

**GUIDE FOR MANAGING ELECTRONIC RECORDS
FROM AN ARCHIVAL PERSPECTIVE**

COMMITTEE ON ELECTRONIC RECORDS

FEBRUARY 1997

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Preface

This is one of a series of products that has been prepared by the ICA Committee on Electronic Records. The mandate of the Committee, which was established in 1993, is to undertake study and research, promote the exchange of experience and draft standards and directives concerning the creation and archival processing of electronic records. The three products are as follows:

Guide for Managing Electronic Records from an Archival Perspective. The Guide is designed to help archival institutions reposition themselves to address the management of archival electronic records. Part I begins with an overview of the technological, organizational and legal trends that are having an impact on the ability of organizations, including archives, to keep and manage records that are in electronic form. It continues with a discussion of key concepts such as “record” and “record keeping” describing how these are impacted upon in the electronic environment, and then proposes strategies for accomplishing the life-cycle management of electronic records. Part I concludes by describing - from the legal, organizational, human resources and technological perspectives - the implications for archives of repositioning themselves to manage archival electronic records. Over time, implementing the proposed strategies will require the crafting of tactics, including standards, which can be recommended for adoption by archives. Part II of the Guide represents a first attempt by Committee members to articulate such a tactical approach. It is anticipated that the contents of Part II will be expanded over time, and that it will form the basis for the development of a series of recommendations to guide archives at the “how to” level.

Electronic Records Programs: Report on the 1994/95 Survey. The purpose of the survey, which was generously supported by the Centre des Archives contemporaines [*Les Archives nationales de France*] and the National Archives of Singapore, was to compile a directory of those archival institutions that have established or are planning to establish a program to manage electronic records. The directory is intended to facilitate information sharing and to highlight problem areas that the Committee should address. It is also intended to serve as a baseline upon which progress in establishing electronic records programs at the international level can be assessed through time. As well as a report on the findings of the survey, the product contains detailed tables describing information on the organizational and legal frameworks for electronic records programs, their program structures, and their technical specifications, information holdings, and access provisions.

Electronic Records: Literature Review. Based on an exhaustive review of the international literature on electronic records, Alf Erlandsson of the International Monetary Fund produced for the use of the Committee a substantial document that provided an excellent overview of the evolution that has taken place in the concepts and strategies related to the management of electronic records from an archival perspective. The Committee concluded that because the literature review could help archivists understand the broad context within which strategies such as those discussed in the Committee's draft Guide have been placed, it should be made available more broadly. It is hoped that the literature review will provide an important tool for use in education and training programs that focus on electronic records. The literature review will be updated periodically.

All three products are available from the Chair of the Electronic Records Committee (see address below) in both electronic (WordPerfect 5.2, or ASCII) and hard copy form or by accessing the ICA web site at <http://www.archives.ca>. These products reflect the collective thinking of the members of the Electronic Records Committee based on four meetings, considerable work between meetings and extensive consultation with colleagues in a variety of countries that share a common concern about the management of archival electronic records. The members of the Committee are very grateful to the ICA Programme Commission and the Secretariat of the ICA for their support and assistance and to the national archives that provided their generous sponsorship of Committee meetings and travel. They are also grateful to Margaret Hedstrom of the University of Michigan (School of Information) who edited the Guide and Ginette Fauvelle and Cécile Sauvé of the National Archives of Canada for the preparation, formatting and dissemination of the various drafts of the Guide and for their assistance in the organization of the consultation session in Beijing.

Before making the products available formally to the international archival community, the Committee established a consultation process to solicit comments. An important step in the process was a one-day consultation session held during the ICA Congress in Beijing. Although the results of the process, which was concluded in September 1996, were incorporated into the final products, the Committee recognizes that changes in technology, record keeping and the role of the archives will require the products to be updated on a periodic basis. The Committee also recognizes that the successful implementation of electronic records programs will require the development of more detailed guidelines for use by archives in dealing at the practical level with the management of archival electronic records. Also, carefully designed standards strategies and the adoption of relevant training and education methodologies will be needed. These, together with strategies for facilitating the establishment of electronic records programs (e.g. based on pilot projects), should become the focus of attention in the future.

For additional information on the products of the Committee on Electronic Records please contact: International Council on Archives, Secretariat, 60 rue des Francs-Bourgeois, 75003 Paris, France.

The members of the Committee on Electronic Records are: Peter Anderson, Scottish Record Office; Niklaus Buetikofer, Federal Archives of Switzerland; Michèle Conchon, National Archives of France; Ivar Fonnes, National Archives of Norway; Hans Hofman, National Archives of the Netherlands; Gertrude Long, International Monetary Fund; John McDonald (Chair), National Archives of Canada; Steve Stuckey, Australian Archives; Ken Thibodeau (Secretary), U.S. National Archives and Records Administration; Pitt Kuan Wah, National Archives of Singapore.

Préface

Le présent document fait partie d'une série de trois produits préparés par le Comité du CIA sur les documents électroniques. Ce comité, créé en 1993, a reçu le mandat de mener des études et des travaux de recherche, de promouvoir l'échange d'expériences et de rédiger des projets de normes et de directives sur la création et l'archivage des documents électroniques. Les trois produits sont les suivants :

Guide pour la gestion des documents électroniques du point de vue archivistique. Le Guide est conçu pour aider les institutions d'archives à se repositionner de manière à régler le problème de la gestion des documents d'archives électroniques. Dans la Partie I, on fait un survol des tendances technologiques, organisationnelles et juridiques qui influent sur la capacité des organisations, dont les institutions d'archives, à conserver et à gérer des documents sous forme électronique. On poursuit la discussion des concepts clés comme le « document » et « la tenue des documents », on décrit l'influence du contexte électronique et on avance des stratégies pour gérer les documents électroniques pendant tout leur cycle de vie. Enfin, on conclut par une description des répercussions que le repositionnement des archives à des fins de gestion des documents d'archives électroniques pourrait avoir sur le plan juridique et organisationnel, sur les ressources humaines et sur la technologie. Au fil des années, la mise en œuvre des stratégies proposées nécessitera l'élaboration de tactiques, notamment de normes, qui devront être adoptées par les institutions d'archives. Quant à la Partie II, elle se veut une première tentative des membres du Comité pour formuler une telle approche tactique. On prévoit que le contenu de la Partie III sera élaboré plus tard et qu'il servira de fondement à l'élaboration d'une série de recommandations pratiques.

Programmes de gestion des documents électroniques : Rapport de l'étude de 1994-1995. L'étude, généreusement financée par le Centre des Archives contemporaines [Les Archives nationales de France] et les Archives nationales de Singapour, visait à dresser un répertoire des institutions d'archives qui ont mis en place – ou qui comptent le faire – un programme de gestion des documents électroniques. Le répertoire doit servir à faciliter l'échange d'information et à mettre en évidence les secteurs problématiques dont devrait s'occuper le Comité. Il doit aussi servir d'étalon pour évaluer à la longue les programmes de gestion des documents électroniques qui seront établis à l'échelle internationale. Ce document contient, en plus des constatations de l'étude, des tableaux d'information détaillée sur les cadres organisationnels et juridiques des programmes de gestion des documents électroniques, leurs structures et leurs caractéristiques techniques, des fonds de renseignements et des dispositions d'accès.

Documents électroniques : Analyse de la littérature. Au terme d'une analyse complète de la littérature internationale sur les documents électroniques, Alf Erlandsson, du Fonds monétaire international, a produit à l'intention du Comité un volumineux document qui donne un excellent aperçu de l'évolution des concepts et des stratégies concernant la gestion des documents électroniques du point de vue archivistique. Le Comité a conclu en disant que l'analyse devrait être plus largement diffusée puisqu'elle est susceptible d'aider les archivistes à comprendre le vaste contexte dans lequel se retrouvent les stratégies dont il est question dans l'ébauche du Guide du Comité. Il est à espérer que l'analyse de la littérature deviendra un outil important des programmes d'études et de formation qui portent sur les documents électroniques. Enfin, les données de l'analyse seront mises à jour régulièrement.

On peut se procurer ces trois documents en s'adressant au président du Comité sur les documents électroniques (dont l'adresse suit) soit sous forme électronique (WordPerfect 5.2 ou ASCII) ou sur support papier. On peut aussi accéder au site WEB du CIA à l'adresse <http://www.archives.ca>. Ces produits sont le fruit de l'effort de réflexion collectif des membres du Comité sur les documents électroniques qui se sont réunis à quatre occasions, de la somme considérable de travail qu'ils ont abattu entre ces réunions et de la longue consultation qu'ils ont menée auprès de leurs collègues dans une foule de pays qui partagent un même souci quant à la gestion des documents d'archives électroniques. Les membres du Comité sont extrêmement reconnaissants envers la Commission du Programme du CIA et le Secrétariat du CIA qui leur ont assuré soutien et aide ainsi qu'envers les Archives nationales qui ont si généreusement parrainé leurs réunions et leurs déplacements. Ils remercient aussi Margaret Hedstrom, de l'University of Michigan (School of Information), pour avoir révisé le Guide et Ginette Fauvelle ainsi que Cécile Sauvé, des Archives nationales du Canada, qui ont veillé à la préparation, à la mise en page et à la diffusion des diverses ébauches du Guide et qui ont aidé à organiser la séance de consultation à Beijing.

Avant de diffuser officiellement ces produits au sein de la collectivité archivistique internationale, le Comité a mis en place un processus de consultation pour recueillir des commentaires. Une des étapes cruciales du processus était une consultation d'une journée pendant le Congrès du CIA à Beijing. Même si les résultats de cette consultation qui a été menée en septembre 1996 ont été intégrés aux produits finaux, le Comité reconnaît qu'à la suite des changements qui surviennent dans la vocation des archives ainsi que dans les domaines de la technologie et de la tenue des documents, il faudra constamment les mettre à jour. Il reconnaît aussi que la réussite de la mise en œuvre de programmes de gestion de documents électroniques dépendra de l'élaboration de lignes directrices plus détaillées à l'intention des archives en ce qui a trait à la gestion pratique des documents d'archives électroniques. De plus, il faudra élaborer des stratégies de normalisation bien pensées et adopter des méthodes de formation pertinentes. C'est sur ces méthodes jointes aux stratégies destinées à faciliter l'établissement de programmes de gestion de documents électroniques (à la suite de projets pilotes) qu'on devrait désormais porter l'attention.

Pour plus d'information sur les produits du Comité sur les documents électroniques, veuillez vous adresser au : Conseil international des Archives, Secrétariat, 60, rue des Francs-Bourgeois, 75003 Paris, France.

Voici les membres du Comité sur les documents électroniques : Peter Anderson, Bureau des archives d'Écosse; Niklaus Buetikofer, Archives fédérales de Suisse; Michèle Conchon, Archives nationales de France; Ivar Fonnes, Archives nationales de Norvège; Hans Hofman, Archives nationales des Pays-Bas; Gertrude Long, Fonds monétaire international; John McDonald (président), Archives nationales du Canada; Steve Stuckey, Archives d'Australie; Ken Thibodeau (secrétaire), Archives nationales des États-Unis et Administration des documents; Pitt Kuan Wah, Archives nationales de Singapour.

Summary

This Guide is one of a series of products prepared by the ICA Committee on Electronic Records. The mandate of the Committee, which was created in 1993 and concluded its work in 1997, was to undertake study and research, promote the exchange of experience and draft standards and directives concerning the creation and archival processing of electronic records. In addition to the Guide, the Committee also produced the results of a 1994/95 Survey of ICA members, to determine those that have established or are planning to establish a program to manage electronic records, and a Literature Review designed to provide an overview of the evolution that has taken place in the concepts and strategies related to the management of electronic records from an archival perspective.

The Guide is designed to help archival institutions address the management of electronic records. Part I examines the technological, organizational and legal trends impacting on the ability of institutions (including archives) to manage these records, presents a discussion of the concepts of "record", "record keeping", "electronic record", and other related terms which were developed for the purposes of the Guide and proposes strategies for the management of electronic records. Part I concludes with some discussion about the implications for archives as they reposition themselves to manage electronic records of archival value. Part II of the Guide describes the first of a number of the tactics archives can use to implement the strategies described in Part I.

Part I is divided into four chapters. Chapter One discusses the significant changes that are taking place in information technology and the extent to which this is having an impact on record keeping and records management. Organizational trends are also examined from a record keeping perspective with special attention being given to the impact of re-engineering, downsizing and restructuring on the approach taken by modern governments to the keeping of their records. The evolution taking place in the legislative and policy environment is also examined in terms of their impact on the conception, creation, and maintenance of electronic records. Overall, the chapter defines the technological, organizational and legal landscape within which most modern archives operate today, and describes how that landscape will influence the strategies and options that archival institutions will need to pursue.

Chapter Two presents the basic concepts that constitute the framework for the strategies presented in the Guide. For the purposes of the Guide, the Committee developed the following concept of "record":

A record is recorded information produced or received in the initiation, conduct or completion of an institutional or individual activity and that comprises content, context and structure sufficient to provide evidence of the activity regardless of the form or medium.

The distinctive feature of electronic records is that the content is recorded on a medium and in symbols (binary digits) that needs a computer or similar technology to read and understand.

The concepts of "record" and "electronic record" are linked to the concept of the "archival function" which was defined by the committee as that group of related activities contributing to, and necessary for accomplishing the goals of identifying, safeguarding and preserving archival records, and ensuring that such records are accessible and understandable. These concepts are used to explain that traditional practices employed for managing records may not be sufficient to ensure authentic and reliable records and that if such records are to be preserved as archival electronic records, archives will need to position themselves at the conception stage, even before records are created.

Based on the concepts described in the second chapter, Chapter Three proposes strategies for accomplishing the life cycle management of archival electronic records. While recognizing that the legal mandates, the resources, and the circumstances of archives vary significantly, the Committee made the following general recommendations concerning the strategies that archives should pursue:

1. The archives should be involved in the entire life cycle¹ of electronic systems that create and retain archival electronic records to ensure the creation and retention of electronic records that are authentic, reliable and preservable.
2. The archives should ensure that records creators create and retain records which are authentic, reliable and preservable.
3. The archives must manage the appraisal process and exercise intellectual control over archival electronic records.
4. The archives must articulate preservation and access requirements to ensure that archival electronic records remain available, accessible, and understandable.

Chapter 4 examines the strategies raised in the third chapter in terms of their organizational, legal and technological implications for archives. It explains these implications in order to help archives establish checklists of the things they will need to consider as they move into a position to influence policy, standards, and the design of record keeping systems. For instance, an archives that strives to position itself at the front end of the records life cycle may need to adjust its enabling legislation or identify new training and education requirements or even job requirements to ensure that it has the staff in place to accomplish the task.

Part II of the Guide, represents a first attempt by Committee members to articulate tactical approaches to the management of archival electronic records based on the concepts and strategies discussed in Part I. Section A contains the first in what is intended to be a series of discussion papers exploring issues associated with identifying and managing the various categories of electronic records commonly found in many organizations. The first paper focuses on records in a database environment. Section B is intended to elaborate upon the strategies described in Chapter 3 of Part I by presenting methods and tactics that can be employed by an archives to address the management of archival electronic records. The first contributions focus on preservation and access.

