Barclays Bank.</u> <u>Legal aspects of electronic records.</u>
6.11.1989	SIMPSON, H.M. (Information Manager, BP Oil U.K. Ltd., Hemel Hempstead). <u>Activities of the Information Management Unit.</u> <u>Relationships between the Information Technology Unit and the Records and Archive Services.</u>
30.11.1989	TAYLOR, M. Assistant Director, ESRC Data Archive, Essex). <u>An overview of the activities of the Data Archive.</u>
_____	ROUGHLEY, E. (Assistant Director, ESRC Data Archive, Essex). <u>Processing statistical and survey data.</u> <u>Reference services of the Data Archive.</u>
7.12.1989	WILKINSON, M. (Archivist, PRO, London). <u>Computer readable data archive programme.</u>
_____	STURM, P. (IT Unit, PRO, London). <u>Optical Disk Project.</u>

21.2.1990	NAUGLER, H. (Assistant Director General, Historical Resources Branch, National Archives of Canada (NAC), Ottawa). <u>Overview of the electronic records programme in the Historical Resources Branch.</u>
———	McDONALD, J. (Director, Information Management Standards and Practices Division, NAC, Ottawa). <u>Overview of the Government Records Branch's roles and responsibilities in the management of electronic records.</u>
22.2.1990	SAUNDERS, W. (Chief, Information Holdings Management Branch, Environment Canada, Ottawa). <u>Records management in Environment Canada and Automated Records Management System (ARMS).</u>
———	DESAUTELS, C. (Office Systems Specialist, Information Management Standards and Practices Division, NAC, Ottawa). <u>Demostration and discussion of IMOSA (Information Management and Office System Assessment).</u>
23.2.1990	HUTTON, M. (Director, Records and Information Management Division, External Affairs and International Trade, Ottawa). <u>Demostration and discussion of COSICS (Canadian On-Line Secure Information Control Systems).</u>
———	DENAULT, R. (Acting Director, Information Assets Management, Transport Canada, Ottawa). <u>Automated records management system in Transport Canada</u>.
26.2.1990	GAVREL, S. (Special Projects Officer, Treasury Board, Ottawa). <u>Overview of the International Standards Organisation and its committees.</u> <u>The importance of information technology from an archival perspective.</u> <u>Information technology standards of specific</u>

interest.

——— FROST, E. (Director, Government Archives Division (GAD), NAC, Ottawa).

Introduction to GAD; relationship to other areas of the National Archives with respect to electronic records.

The changing nature of records.

26.2.1990 BAILEY, C. (Archivist, GAD, NAC, Ottawa).

Evolution of electronic archival programmes in concepts and working reailty from the 1970s to the 1990s.

Managing electronic records: data catagories and priorities.

27.2.1990 LOEWEN, C. (Archivist, GAD, NAC, Ottawa).

Appraisal of electronic records in general and the appraisal of NATES (National Analysis of Trends in Emergencies System) as an example.

——— LOVERING, C. and GIBEAULT, M. (Archivists, GAD, NAC, Ottawa).

Describing Machine Readable Data Files (MRDF).

Levels of description.

——— BROWN, R. (Archivist, GAD, NAC, Ottawa).

General acquisition aims.

Electronic records holdings of Transport Canada and their archival value.

Case study: the acquisition of aviation registration data.

——— MARSDEN, P., VINCENT, C. and TAYLOR-MUNRO, D. (Archivists, GAD, NAC, Ottawa).

Trade Negotiation Office (TNO) Project - records holdings in a modern office.

Managing electronic and paper mix systems.

Unstructured systems for records control and their implications.

Archival value of electronic records.

Technical considerations of electronic records.

Implications of electronic records for the National Archives.

28.2.1990 TAYLOR-MUNRO, D., BILLINGS, B. and SCHNARR, R. (Archivists, GAD, NAC, Ottawa).

Archival control of electronic records.

Technical aspects of dealing with electronic records.

Information technology standards.

1.3.1990 KIDD, B. (Director, Cartographic and Architectural Archives Division (CAAD), Historical Resources Branch, NAC, Ottawa).

Demonstration and discussion of Video Disc Project.

——— BROWN, D. (Archivist, CAAD, NAC, Ottawa).

An overview of geomatics programme within CAAD.

——— KIS, H. (Programme Manager, Manuscripts Division, Historical Resources Branch, NAC, Ottawa).

Machine Readable Archival Integration Programme in the Manuscripts Division.

2.3.1990 BLAIS, R. (Chief, EDP Records Preservation Section, Moving Image, Data and Audio Conservation Division, Conservation Branch, NAC, Ottawa).

Overview of the conservation aspects of EDP records preservation.

——— CARMAN, N. (Archivist, EDP Records Preservation Section, Moving Image, Data and Audio Conservation Division, Conservation Branch, NAC, Ottawa).

Shipping, receiving and registration of archival EDP records.

Evaluation, cleaning and precision rewinding of magnetic tape.

Processing of archival EDP records.

Optical disk as a new storage technology.

Control of EDP records in a database management system.

Demostration and discussion of MINISIS Database Tracking System.

5.3.1990 BROWN, T.E. (Cheif, Archival Services Branch, Centre for Electronic Records, National Archives and Records Administration (NARA), Washington, D.C.)

Overview of the activities of the Centre for Electronic Records.

Appraisal of electronic records.

—— EATON, F. (Acting Chief, Technical Services Branch, Centre for Electronic Records, NARA, Washington, D.C.)

Preservation activities of Technical Services Branch.

—— PALMER, B.A. and HARRISON, D.F. (Archivists, Centre for Electronic Records, NARA, Washington, D.C.)

GAPS Project.

—— PALMER, P.D. (Archivist, Archival Services Branch, Centre for Electronic Records, NARA, Washington, D.C.)

Evaluating government agencies and their records services.

—— McGOVERN, N. (Archivist, Archival Services Branch, Centre for Electronic Records, NARA, Washington, D.C.)

Archival processing of electronic records.

—— HERSCHLER, D. (Archivist, Office of the Historian, U.S. Department of State, Washington, D.C.)

Electronic records in the Department of State.

—— ADAMS, M. (Archives Specialist, Archival Services Branch, Centre for Electronic Records, NARA, Washington, D.C.)

Reference services.

18.9.1991 CHAPMAN, G. Ll. (Vice Judge Advocate General, London)

Admissibility of computer records.