The work of the committee in preparing this guide was based on the personal knowledge and experience of committee members as well as an extensive review of the international literature. No specific references are included in the Guide because they are already contained in the comprehensive literature review mentioned above. The committee is grateful for the contributions that have been made by experts around the world either in the literature or through personal conversations.

Sommaire

Le présent document fait partie d'une série de trois produits préparés par le Comité du CIA sur les documents électroniques. Ce comité, créé en 1993 et dont les activités ont pris fin en 1997, avait reçu le mandat de mener des études et des travaux de recherche, de promouvoir l'échange d'expériences et de rédiger des projets de normes et de directives sur la création et l'archivage des documents électroniques. Outre le Guide, le Comité a également publié les résultats d'une étude menée en 1994-1995 auprès des membres du CIA, afin de déterminer lesquels d'entre eux avaient mis en place - ou comptaient le faire - un programme de gestion des documents électroniques. Une analyse de la littérature du domaine a été menée pour donner un aperçu de l'évolution des concepts et des stratégies concernant la gestion des documents électroniques du point de vue archivistique.

Le Guide est conçu pour aider les institutions d'archives à gérer les documents électroniques. Dans la Partie I, on fait un survol des tendances technologiques, organisationnelles et juridiques qui influent sur la capacité des organisations, dont les institutions d'archives, à gérer ces documents. On discute également divers concepts comme le « document », la « tenue des documents », le « document électronique » et d'autres termes qui ont été définis aux fins du Guide et on avance des stratégies pour gérer les documents électroniques. On conclut par une discussion portant sur les répercussions que pourrait avoir le repositionnement des institutions d'archives afin d'assurer la gestion des documents électroniques ayant une valeur archivistique. Quant à la Partie II, elle décrit la première de diverses tactiques dont pourraient se servir les archives pour mettre en œuvre les stratégies énoncées dans la Partie I.

La Partie I comprend quatre chapitres. Le chapitre I est une discussion des changements importants qui se produisent en technologie de l'information et leur incidence sur la tenue et la gestion des documents. On examine aussi les tendances organisationnelles du point de vue de la tenue des documents en accordant une attention spéciale aux répercussions de la restructuration organisationnelle et la réduction des effectifs sur la façon dont les administrations modernes conservent leurs documents. On se penche aussi sur l'évolution du milieu législatif et administratif, en raison de leurs conséquences sur la conception, la création et le maintien des documents électroniques. Bref, ce chapitre brosse le tableau technologique, organisationnel et juridique dans lequel évoluent la plupart des archives modernes et décrit comment ces facteurs influenceront sur les stratégies et les options que devront suivre les institutions d'archives.

Le chapitre II renferme les concepts de base qui forment le cadre des stratégies dont il est question dans le Guide. Aux fins du Guide, le Comité a défini le concept de « document » comme suit :

Un document est de l'information consignée, créée ou reçue au moment d'amorcer, d'effectuer ou de compléter les activités menées par une institution ou une personne et qui présente un contenu, un contexte et une structure permettant de prouver l'existence de ces activités, indépendamment de la forme ou du support.

Les documents électroniques ont une caractéristique distincte : étant consigné sur un support informatique et en symboles (chiffres binaires), leur contenu ne peut être lu et compris qu'au moyen d'un ordinateur ou d'une technologie assimilée.

Les concepts de « document » et de « document électronique » sont liés au concept d'« archivage », fonction qui a été définie par le Comité comme étant un groupe d'activités connexes nécessaires à l'atteinte des buts relatifs à l'identification, à la protection et à la préservation des archives, tout en veillant à ce qu'elles soient accessibles et compréhensibles. Ces concepts servent à expliquer que les pratiques traditionnelles de gestion des documents peuvent s'avérer insuffisantes pour assurer l'authenticité et la fiabilité des documents et que la préservation de ces documents en tant que documents d'archives électroniques suppose que les institutions d'archives se repositionnent dès l'étape de la conception des documents, avant même leur création.

Reprenant les concepts décrits au chapitre précédent, le chapitre III propose des stratégies visant à gérer les documents d'archives électroniques pendant tout leur cycle de vie. Même s'il reconnaît que les mandats, les ressources et les circonstances peuvent varier énormément entre les institutions d'archives, le Comité a fait les recommandations générales suivantes à propos des stratégies que ces dernières devraient poursuivre :

1. Les institutions d'archives doivent participer tout au long du cycle de vie¹ des systèmes électroniques qui créent et conservent des documents sur support électronique afin de garantir la création et la préservation de documents électroniques authentiques, fiables et durables.
2. Les institutions d'archives doivent veiller à ce que les créateurs se soucient de l'authenticité, de la fiabilité et de la durabilité des documents qu'ils créent et conservent.
3. Les institutions d'archives doivent exercer un contrôle intellectuel sur les documents d'archives électroniques et en gérer le processus d'évaluation.
4. Les institutions d'archives doivent formuler les exigences en matière de préservation et d'accès afin que les documents d'archives électroniques demeurent disponibles, accessibles et compréhensibles.

Dans le chapitre IV, on examine les stratégies soulevées dans le chapitre précédent et leurs répercussions organisationnelles, juridiques et technologiques sur les archives. On explique ces répercussions afin d'aider les institutions d'archives à dresser des listes de vérification des choses dont elles devront tenir compte pour se positionner de manière à influencer la politique, les normes et la conception des systèmes de tenue des documents. Prenons le cas d'une institution d'archives qui cherche à se positionner au tout début du cycle de vie : elle devra peut-être faire modifier sa législation habilitante ou cerner ses nouveaux besoins de formation ou même d'embauche pour s'assurer qu'elle a tout le personnel nécessaire pour s'acquitter de la tâche qui lui est confiée.

La Partie II du Guide constitue la première tentative des membres du Comité pour formuler des approches tactiques en matière de gestion des documents d'archives électroniques qui soient fondées sur les concepts et les stratégies discutés dans la Partie I. La section A renferme le premier document de discussion de toute une série portant sur des questions d'identification et de gestion des diverses catégories de documents électroniques que l'on retrouve dans bien des organisations. Ce document traite surtout des documents dans des bases de données. La section B vise à raffiner les stratégies décrites dans le chapitre III de la Partie I en présentant des méthodes et des tactiques dont pourrait se servir une institution d'archives pour gérer ses documents d'archives électroniques. Ces premières contributions ont d'abord trait à la préservation et à l'accès.

En préparant le Guide, les membres du Comité se sont inspirés de leur bagage de connaissances personnelles et de leur expérience et d'une analyse complète de la littérature du domaine à l'échelle internationale. Le Guide ne renferme aucune référence précise, puisque qu'on retrouve ces références dans l'analyse mentionnée ci-dessus. Le Comité tient à remercier les spécialistes du monde entier pour leurs précieuses contributions obtenues sous forme d'écrits ou lors de conversations personnelles.

¹/ Le « cycle de vie » des documents comprend trois étapes fondamentales : la conception, la création et le maintien (y compris la préservation et l'utilisation).

Table of Contents

Preface	3
Préface	5
Summary	7
Sommaire	9
Table of Contents	11
 PART I Concepts and Strategies	 14
 Chapter 1 Trends and Developments	 14
1.1 Technology Trends and Electronic Records	14
1.1.1 Characteristics of Early Automation	14
1.1.2 Personal Computing	15
1.1.3 Networking	15
1.2 Organizational Trends and Electronic Record Keeping	16
1.2.1 Relationship of Technology and Organizational Change	17
1.2.2 Trends in Record Keeping	17
1.2.3 Development of Effective Methods and Procedures for Managing Electronic Records	17
1.2.4 Constantly Changing Technology and Applications	18
1.2.5 Changing User Needs and Expectations for Access to Electronic Records	18
1.2.6 Introduction of Electronic Record Keeping and the Increase in Organizational and Technological Interdependencies	18
1.3 Legal Issues and Legislation	19
1.3.1 The Definition of a Record	19
1.3.2 The Acceptance of Electronic Records in Legal Proceedings	20
1.3.3 The Authority of the Archives over Active Records	20
1.3.4 Long Delays in Transfer of Records to Archival Custody	20
1.3.5 Privacy and Access Legislation	20
1.3.6 Alienation of Records from Public Oversight	20
1.4 Conclusions	21
 Chapter 2 Records and Archives in the Electronic Age : Key Concepts	 21
2.1 The Concept of Record and Record Keeping	21
2.2 Electronic Records	22
2.3 The Concept of the Archival Function	24
2.4 Redefined Roles for Archivists and Archival Institutions	26
 Chapter 3 Strategies	 27
3.1 The Life Cycle of Electronic Records	27
3.2 Records Creators and Archival Electronic Records	29
3.3 Appraisal	30

¹/ The “life cycle” of records comprises three basic stages; conception, creation, and maintenance (including preservation and use).

3.4	Preservation and Access	31
3.4.1	Preservation	32
3.4.2	Access and Use	32
Chapter 4 Implications for Archives 33		
4.1	Legal and Policy Implications	33
4.2	Organizational Implications	34
4.2.1	Mission and Mandate	34
4.2.2	Policies	35
4.2.3	Functions and Activities	35
4.2.4	Human Resources	36
4.2.5	Communications/Public Relations	36
4.2.6	Community Management	36
4.3	Technology Implications	37
PART II 39		
Section A Categories of Electronic Records 40		
Chapter 1 Records in a Database Environment 40		
1.1	Databases - Content, Structure and Context	40
1.2	Identifying Database Records	41
1.3	Some Principles for Managing Database Records	42
Section B Methods and Tactics 43		
Chapter 1 Preservation 43		
1.1	Preservation of Availability	43
1.2	Preservation of Accessibility	43
1.2.1	Preserve the technology on which the records depend	44
1.2.2	Eliminate dependency of the records on specific technology	44
1.2.3	Preserve operational software	44
1.2.4	Preserve visual presentation capability	44
1.2.5	Eliminate inessential dependencies	45
1.3	Preservation of Understandability	45
1.4	Preservation over the Life Cycle Stages	46
1.4.1	The Conception Stage	46
1.4.2	The Creation Stage	46
1.4.3	The Maintenance Stage	46
Chapter 2 Access 47		
2.1	Intellectual Control	47
2.2	Methods for Providing Access	48
2.2.1	Copies on Physical Media	48

ICA Studies/Études	CIA - Managing Electronic Records	
2.2.2	Delivery Through Telecommunications	48
2.2.3	On-line Access	49
2.3	Responsiveness to Changes	49
2.4	Actions Related to Access over the Life Cycle	49
2.4.1	Conception	49
2.4.2	Creation	50
2.4.3	Maintenance	50

Part I: Concepts and Strategies

This part of the Guide is designed to help archives reposition themselves to address the management of archival electronic records. It begins with an overview of the technological, organizational and legal trends that are having an impact on the ability of organizations, including archives, to keep and manage records that are in electronic form. It continues with a discussion of key concepts such as “record” and “record keeping”, describing how these are impacted upon in the electronic environment, and then proposes strategies for accomplishing the life-cycle management of electronic records. It concludes by describing - from the legal, organizational, human resources and technological perspectives - the implications for archives of repositioning themselves to manage archival electronic records.

Chapter 1

Trends and Developments

The Committee identified developments and trends in three areas as critical for the management of electronic records: the technological, the organizational, and the legal areas. This chapter provides a brief historical overview of these issues. First, it discusses significant changes in information technology and its impact on record keeping and records management. It then turns to current organizational trends, the variety of information technologies available, and their implications for archives. Finally, it examines the legal issues that influence the conception, creation, and maintenance of electronic records. This chapter defines the landscape in which most modern archives operate today, and describes how that landscape influences the strategies and options that archival institutions might pursue.

1.1 Technology Trends and Electronic Records

Since the introduction of digital computers during the 1950s, society has witnessed a rapid evolution in the capabilities of computer technology. This evolution has important implications for who has access to computer technology, which types of information can be handled in automated applications, and which organizational functions or processes can be supported by computer applications. The evolution of information systems is pertinent to issues of electronic records management and preservation because the evolving capabilities and uses of information systems have an impact on the purpose, comprehensiveness, reliability, authenticity, and value of the electronic records. An awareness of these trends will help the reader place into context the concepts of records, record keeping, and the archival function which are the subject of the next chapter.

The evolution of information technology falls into three overlapping phases: the mainframe era, the era of the personal computer (PC), and the networking era. Each succeeding innovation in information technology made new uses for information technology feasible without necessarily displacing older systems. Depending on when computers were introduced into an organization, archivists may encounter electronic records that were created or accumulated under any of the phases in the evolution of information technology discussed below.

1.1.1 Characteristics of Early Automation

The earliest mainframe computers, introduced in large private firms and some government organizations during the 1940's and 1950s, were used to automate computation-intensive tasks, such as accounting and calculating statistics. Data were entered into the computer system, processed in batches, and then the output was used in summaries, bills, accounts, and other business documents or in reports and analysis of scientific research. Mainframe computers were expensive to acquire and operate and they required complex software that was developed for each new type of application. Most organizations set up separate computing divisions and hired specialized systems analysts, programmers, and computer operators to run and control the computer operations. These experts decided which hardware and software would be used, which tasks lent themselves to automation, and how the systems should be designed.

During the 1960s, computer manufacturers introduced the concept of "time sharing" which allowed several users to access the computer simultaneously. Time sharing gave rise to early computer networking and remote access, and it stimulated the development of software to support new types of applications, such as text editing, modeling, statistical analysis, and graphics design. New types of software, along with a steady decline in costs for calculation and storage, made it possible for organizations to automate more complex tasks, but designing systems and operating computers remained a specialized technical area distant from the end users.

A few visionary archivists recognized some possible implications of automation for record keeping and archives. Early leaders in the "machine-readable archives" field argued that machine-readable data might have long-term value and potential for reuse in historical and statistical studies. They urged archivists to appraise machine-readable records and start programs for their care and preservation. In the late 1960s and early 1970s, National Archives in the U.S., Canada and Sweden started special machine-readable records programs. In the mid 1970's, the ICA established an Automation Committee which issued guidelines for appraisal and curriculum development.

The impact of early automation on records management was less apparent because most computer centers established "tape libraries" and handled storage, disposition, and recycling of machine-readable media. For records managers, the most obvious impact of early automation was a rapid increase in printed output from computer systems which added to the growing volume of paper records. The prevailing view of electronic records at the time was they were special media records which were primarily valuable because of their informational content while records that were needed for evidence of actions and decisions were printed on paper and stored in established filing systems.

1.1.2 Personal Computing

A monumental change occurred in computing in 1981 when IBM introduced its personal computers (PCs) for the consumer market. By the mid-1980s, PCs came equipped with "user-friendly" software for word processing, database applications, spreadsheets, and graphics, and many PCs had the capacity to store 20 to 40 megabytes of information.

The introduction of the PC has several important implications for the creation, management, and control of electronic records. Unlike mainframes, which were administered and controlled by central data processing units, PCs were very decentralized. The individual or small group that owned the PC decided when and how to use it, and they controlled the information stored on it. Another important implication is that PCs made computing affordable and accessible to a much larger user population. Taken too literally, the term "personal computer" can be misleading because many small organizations and small businesses also purchased PCs to automate business applications. Common early applications included word processing, where PCs or dedicated word processors replaced the typewriter in the typing pool, and various accounting and business applications. Stand-alone computer work stations were also acquired to support specialized operations such as computer-aided design.

Shortly after PCs became available, archivists began to express concern about the rapid proliferation of text and data files and the difficulty of inventorying, appraising, and preserving these decentralized files. PC systems often lacked systematic backup procedures and the storage media were vulnerable to loss. In a highly competitive market, different types of PC systems (such as IBM and Apple) were totally incompatible with each other. Although archivists recognized that the end users of PCs would have to be trained and encouraged to take care of records stored on their PCs, neither the policies nor practices for doing so were developed.

1.1.3 Networking

The next significant advance in computing began in the mid-1980s with the rapid integration of telecommunications and computing into vast computer networks. Network technology allowed organizations to connect a small number of PCs into a local area network (or LAN) so that work groups could share software and databases, exchange documents, and send messages. By the late 1980s, wide-scale adoption of telecommunications standards such as

TCP/IP and the Internet protocol, made it possible to link hundreds of thousands of LANs and PCs into regional and global networks. The largest and best known global network is the Internet, which was estimated to have 40 million users in 109 countries in 1995.

Approaches to computing have also changed. Although mainframe computers are still used to handle large databases and highly complex operations, mainframe computing has lost ground to other approaches, especially distributed computing and "client-server" architectures. With the client-server approach, each PC on a network is a client with the capability to perform many stand-alone operations. File storage and access to application software can be managed centrally in one or a series of "file servers". This approach combines the autonomy that the PC offers with some of the central controls of the mainframe environment.

The integration of computing and telecommunications in vast networks has important implications for the ways in which records are created. Networking supports easy transfer of messages, documents, and software to anyone who is connected to the network. This state of the technology makes it technically possible to process and communicate all of the information needed to conduct business activities in modern organizations. With the growth of networking and the development of paperless transactions, archivists have become increasingly concerned about the long-term preservation of electronic records. These new archival concerns arise out of both the capabilities of new technologies and the ways in which these technologies are being used in organizations. The next section discusses some important organizational trends and their implications for electronic record keeping.

1.2 Organizational Trends and Electronic Record Keeping

While digital technologies make it possible to create and maintain electronic records, changes in organizational structures, processes and communications shape the purpose, content, provenance, and uses of electronic records. Several important trends in organizations are changing the types of records being created, the relationships between electronic records and records in traditional formats, the ways in which records are controlled and managed, and the patterns of access and use. Archivists should be aware that it is not only technology, but, more significantly, the interaction between technology and organizations that is causing profound and extensive changes in society.

Organizations in both the public and private sector are facing pressure to operate more efficiently and at lower cost. Despite differences from country to country, the global nature of telecommunications and the worldwide dimensions of competitive pressures make these trends international, at least in their general direction. These pressures have served as a catalyst for a series of changes in organizations, including:

- flattening the organizational hierarchy by eliminating middle management positions and delegating more responsibility to individuals and teams;

- replacing stable administrative units with flexible teams and work groups;

- redefining the role and business purpose of many organizations;

- reducing the size of large organizations by outsourcing components of the business process;

- reducing the size of government through privatization; and

- re-engineering work processes to eliminate waste and streamline production.

Many of these structural changes depend on advanced information systems capable of providing employees with complete, accurate, and current information, and proficient at coordinating and monitoring complex workflows. For example, if an organization delegates more responsibility for decisions about a client or customer to its case workers, then the case workers need direct access to information about each case. When organizations replace formal, structured procedures with teams, work groups need new tools that will allow them to share information, collaborate on the development of products, and document their decisions. Powerful new networks provide rapid communications and make it possible to share information across geographical boundaries as well as across organizational hierarchies.

1.2.1 Relationship of Technology and Organizational Change

Organizations often use the introduction of new technologies as an occasion to redesign work processes and change their formal organizational structure. Although new technologies can be introduced independent of organizational change, increasingly technological and organizational change go together. As a consequence, new information systems often also result in changes in workflow, communications, and formal organizational structures. These related changes can affect the provenance, ownership, and physical location of records. When an organization introduces a system that allows users to access shared databases, for example, the provenance of the records becomes more complex, several different administrative units may create and use the records, and the database is stored separately from the operating units - often under the control of an information systems division.

1.2.2 Trends in Record Keeping

Most early systems used computer technology to assist in some portion of organizational record keeping. The earliest systems used the computer for calculations which were then aggregated and summarized with the results printed on paper. By the 1970s, large production systems were used to process many routine transactions. Most of these systems still produced a paper copy that was stored as the "record copy". With advances in networking and software that support complex information flows and collaborative work, more and more organizations are adopting systems that not only process and store information, but that also maintain the organization's records. Systems for electronic commerce and electronic data interchange (EDI), for example, allow organizations to conduct business transactions without producing any paper records.

As a consequence of competitive pressures and available new technologies, electronic record keeping is evolving in new directions that differ from many early computer applications. In some organizations electronic records provide evidence of entire work processes, rather than a portion of them - such as the calculating or text-processing tasks. Once everyone involved in a business process can communicate electronically and share electronic files, organizations are in a position to eliminate the paper records associated with that process entirely. When this shift occurs, the electronic records become the most complete evidence of the business process and paper records begin to function as convenience copies.

Of course, this changeover from conventional to electronic record keeping rarely is well planned, systematic, or smooth. Paper and electronic records exist side by side in most organizations today, creating considerable chaos in both the traditional and new record keeping systems.

1.2.3 Development of Effective Methods and Procedures for Managing Electronic Records

As organizations introduce new technologies and new methods for doing work, older methods and procedures for controlling records are no longer effective. In many organizations, valuable records are kept in centralized databases or they are widely distributed and stored on decentralized hard drives of individual's personal computers. In the first scenario, a centralized information systems division may control access to the organization's electronic records. In the latter case, each end user controls access to his or her own versions of the organization's records.

In either case, measures needed for integrity and authenticity may be overlooked and the electronic records may not be available, understandable, and usable to the organization or to the archives.

Organizations that already rely on electronic records to conduct and document business or that are interested in eliminating paper records from their systems are seeking solutions to issues of authenticity, management, and retention of electronic records. The decisions that organizations take today about the capability of their information systems, the organization and structure of their information resources, and the policies and practices for record keeping in the digital environment will have a significant impact on the types of strategies and methods that archival institutions can employ to ensure long-term preservation of records with archival value.

Because the issues of archival management are closely linked to the design of systems and the establishment of new information policies, archivists have been driven to examine a broader set of records management issues in order to carry out the archival function in the digital environment.

1.2.4 Constantly Changing Technology and Applications

Despite tremendous improvements in the capabilities and performance of information systems, the technology continues to evolve rapidly. The introduction of new processes and systems is driven primarily by market forces over which consumers have relatively little influence. Computer hardware and software manufacturers increase their market share by introducing new products with new features and enhanced capabilities. As a consequence, organizations are likely to upgrade their systems frequently and to completely change computing systems every few years.

The relatively short life of hardware and software has important implications for long-term preservation of electronic records. Organizations replace their systems when their supplier ceases to support an obsolete system or when new products offer advantages over older software. To ensure that records created in the old system will remain available, understandable and usable to users of the new system, the organization must migrate its older records to the new system. Most software systems today provide "backward compatibility" between the old and new version of a single supplier's software, such as between two versions of the same brand of word processing package, but compatibility between competing products is uncommon. Complex systems that were developed for a specific business process or tailored to meet the needs of a particular organization are more difficult to migrate to new systems. Transferring records from older proprietary systems - called legacy systems - to current technology may require substantial reformatting and restructuring of the records. Not only is such a process expensive, it may require substantial changes to the structure and format of the records that compromise their integrity as evidence. As long as information technology continues to evolve and organizations find new ways to apply computers to information handling and communications, archives will have to be prepared to offer advice and guidance in a dynamic environment.

1.2.5 Changing User Needs and Expectations for Access to Electronic Records

Most users of early computer systems had to have special technical skills and access to the computer systems. "Jobs" were submitted to the computer center and the results were returned to the user usually in the form of computer printouts. PCs made it possible for users to access the tools and information stored on their own computers. As more individuals gain easy access to computers, they increasingly prefer to receive information in electronic form. Although many users still print copies of digital documents for review and annotation, the print versions are taking on the role of convenience copies in some applications.

Direct access to digital information has several advantages from the user's perspective. Retrieval and delivery are very rapid. Users can extract portions of documents and analyze and process them more easily in digital form. Some new formats in which electronic records are created, such as hypertext documents, are not meaningful unless they are rendered in electronic form. As the number of users with computers and access to networks grows, archives should anticipate growing demands from users for access to archives in digital form. This demand is likely to encompass records that begin their life in electronic form as well as traditional formats of material that can be converted to digital form by scanning.

1.2.6 Introduction of Electronic Record Keeping and the Increase in Organizational and Technological Interdependencies

Archivists working with electronic records quickly discover that the digital environment involves more complex relationships and interdependencies than has been the case in the past. The relationship between organizational structure and the technology architecture is one area that now demands attention. In some organizations everyone uses the same network, systems, and software to carry out their work, while other organizations have specialized

systems designed exclusively for a particular work process or task. Sometimes computers are used primarily as individual productivity tools and each end user has a great deal of control over when and how they create, manage, and store electronic records.

These various organizational arrangements demand different approaches and strategies for the archival management of electronic records. Where shared systems are in place, the systems administrator may represent a point for coordination of systems development and archival concerns. Where specialized systems are in place the manager for each system or the data administrator may be a good point for initial contact. Completely decentralized systems are more challenging because each end user has a great deal of control over the organization, retention, and management of the records that he or she creates. In any case, archivists cannot expect other specialists to assume responsibility for addressing or resolving archival issues. While the archivist must work with others, this is an area where the archives will be expected to initiate contacts and take the lead.

In the digital environment, the interdependencies among individuals and between various specializations increases. The system designers depend on end users to define the requirements for the systems they design. The end users often seek advice from information technology specialists about what the technology can do, how much it will cost, and how to design the system. Users, designers, and information technology specialists look to management for guidance on how to mesh new information technology with broader organizational needs and how to define new roles and responsibilities in the digital environment. Archivists and records managers are part of this mix too. Increasingly, senior management will expect the archives to help the organization identify which records need to be retained and to provide standards and practices to ensure that records remain available, understandable, and usable as long as they are needed.

1.3 Legal Issues and Legislation

The legislation governing many aspects of information creation, management, use, and preservation has not kept pace with the rapid change in technology - and archives legislation is no exception. In most countries, archives laws were written with paper records in mind and with a simpler model of the archival function and the role of archival institutions. Many archival institutions are finding that the options available to them for dealing with electronic records are constrained by basic archival legislation. Some issues that are particularly problematic include:

- the legal definition of a record, especially when it does not encompass records in electronic form;

- laws that do not accept electronic records as legitimate evidence in legal proceedings;

- legislation that defines the role of the archives as a strictly custodial one;

- laws and policies which impose long waiting periods before the archives can appraise records or influence their disposition;

- legislation governing privacy and access to records; and

- alienation of records from public oversight.

Each of these aspects is discussed briefly below.

1.3.1 The Definition of a Record

In the 1970's it was not clear that electronic records were covered by archives legislation. Gradually, many countries added special terminology to indicate that "machine-readable" or "electronic" records were included in the definition of a record. In some countries, the legislation emphasizes the function of the records rather than the form by stressing that archives and records legislation applies to all records "regardless of their physical form or characteristics". Nevertheless, many people, especially in organizations where EDP applications cover only a small

part of their functions, think that electronic records are outside archival legislation. Others have difficulty distinguishing records from other types of information resources. Many organizations are seeking clear definitions of a record that can be easily understood by people, and implemented in systems and used in legislation and policy development. The concept of a record and advice on this matter are taken up in the next chapter.

1.3.2 The Acceptance of Electronic Records in Legal Proceedings

Electronic records in today's information systems can easily be manipulated without leaving any trace. For this reason their value as evidence in courts is weak, if they are accepted at all. Conversely, many organizations have found themselves vulnerable to discovery and production in court of any information found on their computer systems, even of unreliable information and records that were properly deleted. Progress on these issues can only be made if information systems are designed to keep reliable and secure evidence of all business transactions and if organizations implement policies, procedures, and training for staff in this area. Special means have to be taken and international regulations have to be established in order to ensure authenticity of information transmitted via public networks like the Internet.

1.3.3 The Authority of the Archives over Active Records

In the field of electronic records it is important that archival requirements are addressed during the design of information systems, and that electronic records are carefully controlled throughout their life cycle. The role of archives should be clearly defined in relation to information technology specialists, lawyers and others having interest in the generation and maintenance of evidence by means of records. Archives that have no authority over active records will find their options for dealing with electronic records restricted.

1.3.4 Long Delays in Transfer of Records to Archival Custody

Many countries have legislation which imposes a long waiting period before the archives can take custody of archival records. Like the limited authority of archives over active records, these rules will limit the options available to archives to acquire or otherwise exert control over archival electronic records. Where such rules exist, archives face the possibility of receiving electronic records in obsolete formats that will be difficult and expensive to migrate, if they remain readable at all. In such cases, it will be especially important to work with the records creators to make sure that they care for the archival records before the archives assumes responsibility for them.

1.3.5 Privacy and Access Legislation

Privacy and access legislation is having an increasing impact on the environment in which archives operate. In some countries, pressure for greater government accountability has produced open records laws that regulate the terms and conditions under which citizens can gain access to government records. This increasing openness has been countered with greater concern about the protection of personal privacy. The ease of searching for, retrieving, and manipulating electronic records has raised concerns in many countries about the ability of governments and private organizations to protect the personal privacy of individuals who are the subjects of their records. In some countries, the archives' ability to preserve records may be limited by legislation requiring deletion of personal information after its primary use is exhausted. Usually privacy and access legislation applies to all formats of records, but concern over inappropriate access and unauthorized destruction is especially acute for electronic records. Privacy and access concerns are frequent subjects of debate, and often they are addressed in the legislative arena. Because privacy, access, retention, and preservation all require remedies at the policy level, archives have an opportunity to draw high-level attention to archival concerns. At the same time, measures adopted to govern access and privacy may have unanticipated consequences for the archives.

1.3.6 Alienation of Records from Public Oversight

With decentralization and privatization there is concern that the archives will lose jurisdiction over records that document government functions and activities. This loss of control can occur when governments out source data

processing and information technology services without careful attention to control over the records that those operations produce. It can also occur when government-funded programs and functions are privatized. With fundamental changes in the role of government, the means of communication, and the methods of recording and tracking transactions, archives will be required to re-examine the scope and effectiveness of basic archives laws.

1.4 Conclusions

Archives are part of a rapidly changing world. While rapid development of information technology is one of the most visible symbols of this change, closely related changes in organizations and the role of government are having a dramatic impact on the environment in which archives operate today. Many different factors shape the environment in which archives find themselves and specific technological, organizational and legal trends in each country will have some bearing in the nature of the problems and challenges facing its archival institutions and programs.

In countries with a long history of computer usage, the archives is likely to encounter electronic records in a wide variety of incompatible formats. Records in older, obsolete formats from legacy systems coexist with recent, complex multi-media objects. Countries that adopted computer technology more recently may have leaped over older generations of technology and arrived more directly at the issues of modern electronic records. In either case, pressures for global commerce, information sharing, and interoperability among systems are imposing higher degrees of standardization on the systems and applications used by organizations to create and manage electronic records. This, in turn, presents opportunities for international approaches for archives to pursue. The remainder of the Guide offers suggestions for addressing the electronic records issues in a dynamic environment.

Chapter 2

Records and Archives in the Electronic Age: Key Concepts

The purpose of this chapter is to present the basic concepts that constitute the framework for the strategies presented in the Guide. Starting with the concepts of record and record keeping, it proceeds to a presentation of the characteristics of electronic records and attempts to identify differences (and similarities) between traditional records and electronic records. The concept of the archival function is also introduced. The chapter concludes with a discussion of how electronic records impact on the role of archival institutions as well as archivists themselves.

2.1 The Concept of Record and Record Keeping

The discussions and recommendations in the Guide are based on the following concept of a record:

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

For the purposes of the Committee, the concept of context is related to the environment of the record, as the creation stage - that is, the function that created the record. There are at least three aspects of the context of a record. First, there is the contextual information contained in the record (for instance, the signature of the executive officer). Second, there is the relationship between a record and other records in the fond. And third, there is the activity in which the record was created. The concept of structure is related to how the record is recorded, which includes the use of symbols, layout, format, medium, etc. For electronic records it is convenient to distinguish between physical and logical structure - see Section 2.2 below.

This concept of a record applies regardless of the format or medium of recording.

According to the concept, a record must be related to an activity or action carried out by a corporate body (an

ICA Studies/Études CIA - Managing Electronic Records

institution, agency, company, etc.) or by an individual. This activity and the function it supports determine the provenance of the record, and the record provides evidence of that activity.

All organizations require records of their business functions in order to continue their operations, to satisfy program needs, and to meet administrative and legal requirements. Within this context, the main purpose of records creation and record keeping is to provide evidence. Evidence of activities and transactions is needed for the accountability of a corporate body or an individual.

The reliability of a record is its ability to serve as reliable evidence. Basically, a record can be no more reliable than it was at the instant of its creation. Therefore, direct responsibility for reliable records is that of the records creator. However, the archives should inform and guide creators on best practices for producing reliable records. Authenticity refers to the persistence over time of the original characteristics of the record with respect to context, structure and content. An authentic record is one that retains its original reliability.

Record keeping systems are needed to store and retrieve records in an appropriate way. A record keeping system is an information system that has been developed for the purpose of storing and retrieving records, and is organized to control the specific functions of creating, storing, and accessing records to safeguard their authenticity and reliability. Thus, it is a main tool to preserve records and make them available for use. But, the record keeping system is also part of the context of a record. It provides contextual information that may be crucial to "prove" the records authenticity, and it also may provide contextual information that is necessary for the right understanding of the content.

2.2 Electronic Records

While the concepts of "record" and "record keeping systems" are germane to records in any format, for the purposes of the Guide, some unique characteristics of electronic records which influence the strategies and methods which work effectively for their management and long-term preservation need to be described. These characteristics make an electronic record quite different from a traditional paper-based record, and require the implementation of new methods in carrying out some of the most fundamental records management and archival functions. Therefore it is necessary to understand these characteristics, both in order to identify electronic records and to handle them according to the principles of good record keeping. For the purposes of this Guide an electronic record is a record that is suitable for manipulation, transmission or processing by a digital computer. The following characteristics distinguish electronic records from those in traditional form:

Recording and the use of symbols: The content of a traditional record is recorded on a medium (paper, etc.) and by means of symbols (alphabet, figures, etc.) that can be directly accessed (read) by a human being. The content of an electronic record, however, is recorded in a way and on a medium (high density on a magnetic or optical device) that cannot be directly accessed (read) by a human being, and it is represented by symbols (binary digits) that must be decoded. In general, when an electronic record is produced and stored, it is transferred and transformed from a human-readable to a machine-readable format. This machine-readable version is the recorded piece of information which constitutes the record.

For retrieval of the record, the transfer and the transformation go the other way. As human beings cannot read an electronic record as it is, it is crucial that the transformation back to human-readable format follows the same specifications as were used for the transformation in the first place. To achieve this requires not only preserving the records, but also access to the necessary equipment (hardware and software) to read the records and make the correct transformations plus the controls to ensure that what one sees is what is recorded.

Connection between content and media: The content of a traditional record is recorded on a medium (storage device, like a piece of paper) and cannot be separated from this medium. The content of an electronic record is also recorded on a medium, but from time to time it has to be separated from the original device and transferred to other, and often different types of, storage devices whenever it is retrieved or when necessitated by technological obsolescence. Unlike traditional records, an electronic record is therefore not permanently attached to a specific medium or storage device, so the opportunities for corruption grow. This presents additional problems in ensuring that the record's authenticity and reliability are maintained.

Characteristics of physical and logical structure: The structure of a traditional record is apparent to the user. The structure is an integral part of any paper document, and one of the main criteria for evaluating its authenticity. The physical structure of an electronic record is not readily apparent, and ordinarily unknown to the common user. It is, of course, a result of the structure which the producer created on his or her screen, but it is also dependent on the computer system (hardware and software) and on the available space on the storage device (e.g. the hard disk, floppy disk). Every time the record is transferred to another device, the physical structure may change. The user will always need a computer system that is able to retrieve the record, and which therefore must be able to "read" the physical structure. But except for that, the physical structure will be of no value and of no interest to him or her. That is to say, the record is not dependent on any specific physical recording.

As the physical structure of an electronic record is variable and not readily apparent, it cannot play the same role as for traditional records. Therefore, there is need for a logical structure which makes it possible to identify (delimit) each single record and to represent its internal structural elements (like fields in a schema or table, margins, paragraphs, etc.). This logical structure of an electronic record will, generally speaking, often be the structure which the producer created on his screen. In order to be considered complete and authentic, the record must preserve this structure in some way, and the computer system must reconstruct it when transforming the record back to a human-readable format. The logical structure of an electronic record is represented by, and stored as, symbols or data (binary digits). Accordingly, the specifications of this coding must be available for any retrieval of the record.

Metadata: Metadata is defined as data about data. This is an important concept for electronic records because metadata about the context and structure of a record is needed to make the record understandable and usable. As stated in the concept of a record, information about context is one of the necessary elements in providing evidence of the activity the record represents. Electronic records lack certain elements of traditional records that contribute to establishing the relationship between a record and its functional and administrative context. Thus, electronic records are heavily dependent not only on a well-documented administrative context, but on metadata describing how the information is recorded. Metadata which map administrative and documentary relationships among individual items within a particular record keeping system during the life cycle of that record provide part of the context of the record which must be preserved.

Identifying records: An electronic record cannot be identified by means of being a physical entity, but constitutes instead a logical entity which is the result of and provides evidence of an activity or a transaction. In many cases, such entities (i.e., electronic records) have a parallel in corresponding paper records such as letters, contracts, memoranda, registers, etc. In other cases, the parallels to corresponding traditional records are less obvious or may be absent (e.g. in the case of some types of databases, hypertext, spreadsheets, multimedia systems). Here, the challenge of identifying records (and sometimes also their provenance) will be greater.

Preserving records over time: Preserving traditional records means to store physical units (sheets of paper, volumes, etc.) under the best possible conditions, in order to avoid damage, and to repair damage if and when it occurs. Preserving electronic records is something quite different. The physical units (the storage media) must be stored under the best possible conditions, but regardless of how good the storage conditions are, electronic information will "fade away" after a fairly short time (five to 30 years, depending on the type of medium). Moreover, most computer systems are bound to be obsolete in an even shorter period of time, which means that the information they have produced will not be accessible by successive generations of computer systems. Accordingly, in order to preserve electronic records, they must from time to time be migrated to new technological platforms, (i.e., be copied to new storage devices and in some cases converted to a format suitable for new computer systems).

This section has illustrated the properties which electronic records have in common, and which distinguish them from traditional paper-based records. However, the various environments in which electronic records are created give rise to different types or categories of such records that may require differing methods for records and archival management. The Committee believes that important work remains to be done in defining those environments, and identifying the types or categories of such records. Section A of Part II, entitled "Records in a Database Environment", was prepared in order to stimulate discussion and encourage further work in this area. Over time,

in-depth discussion papers related to the management of other categories of electronic records will be prepared. These will be made available as they are completed.

2.3 The Concept of the Archival Function

Traditionally, archivists have been viewed as being entrusted with the "keeping" of those records deemed to be of enduring value (i.e., archival records), and it has generally been assumed that the functions assigned to archival institutions represented, by definition, the totality of functions appropriate to that task. It is readily observable, however, that the functions entrusted to various archival institutions tend to be more or less broad in scope, depending upon cultural tradition, legislative mandate, and even political decision. Thus, for example, at the national level, some archival institutions are assigned the role of recipient of archival records - at a rather late stage in the life cycle of those records - and focus their efforts on arrangement, description, preservation and use. In other cases, national archives are tasked with appraising and selecting records for transfer, or even setting standards for the maintenance and management of records in their current stages.

As archivists have begun examining how the functions of archival institutions can and should be carried out with regard to electronic records, an awareness has developed that there exists the broader concept of the archival function (which may be defined as the record keeping function applied to archival records - and extended in time), only part of which (and to varying degrees) has traditionally been carried out by archivists and/or archival institutions.

The concept of the archival function is as follows: the archival function is that group of related activities contributing to, and necessary for accomplishing the goals of, identifying, safeguarding and preserving archival records, and ensuring that such records are accessible and understandable.

These activities start at the creation stage of the life cycle of the archival record (and, in the electronic environment, even before that), and continue through the later stages to preservation and use. In the traditional, paper-based environment, the archival function has been a distributed one, with responsibility for carrying it out divided among a number of players, including (but not limited to) records creators, registrars, records managers and archivists. The particular subset of the archival function assigned to any archival institution determines whether that institution's own functions are defined broadly or narrowly.

The important point is that, regardless of variation in administrative and organizational traditions and independent of the functions assigned to an archival institution, there exists an archival function which has been carried out in the past by various players (either as an assigned responsibility or by default), and which must now become the subject of scrutiny as archivists ponder the management of electronic records.

The archival function is driven by the goal of ensuring the creation and preservation of evidence of the activities or transactions of records creators. The natural tendency to equate evidence with the notion of accountability has led to assumptions (sometimes unfounded) that potential records creators can be relied upon to ensure that the earliest stage of the archival function (i.e. actual records creation), is carried out. Once that act takes place (if it takes place), a second set of assumptions has tended to guide practice. As also noted above, to constitute evidence, records must consist of content, context and structure. In the traditional environment, that content, context and structure are of necessity bound to the medium (usually paper) on which it is stored. Thus, it could be assumed that once it was decided to create a record, the goal of creating evidence would be met. Further, as the records creator usually had some need to re-use the record from time to time, and as the tools available for managing current records in the traditional environment have been developed to a fairly sophisticated level (registry systems, file classification schemes, etc.), it could also be assumed that a certain amount of intellectual control over the archival record had been imposed from the earliest stages of the life cycle.

Thus, up until a certain point in the life cycle, the archival function has been traditionally carried out by the records creator and/or records manager, and archivists have generally been comfortable with the process.

As the paper-based archival record has passed from its active life, however, a decision (perhaps interim) had to be

made concerning its longer-term value (that decision might have been made earlier, but it could not have been made later). This aspect of the archival function has been handled variously according to different traditions, but regardless of who has been responsible for carrying it out, records remaining after the disposition process have likely passed in due course to the

custody of an archival institution. At that point, the traditional tasks of final appraisal and establishment of intellectual and physical control over the records have been carried out (although it must be noted that even for the parts of the archival function which have been traditionally carried out by archival institutions, various other players may have had responsibility for certain of those tasks at earlier stages of the life cycle).

In the electronic environment, the existing practices described above for carrying out the archival function will clearly not be sufficient to achieve the goal of creating and preserving evidence. The reasons for this have been categorized according to records creation, records appraisal, records preservation, and records access/use.

Records Creation

It seems less clear in the electronic environment that the record creator can be relied upon to actually create a record. Even if one assumes the existence of a high level of motivation to ensure accountability, the very notion of what a record consists of is not as obvious as in the paper world, and the mechanisms for creating it may not be available to the potential records creator unless certain prior actions have taken place. For example, unless provision for creation of a record has been built into an electronic system at the design stage records creation cannot and will not take place. Thus, in the electronic environment, the records life cycle must be extended backwards - to a stage prior to records creation. This earlier stage has been referred to as the stage of "conception". These two changes - the difficulties associated with relying solely on potential records creators to actually create records, as well as the need to extend the archival function to a new stage of the record life cycle, which is populated by new players (information managers, systems designers, etc.) - create a requirement in the electronic environment for the expertise of trained archivists at a much earlier stage in the record life cycle (indeed, even before that life cycle has begun in the traditional paper-based environment).

Records Appraisal

In the traditional paper-based environment, the players entrusted with carrying out the appraisal and selection parts of the archival function have varied somewhat, according to differing administrative and organizational traditions. Frequently, however, those tasks have not been done until the later stages of the life cycle of the record. In the electronic environment, however, as with records creation, tasks associated with appraisal and selection must be initiated early in the life cycle, often at the stage of "conception", because retention requirements based upon archival considerations should be built into an electronic system at the time of its design. Otherwise, there exists a significant risk that records will be retained in that system only so long as they are needed to meet the business requirements of the users, and then purged. The potential which exists in the traditional record keeping environment to appraise and select records after they have passed beyond their stage of active use does not exist for electronic records. The need to push the tasks of appraisal and selection back to the beginning of the record life cycle reinforces the case made above with regard to the necessity of applying archival expertise earlier in the cycle than might be the current practice. Also, the requirement to appraise and select records at the system design stage - before any records are even created - suggests that new approaches to the appraisal and selection tasks may be warranted. Specifically, attention must be directed toward the functions of the originating body, and the business processes and activities through which those functions are carried out, rather than towards the records themselves.

Records Preservation

The preservation of electronic records poses new and demanding challenges for archivists. As discussed above, for records to serve as evidence, the content, context and structure of the record - which in the electronic environment are independent of the medium - must be retained. Thus, preservation of the medium alone will not suffice. In the traditional, paper-based environment, efforts could be focused on preservation of the physical medium (usually paper), and since the content, structure, and to some degree the context as well, of the record were all bound up with

that physical medium, preservation of the record as evidence was ensured. In contrast, in the electronic environment, archivists can devote a considerable amount of resources to preserving the physical medium (magnetic tape, diskette, optical media, etc.) and still fail to preserve the record.

It has been argued that archival records in electronic form might be more efficiently and economically preserved by the creating entity in the context of its own computer environment. This would, of course, need to be done on the basis of standards developed by archivists, and most likely under systematic monitoring by archival institutions to ensure that the prescribed standards are being met. Adopting such a non-custodial or distributed custody role would permit archival institutions to avoid the complexity and expense of investing heavily in the technology associated with the maintenance and management of electronic records, and would also free staff of those institutions to concentrate on the new auditing and controlling functions and responsibilities placed upon them in the environment of a distributed "virtual archives".

On the other hand, this kind of solution requires a satisfactory awareness of the archival function within the participating agencies. Its successful implementation depends on the willingness of responsible governments, or their agencies, to give the necessary priority to preservation requirements, spend money on migrating records which no longer have any value to the agencies themselves to formats suitable for new technical platforms, and adjust their systems to the standards set up by archivists regarding both preservation principles and user services. There are different opinions as to which approach is best.

Records Access/Use

The electronic environment provides both opportunities and challenges for carrying out those parts of the archival function relating to access and use. Concerning the opportunities, a variety of tools is now available for remotely locating and accessing electronic records, so that neither the archivist nor the researcher needs to be at the same site as the records. Thus, in many cases, there may no longer be a need to gather archival records into a centralized repository in order to provide access to those records and manage their use (although other considerations - for example, to ensure security - might still dictate such an approach). This may have certain implications in terms of the custody/non-custody discussion presented above under preservation, and will certainly lead to the development of new - and better - methodologies for carrying out the access and use portion of the archival function. With regard to the challenges posed by providing access to and use of electronic archival records, these derive from the complexities associated with preserving those records - which have been described above - and also the implications for both archivists and archival institutions in terms of required new expertise.

2.4 Redefined Roles for Archivists and Archival Institutions

The introduction of modern technology has brought about so many - and such basic - changes, that people are being forced to re-examine the ways in which activities have traditionally been accomplished in nearly all arenas of human endeavour. When faced with the challenges and opportunities posed by electronic records, archivists must understand that it is not evolution that is required, but radical change - change toward a broader outlook, changes in training, changes in expertise, and change in terms of assigned roles and tasks. Unless such changes occur, the archival profession will gradually become irrelevant, and archival institutions mere museums of information artifacts.

What changes must occur? Section 2.3 above addressed the impacts of electronic records upon archivists and archival institutions, and in so doing suggested that there exists in the electronic environment an altered dynamic between the archival function and the stages of the record life cycle in the context of which that function must be carried out. This altered dynamic, and the ways in which archivists and archival institutions in any given administrative or organizational tradition respond to it (i.e., what roles they choose - or are directed - to play vis-a-vis the other players), will determine the direction in which change will take place.

To discuss the possible directions for changes, one must turn once again to the record life cycle. In the electronic environment, there must be a greater focus by the archivist upon the conception and creation stages of that life cycle.

This can be done in a proactive way (actual involvement in the processes themselves) by informing, guiding or directing system designers and developers, and record creators, so that authentic, reliable and preservable records are created and maintained, or else by issuing standards and guidelines for others to apply and/or by drafting appropriate legislation and/or rules. In either case, a monitoring role is also implied. It should be noted that involvement at the earliest stages of the life cycle may not be limited to carrying out the traditional tasks (appraisal, etc.) earlier in the life cycle, but will also

extend to a proactive role in mandating and facilitating the creation of records as well. In contrast to their enhanced levels of involvement in the early stages of the life cycle in the electronic environment, archival institutions potentially may find that in the later stages of the life cycle their roles are diminished. Thus, the focus may need to shift to the establishment of mechanisms for monitoring the efforts of those others who carry out the archival functions of preservation, access and use. Even when these responsibilities continue to reside with the archival institutions, however, the associated tasks and roles will vary from those in the traditional paper-based environment.

Chapter 3

Strategies

Chapter Two explained the concept of a record in the environment of electronic recordkeeping and discussed the notion of the archival function. Chapter Three proposes strategies and methods for accomplishing the life cycle management of archival electronic records. These strategies and methods constitute a framework that an archives can use in dealing with such records. The challenges of the electronic age are too great and the circumstances of archives around the world too diverse to allow a simple recipe for all archives. Some archives will find the suggested strategies are consistent with approaches they are already following; others may see the strategies as representing a radical departure. Each archives needs to develop its own approach according to its particular circumstances. And each archives will need to adapt that solution as both its circumstances and the technology of electronic records continue to change.

To ensure that the archival function is carried out effectively, responsibly, and completely in the electronic environment, the archives must adopt a comprehensive strategy which ensures that those who substantially influence the existence, the character, or the accessibility of electronic records contribute to the accomplishment of that function. While the legal mandates, the resources, and the circumstances of archives differ substantially, the Committee believes that there are four things that every archives should do:

1. Be involved in the entire life cycle of electronic systems that create and retain archival electronic records to ensure the creation and retention of electronic records that are authentic, reliable and preservable.
2. Ensure that records creators create and retain records which are authentic, reliable and preservable.
3. Manage the appraisal process and exercise intellectual control over archival electronic records.
4. Articulate preservation and access requirements to ensure that archival electronic records remain available, accessible, and understandable.

Chapter Three is divided into four sections, one for each of these four principles. In each section, the principle is developed, and relevant issues and concerns are identified.

3.1 The Life Cycle of Electronic Records

The first principle in the framework for managing electronic records is:

ICA Studies/Études CIA - Managing Electronic Records

The archives should be involved in the entire life cycle of electronic systems that create and retain archival records to ensure the creation and retention of electronic records that are authentic, reliable and preservable.

There are two basic concepts in this principle: archival involvement and the life-cycle of records.

Archival involvement

For an archives to be involved in the entire life-cycle of records does not mean that the archives is responsible for all actions relating to records during their life cycles. Rather it means that the archives needs to foster understanding of the archival function and to promote standards and practices which achieve the goal of the archival function by all actors who have a role in this function at any and all points in the life cycle.

The archival function extends across the entire life cycle of records, which may be seen as having three basic stages:

conception;

creation;

maintenance (including preservation and use).

Life cycle of records

The life cycle of electronic records is substantially determined by choices and decisions that are made at the stage when the need for keeping records is identified and record keeping systems are designed and developed, before any records are created. In this stage - referred to as the "conception stage" - electronic information systems are designed, developed and implemented. The process includes the analysis of requirements for both information and for the processing of that information for the purposes of current business. It also includes the selection, acquisition, and installation of appropriate technology. Functional requirements for the management of electronic records should be addressed in the design and specification of electronic information systems in order to ensure that the content, context and structure of the records created or retained provide reliable evidence of the creator's activities, and that archival electronic records are identified and preserved. Addressing these requirements in the conception stage will reduce the need to alter systems after they are implemented. Such alterations are often costly and complicated, and may not even be feasible.

While fundamental decisions are made at the point of conception, the creation stage is obviously critical. A system may be designed to satisfy requirements for maintaining accessible electronic records; however, if complete and reliable records are not consistently captured in the system, the design will be of no value. Adequate and reliable records must be created as needed and captured in well-designed record keeping systems.

The maintenance stage encompasses the remainder of the life cycle of archival records, whether they are in paper-based or electronic form. The purpose for maintaining archival records will shift over time. Initially, a record will be used by the creator to support decision making and the transaction of business. Subsequently, it may be stored for some time for use in other activities or to satisfy requirements for accountability. Finally, it will be maintained for legal, cultural and other research purposes. Thus, the maintenance stage of records encompasses both maintenance for business purposes and maintenance for archival value. Actions taken with respect to records during their active phase should be framed to facilitate continued maintenance and accessibility of records after they have satisfied the creator's business needs. Similarly, steps taken for archival preservation must ensure that the records continue to provide reliable and authentic evidence of the creator's activities.

An archives which cannot operate effectively over the entire life cycle of records because of limitations in its mandate, resources or competence, will be substantially hampered in dealing with electronic records. For example, if the records creator created and maintained records in a manner which did not adequately address reliability and authenticity, it may be impossible to verify the reliability or authenticity of the records when they are transferred to the archives. Furthermore, an archives whose activities start only when records are transferred will confront numerous technical difficulties. Many of these difficulties could be eliminated or avoided if the archives could influence the records creators earlier in the life cycle. In many cases, the archives will be unable to solve technical problems in records it receives without the cooperation of the creator. Such cooperation would be easier to secure if the archives had established a collaborative relationship with the creator earlier in the life cycle. However, there

ready cooperation of the creator, technical problems will be impossible to resolve at the end of the life cycle; for example, when the records require use of technology which is no longer available or in the common case of inadequate technical documentation of the creator's system.

3.2 Records Creators and Archival Electronic Records

The second principle in the framework for managing electronic records is:

The archives should ensure that records creators create and retain archival records which are authentic, reliable, and preservable.

This principle does not imply that the archives is responsible for the functions of records creators or that the creators are not competent to manage their records. The archives cannot assume the role of the records creator. The creator must be responsible for creating reliable records and for maintaining them in authentic form for as long as the creator has custody of the records. But archival expertise can show records creators appropriate ways of meeting their responsibilities.

The archives needs to direct, influence, or oversee the actions of other actors throughout the life cycle of archival electronic records. These actors include (1) records creators and records managers; (2) those who establish laws, regulations, and policies; (3) those who allocate resources; and (4) those who produce, supply, and manage the information technology on which the records depend. Success in this area will also entail developing contacts and alliances with others interested in good record keeping, including lawyers, auditors, accountants, and other decision makers.

Actions which the archives can take to influence other actors in carrying out the archival function include:

- issuing and updating regulations governing record keeping to ensure that electronic records are adequately addressed;

- establishing standards for the management of electronic records;

- providing guidance and information which promote a consistent understanding of the reasons behind good record keeping practices;

- specifying how to identify archival records and what is required to preserve them;

- monitoring the implementation of the record keeping rules and regulations issued by archival authorities; and

- promoting cooperation among actors, including records creators, records managers, information specialists, etc.

In addition, archives need to be pro-active in the following areas:

- identifying where and how existing laws and regulations could be improved to facilitate the management of archival electronic records, for example, in the competencies assigned to the archives, in making it clear that electronic information can be a record (that is, that record status is not determined by the technology used to create a record or the medium on which it is stored), and in the articulation of requirements for electronic record keeping;

- issuing or promoting the development and implementation of standards which support electronic record keeping objectives; and

- promoting the development, implementation, and use of both information technology which incorporates

functional requirements for record keeping systems and specific software for performance of archival functions such as classifying, identifying, and retrieving records.

In many circumstances, the above approach will be difficult to take. It will require the archives to take on roles which it has not had before. The archives will need to develop new policies which define its roles; new expertise to play these roles successfully; and, in many cases, change its corporate culture. The archives may also need to acquire new authority and, perhaps, new resources. The changing role of archives will be explored more fully in Chapter 4.

3.3 Appraisal

The third principle in the framework for managing electronic records is:

The archives must manage the appraisal process and exercise intellectual control over archival electronic records.

Appraisal examines the values of records and determines their retention periods; that is, it identifies those records which should be preserved after they have satisfied the creator's business needs. The knowledge and advice of the creating agencies, higher authorities, and others familiar with the operations of the records creators are valuable in the appraisal process. But the archives alone will have the comprehensive knowledge of record keeping throughout the organization over time and the understanding of appraisal theory and methods to make the best selection of archival records.

As noted in Chapter Two, in the electronic environment records appraisal must be carried out in the early stages of the life cycle, often before any records have been created. Consequently, archives will need to adopt an approach to appraisal which is grounded in comprehensive knowledge about the originating body and its functions and work processes; how those functions are assigned to agencies and expressed in their mandates; and how the functions are carried out through business processes and activities. Because it focuses on functions and activities in which the records are created and used, the approach is termed ***functional appraisal***.

The conception stage is the most advantageous time for appraisal, because it provides the greatest opportunity for ensuring that appraisal decisions are effectively implemented. At this stage, an organization articulates what information it will need to conduct its business and determines how to organize and process the information systematically to support its mission and mandates. Functional appraisal makes it possible to identify which record keeping systems will contain archival records, and which records in these systems have archival value. Requirements for preserving these records can be incorporated into system design with greater ease and less burden than would be involved in modifying a system that already existed, which would be necessary if appraisal were initiated at a later stage. Appraisal at the conception stage will also help to avoid the unnecessary expense of applying standards for archival records to records which do not have enduring value.

Appraisal in the conception stage will include identifying functions and activities which will generate archival records; determining what information systems will support these functions and activities; identifying the archival records that will be captured in the systems; and designing these systems to enable retention, preservation and accessibility of archival records. The conception stage concludes with design, installation, and testing of the system. System testing should include tests to verify if record keeping requirements have been built into the system so that appraisal, preservation and access provisions are operative.

When appraisal is initiated at the conception stage, it needs to be continued at later stages of the life cycle. In many cases, automated systems, as implemented, differ substantially from the system design. In other cases, the system may be implemented, but not well used, so that the records that were expected to be produced are not created. Therefore, the records need to be reviewed after the fact to see if they conform to expectations of the conception stage.

Appraisal at the conception state initiates archival involvement in the entire life cycle of the records. After the archives has identified records with archival value, it needs to monitor the creation of records to verify that the creator does create records as expected, and it needs to monitor the maintenance of those records.

When records have been created before the archives has been able to initiate appraisal, appraisal at the creation stage enables the archives to offer suggestions on how the creator might modify its system or procedures to better provide for the identification, preservation and accessibility of archival records. Operational systems are often modified in

response to changing circumstances or business needs. If it is necessary to modify a system to satisfy archival requirements, it will be advantageous to undertake such modifications at the same time as modifications made because of the creators own needs.

Appraisal at the maintenance stage is not desirable. First, there are risks that adequate records will not have been created; that the authenticity of the records cannot be demonstrated; that the records are incomplete, unreliable or not interpretable; or that the information that is retained reflects only how an organization carried out its record keeping, and not how the organization accomplished its functions and activities. Second, changes in systems may make it impossible to access older records or may have destroyed their reliability or authenticity. Third, adaptation of existing record keeping systems to satisfy archival requirements may be very costly and complex, or even impossible.

To ensure that archival electronic records are preserved in authentic form, archives need to maintain intellectual control over the records. As with all forms of records, intellectual control entails describing the records according to archival standards. Description must include contextual information sufficient to define the provenance, context, and structure of the records whenever they are not explicit in the records themselves. This contextual information is the basis for governing actions taken at transitions or boundaries in the life cycle of the records, such as copying or transferring the records, to ensure that the authenticity of the records is maintained across such boundaries. For electronic records, it also means applying controls to any technological migrations or transformations in order to preserve authenticity. Intellectual control over electronic records is further discussed in Part II, Section B, 2.1.

3.4 Preservation and Access

The fourth principle in the framework for managing electronic records is:

The archives must articulate preservation and access requirements to ensure that archival electronic records remain available, accessible, and understandable.

This principle addresses issues that are especially problematic for electronic records because of their dependence on technology which continues to change. The discussion of this principle does not address, except tangentially, preservation requirements that are common to all forms of records, such as the basic requirement that archival records be authentic.

Preservation and access to archival electronic records are interdependent:

available records are physically intact, identified, and readable;

accessible records can be selected within search strategies consonant with the way the creator organized the records, and presented in a historically authentic form; and

understandable records are records which can be used as historical evidence. This requires identification of the provenance of the records, maintenance of the original order of the records, and the availability of related records and other contextual information.

Archival electronic records cannot be preserved by maintaining them in static form, because of technological obsolescence. Even if the records were written on media that would endure forever, eventually it would be

ICA Studies/Études CIA - Managing Electronic Records

impossible to retrieve or output any but the simplest types of electronic records maintained in static form, as explained in Chapter 2.2. Over time, it will be necessary to transform the records in order to migrate them from obsolete technology to current forms. Archival preservation requires that such transformations respect the authenticity of the records and that such changes enable the records to be retrieved and understood. Such transformation must be thoroughly documented.

3.4.1 Preservation

An electronic record is preserved if and only if it continues to exist in a form that allows it to be retrieved, and, once retrieved, provides reliable and authentic evidence of the activity which produced the record. There will be many instances where continued preservation of electronic records will involve options which could diminish the reliability or authenticity of the records, or could affect the possibilities for accessing or understanding the records. Archives need to identify when such possibilities can occur, advise records creators of appropriate choices for records in their custody, and take actions necessary to ensure continued reliability and authenticity of the records in the archives. Section B of Part II provides a more detailed discussion of preservation options.

Whether it has custody of the records or not, the archives is responsible for articulating the implications of the available options for continued preservation and determining which options are appropriate. The archives should address this responsibility both generally, by issuing guidance on the preservation of electronic records, and specifically, by identifying preservation issues associated with a particular record keeping system and determining appropriate actions. If the archives is responsible for preserving the records, it should take the appropriate preservation actions. If another organization has custody, the archives should recommend the appropriate actions and assist in their implementation. The question of custody for archival records should be decided on the basis of determining which organization is best able to preserve and provide access to authentic records over time. Factors to consider in determining the best option include whether the creator's mission entails maintaining and providing access to authentic records over time, and the availability of resources for preservation and access to archival records.

3.4.2 Access and Use

Access to archival electronic records has both a supply side and a demand side. The archival records constitute the supply. Requests for access to the records constitute the demand. Computer technology is the means for delivering records to those who request access.

The supply side of the access function is determinate and fixed. The archival records must remain what was produced by the records creator and selected by the archives through appraisal. The supply is bounded by the business needs of the creator and determined by the organization, processes, and activities the creator used to carry out its mission and functions.

The demand for access to archival electronic records is likely to be highly variable. At any given time, there may be a variety of demands, and the character of demands may change over time. Demands for access for purposes of institutional memory or long-term accountability will derive from the processes which produced the records; however, much of the demand will be essentially independent of the purposes for which the records were created and maintained. The objectives of many demands for access to archival electronic records will not be for evidence of the creator's organization or activities, but for information contained in the records. The evidential character of the records remains critical even in such cases, because it may be impossible to interpret information contained in the records correctly unless the character of the documentary materials as records is understood.

The means of access, information technology, will change over time, and changes in information technology will impact both the accessibility of the records and demands for access. Electronic records will become inaccessible if they depend on obsolete technology. Additionally, as information technology provides ever more powerful and flexible access and retrieval tools, researchers will want to use these tools to access archival records. The number of researchers seeking access can be expected to increase as the technology makes the possibility of remote access increasingly common and cost effective. Finally, the increasing desires of researchers to tap the potential offered by technology for access can be expected to alter the role of archives as mediators or agents of access.

Thus, the function of providing access to archival electronic records can be conceived as one of delivering fixed objects to a changing and diverse market. To remain responsive, the access function will have to adapt to changes in the demands and take advantage of improvements in technology. Simultaneously, it must be able to guarantee

the authenticity of the products it delivers. Resolving these tensions requires appropriate intellectual control over the records, methods for providing access, and timely response to changes in demand and in the technology. These requirements are addressed in Section B of Part II.

Chapter 4

Implications for Archives

The strategies that are described in the Guide are based on the concept of an archives that is actively engaged in the records creating process, understands clearly what a record is, what it means to keep a record and is staffed with individuals who can work well with specialists from a range of disciplines (e.g., information technology, audit, records management, security, legal services, etc.) as well as with the records creators themselves. An archives that is passive and waits for electronic records to arrive after their administrative and operational value to the creating organization has expired will experience considerable difficulty in preserving electronic records cost-effectively.

Even though the Guide provides suggestions to those archives which, by virtue of their enabling legislation, are restricted from adopting an active approach, it sets out a clear message that archives should position themselves at the "front end", even before records are created. And even though an archives does not expect to be actively involved in the appraisal and acquisition of electronic records for some time, it can still accomplish a great deal by influencing the development of laws and policies as well as standards and practices for the management of electronic records. Partnerships with policy makers, standards setters and electronic records creators can set the stage for that future point in time when an archives can assume a more active role.

Such repositioning, however, will have important legal, organizational and technical implications for archives. The purpose of this chapter is to explain these implications in order to help archives establish checklists of the things that they will need to consider as they move into a position to influence policy, standards, and the design of record keeping systems. Examples (in *italics*) from a fictional archives have been included to illustrate some of the ideas and suggestions raised in this chapter.

4.1 Legal and Policy Implications

In order to address electronic records issues, it is important that an archives operates in a legal and policy environment that is conducive to archival concerns. The laws and policies that enable an archives to exist should include clauses that permit (or enable) the archives to be a player at the electronic records "table". The political and other triggers that led to such laws and policies must be understood. Why is the archives being enabled to do something about electronic records? Why did a parliament, a board of directors or some other authoritative body consider it important to establish laws and policies that confirm this role? If such laws and policies are not in place then how can they be established? The need to establish a legislative and/or policy framework for enabling an archives to deal with electronic records (either on its own or in partnership with others) is an important implication of the strategies proposed in this guide.

If an archives is to be positioned at the "conception" stage, then it should also be enabled, again through law and policy, to influence electronic record keeping in creating organizations. Thus, in addition to enabling the archives to support business functions that include the appraisal, "acquisition" (custodial or non-custodial), preservation, and dissemination of records (including electronic records), it should also permit the archives to influence record creation and record keeping (including electronic record keeping) within creating institutions.

Archives should ensure that the laws and policies that govern the management of records in the creating organizations for which they are responsible contain definitions of records that account for all forms of records including electronic records. An archives can play a significant role by advising on the definition of "record" and how the term should be used such that it conveys the same meaning regardless of the law or policy into which it has been inserted.

While laws and policies may contain references to electronic records (or at least account for them in their definitions), they will be ineffective if they do not assign accountability for the proper management of records. Archives should ensure that (or at least influence the extent to which) the assignment of accountability for record keeping is addressed as laws and policies are developed by the records creating organizations or other organizations that have a legislative and policy development role. Such laws and policies can be horizontal (e.g., Freedom of Information, Evidence, Privacy) or vertical (e.g., the enabling law for a new environmental protection program).

In the case of the former, accountability will have been assigned across the organization for the way in which, for instance, the right of access to information by citizens, can be exercised. In the case of the latter, accountability will have been assigned throughout a given program area such that each individual in that program area understands the role and importance of records within the context of the business and accountability requirements of the program as well as their own roles and responsibilities for the creation, care and disposition of records.

Finally, an archives may exist in an environment where there are no relevant laws or policies that address electronic record keeping or the management of archival electronic records. Even in this situation, however, an archives cannot afford to be passive. It must become an advocate and an agent of change that promotes the need for appropriate laws and/or policies.

An archives used the ICA Electronic Records Committee concept of a "record" to come up with a definition of record that was used in the new archives legislation as well as the enabling laws of several other government programs. Accountability for record keeping rests with the heads of each program while the archives legislation provides a role for the archives in setting standards for the management of records.

An archives joined with other concerned organizations to develop a position on the admissibility of electronic records in a court of law. Although admissibility criteria vary from country to country and even within countries, the archives played a valuable role in articulating these criteria and providing advice on the circumstances under which various organizations could make decisions on the retention and disposition of electronic records (e.g. the disposition of source records scanned into an imaging system). This role had a profound impact on the ability of the archives to play a role in advising on (and even setting standards on) the legal and policy considerations that their sponsoring organizations needed to address.

4.2 Organizational Implications

An archives should not address the management of electronic records as a special media issue. Such an approach only helps to reinforce a "business-as-usual" approach which can be detrimental in the long run, particularly if the archives has adopted a passive approach in carrying out its responsibilities. In the ideal world, electronic records should be seen as part of an integrated approach to the management of all records, regardless of their physical form. On the other hand, the way that electronic records are addressed can serve as a catalyst for changes in the way that archives carry out their overall business.

4.2.1 Mission and Mandate

Such an impact extends to the fundamental nature of the mission and mandate of the archives itself. If the archives is to play a role in the management of records regardless of format then it is important that its mission and mandate statements contain statements that make it clear that the archives is in the "business" of dealing with electronic records. Again, the definition of "record" becomes very important. If it is too restrictive, then electronic records may not even fall into the scope of the mission and mandate.

Although every organization has a unique perspective on the distinction between a mission statement and a mandate statement, for the purpose of this Guide, a mission statement describes the objective of the archives while a mandate statement describes what the archives is enabled to do based on a higher authority such as a law, by-law, policy, etc.

Examples of mission and mandate statements that inherently include electronic records (i.e. the definition of "record" includes electronic records) are as follows:

the mission of the archives is to ensure the availability, understandability and usability of authentic, reliable and purposeful records for as long as they are needed to contribute to the collective memory of the country and to protect the rights of citizens.

the mandate of the archives (as authorized through the National Archives Act) is to acquire, preserve and make available archival records and to facilitate the management of records in government institutions.

4.2.2 Policies

Based on an effective and highly relevant mission and mandate, an archives needs to ensure that policies are in place to account for the appraisal, acquisition, description, preservation and dissemination of electronic records as well as for its role in facilitating the management of records. These policies are extremely important and must be developed with care because they will establish the extent to which electronic records are integrated into existing programs or dealt with as a separate "media" issue or program. The extent to which one or several models will be adopted (such as custodial vs. distributed custody vs. a mix of the two) will be dictated by the policies that the archives establishes for itself.

At a more basic level, policies need to be established in the following areas:

facilitating the management of records (what role should the archives assume?);

appraisal (what records should be selected for preservation?);

acquisition (what strategy should be adopted and under what circumstances?);

description (what standards should be employed?);

preservation (what strategies should be considered for maintaining physical and intellectual integrity of records through time?); and

dissemination, access, retrieval (what strategies should be adopted for servicing records?).

4.2.3 Functions and Activities

Based on their mandate and mission, archives should ensure that functions (e.g., acquire/preserve/make available archival records, facilitate the management of records); activities (e.g., facilitate, appraise, acquire; maintain physical and intellectual control; provide reference services) and processes (i.e. the tasks that comprise the work or business processes supporting the functions and activities) are in place to deal with electronic records. Regardless of whether or not an archives establishes a custodial, distributed custody, integrated or stand-alone approach to electronic records, it needs to define the functions, activities and work processes that ensure the survivability and accessibility of electronic records through time.

Although in some circumstances it may be useful to consider electronic records within the same context as all other records that are being addressed by an archives, in other cases it may be useful to establish a focus for electronic records in order to "jump start" an archival program that can be integrated at a later time. Archivists in an electronic environment can no longer afford to be, or be perceived to be, solely the custodians of physical records. They must understand the logical and virtual patterns that give electronic records their content, context and structure. In adopting this approach it will enable archivists to recast their mind set from one that was based on physical entities (generally rooted in paper) to one that is based on records regardless of their physical form.

4.2.4 Human Resources

An archives will need to be staffed by individuals who understand what a record is, what it means to keep a record, what an archival record is and how it should be kept and how to work well with others from other disciplines and communities. Knowledge of archival theory and record keeping concepts combined with an understanding of how modern organizations function and how technology is being used to manage records are fundamental. While extensive knowledge of information technology is an asset, it is not as crucial as the understanding of how technology impacts on record keeping. The ability to express requirements is more important than the ability to use a wide variety of technologies.

The core competencies (skills, knowledge, abilities, etc.) will need to be identified for all of those who will be involved in the management of electronic records. These core competencies need to be converted into job descriptions and statements of qualifications that may, in some circumstances, radically change the occupational profiles of those who are currently employed in the archives.

An archives will need to develop strategies that account for these radical changes. It will need to identify, define, and even develop, special training and education programs to ensure that staff in the archives as well as those who are key stakeholders are aware of what needs to be done to manage electronic records effectively. Recruitment programs and plans need to be established that help archives hire those who can meet the skill and knowledge requirements regardless of their professional or technical backgrounds. In this respect, a distinction will need to be made between what an archivist needs to know and what the archives needs to know. The archivist needs sufficient skills, knowledge and abilities to accomplish the individual job that he or she has been tasked to do. On the other hand, the organization requires a collective set of skills, knowledge and abilities to ensure that it can continually position and reposition itself in spite of the changes that may occur to the records and information management landscape. Such a corporate knowledge base reflects the fact that the whole of the organization can be and needs to be greater than the sum of the individual parts.

4.2.5 Communications/Public Relations

An archives will need to establish effective mechanisms for communicating not only information about its electronic records holdings but also about its programs and activities. It must be very clear about what "business" it is in, particularly if it is to establish close links with the creating organizations. The message concerning the role of the archives in electronic records and the approach it has adopted to position itself and to carry out its responsibilities must be clear and seen as being relevant to both records creators and those who will become potential clients.

In the ideal world, an archives should be positioned such that it can communicate the message that it is the authoritative source on what it means to keep records, the source of expertise for identifying and preserving records, and the acknowledged leader in all matters related to record keeping and the management of archives.

An archives should consider a variety of tools for broadcasting its messages. The use of the Internet and other electronic means should be considered because, on an increasing scale, users of electronic records are expecting that they can be serviced electronically.

Given the diversity of the clients that may be expected to use electronic archival records, marketing strategies should be shaped accordingly. An archives may need to change an existing marketing strategy if it is too highly focused on one client group. Similarly, given the diversity of the communities with which the archives must relate in order to ensure that electronic records are properly cared for in creating institutions, steps may need to be taken to reorient marketing and communications strategies to appeal to these diverse groups.

4.2.6 Community Management

Archives cannot do it alone. An archives cannot address electronic records unless it has allied itself or “partnered” with one or several other organizations. These can range from the creating organization to other related organizations that have an interest in the records, to research groups, to technology vendors, and so on. In building these partnerships, an

archives may need to consider the role of its traditional “partners”. In some countries, archives are expanding their focus

beyond their traditional allies, such as the records management community and the historical community, to embrace other seemingly disparate groups such as lawyers, auditors, and security officials, as well as research scientists, and program managers and staff all of whom have an interest in records and record keeping.

An archives established a partnership to develop a guideline on the management of electronic records. The partners included a representative from the national audit and evaluation association, the head of a government funded research organization, a leading specialist on security issues, the president of the local records management association, a senior management consultant from a leading consultancy firm, and the director of a major law enforcement program that is addressing record keeping issues - including potential archival requirements. All share a common interest in the issue and have agreed to contribute resources in the search for solutions.

An archives should also adopt an active role in the training and professional development of those in the creating organizations who will be asked (or required) to address record keeping in their organizations. Given the changes that are taking place, however, an archives may find itself having to take a leadership role to help ensure that core competencies (i.e., skills and knowledge) for record keeping are identified and that training, recruitment and education programs are established (in partnership with others) to ensure that a community is in place to support the record keeping needs of their organization, particularly in an electronic environment.

An archives conducted a study of the skills, knowledge and abilities that are required to establish a record keeping infrastructure in a large organization that is a heavy user of information technology. The results of the study were used to build a training program (in cooperation with the training and professional development group of the organization) for the records management program and training modules that could be inserted into existing training programs for the information systems staff. A special module was developed for the administrative staff of the senior executive area of the organization and an orientation module was designed for all staff regardless of their location or level within the organization.

4.3 Technology Implications

Regardless of the strategy employed, archives will need to establish an information management and information technology management plan that accounts for electronic records. The technology implications will vary according to the needs and characteristics of the archives. If a non-custodial or distributed custody role has been adopted, then the technology architecture may be in the form of tools that enable archives to monitor the integrity of its “virtual” archives or to help users navigate across various “archival” nodes that are supported by creating organizations. A custodial archives will require technology that supports the functions of archives such as acquisition, control, storage, and dissemination. Regardless, the archives will need to give expression to the set of requirements that can then be turned into technical solutions for dealing with electronic records. These requirements should address data as well as technology requirements for each of the processes of appraisal, preservation and access/use. They should also focus on the continued capability of organizations to migrate electronic records to ensure that they remain accessible in spite of changes to the technology. Finally, consideration should be given to ensuring that the technology architecture of the archives is in line with, or at least consistent with, the evolving technology architecture of the creators and users of electronic records.

In order to address these last points an archives should develop strategies that address data as well as technical standards. Similar to many organizations, the adoption of standards will promote greater connectivity thus enhancing the opportunity for organizations, including archives, to exchange information electronically (i.e., either across a given space at a single point in time or through a given time and space). In achieving the goal of interconnectivity, however, modern organizations are moving away from a strategy based exclusively on the

ICA Studies/Études CIA - Managing Electronic Records

adoption of national and international standards and towards a strategy based on the identification of combinations of de jure, de facto, and even proprietary standards. This strategy is in line with the reality presented by the global information technology industry, as well as the recognition that careful attention to the expression of the requirements for standards - coupled with the adoption of flexible standards strategies linked to strategic business and information technology plans - will be far more productive than rigid adherence

to only national and international standards. As a “business” concerned about the preservation and access of electronic records, archives should consider these and related developments in the standards field as they begin to develop their own standards strategies.

Archives must also assess the extent to which they should become involved in the standards development initiatives themselves. Given that the information technology architecture of an archives should be in line with the architecture of creating organizations and users, participation in for instance, a consortium of records creating organizations concerned with the development of effective standards strategies, will likely be more advantageous than if the archives attempted to identify or develop the standards themselves.

Part II

This part of the Guide represents a first attempt by Committee members to articulate tactical approaches to the management of archival electronic records based on the concepts and strategies discussed in Part I.

Section A, which is intended to be the first in a series of discussion papers exploring issues associated with identifying and managing the various categories of electronic records commonly found in many organizations, focuses on records in a database environment. This paper will be reviewed and finalized by the Committee over the next year, and papers addressing additional categories will be included as the categories are defined.

Section B elaborates upon the strategies described in Chapter 3 of Part I. It discusses methods and tactics that can be employed by an archives to address the management of archival electronic records, and focusses on preservation and access.

Section A

Categories of Electronic Records

Chapter 1

Records in a Database Environment

1.1 Databases - Content, Structure and Context

A database is an organized (structured) collection of interrelated data. It comprises two essential parts: the elements or individual pieces of data contained in the database (the content), and the structures which organize these pieces. Both the content and the structures are essential parts of database records.

In its simple form, a database is a register. Thus, some databases have their parallel in traditional paper registers (like, for instance, parish registers and other personal records) and cardex files. Others have a structure too complex to be compared to any kind of records in the traditional paper world. A database is logically structured as a table with rows and columns. The more complex, modern databases consist of a number of interrelated tables, and there are references from information in one table to corresponding information in another. For example, in an employee database there will typically be one table with basic information on each employee, one table describing each position an employee may hold, one table which identifies each department a position can be connected to, etc. Then, for each person in the employee table there will be a reference to his or her position in the position table, and from there a reference to the department (in the department table) to which the position belongs.

There are different types of such references, some of them wholly dependent on software and sometimes even hardware. But most modern databases are standardized on the principles of relational databases - that is, the reference from one table to another is the identification key of the element it refers to, a principle which is independent of hardware and software.

The development of databases has gone from the simple and non-standard (first generation) to the more complex and standardized (third generation?) relational databases. But the main logical structure - tables with rows and columns and some kind of references between tables - is very much the same, and old non-standard databases can (and probably should) in many cases be transformed to a relational database structure in order to process them with standard software. However, modern databases are growing beyond the relational database structure, for instance by integrating text files, images, sound, etc. Such integrated systems, including hypertext, multimedia systems, distributed databases, and object-oriented databases will not be treated specifically here.

Following widely accepted principles for system development, a logical schema, or logical data model, is constructed which defines what data will be captured in the system and how it will be organized. This schema should be prior to any implementation of the database. The implementation, i.e. the logical structure of the database, should embody the logical schema. However, sometimes the logical structure of the database does not exactly conform to the logical schema, due to limitations in the available software.

Both the logical schema which guides the design of the database and the logical structure of the database as implemented must be maintained as long as any of the data is maintained in order for the database to serve as a record system.² The

²³/ In contrast, the physical storage format (the physical structure) of the database is insignificant for recordkeeping, see Chapter 2, Section 2.2.

logical schema for the database is essential contextual information which relates the database to the business functions and the needs it serves. The logical structure of the database, as implemented, is structural information necessary to retrieve, access and validly interpret data in the database.³

Database structures, in addition to the above logical structures, also include presentation structures. Whereas the logical structures organize data for storage and processing, the presentation structures are visible structures used by individuals to input data into the database and to access and view data. They include forms, reports, queries, views and derived files.

The content (the data) of a database can, and normally will, be changed over time. As a matter of fact, one of the main problems from an archival point of view is that a number of databases are more or less continually updated - part of the content being deleted and replaced with new information. It is a great challenge for the archivist to identify, select and capture immutable records within systems like these. However, quite a few national archives around the world have developed procedures and have rather long experience in selecting and preserving these kinds of records.

1.2 Identifying Database Records

From an archival point of view, one of the main problems is how to identify records within a database environment. What are those pieces of recorded information that constitute records?

There seem to be different opinions as to whether databases themselves are or contain records. On the one extreme you will find the view that databases just contains data or information that are not part of business transactions and which therefore do not qualify as records. On the other hand there is the opinion that databases in general are the result of business activities and that they as such qualify as records, provided that the requirements of evidence are met. This or similar concepts of records are, for instance, included in archival legislation in several countries. Databases may qualify as or contain records, provided that the requirement of the concept of a record is met. These requirements are met when the database provides evidence of business activities, which, inter alia, is depending on the recording of the necessary metadata and other contextual information in order to preserve and retrieve the content, structure and context of the record. What constitutes a single record will depend on the business activities reflected in the database. But the database as a whole should in most cases be regarded as a compound record, and it is recommended that it is scheduled comprehensively - that is, the entire database system (see below).

Transactions related to databases can also produce separate records. This relates both to updating transactions and to information retrieval from the database.

An updating transaction can be recorded by means of an automatic logging function in the system, and thus create a record that provides evidence of the transaction. The content of such a record would typically be as follows; the information that was deleted and the information that replaced it, date and time of the transaction, initials of responsible officer, etc. This kind of record can be stored as an integral part of the database system, or it may be stored separately, for instance as an "historical file".

Lots of transactions can and normally will be based upon information retrieval from a database, especially databases designed for administrative purposes. These transactions can either be conducted manually by a user, or automatically by system routines. For example, an officer may collect information from one or more sources in one or more databases or other electronic information sources onto his screen. This information on the screen is not a record, but he or she may choose to send it by e-mail or record it on some other medium (electronic, paper, etc.) and thus create a record of the transaction. Or the information collected on the screen can be included in some other record like a letter, a memo, etc., which is sent by e-mail or printed on paper. Some database systems will

³4/ See also Chapter 2, Section 2.2 on metadata.

automatically produce standard letters and other records, for instance, to give information to a specific target group, remind clients of certain time limits, etc.

These kinds of transactions apply the presentation structure of the database - the input presentation structure for updating, the output presentation structure for information retrieval. These presentation structures should be considered as themselves records, analogous to the master copy of a paper form. Principles applicable to the retention of forms should be applied to the retention of records of presentation structures.

1.3 Some Principles for Managing Database Records

Decisions on the retention of database records should be taken at the system design stage as part of a comprehensive records schedule for the entire system. If such decisions are not made deliberately, they will nevertheless be an implicit part of the system design, determining for example what records are created, which of them will be retained and how they are to be stored. The implication of this is that important records management and archival decisions must be taken as part of the system design, even before one single record is created.

The retention of database records is complex because both the structures and the data (content) can be changed over time. When either the data contents or the structure of a database is changed, the record is altered. Such alterations are necessary and proper, if the database is to serve as an effective tool in the conduct of business.

Changes in the contents of a database should be managed in accordance with records management principles. In a well-designed database, the logical schema will include rules governing when data may be added to a database, replaced, or deleted from the database. These rules should adhere to the same criteria as govern the retention of any records. The need to retain records in a database derives primarily from the business purposes the database serves, and secondly from laws, regulations or policies concerning the activities or entities documented in the database. These business and legal requirements should be incorporated in the database design, and in the mechanisms implemented to control alterations or deletion of data. These requirements should also be reflected in the records schedule applicable to the database.

When changes in the logical structure are made, documentation of the superseded structure should be maintained for as long as it is necessary to maintain any records to which the superseded structure(s) applied. When major redesign efforts are undertaken, the record(s) applicable to the database should also be reviewed.

Databases should be scheduled comprehensively - that is, the entire database system, including inputs, outputs and necessary metadata and documentation should be scheduled together. Requirements for retaining data should be defined at all levels of the database structure.⁴ In addition, retention requirements should be defined for the presentation structures implemented as persistent options in the database.

Records from updating transactions should be retained if there is need for documentation of these transactions as such, or if the retention procedures implemented in the database are not able to retain records that are of business or archival value, before they are altered. In other cases, there probably will be no need to retain records from updating transactions once the data is stored in the database.

Output presentation records should be retained when there is need to document that these transactions took place, or when they play a role as evidence in a context outside the database system, for instance as part of a case file.

In other cases, the need to retain output presentations can be satisfied by retaining the capability of reproducing the same output from the database.

⁴5/ The relevant levels normally will be: Data element, "record"(the IT term), file and database, where a "record" is a set of data elements, a file is a set of "records" and a database is a set of related files. Please note that "record" in IT terminology is not equivalent to the archival term *record*.

Section B

Methods and Tactics

Chapter 1

Preservation

1.1 Preservation of Availability

The fundamental requirement for preservation is that the records remain physically intact, identified, and readable. “Readable” electronic records are recoverable from storage for processing by a computer or presentation to humans.

Both physical stability and technological obsolescence of digital media may cause problems in reading the records. The choice of media for preservation should be based on the following factors:

The physical format (e.g., bit density, track density, sector size, block size, parity bits, file marks) and the means of identifying and locating each file written on a media volume should be subject to, and in conformance with, open standards.

The technology should provide robust methods for preventing errors in writing information on the medium and for detecting errors in reading. Error detection methods should detect and report errors at the bit level, or at least at the byte level. Error reporting mechanisms should report all errors that are not resolvable through parity checking.

The medium should have sufficient market penetration that additional supplies and support (including the equipment to read and write) can be expected to be available over a length of time which makes it economically viable to use the medium. Two important indications of market penetration are (1) the existence of multiple sources of supply for both the medium and the hardware and software necessary to use it, and (2) the existence of a defined migration path for improved versions of the medium.

The intrinsic longevity of the medium should be known.

Susceptibility to factors, such as changes in temperature or humidity and interactions with contaminants, should be well known. Methods to minimize or eliminate external threats should be available and affordable.

The costs of acquiring, using, and maintaining the medium and the equipment and software to read, write and store the medium should be reasonable and, other factors being equal, should compare favourably with alternatives.

The availability of sound and feasible methods for recovering from loss of content due to natural deterioration or external factors enhances the value of a medium for archival preservation.

Records should be migrated to new media before the current one deteriorates or becomes obsolete. Both periodic inspections of storage media to identify any deterioration and continuing review of the evolution of the technology for signs of obsolescence are needed to determine when to migrate records.

1.2 Preservation of Accessibility

ICA Studies/Études CIA - Managing Electronic Records

Accessible records can be selected within search strategies consonant with the way the creator organized the records and presented in an historically authentic form. Preservation of the binary digits that make up an electronic record is necessary, but it will not be sufficient. Retrieval of electronic records requires transforming the binary digits into forms

that are readable by humans. The processing required for this retrieval will vary, depending on what hardware and software the creator used to create, process, and store records.

If the technology on which the records depend is no longer available, the records will no longer be retrievable unless they are modified to accommodate technological changes. There are five possible ways to address this problem.

1.2.1 Preserve the technology on which the records depend

This option would be increasingly difficult and costly to implement over time. The technology will continue to change with no foreseeable end. Eventually, all of the specific technology on which any electronic records depend will become obsolete. Preserving accessible electronic records on obsolete technology would entail not only repairing, but eventually also fabricating complex hardware which is no longer available from commercial sources. It would also entail an expanding requirement for expertise in increasingly arcane software.

1.2.2 Eliminate dependency of the records on specific technology

This option would involve using standard technology to retrieve records. This option has been used for several decades for simple forms of electronic records, such as narrative documents in plain text and databases in the form of independent logical files. This approach may be feasible for complex forms of electronic records in two types of cases:

- when such forms are subject to open standards, and

- when software is available which faithfully translates file formats. This option would be expensive to apply to electronic records in proprietary formats when conversion software is not available at a reasonable price.

1.2.3 Preserve operational software

Another method for preserving retrievable electronic records involves:

- preserving the applications software on which the records depend;

- preserving the operating system under which the application software runs; and

- using specialized software to run obsolete operating systems "in emulation" under current operating systems. This method eliminates hardware dependencies and provides for authenticity of retrieved records. However, there are difficulties with this approach. First, it assumes that it will be possible to run any operating system under an emulator indefinitely into the future. There is no guarantee that this will be possible. Secondly, the original software usually enables creation and alteration of records. Either this capability will have to be disabled or user access must be limited to copies of records and the copies will have to be replaced or audited after each use. Thirdly, given the diversity of applications software, and the rapidity with which it changes, this method would entail an ever expanding requirement for in-depth expertise in obsolete software.

1.2.4 Preserve visual presentation capability

Another method for preserving the accessibility of electronic records is to use techniques which present the records to users in their original visual format. Currently, there are four techniques to view electronic records in their original format independently of the original software:

- through special purpose software known as "viewers";

- through standardized codes governing presentation;

through preservation of electronic images of documents; and

through preservation of paper or microform printout of the records.

1.2.5 Eliminate inessential dependencies

A final method for retrieval involves eliminating any dependencies on specific technology which are not essential to preservation and access. There are two categories of dependency that can be eliminated. One derives from the functionality of the software used to create and store the records. Functionality which enables addition, deletion, or alteration of records should be eliminated for archival records. The other category comprises aspects of the records that are simply artifacts of the original technology and not essential characteristics of the records.

An example of a technological artifact is the physical file structure used by a database management system (DBMS). A DBMS writes files in a way that optimizes storage and retrieval on the specific computer and operating system being used. The DBMS may write the same data, with the same conceptual definition and organization, in different physical files on different computer systems. Thus, the physical files are artifacts of technology. In contrast, the conceptual definition and organization of the files, and the data themselves, are essential parts of the record.

Discerning the essential characteristics of records enables archivists to define the requirements for preserving records, rather than assuming that the technology has to be preserved. Often, the essential characteristics can be preserved independently of the original technology.

In practice, the custodian of archival records may find it appropriate to use several of the techniques described above. The custodian should select and combine techniques with the goal of enabling the retrieval of records which maintain their historical form, content, and relationships to other records. Whenever maintaining accessibility entails changing the technical characteristics of electronic records, such changes should be the minimum necessary to maintain retrievability, and the results should be as consistent as possible with the original character of the records. Whatever changes are introduced for purposes of preserving records should be completely and accurately documented.

1.3 Preservation of Understandability

While retrieval and presentation are essential for any use of archival records, these processes alone will not guarantee that the records can be properly interpreted and understood. To understand a record, it must be possible not only to know the record contents, but also to be able to relate the way the contents are structured to their creation and use by the creator.

Preservation of an understandable record entails preservation of information about the record. Some of the necessary information will be found in related series of records, such as systems documentation and user manuals. This includes the rules and or conventions, according to which information is conveyed by structure and position, that are known by humans or available to computers and also the rules or conventions for interpreting information which is not stored or available in its full natural language expression.

Full understanding may also entail appreciating that certain information is not contained in the record. For example, things that are common in a business process, such as the policies and procedures which govern the process, often are not mentioned in the records which document each instance of the process. While such policies would be familiar to those involved in the process, the researcher using archival records would need access to contextual information describing the policies in order to understand the record.

The information available from related records series will have to be supplemented with archival descriptions of the provenance of the record and of the historical context in which the record was created and used.

1.4 Preservation over the Life-Cycle Stages

As with appraisal, preservation should be addressed as early as possible in the life-cycle of records, at the conception stage, and appropriate follow-on actions should be taken in the creation and maintenance stages.

1.4.1 The Conception Stage

The best practice is to articulate preservation requirements for archival records at the conception stage, when a record keeping system is being designed. Preservation requirements should derive directly from the appraisal of the records. A preservation plan should be formulated around these requirements. The plan should delineate how the records should be preserved across time and technology.

Planning for preservation should determine when to capture archival records. This will not necessarily be at the end of the life-cycle. Dynamic, real-time systems might not produce discrete aggregates of records no longer needed for current business. When the same units of stored information are used in multiple records in the system, the same stored unit may be part of both active and inactive records. (For example, static information identifying a corporation which is subject to government inspection may be stored once in the record keeping system, but used or incorporated, in records of several inspections.) In such situations, it may be necessary to add to the design of the system processes which identify and capture complete closed records and transfer them to an archival system or subsystem. In such situations, the same units of information might be captured several times, but each set of records output from the capture process would constitute a unique archival resource; that is, the historical record at the time of capture. The timing of capture of archival records should be determined by appraisal criteria, not by technological considerations. Given the ease and economy with which electronic records can be copied, archival records can be captured at any appropriate point in their life cycle.

1.4.2 The Creation Stage

When archival records are identified and a preservation plan established at the conception stage, preservation activity in the creation stage involves monitoring records creation practices to ensure that the records are created as expected and that they can be available, retrievable and understandable over long periods of time.

When there is no archival involvement in the conception stage, the archives should seek to be involved at the earliest possible phase in the life of a system. Solving problems after the fact is likely to be more difficult than preventing such problems ahead of time. Preservation problems are apt to get worse, and more difficult to solve over time. If preservation was not addressed at the conception stage, archivists should analyse records creation practices to determine if it will be possible to preserve the archival records, and to identify any changes that would improve or facilitate preservation.

1.4.3 The Maintenance Stage

During the maintenance stage, monitoring and corrective follow-up actions are necessary to ensure that decisions taken in the conception and creation stages continue to be respected. In the maintenance phase, the record keeping system should be monitored to identify when changes occur, or are likely to occur, that might impact the availability, retrievability or understandability of the records over time. Such changes could occur in the records life cycle, the record keeping system, the enabling technology, or the custody or control of the records.

In many cases, electronic records are created without addressing archival issues in the conception or creation stages. In such cases, archives will have to deal, in the maintenance stage, with existing electronic records systems that do not satisfy archival requirements adequately. Dealing with preservation after the records have been created will be challenging, and perhaps extremely difficult. In such cases, the archives will still need to articulate preservation requirements. The options will be constrained by the existing system design and by the choices that have been made on implementing that design. There may be cases where the existing system precludes the possibility of preserving accessible and understandable records over long periods of time, or makes such preservation extremely

difficult or expensive. In such situations, the archives should determine if the difficulties result from the business requirements of the organization

which creates the records or if they are consequences of the technology chosen to satisfy the business requirements. If the difficulties derive from the technology, the archives should suggest that the records creator alter the technology; that is, that it should redesign its record keeping system. Any such redesign should avoid any alterations in the content, context or structure of the existing records which would diminish their authenticity.

Whether the archives were involved from the conception of a record keeping system or not, it will have to deal with changes in the system over time. As with the life cycle of the entire system, archival involvement in system changes should occur at the earliest opportunity. If a proposed change will significantly alter the content, context or structure of existing records, it may be necessary to capture existing archival records as historical evidence before the change is implemented, even if the information in those records will be migrated into the revised system.

Chapter 2

Access

The prerequisite for providing access to archival electronic records is to take adequate and appropriate preservation actions to ensure that the records remain available, accessible, and understandable. In addition, the methods used to respond to demands for access must ensure that the records are delivered in authentic form with respect to content, structure and context.

2.1 Intellectual Control

Intellectual control ensures continuing accessibility of the records by identifying and describing them. By doing so, it defines the requirements for access to authentic records. (This information is also used as a control in decisions about migrating electronic records across generations of technology.)

The description of electronic records, as of records in general, should include both contextual information and metadata. Contextual information describes the context in which the records were created, including the purpose(s) for which the records were created, the creating organization(s), the functions and activities in which the records were created and used, and historical circumstances which significantly influenced the creation or maintenance of the records. Metadata is technical data about electronic records, such as that which describes the organization and internal structure of the records and rules governing the addition, deletion or alteration of records, or the interpretation of contents.

Identifying records begins with identifying the media on which the records are stored and the specific files written on each unit of media. For electronic records, identification also requires specifying the relationships between the records and the physical files that are written on the media. This may be a simple, one-to-one relationship. (For example, a letter may be stored as a single word processing file.) But it may be very complex. (For example, a report may be a compound document stored in several physical files.) This level of identification is necessary, but it is inadequate for purposes of intellectual control. Enabling users to identify what records exist, to determine the relevance of the records to their interests, and to access and understand the records requires intellectual control and description of the content, context, and structure of the records.

The description of electronic records requires completely and correctly defining the internal structure of a record and relationships among records. In simple cases, such as a document in plain ASCII, the description of internal structure may require no more than describing the genres of the documents (e.g., correspondence, reports). In more complex cases, the description of the internal structure may require technical information about how structure is embedded in physical files and about the processing required to realize the structure when the record is accessed. (For example, for a document whose internal structure is indicated by Standard Generalized Markup Language

codes, it would be necessary to have the definitions of the codes actually used and information that, in order to access the document, software is required which can translate those codes to make the document appear as it should.) In yet more complex cases, the internal structure is not expressed in the file containing the contents of the records. Rather, the structure is superimposed

at the time of access. (For example, a database file may simply contain a continuous string of data, but no codes that indicate where one data record or data element begins and another ends. The logical structure of this data file would be described in another file which defines the logical record layout.) In such cases, description would have to identify what structural data is required, where it is found, and what processing is required to implement the structure when the record is accessed.

Some of the information necessary to identify and describe electronic records will be found in the creator's records. Other descriptive information will have to be created in accordance with archival standards. This will be especially true in the case of systems or bodies of related records that extend across organizational boundaries.

Each archives will have different requirements for intellectual control of records. In all cases, nonetheless, intellectual control is crucial for electronic records. Intellectual control over electronic records will also require identification of any legal restrictions applicable to the records.

2.2 Methods for Providing Access

This section discusses ways of providing access to electronic records which are no longer maintained in the record keeping system in which the creator stored them to satisfy its business needs. Records which are stored in the original record keeping system can be accessed through the means provided in the system for satisfying the creator's access needs.

There are three general methods of providing access to archival electronic records that are no longer maintained in the original record keeping system: copies on physical media, copies delivered through telecommunications, and on-line on a computer system. These methods may be used in various combinations, depending on the character of the records, the nature of the demands for access, and the resources of the archives or other institution responsible for providing access.

2.2.1 Copies on Physical Media

Copies of electronic records may be provided to researchers on digital media. The media used for this purpose should be convenient for researchers to use. When requests for copies are received from government agencies, universities or corporations, the most appropriate media are likely to be those used on mainframe and other large computer systems, usually some form of magnetic tape. For researchers who use personal computers, floppy disks are appropriate for small volumes of records and writable Compact Disk-Read Only Memory (CD-ROM) for large volumes. When copies are provided on digital media, the responsibility for computer hardware and software necessary to retrieve and use the records is usually left to the researcher.

The archives may provide services which go beyond one-to-one copying of digital files which contain or constitute one or more electronic records. These services might include allowing requests which select less than an entire file and then producing a copy of only what was selected. Additional services would also be needed to produce a copy of any record which is stored in more than one file.

Some researchers may not have access to computers or software suitable for accessing archival records. For such clients, it may be preferable to provide copies on media such as paper or microfilm. This method has all the drawbacks inherent in using such hard media; furthermore, there are some forms of electronic records, such as complex databases, which cannot authentically be presented in a single linear format. Nonetheless, production of printed copies will be appropriate for certain types of demands, such as for limited amounts of data from a database or for textual documents. Providing printed or microform copies will require the capability to format electronic records in a human readable form for output.

2.2.2 Delivery Through Telecommunications

The rapid growth of the Internet makes the use of digital networks for delivering copies of electronic records an increasingly attractive method. If the archives, or other access provider, has access to the Internet or dial-up digital communications, then this method will be very similar to providing copies on digital media. There are certain advantages to using telecommunications rather than digital media. Stocks of media do not have to be acquired or stored. There is no need to box and ship media to the researchers, or to track lost shipments or deal with damage in shipment. Delivery through networks is generally highly reliable, and it is faster.

2.2.3 On-line Access

On-line access to electronic records can be provided either on a computer system located in the archives or another research facility, or through telecommunication over the Internet or dial-up digital communications. This method requires the archives, or other provider, to have adequate and appropriate computer resources for retrieving, processing and presenting the records. It will also require providing technical assistance to researchers using the system. Use of a system where access is available only on equipment located in the archives or research facility is probably easier to manage than providing telecommunications access to the system. However, use of telecommunications enables researchers to access the records wherever they are located, without having to go to the archives. Telecommunications also opens up the possibility that more researchers can simultaneously access records than would be possible on a closed system; however, realizing this possibility will depend on the amount of computer resources that are available for remote access.

On-line access, whether in-house or through telecommunications, does not necessarily mean that the records have to be maintained on-line. Demands for access to most series of archival records are so infrequent that on-line storage would be unnecessarily expensive. Descriptive information sufficient to inform researchers what records exist and to enable them to make informed decisions about what records they would like to access should be maintained on-line. The access system should be designed to enable records to be brought on-line rapidly in response to a request. To the extent possible, the user interface for access to electronic records should be consistent with the interface for description.

2.3 Responsiveness to Changes

As with the technology used to create and store records, whatever system is developed to provide access to archival records will be subject to obsolescence. The rapidity with which the access system is likely to become obsolete will increase under the pressure of rising expectations of users. As the technology advances, researchers will want to profit from improved capabilities in accessing archival electronic records. To remain responsive to user demands, an archival access system will have to be developed with flexibility in mind. Designing an adaptable access system will also enable the archives to respond more readily to changing researcher interests. Using generic tools, such as full text searching software for textual documents and powerful data retrieval software for databases, rather than retrieval programs which are tailored to individual series of records, will make it easier to adapt the access system to changing demands over time.

2.4 Actions Related to Access over the Life Cycle

2.4.1 Conception

Access to archival electronic records, like other parts of the archival functions, should be addressed as early as possible in the life cycle. Ideally, this should start at the conception stage. Methods of identifying and accessing archival records should be defined as early as possible, and built into the design of the system. The design should identify all types of archival records, including metadata and other technical information necessary to retrieve and interpret records, as well as the records which document the transaction of business. The system can be designed to standardize and automate the production of metadata and contextual information.

Access restrictions which are applicable to the records should be specified, and the system design should incorporate effective and efficient ways of implementing such restrictions. Life cycle planning of the system should also provide for removing restrictions when they are no longer applicable. When archival records are appraised at the conception stage, the system can be designed so that requirements for long-term access are applied only to those records that are to be retained beyond the agency's immediate business needs.

2.4.2 Creation

As with appraisal and preservation, when archival requirements are addressed in the conception stage, records creation and maintenance will need to be monitored to ensure that actual practices comply with decisions made at the conception stage and also to identify any developments that would require these decisions to be re-evaluated. It is especially important that archival records be identified as such when they are created and that adequate contextual information and metadata be captured with the records.

2.4.3 Maintenance

When archival requirements are addressed during the conception stage and built into the design of the system, the most important actions to ensure long-term accessibility during the maintenance stage will be to implement the design and adhere to plans developed earlier. Active steps should be taken to ensure that necessary contextual information and metadata provided for in the design of the system is in fact retained for the life of the records.

If the records have not been appraised previously, all records in the system will have to be maintained in a manner that will enable long-term use. Similarly, if adequate means of identifying and describing the records have not been built into system design, they will have to be developed after the fact. Contextual information and metadata necessary for retrieval and basic interpretation of the records may be very difficult or impossible to construct if attention has not been paid to these requirements from the start.

Access will occur during the maintenance stage of the life cycle. As long as the records are maintained in the creator's record keeping system for active records, access can be provided from that system. However, it may be desirable to provide access outside of the active system in order to ensure operational efficiency of the system or to protect the system from risks entailed by providing access to persons outside of the creator's organization. This may be accomplished either by removing the archival records from the active system or, if the archival records are still needed for business, by creating a copy of the records.

Intellectual control of archival electronic records that are transferred to the custody of the archives should be integrated with intellectual control of other related records in the archives. Relevant contextual information and metadata produced by the records creator should be transferred to the archives together with the records. When archival electronic records are not transferred to the custody of the archives, the archives should still establish and maintain intellectual control sufficient to monitor the continued preservation and accessibility of the records. The archives should strive to create and maintain an integrated system of information about all archival records, wherever they are maintained, so that users will be able to identify and locate all relevant records.